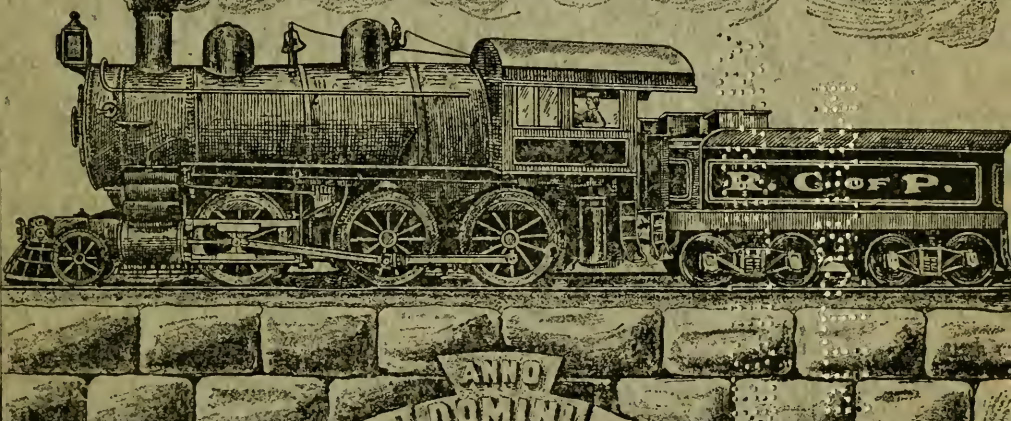
RAILWAY CLUB OF PITTSBURGH.

OFFICIAL PROCEEDINGS.



PITTSBURGH, PENNSYLVANIA.

FOR SALE

INDEX—ADVERTISERS.

OFFICIAL PROCEEDINGS

of the

Railway Club *of* Pittsburgh.

ORGANIZED OCTOBER 18, 1901.

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Meetings held fourth Friday each month, except June, July and August.

PROCEEDINGS OF MEETING, NOVEMBER 27, 1908

The meeting was called to order at the Monongahela House, Pittsburgh, Pa., at 8 o'clock, P. M., with President D. J. Redding in the chair.

The following gentlemen registered:

MEMBERS.

Alleman, C. W.
Ault, C. B.
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Barnsley, Geo. T.
Beatty, E. G.
Bihler, L. C.
Brand, Thos.
Brown, E. W.
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Courson, Chas. L.
Cox, P. L.
Crouch, A. W.
Curtis, H. C.
Davis, G. H.
Deckman, E. J.
Elmer, William.
Gallinger, Geo. A.
Geary, Chas. J.
Gilg, Henry F.
Grove, E. M.
Gulick, H.
Hall, C. W.
Haring, Ellsworth.
Henderson, J. W.
Hoffman, N. K.
Hood, D. G.
Howe, D. M.
Hughes, J. E.
Huyett, E. G.
Hyndman, F. T.
Irwin, O.
Kessler, D. D.
Keyser, R. H.
Kinter, D. H.
Knickerbocker, A. C.
Knight, E. A.
Krause, Julius.
Laughlin, C. W.
Lobez, P. L.
Long, R. M.
Lynn, P. A.
Lynn, Samuel.
Malloy, M. A.
Mason, Stephen C.
Mercur, H. T.
Millar, C. W.
Miller, F. L.
Miller, M. M.
Murphy, W. J.
McFeatters, F. R.
McIlwain, J. D.
McKee, D. L.
McNulty, F. M.
McVicar, G. E.
Neely, J. L.
Neison, W. J.
Nickerson, S. N.
Noble, D. C.
Oliver, W. H.
Peach, W. M.
Peacock, W. W.
Phelps, W. H., Jr.
Porter, H. V.
Quest, W. O.
Redding, D. J.
Robinson, F. M.
Sattley, E. C.
Schuchman, W. R.
Sitts, Lewis S.
Smith, H. H.
Snyder, F. I.
Spangler, C. P.
Stark, F. H.
Stuart, M. D.
Stucki, A.
Summers, E. W.
Swann, J. B.
Swartz, H. E.
Taylor, H. G.
Thomas, C.
Tucker, John L.
Turner, L. H.

Walker, G. G.
Walker, J. W.
Walther, G. C.
Warne, J. C.
Warnock, H. R.
Weigel, F. S.
Whited, Willis.
Wood, W. B.
Woodworth, R. B.
Young, W. W.

VISITORS.

Bell, R. E.
Bennett, R. G.
Carson, Robert, Jr.
Cox, F. W.
Cunningham, Robert I.
Fray, Samuel.
Gale, G. W.
Hudson, Wm. H., Jr.
Johnston, John McC.
Marquis, E. M.
McGinnis, B. B.
Newman, J. C.
Patterson, E.
Reid, W. S.
Robbins, A. E.
Runser, K. W.
Ryerson, Donald M.
Schaefer, Frederic.
Smith, Sion B.
Stroud, B. B.
Trax, E. C.
Washabaugh, B. N.
White, T. R.
Wilson, A. V. F.
Wood, William M.

The minutes of the last meeting being in the printer's hands, the reading of them was dispensed with.

The Secretary read the following proposals for membership:

Altman, C. M., Asst. Foreman Car Inspector, P. R. R. Co., Grapeville, Pa. Proposed by Chas. L. Courson.

Atherton, Henry N., Yard Master, Green Ridge, D. & H. Co., 2004 Boulevard Ave., Scranton, Pa. Proposed by J. H. Rosenstock.

Berg, Karl, Draftsman, P. & L. E. R. R., No. 119 Spences Lane, McKees Rocks, Pa. Proposed by Vincent J. Burry.

Cunningham, R. I., Inspector, W. A. B. Co., 418 West Street, Wilkinsburg, Pa. Proposed by J. W. Walker.

Garwood, A. L., Car Estimator, Pressed Steel Car Co., 25 Dunbar Ave., Bellevue, Pa. Proposed by A. C. Knickerbocker.

Huggans, J. H., Freight and Pass. Agent, Monon., Penn'a. and P. & L. E., Brownsville, Pa. Proposed by H. V. Porter.

Husband, C. M., Civil Engineer, Pressed Steel Car Co., McKees Rocks, Pa. Proposed by F. E. McKee.

Khuen, Richard, Resident Engineer, American Bridge Co., Frick Annex, Pittsburgh, Pa. Proposed by F. H. Stark.

Lawrence, R. E., General Agent, Wabash R. R., 317 Fifth Ave., Pittsburgh, Pa. Proposed by J. L. Neeley.

Matthews, J. A., Foreman Pass. Cars, P. & L. E. R. R. Co., Pittsburgh, Pa. Proposed by J. D. Conway.

Patterson, R. F., Asst. to Electrical Engineer, Pressed Steel Car Co., McKees Rocks, Pa. Proposed by F. E. McKee.

Smith, Russell, Master Mechanic, Pressed Steel Car Co., McKees Rocks, Pa. Proposed by F. E. McKee.

Thompson, B. E., Chief Clerk, Freight Train Master, Penn'a. R. R., Union Station, Pittsburgh, Pa. Proposed by J .S. Fleck.

Van Horne, F. P., Treasurer, Pressed Steel Car Co., Farmers Bank Bldg., Pittsburgh, Pa. Proposed by F. E. McKee.

Winterrowd, W. H., Round House Foreman, L. E. A. & W. Ry., P. O. Box 201, Alliance, O. Proposed by H. J. Speck.

The Secretary announced the death of Mr. Wilson Miller, a member of this Club, whereupon the President appointed Messrs. L. H. Turner, H. B. Ayers and Jas. D. Rhodes a committee to draft suitable memorial resolutions.

PRESIDENT: If there is no further business to come before the meeting we will proceed to the paper of the evening, by Mr. N. K. Hoffman, Superintendent Car Service, P. & L. E. R. R., on "Transportation." I take pleasure in introducing to you Mr. Hoffman.

TRANSPORTATION.

BY MR. N. K. HOFFMAN, SUPERINTENDENT CAR SERVICE, PITTSBURGH & LAKE ERIE R. R.

Transportation comprises traffic, travel and communication. It is concerned with the movement of persons and things, and with the transmission of ideas. Under this head we have the telegraph and telephone, and the wireless telegraph, as well as water and rail transportation.

A great many years ago Noah went into the transportation business, and it has been growing ever since. To-day we have transportation by water and by rail; the force behind it being steam and electricity. Recent experiments indicate that possibly before another decade we will be traveling through the air; but I shall not try to predict the force behind the airship.

I shall confine my remarks, however, principally to railroad transportation. Every man in the land is interested, at all times, in railroads, and the transportation of persons and property over them; the price of whatever he eats, or wears, or uses, the cost and comfort of travel, the speed and convenience with which he shall receive his mail, and the current intelligence of the day, and even the intimacy and extent of his social relations are all closely interwoven. The business employs great numbers of persons. The relative proportion of railway employes has been growing rapidly each year, until now one person in sixty of the population of the United States is employed in the railroad service. The relation of the Government, local, State and Federal, to transportation is so intimate that a study of the transportation service of necessity involves a consideration of some duties and activities of the State; indeed, some branches of transportation, as the mail service, are everywhere carried on by the Government. Whether performed by the Government, or by companies, or by individuals, the transportation service is of a public nature; this is recognized by the State in the franchises giving to such carriers the power to take possession of private property they may need. "The State," to quote the language of the United States Court, "would have no power to grant the right of appropriation unless the use to which the land was to be put was a public one. Taking land for railroad purposes is a taking for a public purpose, and the fact that it is taken for a public purpose is the sole justification for taking it at all." Railroads are obliged to pay a good price for property taken, and therefore try to purchase direct from the owners before exercising their right to confiscate. Wherever you find man, you have transportation, and you will find it graded in accordance with the civilization of the people. To-day the Esquimaux's transportation is by sled, hauled by dogs. The North American Indian used poles tied together with thongs on which they piled their goods. In railroading to-day we must have the telegraph and telephone to enable the officials in charge to view the road, at all points, as a picture, and know where each particular train is located and how it is moving any hour of the day.

Previous to 1852 the Conestoga Wagon was the freight car through Pennsylvania, making the trip—Philadelphia to Pittsburgh—in 20 days. Conestoga Wagons were used between Greensburg and Mt. Pleasant until about 1870, when the Southwest Branch was built. These wagons, with their white covers and four to six horses, made a picturesque scene wending their way along the Old Turnpike.

As the result of cheap transportation, those who produce have multiplied their wants. Thirty to forty years ago the settlers in Kansas, Nebraska and other Western States often lived in "dug outs," with the ground for a floor and sod for a roof, all the personal effects of the family being taken care of under this roof. To-day all is changed. With the present highly developed railroad transportation service to aid them, their efforts are far more productive than they would otherwise be. The farmer, owing to this development by the railroads, obtains practically the same prices in the Middle West that are obtained in the East.

Previous to 1870 passenger cars were coupled with links and pins, and a sign was posted in each coach requesting passengers to be seated when the engineman sounded his whistle and before the train started. If you have ever ridden on a long freight train, coupled with links and pins, you know what it meant in the early days of railroads to be on your feet when the train started. The safest place was to be seated and brace yourself against the seat in front. Hand brakes were used, with the result that the train often ran past the station and valuable time was lost. The coaches were lighted with candles. First we had an improvement, the Miller platform and coupler, making the train more rigid; then the air brakes; first the lights were changed to oil, then gas, and later to electricity, until to-day our first class trains are palaces of luxury, with every convenience at hand, and a passenger can travel thousands of miles without leaving the train, and have all his wants supplied. In order to provide the best equipment, for the comfort of its patrons, the railroads in this country handle up-to-date Pullman sleeping cars, and are hauling two tons of dead weight for every passenger (provided each of the thirty-two berths are occupied) and any person that travels knows how seldom all the berths are in use.

The year 1830 and a few years before and after, were really the turning point in the career of the human race. From that year civilization began to rise by bounds. In 1819 the first steamboat crossed the Atlantic; in 1829 the first steam locomotive was imported from England, for use on a road built by the Delaware & Hudson Canal Company; in 1830 the Baltimore & Ohio opened a railway line 13 miles long.

Even after the rails were laid, for the first railroad, it was undecided whether to use horses or sails as motive power, experiments actually being made with sails. In 1844 Prof. Morse opened his telegraph line between Baltimore and Washington.

Speaking of steam reminds me of Pat's examination: "Can you tell me what steam is?" asked the examiner. "Why sure, sir," replied Patrick, confidently. "Steam is—why—er—it's wather thot's gone crazy wid the heat."

The first locomotive constructed for actual service weighed from three to five tons; total weight of train, ninety tons. On the Pittsburgh & Lake Erie we handled one car load this summer that weighed one hundred and eighteen tons; weight, car and lading, 138 tons. In actual practice to-day, on a great many railroads, a locomotive weighing one hundred tons hauls a train of four thousand tons. Early-day railroading differed greatly from that of to-day. For instance: The Board of Directors of a Michigan railroad balloted for captains of trains, and took the radical step of declaring that no credit would be given the railroad passengers.

Can a railroad executive of to-day conceive the state of mind of an early-day President of a railroad, owning but two locomotives, being obliged to sell one to a hated competitor in order to pay his taxes?

Communities bound themselves to give aid to railroads, and afterwards found they had bankrupted themselves. Some farmers subscribed for railroad stock and gave notes, and secured them by mortgages on their farms; the roads failed and the farmers lost their property. Afterwards the railroads were reorganized, and to-day the West owes her prosperity to the vast railroad enterprises that gives her quick transportation to all points.

Railroads have been harassed from the first. When the great bridge was built across the Mississippi, at Rock Island, in 1856, it was but a short time until St. Louis steamboat interests demanded its removal, as a nuisance, and in 1860 the United States Court, District of Iowa, adjudged this bridge a "material obstruction and a nuisance," and defendant was ordered to remove all the piers and superstruction within six months. But Abraham Lincoln, who was counsel for the bridge company, appealed to the Supreme Court of the United States, and a decision at Washington finally reversed the Circuit Court.

While the first steam railroad was operated in England over 80 years ago, in no country in the world are the equipment and appurtenances for railway travel equal to those available in the United States. Foreign countries are gradually adopting the type of cars used in this country. In England, however, they continue to use the four-wheel, small capacity goods cars for freight, and compartment cars for passengers, these being modeled after the old stage coaches.

When railroads first entered the transportation business in this country and you loaded a car on one railroad destined to a point on another road some distance from originating point the shipment was transferred at the junction point, this being repeated by each road until it reached destination. Now this is all changed, and to-day when you want to make a shipment, there is practically one railway with two termini, the originating point and point of delivery. A shipment will travel from Maine to California in one car. Last year some railroad men undertook to transfer loading at junction points in order to avoid paying per diem on the foreign car. This was a short-sighted policy.

and was stopped when the management of the roads had their attention attracted to the practice by a loss of traffic.

Several years ago a party of English railroad men visited this district, comparing English methods with those of the United States, and looking for something that would be an improvement on their methods. Now in England they usually check the work done by each employe to see that it has been performed properly. They asked how we handled requisitions for cars in this country. When told the Yard Master was directed to place a particular kind of car on a designated track for a firm to load, they immediately asked how we knew the Yard Master had complied with instructions. They stated it was their practice to send a man through the district once or twice a day to check the orders and see that cars had been placed as ordered. I have heard it said, when an agent sells a sewing machine on the installment plan in England, a spotter is sent the next day, who goes through the same formality as the salesman, that is, to take the name and address of the purchaser, and number and kind of machine, and reports to headquarters, and a second man is sent to see if the first two have performed their duties in a proper manner.

In the handling of carload shipments of merchandise and mill products we have to-day a system of checking each shipment that fills all the requirements of our English brothers without the expense and red tape. To-day the railroads are handling frieght of all kinds with greater dispatch than ever before, this being an Age of Advancement. Your shipper is demanding that quick delivery be made, and this is true of the low-class commodities as well as fresh meats, fruits, vegetables and perishable freight. To-day the railroads are handling many perishable articles in freight trains that were formerly shipped by Express, or on passenger trains, and the demand continues for improved service. Take merchandise and other high-class frieght. It is the practice of a number of our railroads to follow a car from the time it is loaded until it reaches destination. First the agent reports the car initial and number, the commodity and destination to a designated officer; a report is made to the same officer from each yard, showing the time of arrival and departure, enabling the officer in charge to demand explanation of any delay at terminals. In case a car is damaged en route, requiring it to be set off, a telegraphic report is made to the Chief Dispatcher, who at once, be it day or night, takes action to have the car repaired and in motion again. It is necessary for the officer in charge of transportation to be able to locate a certain car at any time and predict the arrival at destination, and I tell you we have our hands full at times, for cars will be damaged and wrecks will happen as long as we have railroads. Then our predictions miss the mark, the same as Uncle Sam's Weather Bureau predictions that are nullified by a change in the wind. It often seems that the car we are most anxious to move promptly is the one that gets in trouble, and when you go home at night feeling sure a certain car will reach the consignee in time for unloading in the morning, something unforeseen happens. We recently had a car located in one of the yards and made up in a train of 60 cars, expecting it to reach destination promptly. In starting the train the draw head of this particular car was broken and the car met with six or eight hours' additional delay. Mark you, the one car we wanted moved was the one that got in trouble; the other 59 went through on time.

Expediting the movement of perishable and high-class freight is given very close supervision by the transportation department. The revenue way bill is usually mailed to transfer point, or destination of the shipment; a memorandum bill accompanies the car for the guidance of trainmen and yardmen. In the case of high-class freight it is red, blue, green or some striking color; in addition to this several large trunk lines have a red ball card, others a card showing the date shipped and destination, with heavy red letters, "P. F.," indicating preferred freight. These are applied to the side of car and are more particularly for the guidance of yardmen at terminals, whose business it is to make up trains. While trains are in terminal yards, the memorandum way bill is in the hands of the Yard Master, who, from the different colors, or other distinguishing features, can, at a glance, tell what freight must be expedited. Hence you have each particular car looked after in the office and out in the yard at the same time. In side carding cars the commodity is not usually named on the cards, as cars containing merchandise would at once be a mark for pilferers.

The transportation of common or dead freight is also being given more attention each year. We find that by holding such freight from ten to twenty hours at terminal yards, and then building it up in solid trains for a given destination, that the movement of this freight is expedited, as you meet with practically little delay at division points, and the time lost at originating point is soon made up.

Speaking of transportation reminds me of a story in that line: A clerk, in a rural town, had a pet calf, which he was training up in the ways of the ox. The calf walked around very peacefully under one end of the yoke, while Mr. Clerk held up the other end; but, in an unfortunate moment, the man conceived the idea of putting his own neck in the yoke to let the calf see how it would seem to work with a partner. This frightened the calf, and elevating his tail and voice, he struck a "dead run" for the village, and Mr. Clerk went along, with his head down and his plug hat in one hand, straining every nerve to keep up, and crying out, at the top of his voice: "Here we come!—Plague our foolish souls!—Head us, somebody." In the '60s and early '70s settlers west of the Missouri River were obliged to travel by wagon, using the prairie schooner. It was then a common sight to see these wagons transporting the family and their belongings, with a cow or two tied behind, westward bound. Then, on arrival at destination, they would be unable to purchase seed after tilling the ground, owing to no transportation facilities. Hence the vast tracts of land were used for grazing or left idle. Since the advent of railroads, this is all changed. Transportation being low, the farmer obtains a good price for his produce, and the West is prosperous.

The city streets, the country roads and the commercially important lakes and rivers are improved and maintained at the public expense, and steamship companies are subsidized. At first railroads in this country received aid from many of the states. The National Government began assisting railroad construction later. Most of the aid given by Congress consisted of grants of land to railroads. Roads West of the Mississippi

River were given six square miles of land to each mile of road built. This they sold to settlers at a small price. The railroads were then obliged to wait for years, while the country gradually developed, before they enjoyed the lucrative income of to-day. For many years the earnings of these roads did not more than pay expenses, but to-day these same roads are all paying investments, owing to the development of the country, due to their transportation facilities, without which the West would to-day be nothing more than a grazing ground for stock.

The Government also loaned about $65,000,000.00 to Western roads, which was all repaid by the railroads, although the Government lost some of the interest. It was an excellent investment; but to-day you do not hear of railroads receiving aid from any outside source. In fact, they seem to be common prey of late years. The public, however, is being educated to a higher standard gradually, and we shall, ere long, see a change, and the railroads will get credit for what they have done toward developing this country.

The Railway Business Association has undertaken to make friends for the railroads. If you will take the time to read the excellent address of Mr. Geo. A. Post, at Pittsburgh, on October 29th, you will see how they expect to accomplish this. In granting public lands and loaning its bonds to corporations to further railroad construction, the National Government, no doubt, sought to accomplish several purposes. One was to secure better transportation facilities for the mails, which at that time was carried on horse back and by stages to Western points; another was to secure transportation for troops (the Indians were committing depredation, rendering it necessary for quick transportation to protect life and property); another was the desire to promote the settlement of the country, and thus increase the wealth and strength of the people of the United States. This has all been accomplished, and the Great West, today, stands as a monument, due to her transportation facilities by rail.

We shall see great strides in the way of water transportation in the next decade, with the Panama Canal completed and deep-water navigation from the Great Lakes to New Orleans, via the Mississippi River. Railroading, however, has during the past eighty years made greater progress than any other means of transportation, and, with the possibilities of steam and electric power, will, in the future, make vastly greater improvements. In this country we have to-day over 230,000 miles of railroad (the mileage of the world is about 500,000) with $15,000,000,000.00 invested; wages of employes, $1,000,000,000.00 annually; passengers carried fiscal year ending June 30, 1906, 797,946,116; tons of freight carried, 1,631,374,219; earnings, $2,325,765,167.00; approximately 70 per cent of this is disbursed annually in operation and maintenance, 20 per cent in interest and dividends, leaving the balance available for permanent improvement and surplus. I could not venture to say to what extent this vast sum would be augmented by adding the earnings of the transportation by water, and the earnings of telegraph, telephone and other lines of transportation.

The railroad business is the business thermometer of this country. Let the earnings drop off, railroad managers being then obliged to economize in the purchase of equipment and supplies, how soon this is felt all over the country, particularly in the iron and steel districts, they being, to a very large extent, dependent on the railroads, directly or indirectly, for their success.

Transportation is being given more consideration by State and Nation every year. The farmer has been hampered in the past by bad roads, and I know of no portion of the country where this is felt as in Western Pennsylvania. With the hills and clay to contend with, at certain times of the year transportation of his crops to the railroad is an impossibility, four horses being required to haul what one could do on a good road. Fortunately the State has come to the rescue, but the grading and building of State roads is slow, and it will be some time before the main thoroughfares are in proper condition. The coming of the automobile should be given due credit in this matter. As the owners of these modern machines from the densely populated districts take cross-country trips they become familiar with the condition of the average country road, hence agitation of the question and good roads follow. No one can venture to say what has been the loss to the rural districts by reason of poor roads, but any person that has traveled over one of our new State roads can see an improvement in the appearance of the country, and if you want to purchase property you will find prices advanced. With good roads the farmer is enabled to market his crops at any season of the year and thereby secures the highest prices, for with good roads he gets rural free delivery and telephone communication, which enables him to keep in close touch with the market and take advantage of any advance at all seasons of the year.

It has been the custom to blame the railroads for the high prices of supplies, but I tell you, gentlemen, that is all wrong. With good roads throughout the country the consumer, as well as the producer, will be benfitted, as a careful investigation will show you conclusively where the fault lies and what the remedy is. The average cost for hauling a ton one mile on railroads in the United States is .748 cents; it costs the farmer 5.8 cents to haul a ton the same distance over the average country road. Now it will not take a scientist or a man of great mental ability to see where the trouble lies. Give us good roads throughout the country and you have the problem solved.

The railroads of to-day are managed by wide-awake, practical business men, who are ever alert and anxious to take advantage of every new invention that will be an improvement over present methods. We, as railroad men, have no apologies to make for the record of the railroads of this country in the past, and as for the future, you will find the railroads amply able to meet any emergency that may arise. It is evident we have about reached the limit in speed and endurance of steam locomotive, but remember electricity is in its infancy. A few railroads are now using electric engines for short hauls, and you may expect some wonderful improvements in their aptitude for long-haul transportation.

PRESIDENT: Gentlemen, Mr. Hoffman's paper is now before you for discussion, in which it is hoped you will all feel free to take part, with a view to bringing out any additional facts relating to the transportation problem which may occur to you. Mr. Hoffman will be glad to answer any questions pertaining to the subject which you may care to ask him. I will ask Mr. Bihler, Traffic Manager of the Carnegie Steel Company, to open the discussion.

MR. L. C. BIHLER: Mr. President and Gentlemen—I received a very cordial invitation from your Secretary to come out and punch holes in what Mr. Hoffman said, but I confess that I am unable to do so. There is nothing which you can add to what he has prepared. He has carefully searched the record for facts and has, therefore, an interesting paper. He even goes back to Noah, and says transportation dates from then; all of which is a fact. But think what might have happened to us if Noah had had a car shortage. He was the first man of record with a large lot of stuff to move with a limited amount of equipment.

Mr. Hoffman has, as I said, prepared an interesting paper in which he treats of ideal conditions of transportation. Sometimes it doesn't go just as smoothly as it should. There is no use going back to the period of 1901 or 1902, when you might have picked out a few flaws. Forget that and look to the future. Mr. Hoffman predicts that transportation lines would be able to furnish abundant facilities to take care of anything that comes along in the future. We hope that is so, because the history of this district for the last fifteen years is that the transportation lines were always pushed for additional facilities. They have not, however, in the last year been pushed, with 500,000 cars idle and anxious to do something, so that we have not been able to blame them for anything. All we might say is that they do not do enough repairing in the idle period; and there was a little worry about two months ago when there was a car shortage, not that cars didn't exist, but there were not enough in good condition to carry loads.

One point Mr. Hoffman spoke about is a very important one. I am glad to say it is not in force on many roads, but it was on some. When the per diem rate was 50 cents per day per car, some transportation people thought it was cheaper to spend three or four dollars to transfer a lot of lading to save 50 cents or $1.00 on two or three days while the foreign car was on their line. We thought at the time that it was unwise to jeopardize a customer's interest by transferring a load to save the per diem charge and hold it on a platform four or five days until a home car came along. Mr. Hoffman is absolutely correct when he says that the road that did this lost business and prestige through it. I can cite several instances of that kind if it is necessary.

Mr. Hoffman also referred to the fact that the railroads have been subject to attacks, a good many of them unwarranted, which is so. But I think it is also fair to say that within the past year the pendulum has begun to swing the other way, and it will keep on until it gets to the right place. When we have such missionaries as W. C. Brown and George A. Post and a few others to help swing the weight around in a proper and reasonable shape we may expect it.

Mr. Hoffman is quite immune from anything I could say, he has prepared his paper so carefully, except that I might say this: About two years ago I was asked to address an audience and had the nerve to say that Transportation is king. Some in the audience did not quite agree with me. But I did not change my mind and I am of the same opinion still. If you think it over you will find that the products of the soil and the mine are n. g., as to real value, until taken from the earth and unless the proper transportation goes with it.

Mr. Hoffman referred to designating cards that the railroads use to indicate quick transit freight, like the Red Ball card, the B. & O., 98 and 99 and those others. They are good enough things, but when the shipper offered to help identify a load intended for quick transit, the M. C. B. framed such a "wise" rule that when the shipper puts on a card you call it an "advertisement." For five or six years we had the privilege on export trade to have a yellow card which simply bore the name of our company and the words "For Export." It was printed in large type and intended to catch a trainman's eye, and when they saw it they knew that something out of the ordinary was required. But the day of reckoning came, and they called it an advertisement and tore it off. I hope some day there will be a change of heart and the card will be treated as an inoffensive thing that helps the transit of the car.

Mr. Hoffman referred to the fact that water transportation is going to be the great thing of the future, which is true. Think of the Pittsburgh district railroads, if called on to move all the coal that now moves down the Ohio River, for instance! Troubles would be a great deal worse than they are.

PRESIDENT: I see Mr. Robert J. Bailey, Car Accountant of the Monongahela River Consolidated Coal & Coke Company, and he ought to be able to tell us something about transportation, both by land and water.

MR. ROBERT J. BAILEY: You have all heard tell of the ancient maiden lady who looked out for the main chance. When it did come, in order that it might not get away she said "Yes," but she at once qualified it by saying, "This is so sudden." They have a very old-fashioned custom over in Sweden which is carried out in practical life by some of the higher classes. It is this: After the head of the family has been furnished with a real square meal—as Mr. Hoffman has done for us—he puts his hand on his heart in this shape and bows and says, "I thank you." I thank you, gentlemen.

PRESIDENT: Mr. E. C. Sattley, of the Page Woven Wire Fence Company, has undoubtedly had trouble in the movement of freight.

Mr. E. C. SATTLEY: Mr. President and Gentlemen—The time would be altogether too limited to express the troubles we have. Suffice to say, I think Mr. Hoffman has presented a most able paper and one which we will all profit by, particularly by reading in the Proceedings. I think we get considerable value by studying the papers when they apper in the Journal, and I only wish this publication could appear sooner after the papers are delivered. I have wondered whether it is not possible to get these printed and distributed earlier. For instance, while the subject matter is fresh before us we appreciate same the more and study the situation better than when such delivery is removed three or four months from the presentation of the paper. I believe I express the sentiment of a good many of our members when I say we would appreciate it very much if it were possible to expedite the delivery of the printed Proceedings. These remarks, however, are not intended as any criticism of the past, but simply an expression of our thanks for the Journal, and the hope that their forwarding can be advanced as much as possible.

PRESIDENT: I think we all agree with Mr. Sattley that the printed Proceedings of the meetings would be much more interesting if they were issued shortly after each meeting. One of the causes of delay in printing is that the Secretary sends out to each speaker who has taken part in the discussion a typewritten copy of his remarks, to be edited by him, and in many cases the corrected copies are not returned for several weeks and the printing of the Proceedings is delayed accordingly. A time limit will be placed on the returns, and where they are not returned promptly the Secretary will edit them to avoid delay in printing. I see that Mr. John L. Neely, of the American Sheet and Tin Plate Company, is with us. May we hear from him?

MR. J. L. NEELY: Mr. President and Gentlemen—I do not think this is any place for apologies. If a man can make a speech or can talk on this great subject of transportation, he ought to get up at the call of his name and do it. However, I cannot make a speech or sing a song, and have been told that I make a ——— poor prayer, and in consideration of these facts I am sure you will excuse me from taking up valuable time from other persons whom I know are in the hall and are able to discuss this subject far more intelligently than I. Assuring you, however, of my appreciation of this opportunity, I desire to congratulate Mr. Hoffman on his very able paper.

PRESIDENT: Mr. Gilg has had more or less to do with transportation interests; he has always something to ship or sell.

MR. HENRY F. GILG: Mr. President, I would like to ask Mr. Hoffman whether he has any figures on the cost of transportation in the earlier stages. I believe he gave the cost per ton mile as .00748c. If he has the figures, it would be interesting to know what the railroads have done during the past two generations in reducing the cost of living.

PRESIDENT: Mr. Stark is one of the standbys on this subject.

MR. F. H. STARK: Mr. President—I will confess that

I am disappointed in the paper. I am one of those fellows that Dr. Levy referred to as continually having in mind tonnage, tonnage, tonnage.

Brother Hoffman has gone down into the depths of ancient history and taken aerial flights of imagination, and through it all has completely steered away from the subject which I was in hopes he would treat on, to wit, the question of improved facilities, especially in the Pittsburgh district, in order that cars might be moved more promptly and avoid the sulphur and other elements in the coal rusting out the floor sheets of the steel cars as referred to by one of the P. R. R. men a few months ago.

I realize that in the Pittsburgh district it is a very difficult proposition to increase railroad facilities in proportion to the increased tonnage, for we have nothing but rivers with hills on either side, making it a more expensive engineering problem to increase terminal facilities in order that the volume of traffic might be handled without congestion. Mr. Bihler states that Transportation is King. I contend that Coal is King, Iron Ore is Queen and transportation companies are subjects. This country has experienced a wonderful growth. The population has increased ten million in the last ten years. Agriculture has about trebled in fifteen years. The value of manufactured products has almost doubled in six years, and in the same period there has been an increase of 45% in the tonnage of coal alone.

During the period from 1896 to 1906 there was an increase of 108% in the tons of freight carried. To meet this (or partially so) the railroads had increased their mileage 21%, their freight car carrying capacity 26% and their locomotive tractive power 160%. Every added production carries with it increased responsibility on the part of the public carrier, and to this end railroads entering Pittsburgh have spent millions of dollars. While the increase in tons of freight carried between 1896 and 1906 was 108% and the locomotive tractive power 160%, I would like to have Mr. Elmer or Mr. Turner explain to us why, with an increase of 160% in tractive power, they are not able to promptly move freight during busy periods.

We have had a breathing spell during the last eight or nine months and have an opportunity now to spit on our hands and take another grip and call out "Look out below." I believe that within another twelve months we will all be busy and happy again.

I enjoyed the paper and trust that nothing I have said in humor will be taken seriously.

PRESIDENT: Mr. Turner, would you like to tell where the shortage comes in?

MR. L. H. TURNER: I had hoped that Mr. Hoffman would dwell more upon the manner of increasing the mileage of freight car equipment of the country. There are in service to-day in the United States, approximately, two million freight cars. At an average valuation of $500.00 per car, which is low, we have one billion dollars invested in freight car equipment. The average mileage of freight cars is not far from twenty miles per day. If this mileage could be increased five miles per day, or considerably less than a thirty-minute run, it would add to this country at once two hundred and fifty million dollars worth of equipment. In all the progress that has been made in railroad operation for the past few years the increased mileage of cars seems to have met with the least, and it is certainly one of the most important.

Mr. Stark has stated that within a certain period the tractive power of the locomotives of this country has been increased 160%, and that the tonnage has only increased 108%, and asks why the movement of tonnage has not kept pace with the increase in tractive power, which would imply that either our locomotives are not as efficient or not as well operated as in the past. The difficulty certainly lies in the fact that cars are kept standing around yards and in terminals and on the tracks of the consignor and consignee much longer than they should, which is proven by the fact that our locomotives make from three to seven thousand miles per month, while freight cars make only seven hundred. If some arrangement could be made whereby cars would not be used for store houses so extensively, car famines would be a matter of the past. The gentlemen having charge of the car service of this country can build for themselves a monument of lasting fame by correcting a condition that should not exist.

PRESIDENT: Mr. Elmer, may we hear from you?

MR. WM. ELMER: Mr. President—It just occurred to me while listening to Mr. Stark that part of his difficulty might be due to a fact that he may have lost sight of. Some years ago locomotive driving wheels were 50″ in diameter, then they were 56″ and now a great many of the larger freight engines have 62″. That means about 50% increase in speed. So, while they may have a good deal more in draw bar pull, they do not have it with wheels running at that rate of speed. And the idea now seems to be very firmly imbedded that freight should be delivered more promptly, that cars should be got over the road more promptly. The parallel can be drawn between the Conestoga wagon and the automobile. The Conestoga wagon with four or six horses could haul five or six tons over the mountains, and automobiles with 60, 80 and even 100 horse-power haul hardly over one ton. The greater part of the difference is gone in the shape of speed.

MR. H. V. PORTER: Mr. Hoffman spoke about a 60-car train, one car of which had preferred freight in it, the draw-head of which was pulled out when it was ready to start. I would like to ask if he has any method for guarding against accidents as that in cars he wants to use for preferred freight?

PRESIDENT: If no one else wishes to discuss the question I will ask Mr. Hoffman to answer the questions that have been asked.

MR. N. K. HOFFMAN: The gentleman asked what precautions we can take to prevent the breaking of drawheads. We rely on our inspectors, of course, for that. Trains are inspected. But when it comes to obviating the breaking of a draw-head that is something beyond human control. It depends a good deal on how mad your engineer is when he goes to start the train.

Mr. Bihler referred to the side carding of cars that has been done away with. I do not think I am giving away state secrets which should not be known when I say that at a recent meeting of the American Railway Association in Chicago a resolution was passed to take up this question with M. C. B.

people with a view to permitting a card 5"x8" to be placed on the side of the car by the shipper on which the name of the shipper may appear in letters not over ½" in height, to be printed with black ink. They draw the line on any other color but black. I think that is in a fair way of being adopted.

The question was asked about the cost of transportation in the early days. I regret very much that I have no figures to enable me to answer.

Mr. Stark asked a question that is a puzzle to me. I frankly confess that I am not an expert on sulphur and smoke, etc. He should have asked Mr. Turner about that.

Mr. Turner asked a question that is receiving great attention from transportation men all over the country today: How to reduce delay in terminal yards. I am a member of the Association of our lines that has undertaken to do something in that line. The yard masters at terminal yards make a report to the transportation officer of the road giving in detail the cars, car numbers, time of arrival at the yard and time of departure. I can say to my personal knowledge that on certain lines where this has been tried they have reduced the terminal delays from an average of eight hours to two hours and thirty minutes. That is an average in large yards where they handle from two to three thousand cars a day. And they are still working along this line.

Referring to the increase of mileage per car per day, after we get rid of terminal delays at yards it is up to the consignor and consignee to help the railroads. With a road like the P. & L. E. the principal delay is in loading and unloading freight. As Mr. Stark says, the carload arrives ahead of the waybill oftentimes.

Speaking about the speed of the freight trains, about six months ago, if I remember aright, there was some criticism on the speed of our freight locomotives, particularly when the crews were going back light to headquarters. I believe Mr. Weigel can say something about that. I know he was mixed up in it.

MR. R. J. BAILEY: The spirit moves me. The question in relation to costs kind of strikes home on our company. We have over 600 cars. Last year, by actual count, there were 700 drawheads broken on those cars. I have a practical solution to offer, in line with the action of one of the principal railroads in this country. The P. R. R. have a rule in force now which says in substance that the speed of impact when switching shall be two miles an hour. In my own observation I have seen cars in freight yards assembling in different parts of the yard running past me at the rate of eight to ten miles an hour, and about ten to thirteen rail lengths ahead of impact the man who was riding the car got off, and it was going like "Sam Hill." Reduce your impact to two miles an hour and there will not be so many couplers broken.

MR. C. B. AULT: Is it in order for me to add just a word? The question was brought up a few moments ago about delay at terminals. A number of years ago I was agent, chief clerk and janitor at a division point out in Western Texas on the Southern Pacific Railroad. I don't think there were any terminals on the road at all. I know that if I had a delay of 15 minutes on a freight train I had to give an account of it. We used to get them out anywhere from 7 to 12 minutes from the time they came in the yard. We had the engines and everything ready and all we had to do was to take the numbers of the cars and see that the seals were intact. I have often wondered why they have such delays on through freight trains in this part of the country. I should think when they make up a through train at Pittsburgh for Chicago it would not be necessary to switch it over again down here at Conway and out at Alliance and Chestline; and down at McKees Rocks and out at Youngstown and such places. I should think they would hike that train right through. I know we had to get trains out in 15 minutes or they wanted to know why.

MR. L. H. TURNER: It seems to me that the word "terminal" can hardly be applied to a place where trains are received and moved out of the yard in nine minutes, and would be more appropriate if it was classified under the head of a "water station." It reminds me of the clergyman who had been invited to take charge of another congregation. He visited the city, looked over the church and parsonage and was very much pleased with same, and upon his return home called the trustees of his church together and stated the circumstances, and incidentally mentioned that the salary would be $500.00 a year more and stated to the trustees that he felt he was called to that place. One of the old deacons who, in his younger days, had been an expert in the great American game of draw poker, spoke up and said: "H—l, that ain't a call, that's a raise."

While we attempt to handle our trains as expeditiously as possible, we require much more time than given by the gentleman just spoken to get our trains through our yards.

MR. WM. ELMER: I do not think that statement ought to be allowed to pass without remark. In the first place, I do not think they could get through the inspection in 7 minutes and have any sort of inspection at all. You could hardly get the engine cut loose and another one on and the air coupled and the train charged in any such short time as that.

One reason possibly is that the Southern Pacific is like one of the divisions of the Pennsylvania, which has been likened to a long straight gut, where anything that is put in at one end has to go straight through it and out at the other. In some other portions of the P. R. R. the cars are assembled from a great many different connecting points; they must be classified for destination, and it will take several hours to collect the train. When that train gets to another yard there are different destinations that must be made up in that yard and other classifications to go through with, and I think it is hardly a fair comparison to make between a railroad which in transportation is a long straight gut and one with a great many feeders and branches.

MR. C. B. AULT: I would say that they didn't have very much air out there to connect up. But the point I was trying to make was not to compare the system of handling trains on the Southern Pacific with that of the East. But I believe they may have a system here whereby the trains that are made up to go through can be run through terminals by changing the engine and inspecting the cars without breaking the train. I know if you want to get a car over the C. & P. down to Toronto, for instance, it is subject to two or three delays before it gets there. That does not seem reasonable in 60 miles. If they had a train going through they ought to be able to get it through the yards without too much switching delays.

MR. JULIUS KRAUSE: I wish to say a word about transportation. Almost fifty years ago, when oil was first discovered near Oil City, I had a brother who was going into the transportation business. He had a country wagon and two horses and he proceeded to haul oil from Oil City to Freeport, Pa. Nine barrels per load at five dollars per barrel. He was making money. But this did not last long. The Columbia Oil Company was organized by Thomas Scott and Andrew Carnegie. They constructed a branch line to the oil field and had tank cars built, and the result was that the country wagons were not able to compete with the tank cars. The next step: Several years after this the Standard Oil Company constructed pipe lines to take the place of tank cars to transport oil from the oil fields to the refineries.

I have been an employe of the P. R. R. for the last forty-three years, and I must say that the railroads have advanced very rapidly. If you examine the terminal and classification yards and find from 20 to 30 tracks in one yard holding from 80 to 100 cars per track that are required for the different destinations. It was always difficult for me to understand why freight cars cannot average more than 20 miles per day, and we are accused by our patrons that it is for want of system. I cannot agree with them, as the fault is not all with the railroads, but often with the consignors and consignee. I might cite a few cases to prove this. When at the Greenville Yard I was introduced to the Superintendent and congratulated him on his fine facilities and the large number of loaded cars he could care for. I noticed a large string of class "Gr" gondola cars loaded with structural steel and asked him why he was holding the cars. He answerd: "There were 100 cars in this lot, loaded with a bridge consigned to Africa, and I have held this shipment for one month on account of the vessel not arriving on scheduled time." He stated that they had heard from the vessel that morning, that it would reach New York in about two weeks and he would unload the cars the next day to release them. This is some of the troubles railroads have to contend with.

Mr. Stark asked, "Why cannot coal be moved more promptly?" When in the Baltimore Yard two years ago I noticed a large number of cars loaded with coal, and some individual steel cars were being repainted by owners with the load still on them. Upon making inquiry, I found the cars had been held there for some time on account of being unconsigned.

MR. L. C. BIHLER: Mr. Krause referred to the GL car, which is a hopper and don't hold steel. If it was a GR, that is a different proposition. I do not think it is particularly incumbent on a steel shipper to follow our steel through all the different stages of manufacture, if we ship it to another fellow and he piles it up. The trouble has been long since rectified by the P. R. R. putting in a large steel storage yard down at Greenville, N. J., and if steel stays in the cars the responsibility for it is with the railroads, because they have carte blanche to unload at consignee's expense if there is a likelihood of the ship being delayed. Of course, if we are talking about ancient history we can rake up a lot of trouble that used to exist. But the world moves, and that trouble does not exist at the present time. The P. R. R. has spent a good many hundreds of thousands of dollars to release cars containing steel for re-shipment by water from tidewater.

Mr. Hoffman refers to it being "up to the consignee" and shippers to do their share. I think, with the reformation in car service that has occurred in this district in the last two or three years, through the indefatigable energy of W. M. Prall, whom most of you are acquainted with, there has been a strong and steadfast improvement, as Mr. Stark says, and I would say that the industry has certainly contributed its share to modern apparatus and appliances for freight unloading, notwithstanding Mr. Turner's insinuation that they are in default. When you are willing to spend hundreds of thousands of dollars for a car dumper, I do not think all the blame rests on industry.

MR. JULIUS KRAUSE: About that sulphur: The P. R. R. has in service 25,000 steel hoppers that have been used in coal trade for the last ten years, and the same identical sheets are still there. The sulphur has not used them up, as we are told here.

About that advertising card, Mr. Bihler appears to be out of humor. I must say that the Carnegie people kept their card down to reasonable size, but quite a number of shippers kept on increasing the size of the card until they reached one yard square, and when cars reached home we found initials and numbers partly covered. It was then that the railroads objected, as they wished to repaint their own cars.

MR. A. STUCKI: I certainly think a vote of thanks is in order to Mr. Hoffman for such an excellent paper, and also to the persons who have taken part in the discussion, and, therefore, I make such a motion.

The motion, being duly seconded, was carried unanimously.

PRESIDENT: Before adjourning one of our members has something to say. He has been called on before on certain occasions for similar purposes and has always been found ready to deliver the goods. I will ask Mr. D. M. Howe to tell his story.

MR. D. M. HOWE: I have a few words to say that are entirely foreign to what has gone before this evening. And what I have up my sleeve is a very pleasant duty for me. I will start out by saying that about seven years ago I was in a certain office in this city and, after I was through with the business for which I went there, the gentleman who occupied that office asked me if I would not join the new Railway Club that was about to be organized. After he went through the details I told him I would be greatly pleased to do so. That was just a starter, as far as I am concerned, and there have been many hundreds who have become members of this Club who have come in through the same office. That gentleman started seven years ago, and has built this magnificent organization to what it is today. And through him have been procured many of the most valuable papers that we have had read before us on many different subjects, whereby we have all become enlightened as far as we could. I do not know whether I have been much enlightened by the one to-night or not, because there were so many different subjects dragged in. But what I am coming to is simply this: The subject of all these boquets I am trying to throw is Mr. John D. Conway, Secretary of this Club, the man who worked faithfully and hard to make this Club the success that it has been. And I stand here to represent the membership of this Club in presenting to Mr. Conway a magnificent hall clock. Mr. Conway, we hope you will accept this as an expression of the kindly feeling of your friends in this Club.

I hope you will notice that "moon-faced fellow" up at the top. He is something of a rounder himself, and he will be watching you when you come in late at night, as will your wife.

MR. J. D. CONWAY: Mr. Speaker, President and Fellow Members of the Railway Club of Pittsburgh—I certainly thank you. There has hardly been in my entire life a prouder moment than this, when I lack the command of fitting oratory to respond to the very graceful and clever remarks of your spokesman.

I presume many of you have at some time or other been placed in just such an embarassing position, when you lacked the words to express the sentiment or thought that was in your heart. I must say that you have me on this occasion.

The present of this magnificent clock, while one of the most beautiful of its kind, I assure you is very highly appreciated, but my keenest appreciation lies in the fact that I have merited at your hands the sentiment that prompted this recognition.

If in the past seven years that I have served as your Secretary there was any doubt of your regard in my mind it would at this moment be dispelled, as you have, not only as individuals, but as an organization, shown your kindly feelings, and I am as proud as I am sensible of the honor you do me. I cannot put my feelings into words, but I tender you my most earnest thanks for the appreciation that you have expressed.

PRESIDENT: If there is no further business to come before the Club, a motion to adjourn will be entertained.

ON MOTION, Adjourned.

NOTE—Any of the members who wish to secure bound volumes of the Club Proceedings, numbers one to four, can do so by remitting 50 cents for each single volume to the Secretary.

In Memoriam

MR. WILSON MILLER

Passed out of this life on October 31st, 1908, in his eightieth year. He was prominently connected with many of the large commercial enterprises in Pittsburgh for over one-half a century. Having spent his entire life in our city, he was an important factor in its great development, and in his passing, the community loses a character to be admired for its integrity and honor, and the companionship of a lovable man.

L. H. TURNER,
H. B. AYERS,
JAS. D. RHODES.
Committee.

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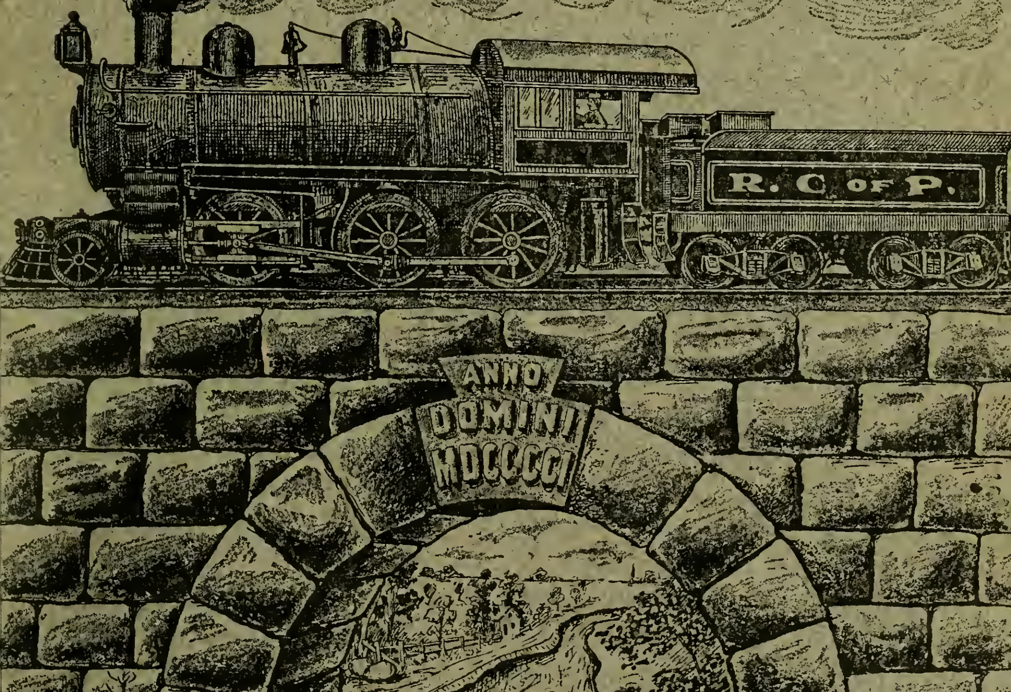
OF
PITTSBURGH.

OFFICIAL PROCEEDINGS.



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of the

Railway Club *of* Pittsburgh.

ORGANIZED OCTOBER 18, 1901.

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Meetings held fourth Friday each month, except June, July and August.

PROCEEDINGS OF MEETING, DECEMBER 16, 1908

The meeting was called to order at the Monongahela House, Pittsburgh, Pa., at 8:20 o'clock, P. M., with President D. J. Redding in the chair.

The following gentlemen registered:

MEMBERS.

Alleman, C. W.
Allen, Harvey.
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Geary, C. J.
Haring, Ellsworth.
Hoffman, N. K.
Hood, D. G.
Hosfield, W. G.
Howe, D. M.
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Kennedy, Jas.
Kerr, Edward.
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Knox, Wm. J.
Koch, Felix.
Kull, W. A.
Layng, F. R.
Long, R. M.
Mercur, H. T.
Miller, F. L.
Mowry, Jas. G.
McClumpha, H. E.
McFeatters, F. R.
McIlwain, J. D.
McMaster, R. T.
McNulty, F. M.
Nickerson, S. N.
Noble, D. C.
Oates, Geo. M.
Oliver, W. H.
O'Neal, J. E.
Orchard, Chas.
Pfeil, John.
Porter, H. V.
Redding, D. J.
Rinehart, H. W.
Ryan, W. F.
Sattley, E. C.
Schuchman, W. R.
Setchel, J. H.
Sitts, Lewis S.
Smith, D. W.
Snyder, F. I.
Stark, F. H.

Stuart, M. D.
Stucki, A.
Unger, J. S.
Warnock, H. R.
Weigel, F. S.
Wood, W. B.

VISITORS.

Bassett, Ira S.
Baughman, B. B.
Bingler, W. F.
Brown, Geo. H.
Chalfant, J. G.
Cline, J. R.
Evans, Thomas.
Gallupe, Robt. G.
Griswold, W. W.
Gross, Jas. H.
Fay, F. L.
Hudson, Wm. H., Jr.
Irwin, R. W.
Keeler, B. A.
King, J. W., Jr.
Kirk, John L.
McCandless, Bruce A.
McKee, Wm. J.
Perry, J. E.
Phillis, James J.
Pierce, H. B.
Rahm, Edward.
Ramsey, J. J.
Rhodes, P. S.
Sharp, C. E.
Schultz, Geo. H.
Shuck, Wm. C.
Smith, Sion B.
Sparks, W. R.
Stevenson, W. H.
Thomas, D. C.
Updegraff, W. F.
Wilson, N. V. F.

The minutes of the last meeting being in the hands of the printer, the reading of them was dispensed with.

The Secretary announced the following proposals for membership:

Amsbary, D. H., Manager, Dearborn Drug & Chemical Works, House Bldg., Pittsburgh, Pa. Proposed by A. W. Crouch.

Bennett, R. G., Inspector, M. P. Dept., Penna. R. R. Co., 32nd and Carson Sts., Pittsburgh, Pa. Proposed by M. A. Malloy.

Carson, Robert, Jr., Terminal Way, South Side, Pittsburgh, Pa. Proposed by Henry F. Gilg.

Fay, F. L., Car Accountant, B. & L. E. R. R., Greenville, Pa. Proposed by F. R. Layng.

Green, Harry W., Dist. Sales Agent, American Steel Foundries, 36th St. and A. V. Ry., Pittsburgh, Pa. Proposed by Harry L. Allen.

Hunter, Frank A., Sec'y. and Treas., Hunter Saw & Machine Co., 57th and Butler Sts., Pittsburgh, Pa. Proposed by Chas. J. Geary.

Metcalf, Harry E., Salesman, Ingersoll-Rand Co., Bellefonte and Elmer Sts., Pittsburgh, Pa. Proposed by M. A. Malloy.

Reid, W. S., General Inspector, Dearborn Drug & Chemical Co., House Bldg., Pittsburgh, Pa. Proposed by D. D. Kessler.

McGinnis, B. B., C. C. to M. M., Mon. Div., Penna. R. R. Co., 32nd and Carson Sts., Pittsburgh, Pa. Proposed by M. A. Malloy.

PRESIDENT REDDING: As this disposes of the regular business before the Club, we will now listen to a lecture on the Safe Handling and Transportation of Explosives and Inflammables, to be delivered by Colonel B. W. Dunn, of the Regular Army, who, on account of his vast fund of information and special knowledge on this subject, has been assigned to the duty of assembling and disseminating all the information necessary for the use of shippers and railroads in the handling of these materials. I know that the Colonel will also be glad to take part in any discussion that may be brought up relative to the handling of explosives in and about mines, and I take great pleasure in introducing to you Colonel Dunn.

COLONEL B. W. DUNN: Mr. Chairman and Gentlemen —I wish first to express my appreciation of the honor conferred by the invitation to meet you here this evening. The presence of so many representative gentlemen on this occasion indicates the interest taken by you in a subject which has been of absorbing interest to me for the last year and a haif.

At the request of your Chairman, I prepared in advance of this meeting an address relating especially to the Regulations for the Transportation of Inflammable Articles and Acids, which you will see in print. I propose to omit reading this formal address at this time and to talk to you informally about the other branch of our work, the safe transportation of explosiyes.

Any system of regulation, it does not seem amiss to remark, that secures the purpose for which we intend it, must involve two important features: First, the regulations themselves must be wisely drawn, and, secondly, they must be intelligently enforced. It is difficult to do either one of these things well, but if either is to be neglected ,it is far better that it be the task of preparing the regulations, for the reason that a set of regulations of medium efficiency, intelligently applied, will do a great deal of good; while the best set of regulations that human ingenuity can devise will be productive of negative results only, if not enforced. So that we are concerned principally with the question of the enforcement of regulations.

My experience of 30 years in the military service entitles me to feel that I know something about the enforcement of regulations. We have in this service a relatively perfect method for doing this. Starting with the private in the ranks, we have the corporal to look after him; and the sergeant is there to see that the corporal does his duty. The lieutenant checks the sergeant, the captain the lieutenant, and so on up. In the railway service, similar checks are not available. Even in the military service, when you leave the drill ground and distribute your forces in battle formation, you must depend upon individual action to carry out orders. A railway man, in the matter of these regulations then, is very much in the condition of a soldier on the firing line. The vast interests that are entrusted to him must depend upon his individual action. The opportunities we have to check him are few and far between, while in the matter of explosives he is pitted against an enemy more dangerous than the enemy confronting the soldier. This "explosive" enemy is one that never sleeps, and he is always ready to bring about the destruction for which he was manufactured. The railway skirmisher, if I may so term him, has as weapons for his defense only his knowledge of the characteristics of these explosives. If that knowledge is not sufficient then he must depend for his guidance on rules, which depend upon the knowledge of others. The man without knowledge should be very slow to criticize the rules furnished him by people who have the knowledge.

Now, the first question I would like to ask you, gentlemen, as a jury of American citizens—not as shippers, or railway, or professional men—to consider, is whether you think that something should be done in this matter of safeguarding the transportation of explosives. It comes to my mind that one railroad man, whose troubles were due to the fact that his work was at a desk over which complaints and questions concerning regulations were coming, remarked that he thought "a 75% fuss was being made about a 5% business." If that be true, the sooner we learn it the better.

In order to decide whether something should be done, let us consider some important facts. In this country there are over 150 factories devoted entirely to turning out individually every day from 500 to 150,000 lbs. of explosives. During any one year their combined product is something over 500,000,000 lbs. We do not know definitely how many cars are required to transport this product, but we have some statistics showing that in the year 1906 a single railroad transported over 91,000,000 lbs. of explosives and used for the purpose over 19,000 cars, giving an average lading per car of a little over 4000 lbs. Now, that railroad has located on its lines more manufactories of explosives than any other railroad in the United States. It is at factories that carload lots originate. Therefore, the average load per car on that railroad must be very much in excess of the average load on any other road. As the average load decreases, the number of cars must increase. We also know that at least 50% of these 500,000,000 lbs. of explosives must be reshipped at least once before reaching a final destination.

From this we can arrive at the fairly accurate estimate, that between 600 and 700 cars are loaded somewhere in the United States every day with some quantities of explosives. If we knew how many days these cars are in transit on the average we could give at once the number of cars that are always on the railroad bearing explosive lading. We know many cars are a month or more on the road, others two weeks, others two or three days. If we assume ten days as the average, we pass at once to 6000 cars; if we assume eight days we have about 5000, and I think the latter is a pretty fair estimate. If these

5000 cars were distributed equally over all the railway mileage of the country, it would mean that about every 50 miles a passenger traveling by rail would be carried within a few feet of what is frequently a moving magazine. Now magazines, as residents of villages and small towns know them, are things to be shunned. City ordinances require them to be placed in unfrequented spots and a warning to be placed near them to keep visitors out of dangerous territory. Many a resident of a villege who would resitate to go within half a mile of one of these magazines, is thus carried unwittingly and unthinkingly within a few feet of a car that contains probably from two to ten times as much explosive material as that magazine in his village which has so much of his respect. It is, therefore, an important matter for the passenger on railroads to see this traffic safeguarded.

It is important also to the general public, provided it can be shown that accidents ever happen in the transportation of these dangerous articles. Probably all of you will recall that three years ago, at Harrisburg, a freight train was stopped suddenly by the application of the air brakes which at that time applied to only 50% of the train, and the leading car in the rear half, to which the air was not applied, buckled. It was thrown over on the passenger track and was struck almost immediately by a fast passenger train. It took the country a long while to recover from the consternation produced by that unfortunate disaster. Twenty people were killed outright by the explosion or burned to death in the resulting fire. Incidentally, and not as the most important feature, the Pennsylvania Railroad paid out over $500,000 in damages. No wonder many of the officials of that road thought the transportation of explosives was not a paying business.

In 1907 a freight train at Sanford, Ind., pulled in on a side track to let a passenger train go by. In this freight train was a car loaded with black powder which had come from near Boston, traveling nearly a thousand miles under its original seals. If anything was wrong in the car no one suspected it. No effort had been made, so far as we know, to determine while in transit whether everything in the car was right or not and the regulations then in force did not require this precaution. When the locomotive had passed some distance beyond this powder car, and a passenger coach was nearly opposite it, an explosion occurred which killed about 17 people and seriously injured some 35 others.

That fact, gentlemen, gives the general public, and it gives the railroad officials, reason to think that something ought to be done to promote safe transportation. This is especially true when we examine the details of this accident to determine by theory how it might have happened and in a way that could have been prevented if regulations now in force had been intelligently applied. I am speaking of this only as theory and for illustrative purposes, and with the knowledge that claims have been made that this particular explosion was due to malicious action of some individual. Even if that be accepted, the theory may nevertheless be useful to point out how an explosion of that kind might happen again. Dozens of reports have come to my office showing that packages of explosives in transit have leaked and the contents of the packages escaped; and we have found too frequently varying quantities of loose black powder on the floors of cars. It might readily have occurred in this case. We also know that frequently there are cracks in the floors of cars, or some small hole through which loose powder can escape. If such were the case in this car and the hole was small enough, nothing might happen while the car was moving, for the grains of powder would be too much scattered. But let that car stand for a while and all the escaping powder grains be blown by a strong wind toward the passenger track; it would be very easy to see how a spark from the engine, or a lighted cigar from the window of a coach, or a coal from the fire box, might have ignited such a train of powder. And it is characteristic of black powder, to be kept in mind, that, more than any other explosive, a train of it under these circumstances, lighted at one point, would carry the fire up the train to the source.

Some years ago, in the city of Wilmington, a wagon loaded with powder was being driven along the street. One of the kegs had a hole from which powder escaped in small quantities, and a man driving a fast trotting horse two blocks away, crossing the street at right angles, happened through a spark produced by the shoe of the horse striking a cobble stone, to ignite this train of powder. The fire followed that wagon two blocks, caught up with it and exploded the entire load.

A little later, in the same year in which the Sanford accident happened, another one occurred which was even more remarkable in some respects. A car load of 5000 lbs. of dynamite was ordered by a contractor near Detroit. It was shipped from a magazine in the outskirts of Buffalo. Now, storage magazines are a most fruitful source of bad material. When explosives are shipped from the factory they are freshly made and in their best condition. After storage in magazines, under the influence of heat and especially of moisture, we know that these explosives deteriorate. We do not know exactly the condition of this particular shipment; but we have reason to suspect that it was not in the best condition. An essential feature of the regulations is that an agent, who assumes the very grave responsibility of making his company liable for what may happen in the transportation of a shipment of this kind, should very carefully examine the shipment before accepting it. If signs of deterioration were present in this case they were not discovered. The only thing, apparently, that was done was to placard the car "explosives." In addition to not inspecting these packages, no attention was paid to the proper loading and staying of the packages in the car. They were allowed to go exactly as ordinary merchandise would have gone. Twenty-four hours after the car started, the conductor noticed that two of the boxes of dynamite were standing on end over the truck in one end of the car. He evidently did not know anything about dynamite. We are trying in this campaign of education to remove similar ignorance from the minds of other conductors. The fact for you to appreciate, in this connection, is that dynamite is prepared by taking a dangerous liquid, known as nitroglycerine—too dangerous to handle under ordinary circumstances, especially in transportation—and causing this dangerous liquid to be absorbed, exactly as a sponge absorbs water, in order to remove at least a part of the danger. Now, to use a homely illustration: If you take a sponge 18″ long, as these cartridges were, and 2″ in diameter, hold it vertically and pour water on it, you will find that after a while its absorbing power is exceeded and the water begins to drop from the bottom. Evidently, more water would drop from it while held in a vertical than in a horizontal position. The same fact holds in regard to dynamite. This long 18″ cartridge, standing on end during August, when the temperature was high, was in just the position to cause it to leak nitroglycerine. The conductor should have known this, but he did not. Twenty-four hours after the boxes were noted standing on end, the car pulled into the little village of Essex, and, to the surprise of persons in the vicinity, there was apparently a small fireworks display under the car. Every little while there was an explosion resembling that of a firecracker. The conductor went to see if he could discover the cause of this unusual occurrence, taking two of his train men with him, and opened the car. They found these same two boxes standing on end, and they were over the truck in which the firecracker noises occurred. The conductor noticed that the floor was wet with some kind of liquid. He did not know what to do, but thought that, so long as the trouble occurred while the boxes were in that position, he might as well put them down on their side and see if that would stop it. The trainman who put the box on its side got his hand wet with this liquid. The testimony shows that he did not appreciate the danger because he remarked as he playfully wiped his companion's face, "This stuff is good for your complexion."

Now, evidently there was a hole in the floor under one of these boxes. While they were standing over it the liquid could only pass through slowly, drop by drop. As a drop leaked through it struck the wheel, which in its revolution brought the drop around to the rail and caused a firecracker explosion. Putting the box on its side allowed the liquid to flow through faster, possibly in a small stream, and by the time the conductor got out and closed the door and gave the signal to go ahead, there was quite a pool of this dangerous liquid nitroglycerine on the wheel and on the rail. When pressed between the wheel and rail the natural result was an explosion, big enough now to extend to the two boxes over it, and the explosion of these involved that of the entire shipment. Four or five people were seriously injured and two or three killed, and among the injured was a young girl employed a block or two from the station. Eight months afterwards I was in the court where the suit for damages was being heard and into which this young girl had been brought before the jury on a stretcher. It is possible that her condition was exaggerated somewhat, in order to increase the amount of damages, but whether that be true or not, the girl had been bedridden from the time of that explosion, and her appearance indicated that her physicians were right in saying that she would never walk again.

Gentlemen, doesn't it seem pitiful that any such disasters as these can happen on the railroads of the United States? It does not make any difference whether the cost to the railroads is $1,000 or $100,000. It does not make any difference when we say that the railroads are killing people by the thousands every year in different ways. We simply cannot escape from the fact that death caused by explosion does produce upon the human mind a much stronger impression than when caused in any other way. It is simply human nature, that if a thing happens in a slow way, that you can follow mentally, the impression is not so strong as when it comes suddenly. This was exemplified in the explosion that occurred some months ago in the turret of the battleship Georgia. There was only a loss of sixteen men. If we had been at war and the Georgia with a full crew had gone to the bottom, the country would not have felt the disaster as it felt that apparently preventable sacrifice.

No man who has sat in an audience of this kind and heard descriptions of accidents such as these can, I am sure, fail to say at once that if anything can be done to prevent them it should be done. If this is your verdict now you have resulting responsibilities resting upon you individually; if you are a railroad man, with duties to perform under these regulations, then that responsibility will rest on you all the stronger hereafter. If you are a manufacturer, or shipper of powder, then an equal responsibility of a different kind will rest upon you. Even if you belong to neither of these classes and you feel that this is a matter deserving attention, there is a responsibility upon you to take advantage of such opportunities as may come to you to spread this conviction. You may be able to cause some man at some time to perform a duty he might otherwise have neglected, and thus assist in the saving of human life.

Assuming that you agree with me that something should be done, let us see what has been done up to the present time:

Colonel Dunn then explained the reasons that led the American Railway Association to organize its Bureau of Explosives, and described the methods adopted by it to educate all concerned and to secure enforcement of the regulations. About sixty lantern slides were used to illustrate instructive remarks relating to the characteristics of explosives, their powers to work destruction, good and bad methods for loading packages in cars, etc.

Col. Dunn's formal address, previously mentioned, follows:

SHIPMENTS OF INFLAMMABLE ARTICLES AND ACIDS.

BY COL. B. W. DUNN, C. I., BUREAU OF EXPLOSIVES.

I wish to invite your attention to the Regulations for the Transportation of Inflammable Articles and Acids, effective October 15, 1908.

It is not surprising that some misunderstanding and some dissatisfaction has resulted from the publication of this new set of rules. Most of the railroads had not attempted to regulate this traffic, although some of them had issued regulations. Overworked agents, ignorant of the necessity for them, see in the new regulations an additional and a voluminous set of rules to be memorized; more delay in clearing their platform; more responsibility upon them and their subordinates.

Shippers who have heretofore been worried only by their freight bills object to the imposition of additional burdens upon their packing and shipping departments, and they resent especially our asking them to share any part of the moral responsibility for accidents, fires, or damage that may be caused by their shipments.

Now I, more than any other individual, am responsible for the existence and the wording of these regulations, and in my capacity of a federal official, only temporarily connected with this work, it is believed that in at least one important quality, disinterestedness, I am qualified to attempt to remove your misconceptions and to meet your criticisms. The principal plank in our platform has been that a rule which cannot be successfully defended and that does not receive the approving verdict

Number 1.

This is an interesting illustration of the power exerted by relatively small quantities of high explosives. A 12 inch projectile containing about 135 lbs. of the high explosive used in our military service was suspended about 3 feet below the surface of the water and exploded electrically. A solid column of water from 10 to 12 feet in diameter and about 50 feet in heighth results from the pressure of escaping gases. Such an explosion taking place within 15 feet of the unprotected bottom of a battleship would do serious injury.

of the majority of a jury of fair-minded men, representing all interests affected by the rule, has no place in a practical set of regulations.

It is my conviction, based on an extensive experience, that a large majority of the manufacturers and shippers of explosives, inflammable materials and acids, in the United States, are capable and fair-minded men, quick to comprehend and balance the reasons for and against any proposition affecting their interests, and ready to abandon a contention when the weight of the argument is against them. It is much easier for me to acknowledge a defect of this kind, since I have no material interests that will be affected injuriously by a change in any of these rules.

In the spirit indicated by these introductory remarks, I propose to sketch for you the origin and growth of these regulations and to explain to you some of the cardinal principles that controlled their preparation. If I succeed in convincing you that the regulations are wise, practical and necessary to promote safety, I shall feel justified in asking you to give them your active support; to perform your respective duties under them willingly and accurately, to assist me hereafter, according to your opportunities, in communicating your conviction to other critics. If I do not convince you, you will still derive this benefit from listening to my remarks: you will understand my position and you will be better qualified to marshal your arguments for my conversion.

It is not claimed that the regulations are perfect. They represent only a first honest effort to devise good practical rules that will promote safety. Experience has already indicated some, and it will show many more ways to improve them. You can assist in this improvement and I promise you, not only to hold my mind open to conviction, but to use my full influence, after conviction, to secure a remedy for any unnecessary hardship imposed by the rules.

Origin of Regulations.

It will not be necessary to go back further than about three and a half years to sketch the history of the movement that has resulted in the promulgation of these regulations. One of the most influential and useful representative bodies in this country is the American Railway Association that was organized in 1886 and now meets semi-annually to consider matters affecting the operation of 246,172 miles of railroads in the United States, Canada and Mexico. In April, 1905, a man who is to-day one of the most prominent, progressive and well balanced, of our great railway presidents, urged this association to secure the adoption by all of its members of a set of regulations to promote the safe transportation of explosives. He was actuated by vivid recollections of the disastrous explosions at King's Mills, Forest, Crestline, and Redstone Junction, Ohio, and Greenwood, Delaware, that had caused the deaths of thirteen people, injuring twenty-five others, and cost his road more than $303,000.00.

Number 2.

For years enthusiastic inventors have endeavored to perfect means for firing with safety sensitive high explosives from cannon. In this case the inventor's confidence in his own device had led him to fire this gun frequently in the presence of friends and members of his family. When brought to the Government testing grounds for a final trial the inventor objected to placing his device in a secluded and protected spot where loss of life could not occur, stating that such action would discredit his invention. He showed no objection to the rule, however, when the result of the test was as shown above.

He knew that since these dangerous shipments are necessarily interchanged little good could come from individual railway initiative; that uniform action by all roads was necessary, not only to minimize dangerous conditions of the shipments that are, at best, sufficiently dangerous, but also to avoid obstructive and competitive traffic and commercial conditions. The soundness of his proposal was so self-evident that the appointment of a committee to draw up such a set of regulations was authorized unanimously. The wisdom of this action was signally emphasized within a few days of that meeting by the occurrence of a disastrous accident at Harrisburg, Pa., that resulted in the deaths of twenty more people and a cost to the Pennsylvania Railroad of more than $500,000.00.

The Committee on Transportation of Explosives worked diligently during the summer of 1905, employed civilian experts on explosives and consulted with experts from the Army and Navy. Immediately after the Harrisburg accident the Pennsylvania Railroad also took the important step of putting a competent man on duty as inspector to travel over its lines, educate shippers and employes and check their compliance with its regulations for the transportation of explosives. In November, 1905, the Association approved the regulations presented by its Committee and as soon as they could be republished its members prescribed them for the guidance of their employes and shippers.

Before the Association met a year later this Committee had accumulated experience to justify the self-evident fact that *regulations do not enforce themselves,* and it recommended that the inspection service inaugurated on the Pennsylvania Railroad be extended by the organization under the auspices of the Association, of a Bureau for the Safe Transportation of Explosives and Other Dangerous Articles, whose agents should devote themselves to educational and inspection work for all members. It was urged with convincing force that in no other way could the necessary uniformity of enforcement be so well and so economically secured. The Committee presented a Constitution and By-Laws for this Bureau which the Association approved, and the inclusion in the bureau title of the words "Other Dangerous Articles" was the first step toward extending the agitation for safe transportation to include inflammable material and acids. The practical work of the bureau began in a modest way June 10, 1907, and full information in regard to its work from that date will be found in the two published reports of the Chief Inspector dated February, 1908, and October, 1908, respectively.

Appreciating that explosives must be kept away from fire, and that inflammable materials and acids are the most fruitful sources of fires on railroad property, the Chief Inspector addressed a communication to railway officials in July, 1907, urging concerted action to regulate traffic in these articles and requesting their opinions and experience on certain fundamental points. After studying their replies, a set of rules was prepared and published in galley proof form in September, 1907. More than a year was consumed in consultations and conferences, with shippers and railway officials and employes, and many revisions of the proposed rules were made to meet criticisms and sugges-

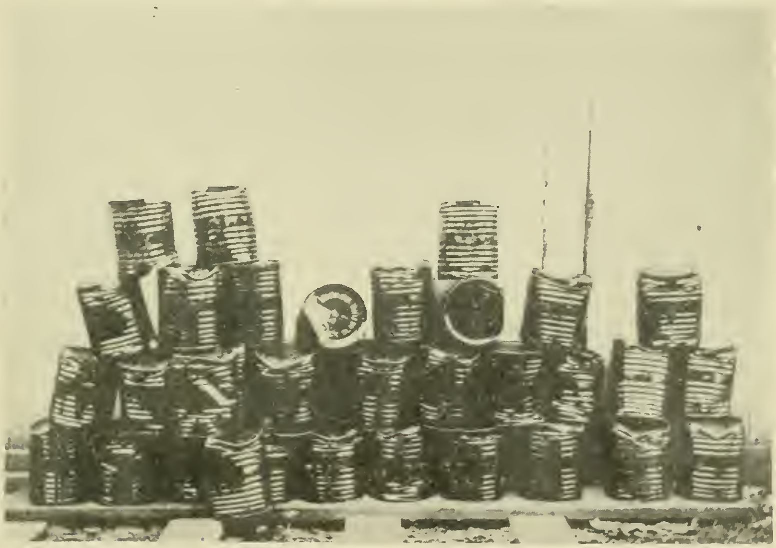
Number 3.

A storage magazine containing 19,000 lbs. of dynamite and about 1000 kegs of black blasting powder was exploded September 16, 1908, by lightning. The destructive effect of gases from this amount of explosives is shown by the above picture. One of the cars in a freight train 200 feet distant was overturned and the bodies of practically all cars in the train were crushed.

tions from shipping and railway sources. Several days were spent, at different times, in conference with the Executive Committee of the Manufacturing Chemists' Association, composed of gentlemen exceptionally well qualified by education and temperament to criticise these rules, and many useful suggestions from them were adopted. The Chairman of a Board that represents a majority of the wholesale and retail druggists of the United States was also consulted frequently and some of the rules for shippers were suggested by him. At a meeting in Philadelphia in September, 1907, of representative shippers of all classes of inflammables and acids, full discussion and criticism were invited and some of the suggestions made were accepted. At different times, shippers of paints and varnishes and a prominent official of their National Association have been consulted. The Chief Inspector even went so far as to suggest that he be invited to attend the last annual convention of the National Paint, Oil and Varnish Association to discuss these regulations, and was informed that the rules of the Association prevented his presence. These instances might be still further elaborated, but I have made clear, I hope, that we cannot be charged with being arbitrary; that the active co-operation of all parties interested in perfecting these regulations has been solicited in the past and will be welcome in the future.

In the meantime, beginning in the fall of 1907, progress was being made in promoting the safe transportation of explosives. Not only were the railroads moving voluntarily in this matter in the interests of public safety and spending money to maintain their Bureau of Explosives, at the rate of about $75,000 per annum, when the financial depression made it exceedingly difficult to meet their necessary operating expenses; they were doing this, not under the guidance and protection of, but in spite of federal legislation. An old act of Congress passed in 1866 required shippers to pack nitroglycerin explosives in a manner that was not only expensive and impracticable, but actually impossible of fulfillment, and severe penalties were prescribed for violations by shippers and common carriers. Over 300 million pounds of these explosives, essential to all enterprises involving construction, must be transported each year by the railroads. This is an unwelcome but a necessary public duty, and the railroads performed it in spite of the penalties of this old law and in the face of the reasonable ground they had to fear that some of the people benefited by their action might work for their prosecution. Steps inaugurated by the Bureau to secure a repeal of the law resulted finally in the Act of May 30, 1908. The original draft of this law was prepared by the Bureau, but important modifications were made in this draft by Congress. The distinctive and valuable feature of the law as approved is the authority granted by it to change the rules whenever necessary, to keep them in accord with modern knowledge and experience.

The title of the Act and Section 4 preserve the wording, "explosives and other dangerous articles," but Section 2 gives to the Interstate Commerce Commission only authority to formulate rules for the transportation of explosives. From this fact



Number 4.

When a car containing cans of black powder is subjected to a severe shock such as can be given by careless coupling, it is probable that many of the cans will be deformed and the seams in some of them opened. An open seam means leakage of powder to the floor of the car. This has been the first step in practically all serious accidents. So long as the cans are intact it will be very difficult to ignite the powder; but when loose powder is present ignition can take place in many ways.

has arisen a misconception as to the legality of the American Railway Association Regulations for the Transportation of Inflammable Articles and Acids.

It is impossible, in fact, to regulate traffic in explosives effectively without regulating that in inflammables. The Interstate Commerce Commission did not prescribe rules for the transportation of inflammables, but it required the railroads to do so, and this is also required indirectly by Section 4 of the

Act of Congress. The common carriers are enjoined by the Interstate Commerce Commission to keep inflammable articles of all kinds and acids out of cars that contain explosives and out of adjacent cars (pars. 1682 and 1686), and to make these rules effective (General Notice). It is, therefore, necessary for the common carriers to define inflammable articles and acids and to provide practical means for distinguishing them on freight platforms.

Section 4 requires shippers of "explosives and other dangerous articles" to mark packages correctly and, further, to give the common carrier information of the *character of the contents.* To make this part of the law effective, the common carrier must define "other dangerous articles," tell the kind of information required of shipper as to contents of packages and provide practical means for them to furnish it.

In addition, the common carrier still has, as he always has had, the right under the common law to prescribe, without discrimination, the conditions under which he is willing to assume the risks of transporting any articles deemed by him dangerous.

It follows, therefore, that any shipper desirous of challenging the legality of any of the rules under discussion must prove to the satisfaction of a court of competent jurisdiction that the rule is unreasonable and unnecessary. If he can do that, it is believed that he can more readily convince me, secure my assistance in convincing the Committee on Transportation of Explosives and the American Railway Association, and thereby arrive more directly at the remedy sought. A judge is not liable to assume the responsibility of telling a common carrier that he need not adopt the precautions against accident and fire deemed necessary by the carrier. To do so would make the court responsible, morally at least, for anything that might happen, including a disastrous explosion and loss of life. The Interstate Commerce Commission would have no jurisdiction of a question of this kind, so long as freight rates and discrimination are not involved.

Cardinal Principles.

In undertaking any new and important work a conservative man first seeks the teaching of all available past experience.

Regulations governing the transportation of inflammable articles had been issued by a number of roads previous to the inception of our work in the summer of 1907, and they had been enforced by some of the roads. The plan of securing special treatment by labels on packages, to advertise the nature of their contents and the precautions necessary in handling them, was a promi-

Number 5.

The above picture was taken to illustrate the condition of some of the cans in a shipment of black powder accepted by a station agent without the inspection on his part required by the regulations. The cans had been stored by a contractor under improper conditions and many of them, not actually ruptured, showed large holes produced by rust and through which the powder grains could readily escape. If loss of life should occur through neglect of this kind, a station agent would be morally responsible, at least, and it is believed that he could be properly prosecuted for manslaughter.

nent feature of these rules. Railway employes, however, were required to attach the labels, and for their guidance a list of inflammable articles, involving many technical and trade names, was furnished.

I visited during the summer of 1907 several large forwarding stations to see how these rules operated. During a busy day I saw dozens of wagons discharging tons of miscellaneous freight on a platform where billing clerks, foremen and laborers were busy sorting, recording and distributing this freight to a long line of cars that had to be loaded and moved promptly to the classification yard to give place to other lines of empty cars destined to contain other tons of similar freight. Any material delay in this work would produce a serious congestion. I did not see any employe comparing the name on a package, or dray ticket, with the long list of inflammables, to ascertain whether the package required a label. On the contrary, I saw a boy armed with a pot of paste, a brush and a bag filled with labels. His was the mature judgment, based on his negative knowledge of science and of the chemistry of inflammable materials, that guided him in the distribution of his labels. Anything packed in a can, or in glassware, or in a barrel, was liable to get a label for the simple reason that the package excited his suspicion, and he had to be on the safe side. The most dangerously inflammable liquid might have been enclosed in a cracker box and given its proper technical name without attracting the boy's attention. On the other hand, a barrel of molasses, or of cotton seed oil, or of lubricating oil, or a can of dry paint, was almost as liable to get a label as a barrel, or can, of gasolene.

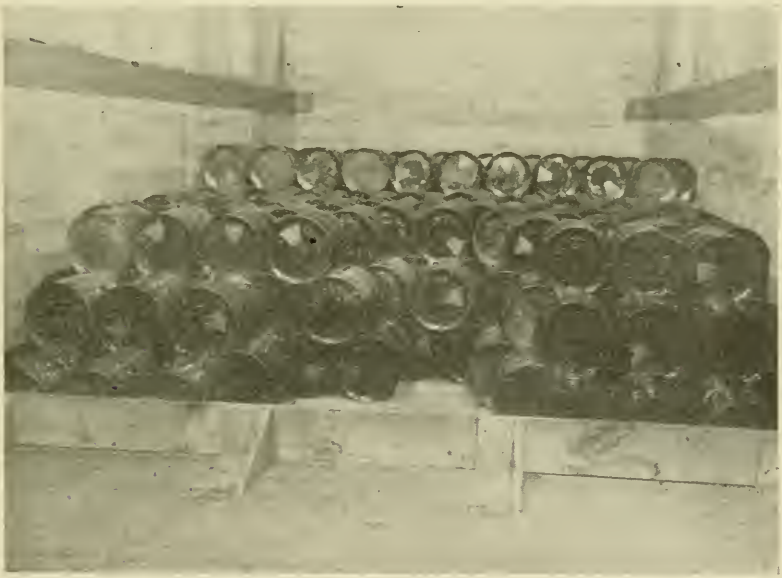
This experience produced no tendency on my part to criticise the agent. His course was not only natural, but necessary, to come as near as possible to meeting all of the rules of his company. He was supposed, it is true, to be guided by the list in attaching labels, but he was also required to move his freight. I had to admit that, in his place, I should have taken practically the same course. My experience did suggest, however, a cardinal principle for the new rules that I was to prepare, viz:

The label must be retained and improved, but the shipper must bring his packages to this busy platform with all necessary labels attached to them. He has the time and knowledge required to do this, and the agent has neither of these essentials.

In all my conferences and discussions I have found only one shipper who was unreasonable enough, from my standpoint, to contest the soundness of this cardinal principle. His contention was that the name of the article on a package conveyed all the information that a shipper can properly be required to furnish the carrier. This contention is refuted by the wording of the law, Section 4, which calls for the proper name and, in addition to this, *information concerning the character of the article.*

OTHER DANGEROUS ARTICLES.

What are "other dangerous articles"? Since the law does not define them, the railway rules must. We all admit that the



Number 6.

The above picture illustrates an approved method for loading cans of black powder developed by the Bureau of Explosives and now generally used by all manufacturers at their important loading stations. Some of the cans were removed before taking the picture in order to illustrate the method of packing them to secure interlocking. When packed in this way, a single floor brace holding the front row of cans will prevent movement of cans in the other rows. If more than three tiers are piled in this way, a deflection of the car floor under a shock would be liable to throw some of the cans upward and destroy the interlocking. The floor brace represents the best use of the amount of lumber involved. It is made up in the carpenter shop and the amount of nailing required in the car is reduced to a minimum.

well-known inflammable liquids, such as gasolene and benzine, are dangerous; and that in descending the scale we must not use the word "inflammable" strictly as defined in a dictionary. Lumber, dry goods, rubber, and even a keg of nails can under favorable circumstances (in an atmosphere of oxygen, for example) be made to burn. A barrel of axle grease, of lubricating oil, of paraffine wax, would add materially to the intensity of a fire, but would not originate one. The danger is strictly relative and shades off imperceptibly as do the light effects in a well executed painting. It is more than difficult to know where to draw the dividing line. It is more important to the railroad than to the shipper, that useless precautions be not required; for precautions enforced mean delay, extra work and expense, in transporting innumerable packages while a single shipper is concerned only with the relatively small number of packages shipped by him. The lower we draw the dividing line, however, the greater the risks that must be assumed by the carrier.

Another point is that there is a practical limit to the special treatment of packages and cars. When the average number of placarded cars in a train becomes too great, the best of employees will cease to handle and couple the cars with unusual care and will neglect to protect them from lighted lanterns and other sources of ignition. Experience in this direction may cause, in the future, a lowering of the dividing line that we are unwilling to make at present.

The first step in our definition is to classify "other dangerous articles," and since rules are to be made for each group, and brevity is the soul of good rules, we must have no more groups than are absolutely necessary. If the shippers who have contended that their products should be placed in groups by themselves and have special labels assigned to them, differing from other labels in all respects, had ever attempted to draw up a practical set of regulations they would not have raised the contention. After much discussion and consideration, our classification into three groups, I. Inflammable Liquids; II. Inflammables, and III. Acids, seems to stand criticism. We have omitted cylinders containing compressed non-inflammable gases and liquids which are now under investigation with a view to adding a paragraph later on to cover them.

Inflammable Liquids.

The only uniform measure of the danger of fire from inflammable liquids recognized by competent and disinterested judges, is the *flash point*. It is true that the degree of danger in transportation is materially influenced by the kind of packages used, and the care exercised in packing them. A liquid, hermetically sealed in a strong metal receptacle, is safer than the same liquid in glass; and a strong glass vessel, well packed and cushioned, is safer than a weak one poorly packed. For our purposes, however, it is impracticable, at this time, to recognize these differences. Individually defective packages are found in the best types, and precautions must be gauged by the exceptional cases. We are justified in assuming that, in any type of package, we shall occasionally have a rupture, an open seam, or other defect, that will allow the liquid to escape in a car in transit and we must avoid as far as possible the danger of fire from this leakage.

Number 7.

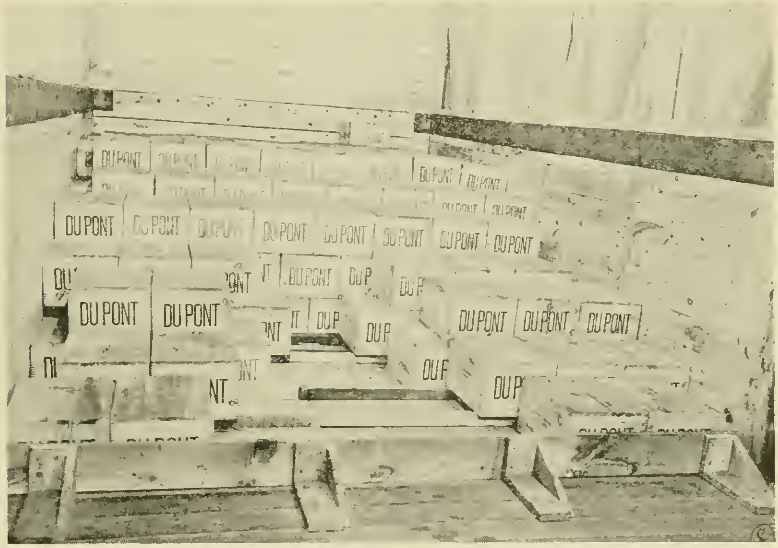
When necessary to place the maximum load in a car, about 2000 kegs, the above picture shows the best method for loading and bracing. All kegs must be loaded with their ends toward the end of the car and no kegs are allowed to be placed in the space opposite the doors. If this space should be utilized, the regulations require that the doors be solidly boarded to at least the heighth of the lading.

It is capable of scientific demonstration that if the temperature in the car is above the flash point of the liquid and the quantity and exposed surface of the liquid sufficient, the vapors of the liquid will form and mix with the oxygen of the air. This mixture can properly be classed as an *explosive* since it furnishes an intimate association of finely divided combustible matter and oxygen, the essential characteristic of all explosives. You get practically the same conditions when you have a leaking gas pipe in a cellar or other closed space.

Another essential point is that the kind of liquid is immaterial. A mixture of oxygen with the vapor of an illuminating oil flashing at 110°, or turpentine at 90°, or whiskey at 85°, or grain alcohol at 55°, or wood alcohol at 40°, or gasolene at 0°F, would all produce, when ignited by the flame of a match or lantern, practically the same destructive effects. The differences in danger for these liquids, assuming the leakage to have occurred, is due to the varying chances in favor of the temperature being above the flash point at the time. It is only in isolated cases that the temperature in a car is above 110°, although it does undoubtedly get above 120°F. in some localities in the United States during the summer. It will always be high enough to make gasolene dangerous. If we decide to take the risks on liquids flashing above 100°F., why, it is asked, should we not come down still lower, say to 90°, and take these risks also? The further we come down, the more rapidly we increase the number of our assumed risks and the number of occasions where cars will present the dangerous combination of leakage and sufficiently high temperature.

In spite of my desire to accommodate shippers and to relieve the already overburdened railway employe from unnecessary work, I have not felt at liberty, in my capacity of advisory expert, to recommend a lower dividing line than 100°F., until experience may show it to be necessary to secure practicability. In this I am supported by the judgment of that eminent authority of national repute, Dr. C. B. Dudley, chemist, Pennsylvania Railroad, and President Bureau of Explosives, as well as by all of the chemists that I have consulted.

Now, assuming that 100°F. is a reasonable limit, and that all packages below it are to be presented for shipment with a distinctive label (that will immediately indicate to a railway employe when that package reaches his crowded platform, where to store it on that platform to minimize danger of fire, what car to put it in later and the kind of placard to be attached to this car) what must the shipper do with the "other dangerous articles" that are less dangerous than these because they flash above 100°F? Does the law, and our general principle of placing on the shipper the duty of furnishing the carrier proper



Number 8.

The above picture shows the application of the method for loading black powder cans shown by No. 6 to the loading of dynamite in one end of a car. Interlocking is obtained by raising some of the tiers of boxes. The strips of lumber placed on the floor for this purpose need not be nailed to the floor as the weight of the boxes is sufficient to keep them in place.

information, justify us in asking the shipper to do anything unusual in making such shipments?

I have had considerable difficulty in convincing critics that it is necessary for the shipper to furnish information even when no label is required.

Since the railway employe cannot tell the characteristics by inspection and is required to check in a general way the performance by the shipper of his duty, I claim that it is not imposing a hardship to ask the shipper to say, in effect, "these packages are all right, and I am complying with your rules by presenting them to you without a label."

If the railway employe passes this information down the line, other employes, whose suspicions might naturally be aroused that the duty of labeling the package had been neglected, would also be assured that "it was all right," and the package would not be delayed in transit for investigation.

The only possible way to avoid the necessity for this "all right" or "no label required" statement from the shipper, would be to remove all checks on the shipper and to instruct agents to assume, in all cases, that packages without labels do not require them. Unfortunately, experience tells us that this would not be a safe course; that a careless shipper will frequently neglect his duty, but an honest one will not do so and state the contrary.

Responsible and conscientious shippers do not appreciate the willingness of unscrupulous shippers to deliver dangerous and poorly packed shipments to railroads when they feel reasonably safe against detection.

When you consider the trouble the railroads are assuming in this matter you will admit that we have made it extremely easy for a shipper to do his part. He must, in any event, submit a shipping order, enumerate his packages, give names of contents and sign the order. All we ask him to do in addition is to use a rubber stamp to state, opposite each entry on the order, the color of label applied or "No Label Required," and then to show his honesty and good faith, qualities that no reasonable man should object to demonstrating, by stamping, writing or printing, above his signature the prescribed certificate. Many large shippers have assured me that, after preparation—by having their shipping orders printed with the names of their standard articles, the color of labels required by them, "No Label Required" for other entries, and the certificate at the bottom—they can comply with this much discussed paragraph, 1802, without any inconvenience.

For example, a large and progressive firm in Indianapolis has prepared a printed blank shipping order on which the general term, "Drugs," appears in four places with the words, "No Label Required," "Red Label," "Yellow Label" and "White Label," printed after it successively. All that is now necessary for the shipping clerk to do is to enter in each case the number of packages of "Drugs" whose characteristics bring the packages under the different classifications.

If a shipper presents his package, with a shipping order properly prepared and certified, it is not the duty of the agent, without grave reason for his suspicion, to question the veracity or accuracy of the shipper. The shipper has assumed in this case full responsibility and is liable to a fine of $2,000 and 18 months imprisonment for misrepresentation. If the agent has any reasonable doubt and the shipper insists, after being cautioned, that his certificates and notations are correct, the agent should forward the shipment and then take steps under paragraph 1871 to have the matter investigated by the Bureau of Explosives.

Special Labels Permitted.

Some shippers having a just cause of complaint on a single, and generally a minor, point have allowed themselves to become actively antagonistic to the regulations as a whole. For example, a dealer in paints writes:

"What do you think my material is? Dynamite? The label on my package tells my customer to keep the paint away from *stoves, radiators* and *direct sunlight.* I recommend him to use some of these paints on stoves and radiators and others on houses exposed to sunlight. Some of my paints are used on locomotive stacks, which get very hot for long periods of time. You are trying to ruin my business. What legal right have you to do so?"

If this correspondent had read the regulations carefully he would have found, in paragraph 1808, a remedy for his trouble. Other dealers in paints had applied to the Chief Inspector and received, under that authority, permission to furnish their own labels with the necessary change in the wording. Each special label thus authorized must have an identification number and a duplicate must be on file in the office of the Chief

Inspector, whose written approval must be received before the label is used. There is no objection to the appearance of the shipper's name at the bottom of the special label. The size, color, shape and the wording on the upper half, including the word or words in large type in the centre, must accord with the standard label for the group.

In preparing special labels and in authorizing their use the shipper and the Chief Inspector must bear in mind that the special label will not accomplish the purpose of the regulations if its differences from the standard label can be detected without a close examination. With this point covered the convenience of shippers will be consulted to the fullest extent possible. Packing boxes with *satisfactory* labels stamped or printed on them during manufacture will be accepted, but the printing must show the special authority of the Bureau of Explosives and the identification number of the label. In some cases it may be possible to permit data, required by the pure food law, to be placed at the bottom of the label in small letters, thus combining two necessary labels into one.

Shippers' Duties.

It is the duty of a shipper to study carefully the "General Notice" and all of the "Directions for Shippers in Section I;" and to devote special attention to the definitions in paragraphs 1821, 1831 and 1851, and to the requirements of paragraph 1802. He must then have, or acquire, an accurate knowledge of the characteristics of his own shipments. If he does not know whether any of them flash below 100°F., he must find out by making, or having made, the prescribed test. If no facilities exist in his vicinity he can deliver his samples to "Chemical Laboratory, Bureau of Explosives, South Amboy, N. J.," where a reasonable charge will be made for analysis or tests. He must remember that the necessity for a label is dependent on the definition of the group and the nature of his material, not on the inclusion of his material in the incomplete lists of samples. The Chief Inspector is always available for the settlement of doubtful points by correspondence.

Manufacturers should supply necessary information to their customers who may desire to reship the manufacturer's products in original packages. A manufacturer of a dozen different standard brands of paints and varnishes, for example, should furnish a printed list of his brands stating after each the color of label required, or "No Label Required."

The general terms in paragraph 1802, "illuminating and other oils, paints, drugs, chemicals, etc.," describe as well as seems practicable, the "other dangerous articles" that lie in the borderland between general merchandise and inflammable materials requiring labels. For reasons already given the shipper must state on his shipping order "No Label Required" and furnish the certificate for these articles. The "etc." is intended to include synonymous terms. Shipping under the term "medicines," for example, instead of "drugs," of "chemicals" would not relieve the shipper from this duty.

Just because these borderland articles cannot be defined definitely and because all terms under which they may be shipped cannot be given, we need a general principle for the settlement of doubtful cases. This principle is that a railway agent has a right to demand an assurance from the shipper when he deems it necessary, and a shipper desirous of co-operating in this worthy movement to promote safety will give the assurance (no label required and certificate), even in a case where the shipper considers the agent's action an absurd interpretation of the spirit of the regulations. After complying with the agent's request, the shipper should immediately report the circumstances to the Chief Inspector, 24 Park Place, New York City, to the end that the agent, if wrong, may be corrected.

In like manner, the agent, unless he has positive knowledge of his own that the shipper is guilty of misrepresenting his shipment, should accept a properly prepared and certified shipping order and forward the shipment. In doubtful cases, however, the agent, immediately after forwarding the shipment, should report the matter through proper channels; and, if possible, obtain and forward to the "Chemical Laboratory, Bureau of Explosives, South Amboy, N. J.," a sample to the end that the shipper, if wrong, may be corrected.

By following out this reasonable plan for mutual assistance and co-operation, education of agents and shippers will proceed rapidly and amicably and uniform observance of the regulations will be promoted.

Duties of Railway Employes.

In addition to the important duties already mentioned, railway employes should familiarize themselves thoroughly with their specific duties as given in Section II, "Cautions and Directions for Railway Employes," and endeavor to appreciate the *reasons* for the rules. This reason will assist materially in fixing the rule in the memory and it will also conduce to an intelligent application of the rule. In cases of emergency, or where, for other just cause, it is impracticable to comply literally with the rule, an intelligent employe who understands the object in view will be able to use other practicable precautions whether specified in other rules or not.

For example, it is evident that one of the most important rules is 1896, which prohibits entering with a lighted lantern a car containing inflammables. It may be said that this is the final and paramount precaution against fire for the enforcement of which the other rules are merely preparatory. A label on a package is used to indicate that a placard is to go on the car; and one of the principal objects of the placard is to apply rule 1896. It is believed that railway officials will recognize the importance of this rule and equip their freight stations where it is practicable with electric lights. In the meantime, what must necessarily be done at points not supplied with electric lights? Evidently work cannot be restricted to daylight, and it is probable that special instructions of individual companies will modify this rule for specified points. An intelligent employe at such a point will readily appreciate that it will be practicable to apply rule 1898 and open the car for detection of odors of inflammable liquids, and for proper ventilation, before bringing a lantern near it.

It has apparently been assumed by some employes that the principal object of the rules is to add to their clerical duties; that their duties involve only the securing of proper certificates and stamps and making the proper endorsements on revenue and other way bills. It would be the height of folly to undergo the burden and expense of posting all these silent sentinels, labels and placards; and then, by ignoring their warnings, to incur voluntarily all the danger involved. These sentinels cannot prevent fires unless they prevent an employe doing something that would bring about the fire.

Conclusion.

As far as practicable in my limited time, it is believed that I have presented the principal facts that you need in order to decide whether this general movement to promote the safe transportation of explosives and other dangerous articles is worthy of your approval and active co-operation. Upon each individual that decides affirmatively rests the responsibility, as a public spirited American citizen, to spread that conviction and to perform willingly and accurately his duty as specified by the regulations.

Resuming his informal address Col. Dunn said:

There is one other question upon which I agreed to talk and that is the use of explosives in mines. This is a specialty in itself, and our specialty, for the time being, is the promotion of safe transportation. But let us consider for a moment the dangers that attend mining. First and foremost thousands of men are required constantly to handle explosives when they are absolutely ignorant in many cases of the characteristics of these explosives. Necessity requires the handling by men who are not only ignorant but who furnish the greatest examples of recklessness to be found anywhere. This handling is under enforced conditions where the carelessness of one man involves the safety of all the others. These conditions are a great deal worse than anything we have in transportation.

In addition to the danger from explosives we have in mines something that is worse: the gaseous condition, a mixture of gas with the proper proportion of air, gives us a more dangerous explosive than the blasting agent, because that will not be exploded by bringing a flame near it, as will the explosive formed by the mixture of gas and air. And you can get a very powerful explosive by mixing coal dust with air. All explosives are essentially a mixture of combustible matter with a substance bearing oxygen. The air furnishes oxygen and gas, or coal dust, the combustible.

Now, what is the remedy? What has been the remedy in our transportation problem? First, rules and regulations, made just as efficient as they can be made, rules whose preparation not only requires knowledge of explosives but practical knowledge of mining operations. I do not know the practice of mine operators in this respect, but if it is true that different mines of the same kind have different rules, then, as with those manufacturers of explosives who have heretofore had their own methods of loading explosives in cars, some have better rules than others and the best rules should be adopted by all. The first step in co-operation, then, would be for the mine operators to get together and see that the very best set of rules possible is provided and universally adopted. Having a set of rules is only a start. We must provide for enforcement, first, by education, and second and most important, by checking, by inspection. Each mine must have an efficient inspection force, and by that I mean all that the word implies. It is not usual to get a thousand dollar result out of a hundred dollar man. I do not know what you pay your inspectors, but if by paying more money you can get better service, it is the best investment you can make. Everything will depend on the efficiency of their inspection.

Secondly, there should be a combination of the vast interests engaged in this matter, to get a secondary check. I would advocate the forming among yourselves of something like the Bureau that has been formed in the interests of the railroads, and the provision of bureau inspectors to check your local inspectors. The mine laborer should never know when the local inspector is going to check him, and these local inspectors should never know when a higher inspector, from a central organization, is to check them. In that way only will you approximate the essential features of any effective plan for enforcing regulations, namely: education, followed by constant and efficient checking of violations.

And this testing station recently established here in Pittsburgh is essential. I have known people to be hoodwinked time and again by agents for so-called new explosives. I had a friend come to my laboratory once who had been asked to invest in a new explosive. After asking him some questions, I found that the new explosive had been invented by an ordinary laborer working in a tannery, who had discovered that a mixture of picric acid and other chemicals used in his trade would explode, and that was his valuable secret. I told my friend there was nothing valuable in it and to let it alone. He did so, but a friend of his thought there was so much money in it that it would pay him to organize a company; and he went to New England hoping to demonstrate the great value of the new explosive to quarrymen. A few months later this promoter ended his career by going into the next world with the inventor. They were charging a blast hole when the usual result followed.

This accident helps to show that there has not been in this country enough education and inspection in regard to explosives. Anybody is free to offer for sale any mixture called an explosive, if he can get any one to buy it from him, to endanger life and property by its use. In using explosives in mines there is a limit charge that you should not exceed under any circumstances. There are probably not many mines in this country where the foremen know enough about the limit charge of the explosives they are using. When they can get coal with a deep hole and a heavy charge better than with more holes and small charges, they will take the easy way every time. Just as we induced the manufacturers to help in this work to promote safe transportation you mine owners and operators must seek the co-operation of all concerned with your problem.

It is commonly believed that a labor union is imbued with only one object, to protect the pocketbooks of its members. Possibly that is true, but I believe that, when approached in the proper way, the governing committee of almost any one of these unions will see that it is to their interest to assist in making their members obey a proper set of rules for mine operation, just as the manufacturers of explosives are working to make their employes obey a proper set of rules for transportation. These committees should work with operators to secure information to show who is violating the rules, and they should welcome a proper punishment of the delinquents. Combine all such outside efforts with inspection and education, inspection such as I have sketched, and you will be working along the most promising lines. I thank you, gentlemen, for your attention.

MR. J. S. UNGER: After Col. Dunn began, I remembered that I had met him before. I remembered the time, about eight years ago, when we tested, at Sandy Hook, the two 11½" plates just shown on the screen. I might tell you this, as Col. Dunn is a very modest man. If you noticed, one of the plates was marked "Explosive D." Col. Dunn is the inventor of that explosive. He is also the inventor of the "Dunn Delayed Action Fuse," whereby it is possible to explode a projectile on impact, while passing through the plate, or just after it has passed through. I just make mention of these facts, which I know Colonel Dunn would not refer to, so you may know that he is an inventor of quite some note.

MR. D. C. THOMAS: I was very much pleased with the lecture. I don't believe I will set a box of dynamite on end—I do not think that has ever occurred to mining men as a source of danger. I assume that most of the railroad men always did know that it was dangerous to have a car loaded with matches next to a car loaded with dynamite, but that there are many points in the lecture that they did not know.

Our greatest trouble in transportation is connected with the electric wires in mines. We have had explosions occur from miners putting their kegs of powder in empty cars when the rails were used for return current, the current passing through the draw bars and couplings and the kegs coming in contact with the draw bars. Some years ago we opened up some new mines. We had our own railroad, also a central power plant. and in one of the mines the wire was not sufficient to carry power needed. We connected to the rails of the railroad for return and found it gave us relief, as far as power was concerned, but when we went to haul our powder over the line it always gave me a great deal of uneasiness to know whether there was any danger. I have heard electricians claim that there was no danger.

MR. F. H. STARK: From some of the pictures I would imagine that something happened about as quick as when Pat straddled the gun. A friend said that if he came back as quick as he went he would not be long gone. I have been railroading for thirty years, and I never knew that it made any difference whether a box stood on its side or its end.

I never supposed that there was any serious property loss on account of explosions. I received the pamphlet issued by the Bureau for the Safe Transportation of Explosives, and found that in the United States during the past two years there has been an extraordinary loss of property, to say nothing of the loss of life. Colonel Dunn is doing good missionary work, if he can save only the lives of a few people. I know that all here interested in the transportation of explosives have been instructed through this talk. We certainly appreciate his coming here, and I would move you, Mr. President, that we extend to Colonel Dunn a vote of thanks in expression of our appreciation.

The motion was carried by unanimous vote.

PRESIDENT: I take pleasure in extending to you the thanks of the Club.

COLONEL B. W. DUNN: I do not want simply to say "I thank you." As you know, I am only temporarily engaged in this work. I came to it because the members of the Committee who consulted with me concerning the first set of regulations thought I could help the American Railway Association in organizing this Bureau. The application for my services for one year was made to the War Department, and the argument presented in favor of it was that the U. S. Government is interested in this matter as the principal shipper of explosives and ought to permit the utilization of any man who can be of any use. That year was up last June, and my detail was extended first to November, and finally to the first of February, 1909, when I am supposed to go back to regular duty. I have had during this time a most interesting piece of work that has brought me into touch with many prominent men and many important interests. I was injected suddenly, as a stranger, into railway circles, and before coming to work I wondered how I should get along. I must say that I have received from railway officials and others appreciation, co-operation and assistance that cannot be readily described.

Your enthusiastic vote of thanks is another evidence of this appreciation and I thank you very much for it.

ON MOTION—Adjourned.

OFFICIAL PROCEEDINGS

RAILWAY CLUB OF PITTSBURGH

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Vol. VIII. January 22, 1909 No. 3.

SUBJECT: "SOME ENGINE HOUSE AUXILIARIES."

By Mr. Wm. Elmer, M. M., Pennsylvania R. R. Co., Pittsburgh.

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of the

Railway Club *of* Pittsburgh.

ORGANIZED OCTOBER 18, 1901.

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Meetings held fourth Friday each month, except June, July and August.

PROCEEDINGS OF MEETING,
JANUARY 22, 1909

The meeting was called to order at the Monongahela House, Pittsburgh, Pa., at 8 o'clock, P. M., with President D. J. Redding in the chair.

The following gentlemen registered:

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Barnsley, Geo. T.
Barwis, J. McC.
Bennett, Robt. G.
Berg, Karl.
Bixler, H. C.
Carson, Robt., Jr.
Chapin, E. S.
Chittenden, A. D.
Colburn, Wm. W.
Conway, J. D.
Courson, Chas. L.
Courtney, D. C.
Crouch, A. W.
Cunningham, J. D.
Cunningham, R. I.
Deckman, E. J.
Drayer, U. S.
Elmer, Wm.
Falkenstein, W. H.
Fleck, J. S.
Gearhart, J. A.
Geary, C. J.
Gray, C. B.
Green, Harry W.
Gulick, H.
Halliwell, C. J.
Hamilton, Wm.
Hill, M. H.
Hosfield, W. G.
Howe, D. M.
Hughes, J. E.
Hunter, H. S.
Huyett, E. G.
Kaup, H. E.
Kessler, D. D.
Keyser, R. H.
Knight, E. A.
Kull, W. A.
Lehr, H. W.
Long, R. M.
Lynn, Samuel.
Malloy, M. A.
Mason, Stephen C.
Matthews, John A.
Metcalf, H. E.
Mingus, G. W.
McClumpha, H. E.
McGinnis, B. B.
McIlwain, J. D.
McNulty, F. M.
Oates, Geo. M.
Oliver, W. H.
Pendleton, D. D.
Porter, H. V.
Quest, W. O.
Redding, D. J.
Reeve, F. J.
Reid, W. S.
Riddell, W. J.
Rinehart, H. W.
Rutzky, B. E.
Ryan, W. F.
Sager, Wm. B.
Shuck, Wm. C.
Sitts, Lewis S.
Smith, D. W.
Smith, W. A.
Stucki, A.
Sweeley, G. P.

Tate, R. H.
Tucker, J. L.
Walker, J. W.
Walther, G. C.
Warne, J. C.
Warnock, H. R.
Woodworth, R. B.
Wright, J. L.
Young, W. W.
Zinsmaster, F.

VISITORS.

Coho, O. C.
Collison, T. A.
Emery, E. A.
Ferree, H. W.
Foreman, Jacob E.
Friederici, Fritz.
Gale, G. W.
Gutierrez, S. J.
Haynes, J. E.
Heggins, C. H.
Hudson, W. A., Jr.
Hudson, W. L.
Krause, R. A.
Mills, S. Harold.
McDermitt, W. W.
McFarlane, Geo. R.
New, Wm. G.
Sheaffer, W. A.
Smith, Sion B.
Stoll, H. B.
Thompson, G. W.
Vauclain, C. A.
Westhauffer, P. E.

The reading of the minutes of the last meeting were dispensed with, they being in the hands of the printer.

The Secretary read the following applications for membership:

Brown, F. G., Representing H. W. Johns-Manville Co., Pittsburgh, Pa. Proposed by H. V. Porter.

Cargo, B. B., M. M., Lake Terminal R. R., Lorain, Ohio. Proposed by F. H. Stark.

Davis, I. J., Genl. Foreman, Pressed Steel Car Co., 1364 Fourth Ave., Coraopolis, Pa. Proposed by A. C. Knickerbocker.

Foreman, Jacob E., Tank Shop Foreman, Penna. R. R., 28th St. Shops, Pittsburgh, Pa. Proposed by Wm. Elmer.

Griswold, W. W., C. C. to Genl. Mgr., Wabash-Pittsburgh Terminal Ry., Wabash Bldg., Pittsburgh, Pa. Proposed by C. O. Dambach.

Grose, James H., Supt., Howard Axle Works, Carnegie Steel Co., Homestead, Pa. Proposed by Chas. Orchard.

Gutierrez, S. J., M. P. Inspector, P. R. R. Co., 6228 Station St., Pittsburgh, Pa. Proposed by Wm. Elmer.

Harrigan, P. J., Car Builder, McKeesport Connecting R. R., 716 South Evans Ave., McKeesport, Pa. Proposed by A. Stucki.

Krepps, W. K., Salesman, Crucible Steel Co. of America, Frick Bldg., Pittsburgh, Pa. Proposed by D. J. Redding.

Lambert, G. J., Yard Master, P. & L. E. R. R., Monessen, Pa. Proposed by H. R. Warnock.

Lewis, James M., Secretary and Traffic Manager, Consolidated Lamp & Glass Co., Coraopolis, Pa. Proposed by F. H. Stark.

Lincoln, L. P., Supt. Fitting Dept., Homestead Steel Works, Munhall, Pa. Proposed by Chas. Orchard.

May, T. M., Representing Brady Brass Co., New York, N. Y. Proposed by H. V. Porter.

Moore, John L., Asst. Secretary and Treasurer, Monongahela Connecting R. R. Co., Jones & Laughlin Bldg., Pittsburgh, Pa. Proposed by Frank McCune.

Noland, J. J., Vice President, Hutchins Car Roofing Co., Hyde Park, Pa. Proposed by C. W. Alleman.

Prickman, W. R., Agent, Wabash-Pittsburgh Terminal Ry., Crafton, Pa. Proposed by C. O. Dambach.

Purdy, W. F., Chief Engineer, Wabash-Pittsburgh Terminal Ry., Wabash Bldg., Pittsburgh, Pa. Proposed by C. O. Dambach.

Schreiner, W. C., Mgr., Main Belting Co., 208 Third Ave., Pittsburgh, Pa. Proposed by J. D. McIlwain.

Smith, A. D., Supt., Canfield Oil Co., Fourth Ave., Coraopolis, Pa. Proposed by F. H. Stark.

Starkey, Samuel, American Bridge Co., 6962 Bennett St., Pittsburgh, Pa. Proposed by A. C. Knickerbocker.

Swearer, Howard R., Representing James B. Sipe & Co., 516 Federal St., N. S., Pittsburgh, Pa. Proposed by Geo. T. Sipe.

Ward, V. B., Vice President, Island Petroleum Co., P. O. Box 978, Pittsburgh, Pa. Proposed by F. H. Stark.

Winter, F. W., Patent Attorney, Frick Bldg., Pittsburgh, Pa. Proposed by A. Stucki.

PRESIDENT: As soon as these applications have been favorably passed upon by the Executive Committee the gentlemen will become members.

SECRETARY: It is with regret that we have to announce the death of Mr. Charles A. Brayton, President of the Standard Car Wheel Co., of Cleveland, O., who died in that city on December 24th, 1908.

PRESIDENT: I will appoint Messrs. J. D. McIlwain, F. J. Lanahan and S. L. Smith a Committee to draft suitable memorial resolutions.

MR. STEPHEN C. MASON: I presume all of our members are more or less familiar with the movement inaugurated in New York some time ago under the name of the Railway Business Association, to promote a better sentiment on the part of the public toward the railroads. This is a movement which should have been begun years ago, but matters drifted along until during the last few months the situation became so acute that particular attention was attracted to the prevailing spirit of antagonism, both on the part of the general public and in legislative bodies, against the railroads in common with other corporations. This organization is doing good work in securing memorials from the different trade and commercial organizations throughout the country in support of the movement, and it gives me pleasure to report that the Pittsburgh Chamber of Commerce on January 14th adopted the following:

WHEREAS, Pittsburgh depends largely upon the prosperity of the railroads; and,

WHEREAS, It is of great importance to the commercial interest of this community that the earnings of the railroads should enable them to maintain normal operation and proper facilities; it is

RESOLVED, That the Pittsburgh Chamber of Commerce urges upon Congress and upon the Pennsylvania Legislature the necessity of moderation and conservatism in the regulation of the railroads, and that requirements imposed will be confined to such necessary enactments which will not imperil dividends, cause deterioration of service, reduction of the wage scale or neglect of construction for future needs.

In line with the spirit of this resolution and in indorsement thereof I move, Mr. President, that this organization adopt the following resolution:

RESOLVED, That the Railway Club of Pittsburgh notes with satisfaction the movement now under way and being promoted by the Railway Business Association for the creation of a better sentiment on the part of the public toward the railroads, and the resolutions in support of the movement being adopted by the various trade organizations of the country on a similar line to that adopted by the Pittsburgh Chamber of Commerce, and pledges the hearty support of this organization in the movement, and urges upon Congress and the Legislature of the State of Pennsylvania careful and conservative consideration of all proposed enactments affecting the railroad interests.

The motion being duly seconded, the resolution was adopted as read.

PRESIDENT: If there is no further business we will proceed to the reading of the paper of the evening, "Some Engine House Auxiliaries," by Mr. Wm. Elmer, Master Mechanic of the Pennsylvania Railroad, whom I have the pleasure of introducing to you.

Some Engine House Auxiliaries.

BY MR. WM. ELMER, M. M., PENNA. R. R. CO., PITTSBURGH.

Mr. President and Fellow-Members: It will be my pleasure this evening to submit for your consideration some engine house auxiliaries which have been found to be of considerable service in expediting the movement of locomotives at terminals, and all of which have been tested out and tried by time. Let us start first with the inbound engines on their way to the ash pits. At busy points it has been found to be of great benefit to be able to get a report of the condition of the incoming engines at the earliest possible moment. Very frequently the ash pits are a considerable distance from the engine house office, and the time lost by the crew in walking for several minutes, stopping to chat on the way, examining the latest improvement or even going home without doing it at all, makes it very desirable that some better and quicker means be used for getting the engine's condition than to depend on a report by the engineman. For this purpose it is the practice of some of the larger roads to use inspection pits, at which a small force of men is stationed, and these examine the engine as soon as it comes on to the pit. The work is systematized, so that each man has certain definite duties to look after and is held responsible for inspecting certain parts of the engine. At a large terminal handling from 100 to 150 engines per day a force of four to six men are employed, and these are under the charge of one of their number, who is paid 27 to 29 cents per hour and is called the Head Engine Inspector. It is his duty to examine around the outside of engine and tender, including trucks, wheels, draft and brake rigging, couplers, grab irons, foot boards, pilot, steps, safety appliances, etc., to see that they are in good condition and report any defects; use the gauges for determining the proper height of couplers, open and close the knuckles, note the condition of locks, etc., and try the gauge for wear. He should pay particular attention to driving wheels, flanges and tires, main and side rod brasses, knuckle joint pins, crosshead pins, crossheads and guides. He should note loose pipes and clamps, oil cups and lids, cracks or breaks in frame, working of cylinders, missing or defective safety pins and look over the valve gear, springs and spring rigging. He should report any hot bearings, leaky washout plates or plugs or any other defects that might come under his notice. It is his duty to see that all other inspectors report for duty promptly and that they perform their work properly; that the pits, buildings and surroundings are kept clean, that all defects are reported, and that each inspector makes out a report on the proper form for each engine inspected, whether defects are found or not.

Another engine inspector starts in under the pilot and examines the truck, wheels, frame, braces, axles, boxes, king bolt, etc., main frames, stiffening pieces, driving boxes, shoes, wedges, pedestal caps, valve gear, eccentrics and straps, and oil pipes, cups, lids, etc. Also draft gear between engine and tender, spring chambers and buffer castings, ash pans, dampers, grates and grate rigging and underneath the tender, including trucks, center castings, wheels,. frame and side bearings.

The head air brake inspector examines the brake valve, air pump, gauges and governors, noting dates on tags and reporting same for attention after 30 days from date. He examines all air pipes and reservoirs above the running board to see that they are tight and properly secured, the sanding devices, gauge glass and gauge cocks, trying them and blowing them out. He notes the condition of the fire door, latch and chain, the apron and hearth plate, wash out plugs, sprinkling hose, etc. He examines the throttle gland to ascertain if packing will last until the engine is due for boiler wash. When an engine is due for boiler wash he will call attention to the need of throttle packing, if such is the case, together with any valves in the cab that need packing. His most important duty, and one which he performs as soon as he climbs on the engine, is to examine the crown and side sheets for leaks and to note the condition of the flues. This examination is made in the presence of the engineman, and before the latter is relieved, and is of great advantage in protecting the engine house people in the event of subsequent discovery of damage due to low water. This inspector also examines the staybolt and boiler wash tags, notes when the engine is due for staybolt test or boiler wash attention and keeps a book record of the same. When an engine is due for staybolt test or boiler wash, he chalks the steam chest so that the hostlers may know that the fire should be knocked out.

These staybolt and boiler wash tags have been found a very simple solution of a very vexing problem. The devision with which I am connected has about 700 locomotives and a dozen or more engine houses. A locomotive may be at one

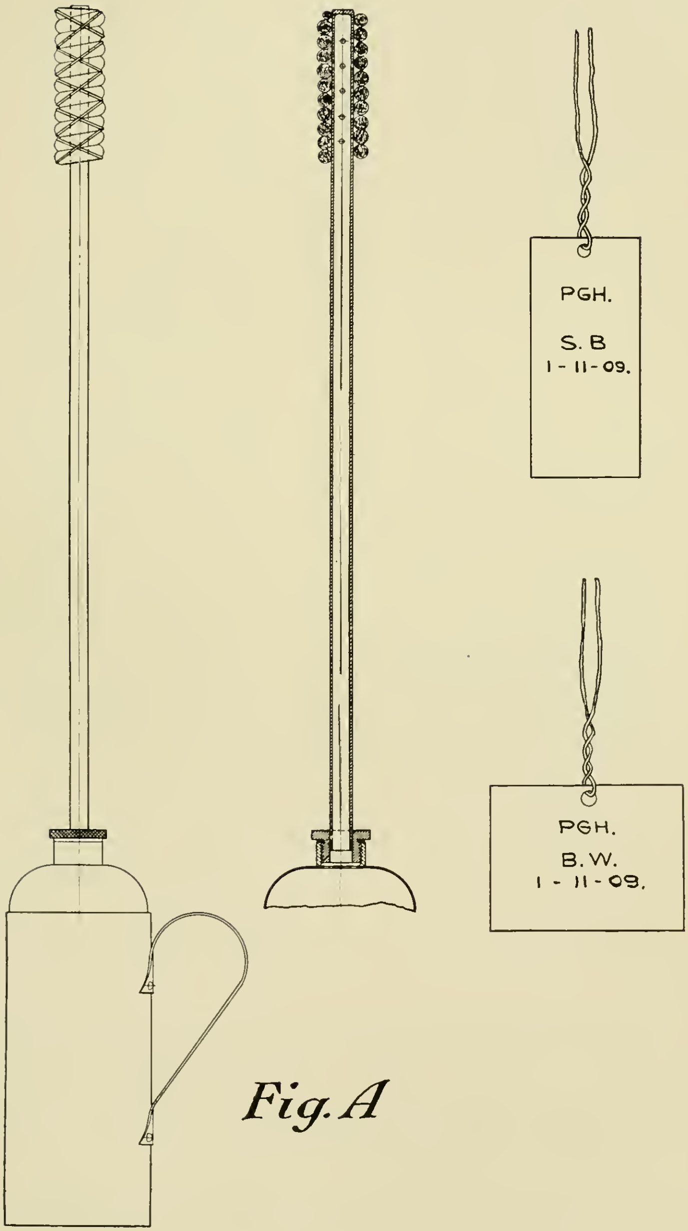


Fig. A

terminal on Monday, another on Tuesday, a third on Wednesday, and so on, and the method of keeping a book record in the master mechanic's office and sending out letters to all points giving a list of engines due was found so cumbersome and unsatisfactory and was giving such poor results and requiring the interchange of so many messages between different engine house foremen in order to prevent giving the same attention to the engine at different points on the same day, that it was decided to have each engine carry its own record. For this purpose small tin tags 1⅛ by 2½ inches for the staybolt test and 2 by 1½ inches for the boiler wash are fastened by wire to the water bottle connection. These are marked with steel stamps to show the point and the date when the engine was given attention, and so soon as the proper time comes around there are the reminders that the engine is again due. An engine coming to any terminal without these tags is taken in hand at once and new tags applied. Of course, a book record is kept, simply as a check, but the list of overdue engines is surprisingly small.

One duty of the head air brake inspector which may not interest all those present, but which nevertheless is a very important one on roads equipped with track troughs, is to lower the water scoop while the man underneath gauges it, to see that it is neither too high nor too low. This underneath man is also an air brake inspector, and he examines all air pipes, hose and connections below the running board, brake rigging of engine and tender, notes the piston travel and locates leaks of every description. For this purpose what we call a wickless torch has been found of considerable service, and the men who use them prefer them to those of other patterns. They burn less oil than other torches, require no wicks and almost no repairs.

The steam heat inspector examines all valves in the cab and at rear of tender, all joints and pipes between engine and tender and on front and rear. He tests the governor to operate at 100 lbs. and reports any leaks or defects in the portion of the equipment for which he is responsible.

When these examinations have been completed (and it does not take long, from four to five minutes being sufficient) each

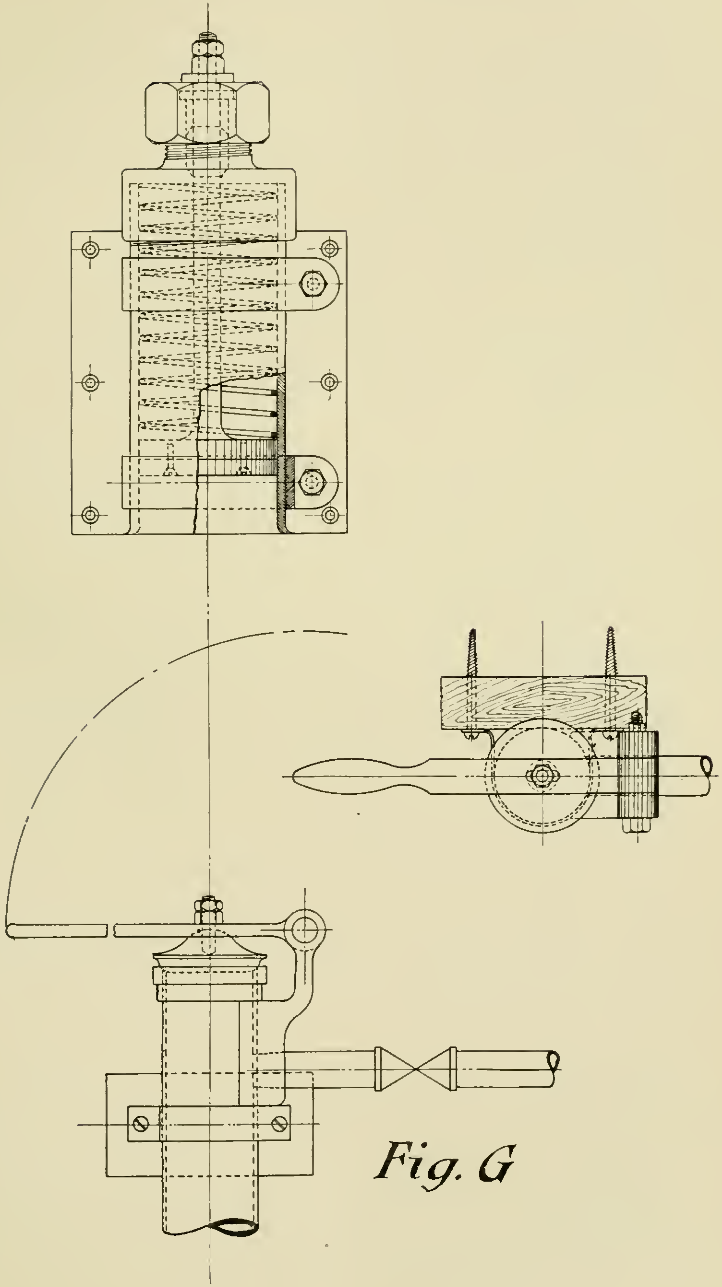


Fig. G

man writes his report on the proper form and sends it by pneumatic dispatch tube to the engine house office. By this means the reports covering the condition of the engine will reach the work distributor's desk almost as soon as the engine reaches the ash pit. The tube can easily be installed by any competent pipe fitter and is usually constructed of two-inch pipe laid in a box underground or carried on the ends of the ties. The fins should be smoothed off the inside of the pipe and a simple carrier can be made of an old air brake hose. When the reports are ready they are slipped into the carrier and the latter pushed into the open end of the tube. A hinged flap valve is then held against the tube and the air pressure turned on, a distance of several hundred feet requiring only a few seconds. As almost all of our larger engine houses are provided with air compressors, it is easy to secure the motive power needed by using a reducing valve set to a few pounds. The carriers as they come out of the tube strike against a spring buffer a foot or so away and drop into a basket. The man at the receiving end then signals to the other end by means of a bell or incandescent lamp and the air is shut off and the flap valve allowed to fall.

The usefulness and value of this simple and inexpensive tube system can hardly be appreciated by those who have never used it. The condition of an engine is known to the engine house force within a few minutes after it reaches the inspection pit, and they know at once whether the engine can be marked up for a run and a crew called or whether it will require shop attention which may take several hours. The combination of inspection pits and pneumatic tubes will save their cost many times over at nine-tenths of the large engine terminals of the country.

It might be well to say a word in regard to the layout of tracks, etc. At small points handling from fifty to one hundred engines per day one pit will be sufficient. At larger points two pits may be needed. It is often better to provide two inspection pits, even at the smaller terminals, in order to furnish a means for quickly passing shifting engines on to the ash pits without the unnecessary delay which would be occasioned if they were blocked in with a number of road engines and held until the

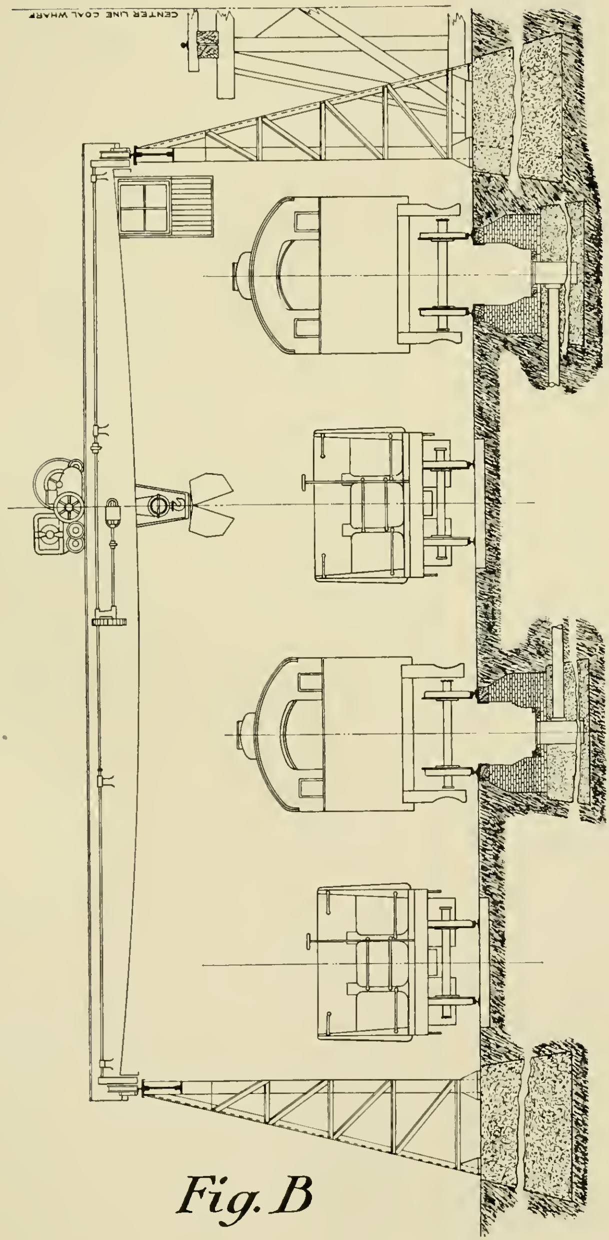


Fig. B

latter could be inspected. The shifters, as a rule, come to the engine house twice a day to have their fires cleaned and to take a supply of coal, water and sand, and as their running speed is low and their work not continuous, it is hardly necessary to give them the same careful inspection required by road engines. A by-pass method of sending the shifters over one inspection pit during certain hours of the day, usually around six o'clock in the morning and evening, or else at noon and midnight, and reserving the other pit for road power, will be found a decided time and money saver. The different shifting engines can be kept track of by the head inspector and stopped for a thorough looking over at weekly or semi-weekly intervals.

The facilities to be provided at engine house inspection pits should receive careful consideration, as a satisfactory equipment at this point will repay large dividends on its cost. The pits themselves should be about 80 feet long, 4 feet wide and 3 feet 6 inches deep. If the plan of tracks permits, it is a convenient arrangement to provide a small building for the men between the two pits, and steps arranged to lead down into a cross passageway connecting the latter so that access may readily be gained to the space underneath the engine without exposing the men to any risk of accident while entering or leaving the pit. The shanty should be sufficiently large to provide space for desks and benches for the inspectors to write out their reports and should be well heated and lighted. A telephone should be conveniently placed with an independent line leading directly to the engine house office, and the necessary lockers for properly taking care of clothing and overclothes should be furnished. A wash basin inside and a hose connection outside will complete the facilities for neatness and cleanliness.

Proceeding now to the ash pits, it may be noted that there are as many different ways of getting rid of cinders as there are fleas on a dog. The first and old reliable way was undoubtedly the shoveling method. This was improved upon by putting the ash car on a depressed track so that the men did not have to handle the ashes twice and throw them so high over the side of the car. In some cases the depressed track has been put still lower and the cinders simply slide into the car. It is not often,

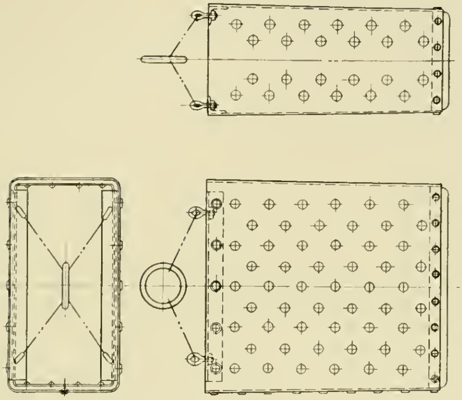
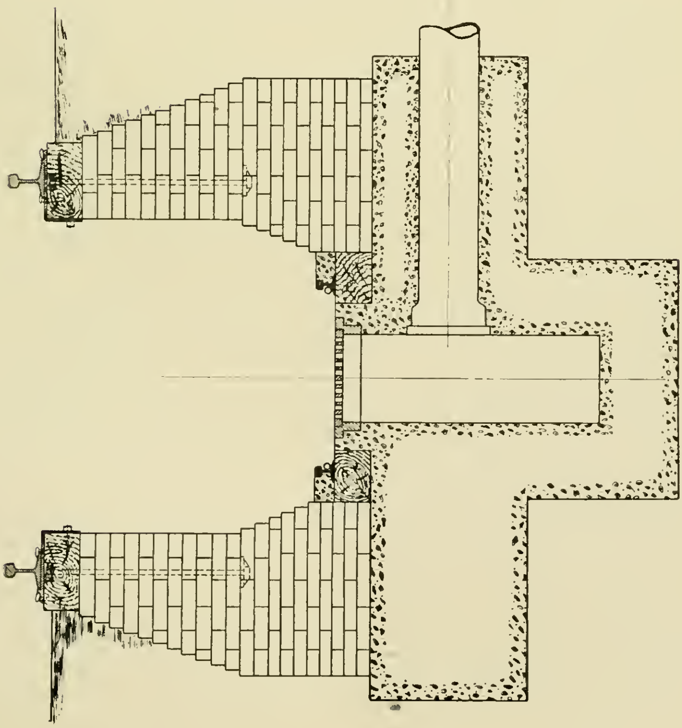


Fig. C



however, that the drainage conditions are sufficiently good to permit of this arrangement, and unless they are good it is risky to use the depressed track at all. Many a car has been pulled off its trucks on account of the latter being frozen fast, and the scheme is also bad in that it permits shifting at only one end as a rule. If the inbound engine track is full the shifter can not get in to take away the loads and put in empties. Furthermore, the shoveling method, while well suited to the smaller points, is not satisfactory at large terminals. Quite a common method is to drop the sparks and ashes into buckets in the pits and then hoist these up by various power appliances. As most terminals of sufficient size to have ash hoists at all will have air compressors, it is very usual to employ pneumatic ash hoists. The buckets are five or six feet long and rest on small trucks running on a track in the bottom of the pit. They are of the clam shell type and automatically open when the arms on the bucket strike against a ring carried on the bottom of the air hoisting cylinder. This cylinder swings on trunnions at about its middle point and is carried by a trolley running on steel I beams spanning the ash car and ash pit tracks. The trolley and its load are traversed by a second air cylinder. The disadvantages of this scheme are that the buckets must be pulled along in the pit until they are under the hoist, and this delays the engine movement sometimes until all the buckets have been emptied. But even so it is a much quicker operation than shoveling the contents of the big modern ash pans a single shovelful at a time. Some rather recent installations have adopted the electric crane for handling these ash buckets, and this method is all that could be desired. At one point four ash pits, each holding four engines, handles from 300 to 400 engines per day, and the limit of what the ash pits can do is not in sight yet.

This layout consists of two inspection pits, one on each side of the coal wharf approach. Each inspection pit leads to two ash pits 30 ft. centers with the ash car track between and on the same level. An electric traveling crane of five tons capacity spans the pits, which are 240 feet long, and the buckets can be lifted and emptied at any time when they are not covered by a locomotive.

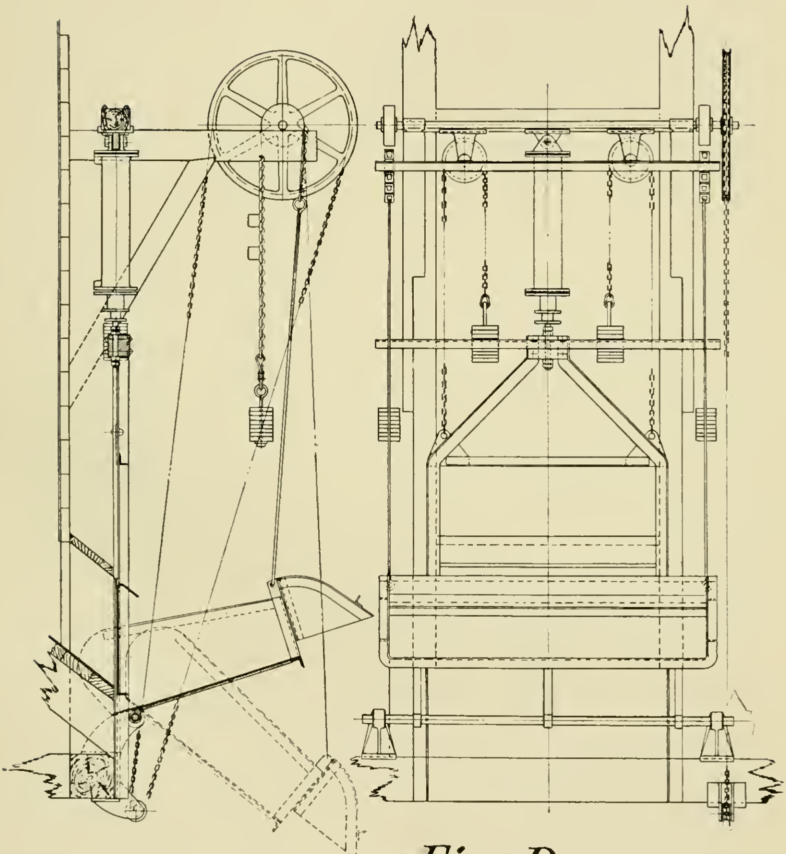


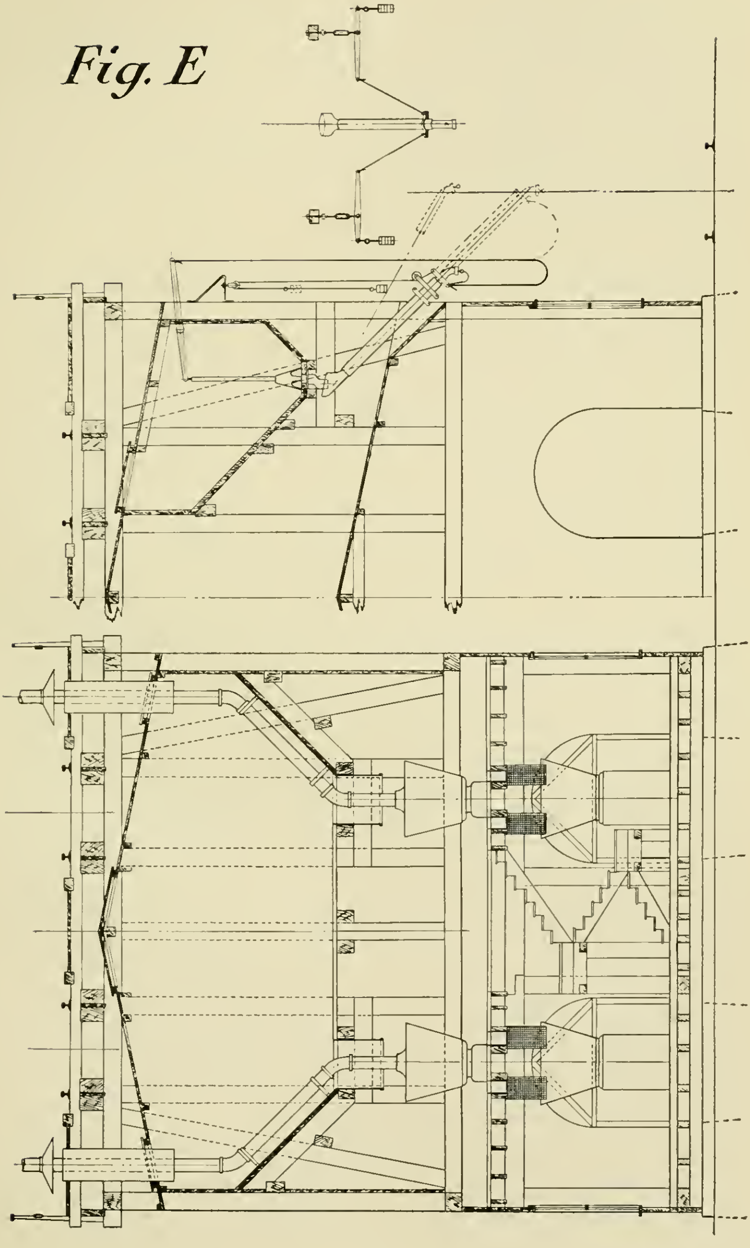
Fig. D

The matter of providing satisfactory drainage for ash pits is an important one. Sewers stopped up is a frequent cause of annoyance, but it can easily be cured by proper design. In the first place, the fall of sewer pipes should not be less than one feet in 100, so that a sufficiently rapid flow may be insured and the sediment not permitted to lodge in the pipes. These should not be less than 8 inches in diameter, and brick wells, 3 feet square, should be built every 100 or 150 feet, provided with ladders built in at one corner and with frames and gratings on top. These wells serve as catch basins for sediment and should be regularly cleaned out, and if the sewer should stop up the point where the clogging exists can easily be located and hose pressure turned on to remove it. At several points in the bottom of the longer ash pits small wells should be built and heavy wire netting baskets put in with screen lids flush with the ash pit floor. These baskets can be lifted out and the finer ashes and cinders caught by the netting will thus be prevented from finding their way into the sewers. Here the electric crane is very useful, as the baskets can be carried to the ash cars and dumped out with almost no labor. A short, straight connection should lead from these small wells in the bottom of the ash pit to one of the larger wells mentioned before. No ash pit sewers should have any Y or T branches. All intersections should be in wells.

The hose for wetting ashes is a frequent source of trouble in winter and an expense at all times. The shorter the pieces the less the liability to freezing up and being cut in two on account of having been left across the rail. A satisfactory installation has self-draining yard hydrants every 25 feet along the side of the pit, and then only a 6 foot piece of hose is necessary. The valve being below the frost line, there is no trouble from freezing, and the hose is so short that it is not cut and the water quickly runs out.

The next step in the movement of the locomotive usually brings it to the coal wharf. This may be of many types, from the primitive and expensive method of shoveling from cars direct, or into barrows which can be dumped onto the tender, to the large modern gravity or mechanical wharves handling

Fig. E



50,000 or more tons per month. The proper type of coal wharf will not be discussed here as it is almost always governed by local conditions and quantity of coal to be handled. It may be interesting, however, to mention an air-operated coal gate which has been found very satisfactory in service and which will handle run of mine coal with any size lumps at the rate of over 2000 lbs. per second. The gate is 5 ft. wide and consists of a steel plate carried in a frame sliding in guides. An air cylinder above pushes it downwards to open and pulls it upward to close, thus giving the undercut feature, without which it is almost impossible to handle lump coal. The movement is controlled by a four-way valve conveniently placed to be operated by a man standing on the tender.

The next operation is taking sand, and here again there are many contrivances in everyday use. Any spout fixed in position is unsatisfactory, as it requires accurate placing of the locomotive sand box under it. A device which we have used for some time, and which is well liked by all who handle it, consists of a swinging telescopic spout which can reach any sand box on either high or low engines. It can be moved up or down, in or out, and to right or left, so that an engine can be stopped almost anywhere within 8 or 10 feet and it will still reach. The valve is a cone shaped casting, pointed at both ends, and seats itself against a sharp edged hardened steel ring. Its weight causes it to cut through small sticks and roots, and that very great annoyance of sand still running after the valve has been shut off is hardly ever experienced. The bottom of the spout is covered by a cap to prevent the last few grains from dropping down on the machinery, and the outside sleeve protecting the telescoping portion prevents rain from getting in.

The matter of handling sand is treated in many ways, and on my own division we have quite a variety of methods. We think the best is to put the sand house in the end of a gravity coal wharf wherever that is practicable. The sand car can stand at the end of the wharf and does not have to be shifted as often as the coal cars. The sand is unloaded into the wet sand bins at the top, and from there it falls by gravity through the stoves and is dried. It then passes through screens where

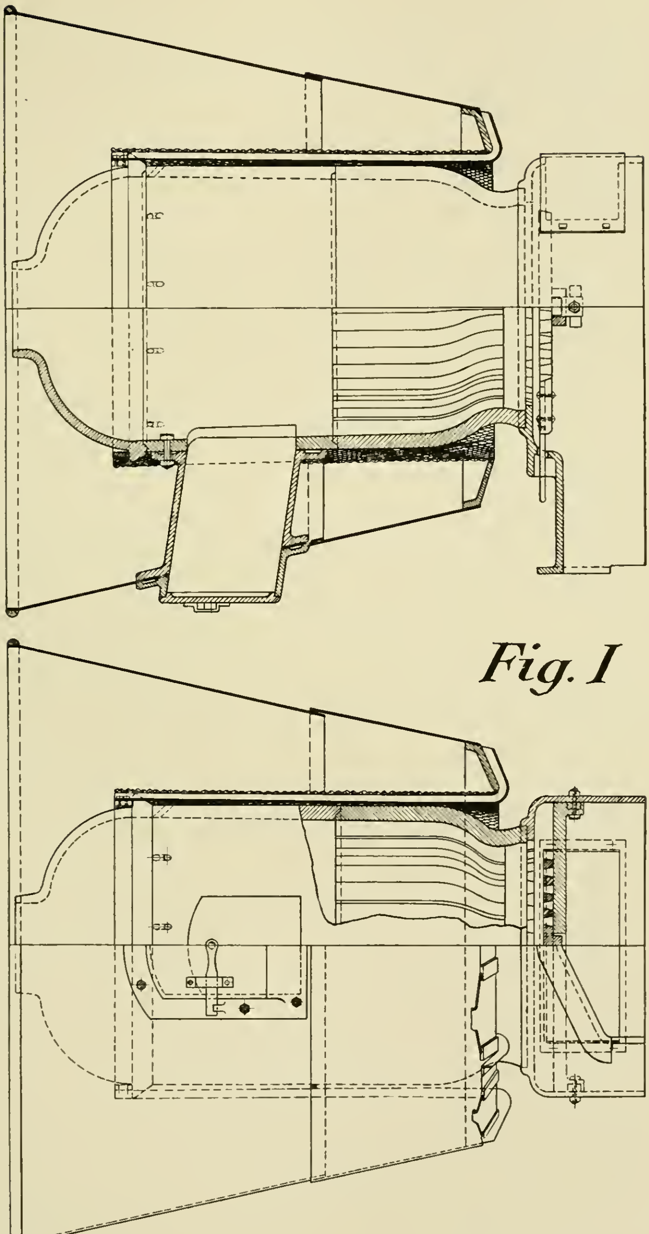


Fig. I

pebbles and other foreign matter are taken out, and falls into the hoppers of the blowing-up drums. When one of these is full the inlet opening is closed and air pressure turned on, and the sand is elevated to the dry sand bin through a 2 in. pipe. The elbows in this line are of cast iron, long sweep, with the outer wall much thicker than the inner. In this way they are not cut out so quickly. In order to avoid the trouble of sand frozen in the cars it is usual to board up the space under the coal wharf and store the winter's supply there. A small bucket conveyor elevates the sand to the bin, and the plant is independent of the weather and slow shipments.

The different schemes for drying sand are almost legion, but the old stove is probably the most used. These are frequently made very much like the round house or cannon ball stoves, with an encircling sheet iron funnel shaped hopper having the lower portion constructed of netting. It does not seem right to have the netting on the outside where the wet sand is and leave the dry sand packed around the hot stove with no way to get out but by forcing itself through layers of wet sand surrounding it. A very satisfactory arrangement is to have the netting close to the stove and separated from it by spacers, so that as fast as the sand is dried it is free to fall through. A row of holes drilled through the stove body near the upper part of this space will permit the steam to pass off through the smoke pipe. Stoves last much longer with this arrangement, as the sand does not bake against the barrel and burn the sections out. It has also been found very beneficial to put the stove sections on a boring mill and face the joints before erecting. This avoids the leakage of air through the joints as would be the case with rough castings. An opening at the bottom of the stove sufficiently large to take out the grate will prevent tearing down the whole arrangement when this repair must be made.

The operation of taking water can often be done on the same stop as for sand, and after a good 12-inch plug the next most useful things to the engine house people are the wide openings in the tanks of our modern engines. It took a long time to adopt such a simple improvement, and it saves much backing and filling in order to stop at exactly the right spot.

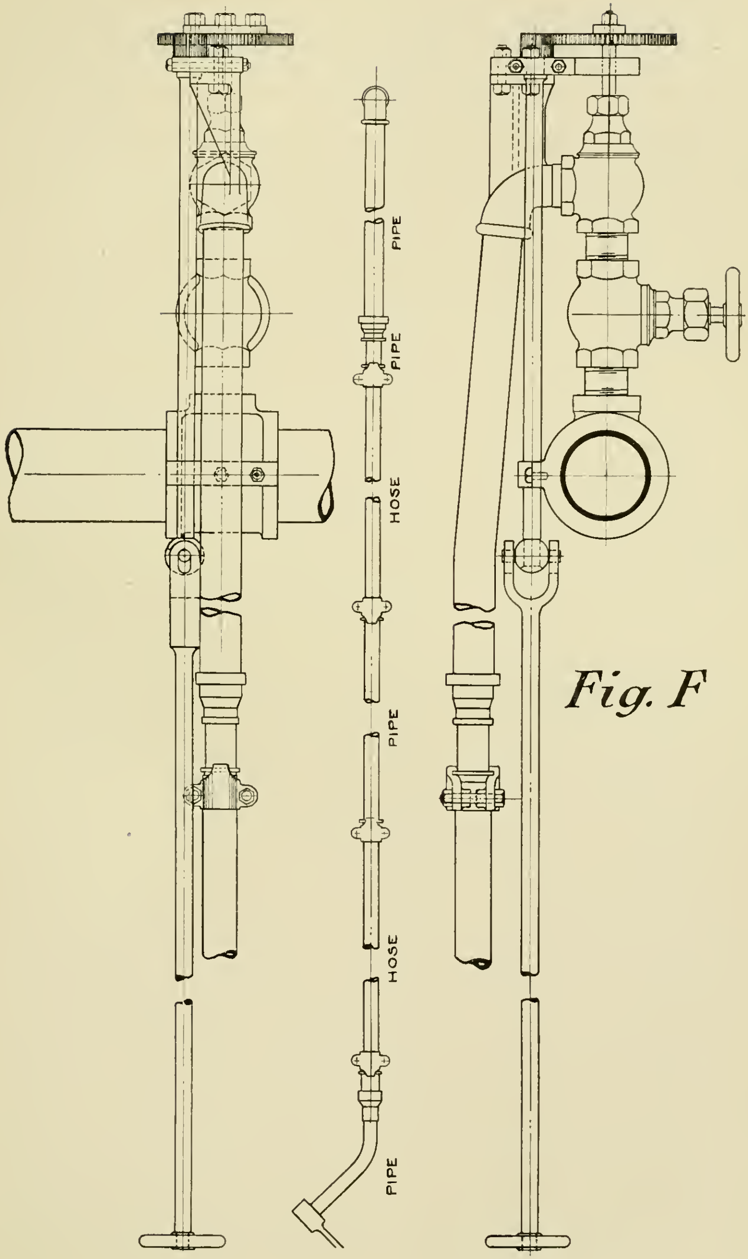


Fig. F

The turntable, with its accessories of motor, locks, pit, etc., is the thing around the engine house which should be of the most substantial and reliable character. In this climate a good deep pit, with its floor not less than 3 feet below the bottom of the girder, is a great satisfaction in a deep snow. The electric motor is preferred at busy points, and even this piece of machinery, reliable as it is, should be provided with a quick means of getting the pinion out of mesh with the gear, so that the bars may be shipped and the table turned by hand in the event of the power failing or something breaking down. The best method of getting current to the table seems to be by the use of collector rings underneath around the center, as this avoids the overhead devices which are usually clumsy and hard to hold up.

Inside the engine house there are several auxiliaries which are of great use. The systems of piping for boiler washing and filling which have been devised in recent years leave little to be desired, and as one of the best of these schemes has already been presented to this Club in great detail, you are doubtless familiar with the whole matter and nothing more need be said.

In most modern engine houses there are one or more columns between the tracks, and the one at the front of the engine should be utilized for a jib crane of about 2000 lbs. capacity. This will be found of great assistance in handling stacks, fronts, bells, air pumps, steam chest lids, etc. A differential chain block hung on a trolley will be found to answer all requirements.

In some of the older engine houses where the modern piping systems have not been introduced it is often found that the steam blower line is a source of annoyance. It is sometimes run around the outer circle wall just under the window sills, but this is a very bad place as the whole line is destroyed every time an engine runs through the wall. Sometimes the line is run overhead with drop connections coming down the wall, but this is bad on account of the vertical pipe filling with water and leaking at the valve. A satisfactory arrangement is to run the line on the roof trusses just back of the smoke jacks, using not less than 3 inch pipe, with tees looking up at every stall. On top of these tees are placed globe valves and on top of these angle valves with their stems looking up. The globe

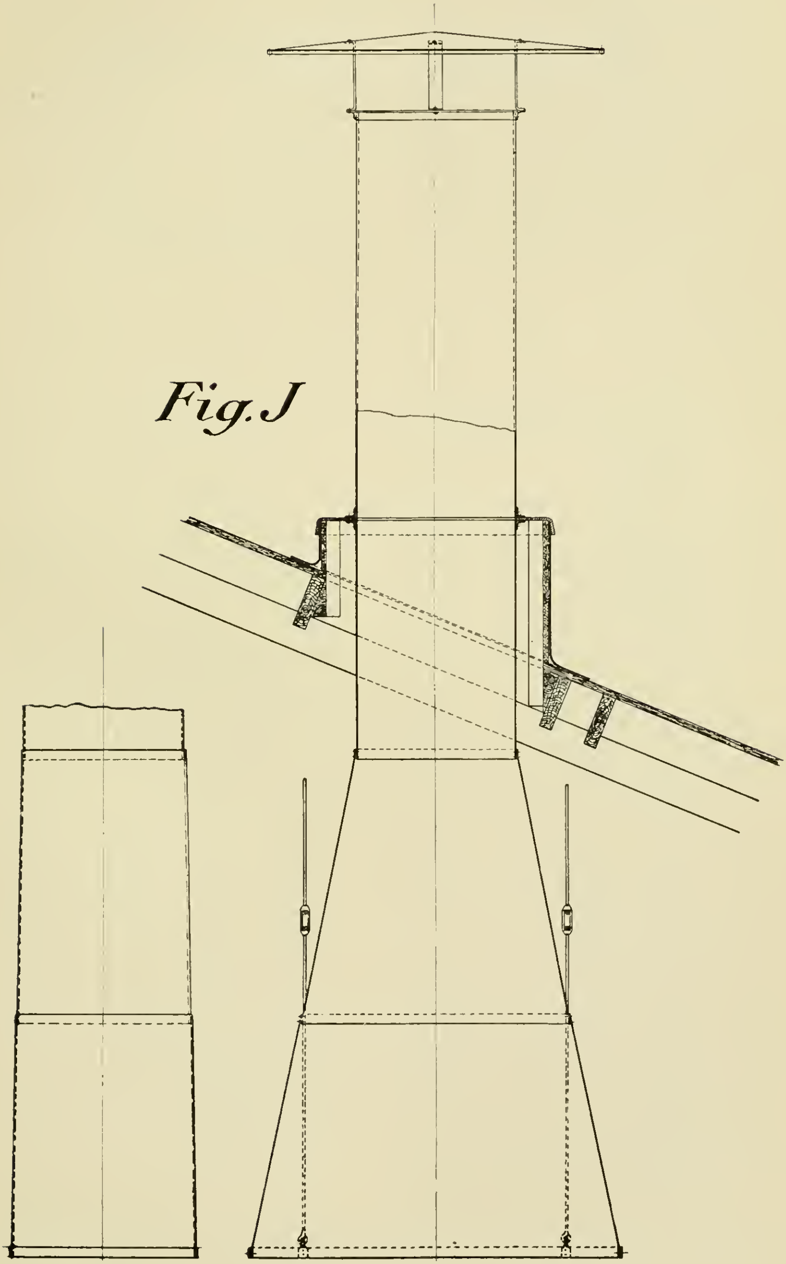


Fig. J

valves are only used to shut off the steam from the angle valve when the latter is to be repaired and saves shutting off the steam from the whole line. The up-standing stem of the angle valve carries, in place of the hand wheel, a gear wheel with which meshes a wide-faced pinion operated from the floor by means of a long rod with a universal joint near the top. From the outlet of the angle valve a short run of iron pipe turns downward, then a short piece of hose, then a longer piece of iron pipe and a 5 or 6-ft. length of hose to couple to the smoke box connection. This arrangement provides for high or low engines standing either forward or back under the smoke jack hood. It does not seem to wear out and it does not leak. It is almost impossible to prevent hot water working through a valve or around the packing, but this scheme keeps the valve stem packing away from pressure most of the time and dry all of the time, and the drop pipe has no steam and consequently no condensation in it. Any condensation in the main line overhead lies in the bottom of the pipe and is carried on to the trap in the end of the line.

One of the engine house details which is constantly in sight are the windows. These get dirty very easily and are a constant expense to keep clean. With the usual construction involving a high wall to let in lots of light, it is often necessary to clean the upper sash by ladders or long-handled brushes. A scheme which has been found very satisfactory is an arrangement of four sash in a single frame, the top one balanced against the lower and the two intermediate ones balanced against each other. This does away with sash weights, and any sash may be pulled down to the window sill level and the glass easily and cheaply cleaned. It also has the advantage of giving a clear opening of 75% of the frame area in summer time. A 12-inch I beam makes a very good frame as it never rots out and is stiff and rigid. Short sections of the parting strips are removable at the bottom so the sash can easily be slipped in and hung.

The question of smoke jacks is always a live one, and each year we hope that the final solution may arrive. We have tried nearly all the kinds there are and some faults exist in each

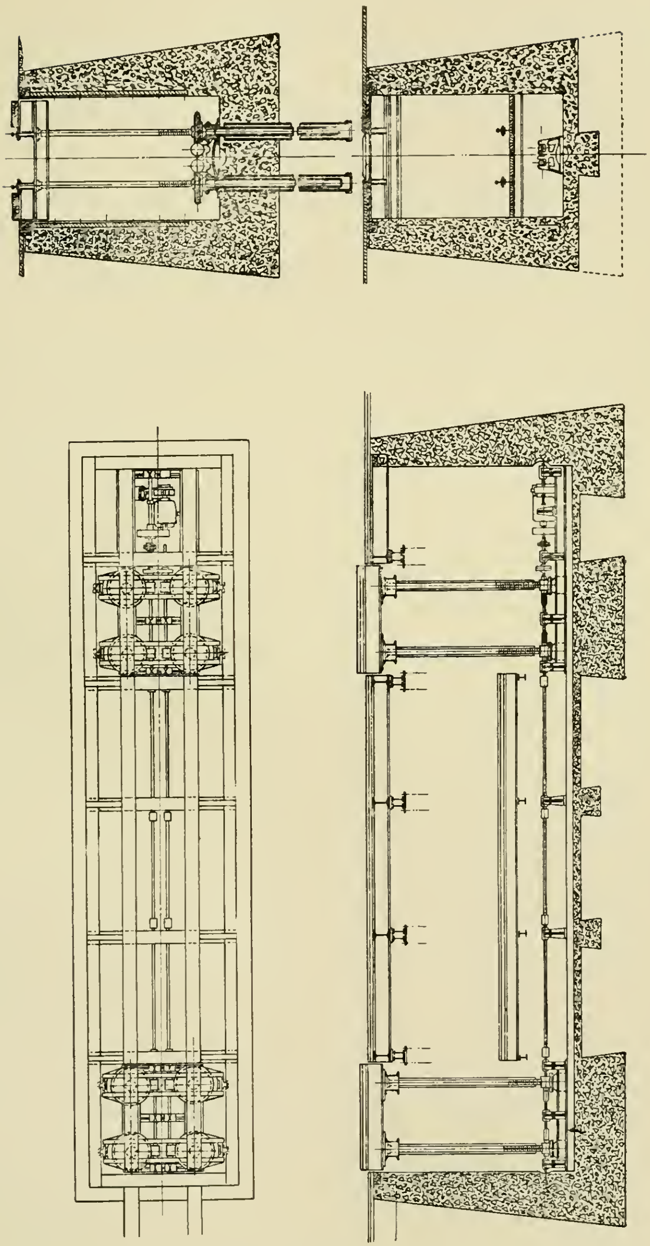


Fig. H

variety. It seems to be going back to first principles, but on my division we are making them of sheet iron. Cast iron are too heavy for our old roofs, and we have not yet found the fire proof wood. It should be borne in mind that a smoke jack nowadays is not the 12 or 14-inch affair it was a few years ago, and experiments have proven that nothing less than 36 or 37 inches will get rid of the smoke from the large modern engines. The hoods should be 7 or 8 feet long so the engine may be moved a little without geeting out from under the jack. The slope from the bottom of the hood upwards should be as gentle as possible, for an angle of 45° will cause the gases to deflect outwards into the house. Bearing in mind the heavy exhaust which an engine often gives in backing out while still under the jack, it will be recognized that quite a mechanical problem is involved in the design of something strong enough to stand the wind pressure above the roof and the steady blast and vibration when the blower is on strongly under the roof. Besides the design to withstand external stresses the still more insidious chemical actions must be guarded against. The sulphuric acids in the stack gases, the heat and moisture of the exhaust steam, the oil and grease thrown upwards, and the sand blast action of the blower make a hard set of conditions to meet. We chose iron because it has a much better power to resist deterioration than steel, and because it has the strength, even in comparatively thin sheets, to resist the mechanical stresses. We frankly admit the necessity of frequent painting, and the only problem is the kind of paint and the frequency of applying the successive coats.

One more engine house auxiliary to which I wish to direct your attention is the drop pit. It is one of the most important of all the appliances in the house, and one of the most difficult to keep in good condition. The girders, if made strong enough to carry the modern heavy engines, are awkward to handle, and many a time a joint blows out of the jack just at a critical time. I want to briefly describe a drop table which was designed to do away with all the troubles of the old drop pits, and while only a few have been built, yet they have been in service for several years and have cost almost nothing for repairs. The arrangement for removing a single pair of wheels consists of two elevators about 40 feet apart, operated by screws and set in one of the pits. The screws are prevented from turning and are raised and lowered by worm wheel nuts at the bottom, arranged in pairs and revolved by worms on long parallel shafts geared together and driven by an electric wotor. The two elevators rise and fall together and when in their upper position the rails they carry line up with the track rails and an engine can be run on or off. In dropping a pair of wheels, the rods are taken down, pedestal caps removed, etc., and the motor started. Both tables go down, one bearing the pair of wheels, the other empty. At the bottom the wheels are rolled forward through the wide pit under the engine, which is supported by I beams, onto the empty table, and when the tables are again raised, there are the wheels on the floor in front of the pilot and the engine can be run out and another one brought in at once.

Another design operating in the same way is one long table to take out an entire set of wheels at once. The back end of the engine is supported by a heavy beam spanning the pit, and when the wheels go down they are rolled under the beam and the table raised to the floor level. A pair of odd wheels to carry the engine can be put under and the pit cleared promptly for another engine.

Still another design is a similar but shorter table, suitable for handling two-wheel or four-wheel engine trucks, or it can be used for a front or rear pair of drivers or trailer wheels. This table is 24 feet long and operates in the same way as the 55-ft. table, except that no supporting beam is necessary. The table does not have to go down so far and the operation is quicker.

The last of the devices I wish to mention is an improved design of crew board to be placed behind glass in the parition separating the engine dispatcher's office from the enginemen's lobby. This board has a number of units of convenient size put together in one frame, and the number of units can be increased as business grows, something after the manner of the elastic book case idea. Each of the units are built up of five plies of quarter-inch oak, glued together with the grain crossed to prevent warping. Rectangular holes 1¼ by ¾ inches are chiselled through the board and the plugs have flanges at one end to prevent their being pushed too far in. The titles are made up on strips which have plugs on their backs, so that changes may readily be made without scraping off old and painting on new titles. The names on the plugs are large enough to be read by the dispatcher without getting up from his desk, and a twelve-section board has been found ample in size to care for dispatching from 150 to 200 engines per day.

PRESIDENT: Gentlemen, this very able paper is now before you for discussion. There is a large number of practical railroad men here whose daily work throws them in contact with problems such as Mr. Elmer has outlined, and we would be glad to hear from a great many of the members. Can we hear from Mr. H. R. Warnock, of the Monongahela Railroad?

MR. H. R. WARNOCK: There is not very much to say, only to comment on the paper. It occurs to me, forcibly, that this is a very live subject, and one of very great interest to everybody, especially to those connected with transportation departments. It is a subject that is often neglected and avoided by many of the railroads and especially by the manager or the one to whom it is up to to produce the coin to give us these engine house auxiliaries. I have had considerable experience along this line, but not always with the facilities outlined in Mr. Elmer's paper. Most everything there facilitates the quick movement of engines in and about the engine houses, which, of course, gives quick movement of freight out of the yards.

PRESIDENT: Mr. W. S. Reid, engineer of tests of the Dearborn Drug and Chemical Co., is an old railroad man who has had experience where they do not always have these facilities.

MR. W. S. REID: My experience has been like Mr. Warnock's. The paper of Mr. Elmer applies to all such things. It is so well put that I could not say anything in addition to it.

PRESIDENT: Mr. C. B. Gray, assistant master mechanic of the P. R. R. at Ormsby, is with us and can probably tell us something.

MR. C. B. GRAY: The only trouble with this drop pit method Mr. Elmer mentioned is that it is very expensive in first cost. A somewhat simpler method has lately appeared in some of the technical papers is the use of a Gantry crane, or rather two Gantries, one for each end of the locomotive. In this case the locomotive is simply raised high enough to roll the wheel or wheels from under it. Figuring rather roughly, I think it would only take about 15 to 20 H. P. to accomplish this, and it appears on the face of it to be cheaper than digging a hole in the ground and putting in an expensive concrete structure, and it could be installed in small engine houses and terminals where the expense of the drop pit would not be warranted by the number of locomotives handled. Other advantages of this method over the drop it are: First, The saving in time, as the wheel or wheels would be rolled directly from under the locomotive instead of first having to be dropped then rolled forward or sidewise, as the case might be, then raised up again to the level of the ground. Second, these Gantry cranes could be used, when not in use for locomotive purposes, for unloading cars and handling material. It, therefore, appears to me that this method has the advantage, both in cheapness and efficiency, at every point over the drop pit, such as mentioned by Mr. Elmer, or the old air or hydraulic operated drop pit.

PRESIDENT: I presume the more general practice of drop pits where we have power at all is to use pneumatic hoists that can be installed very cheaply. The device described by Mr. Elmer is undoubtedly a very complete equipment.

MR. WM. ELMER: It might be well to run over these exhibits. (Thereupon Mr. Elmer explained the exhibits more in detail.)

PRESIDENT: (Referring to the wickless torch) Do you use that for anybody else, say for enginemen?

MR. WM. ELMER: The tube is pretty long for engineers to handle and they do not need to get in so close. They are only used by the inspectors. These torches have been tested with the wick torch to see how long they will burn and we found they use about 1c worth of oil in 24 hours, one filling lasting about eight hours.

PRESIDENT: (Referring to the cast iron elbow in the sand conveyor pipe) How long do they last?

MR. WM. ELMER: They last about six months with the quantity of sand we use. It makes a difference how much sand you use.

PRESIDENT: We have the practice of building up the curve with a big mass of lead. It seems to wear away not quite so fast as cast iron.

MR. J. E. HAYNES: Mr. President and Gentlemen—I have read Mr. Elmer's paper with very much interest. It presents a subject which occupies an important position among railway economies. The importance of having proper facilities for handling locomotives cannot be overestimated. With the increased size and demand for motive power during periods of heavy traffic makes it advisable to give the subject careful consideration. We have the improved coaling and sanding devices, ash pits with air and electric power, inspection pits and tracks with pneumatic tubes to deliver reports to the engine house foreman, turn tables (power driven), drop pits of different designs, and quite a number of other devices. Personally I cannot say that I am in favor of the design of drop pit shown in Fig. H. It seems to me that they are very expensive to put in and I believe that the cost of putting in one pit of that design would build three good drop pits at right angle with the tracks, to connect three or four pits together, so, if such is the case, repairs could be made on four engines instead of one and save carting and moving material around so much. This is all lost time and practically dead labor.

I would like Mr. Elmer to give us the cost of putting in a drop pit of the design of Fig. H.

PRESIDENT: It might be better to have Mr. Elmer answer all the questions that may be asked at once in closing the discussion.

MR. C. J. HALLIWELL: It is my belief that two or three crosspits, at right angles to the track, could be installed at less expense than would be involved in building one of the pits in question, in which event two or three engines could be handled, while only one otherwise. When repairs are to be made to two or more engines, they would also save carting and moving materials around.

MR. E. S. CHAPIN: In regard to that feature of taking time on the drop pits, it has been my privilege to work on this character of pit. We take an engine in on the ordinary track, remove the pedestal caps and get everything ready, take her over to the pit, drop the wheels and put new ones under, and save time in that way. We do not keep the engine on the drop pit the entire time.

MR. R. M. LONG: I would like to ask what you hold the engineer for in regard to work reports of engines? Is it not a fact that after the inspection is made on the pit and fire is cleaned, that, in this district, where we have bad water, you have a lot of trouble after cleaning the fire in the way of flues and fire boxes leaking?

PRESIDENT: Mr. F. J. Reeve, General Foreman of the Pittsburgh Coal Co., what do you think of this thing?

MR. F. J. REEVE: Mr. Chairman and Gentlemen—I do not feel that I could say anything that would add to the paper. There is one feature that perhaps was not touched on, but possibly it does not come just under this head, that is the subject of portable tools for repair work. The size of the engines has increased so much since I was in active locomotive work that I cannot add anything. It has been my privilege, however, to visit a great many shops in different parts of the country and I have noticed the improvements in the facilities they have for handling the work. It is my opinion that the devices given by Mr. Elmer are as good as any I have seen anywhere in the country.

PRESIDENT: I would like to ask a few questions. One is as to general information about opening front ends, whether you do that every trip or have regular intervals, or whether you put all engines into the round house with the fires out and examine the fire boxes, or how often do you find it necessary?

Your paper states that you test stay bolts once a week. Different roads have different practices, and I would like to know what the up-to-date practice is in regard to removing staybolts. When you find a staybolt broken do you consider it necessary to remove that bolt at once, or do you have a limit of several bolts to go on?

How often do you find it necessary to test boilers with pressure?

When handling engines on and off the drop pits, of course at times those engines are dead. Have you found any good device for handling these dead engines, such as a capstan or windlass?

One point in connection with the operation of electric driven turntables, which should be emphasized, is the matter of carrying the wires to the table. There is a record of the burning of one roundhouse recently, where the wires from the power plant were carried overhead through the roundhouse to the turntable, and immediately after the fire started the insulation was burned from these wires and the turntable motor put out of commission. As the result of this, several locomotives were burned up with the house, which might have been saved had the wires been carried to the table in an underground conduit.

A VOICE: I would like to ask Mr. Elmer whether he checks up the inspector's report with the engineer's report?

MR. E. A. EMERY: One subject I would like to mention tonight, and that is, how do you prevent engines from getting into the turntable pit occasionally? Sometimes your relief valves are not working, or from some other cause never satisfactorily explained, you find that a big "hog" has run out and gone into the pit and possibly knocked the table off the pivot and tied up your whole apparatus at one jump. In the West we have a system I have never seen in the East, which consists simply of a derail located between the round house track and the pit, which is always open unless you close it up. When you throw the lever to lock the table you close the derail. Unless the table is locked the engine goes onto the ground.

I recall a case where a special train was due in Salt Lake City a year or two ago, and about the time they were going to get the engine out of the house for this train either a leaky throttle or a Japanese, or something else—they are about equally malicious—started the engine out and it came with considerable velocity and there was not a possible way to catch her, and she went into the pit—and the wrecker was out on the road. The master mechanic went gray headed. The superintendent was on that train, and that train was held up a good while. Possibly that has occurred to some of you, and this device, which costs comparatively a small amount, consists simply of a derail. The details are an easy matter to work out. A push rod connection is made from the bolt pocket back to the spring of the derail. The derail is held open by the spring until you close it by putting the table in position and throw in the bolt to lock it. We will assume that you never had any of these troubles or you would know of some remedy for these conditions. But there may be a few of you who can recall similar experiences by which your traffic is tied up when you have an engine where you don't want it—in the pit; and everything stands still until by main strength and awkwardness you jack the engine up and put rails under it and get it back into the house. Considerable time has elapsed and a good many trains have been held up and everybody that could work in the pit has been hurried in, and you can readily conceive the results as to the number of letters from the superintendent of motive power and the general manager and the president, all interested and insisting on knowing how the engine got in there, and you find it hard to tell how it got in.

This device is one that occurred to me as a roundhouse improvement, and when you come to think it over you will find there may be something in it.

PRESIDENT: Could we secure a print of the apparatus or the mechanism of that derail?

MR. E. A. EMERY: I think possibly I could get it for you. Possibly the Denver & Rio Grande at Pueblo could give it to you. Their house is large and in several sections. They have a passing track coming in from the outside and they have this passing track guarded.

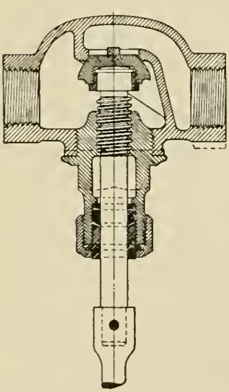
MR. E. S. CHAPIN: About how far from the pit do you put the derail? In our own engine house at East Altoona we use a shifter to move the engines to set valves, etc., where they are dead. Would your derailer be in such position that you could not use the shifter until the table was in place?

MR. E. A. EMERY: It would be, normally. But that would be a case where it would be possible to have a means of throwing the bolt for that occasion and then the track would be clear. I would suggest that a stub end be used instead of a split. If snow is falling somebody has got to clean it if it is a split, and the stub end is just as effective and does not require so much attention.

PRESIDENT: That is a very useful addition to the equipment described by Mr. Elmer, and we ought to hear of more.

MR. R. M. LONG: How long does it take from the time the engine is given up until it is in the round house, and about what does it cost to handle the engine and make inspection?

MR. A. STUCKI: In regard to the valve arrangement in the overhead steam pipe, it strikes me that a special globe valve with a low outlet could be used to advantage. I also think that there are enough round houses and enough similar cases in overhead work to justify such a special design, and the accompanying sketch will show what I really have in mind. It wouldn't cost any more than the ordinary globe valve, and would avoid any possibility of dripping, even if the valve should leak. It would do away with the gear wheel and pinion, the special tee, the connection between valve stem and pinion spindle, and also the universal joint. It certainly would simplify the installation and possibly reduce the liability of getting out of order.



MR. WM. ELMER: To answer the last matter first, the straight valve is the first thing we tried. But a valve with the stem pointing downward has a pocket of hot water condensed in the bonnet which usually succeeds in getting through the packing, and we have never found any means of packing the valve stem so that it would not get through in a very short time. If you can keep the stem turned up and the water away from the bonnet you will never have a leak. Almost any kind of packing will do it.

In regard to the operation of raising the locomotive, a device was illustrated in the Railway Gazette, which was possibly a little more expensive affair than Mr. Gray was trying to bring out. The front portion of the machine can be fixed and will grasp at the smoke box, and the rear portion must be movable. Some of the short shifting engines would have to have a machine set for 20 ft. centers, and some of the long Pacific type would be perhaps 40 ft. That structure will not be cheap when it is all done. It is a cheaper proposition than the drop table buried in the ground, but which is best of course depends on local conditions and whether the engine house handles three or four pairs of wheels a day or one a week.

In regard to the cost of the drop table, that varies from the smaller 24 ft. table, which is for trailer wheels or front or rear drivers or engine and tender trucks, costing about $8,000.00, to the large ones, which cost about $11,000.00.

I am not clear whether I understand the gentleman who spoke of the use of the drop table. As I understood him he seemed to think that the drop table required the engine to stand on the table until the wheels had been taken out, the work done and then brought back again, which might be one or two or three days.

(The speaker then described the working of the drop tables.)

MR. J. E. HAYNES: What I wanted to bring out was the cost of putting in, operating, repairs to, and results of the different kinds of drop pits now in use.

MR. WM. ELMER: You can do exactly the same thing on this drop table that you could with a hydraulic or pneumatic drop pit and without moving the girders. If I understand the style of drop pit you mean it is one in which a pit extends across and connects two tracks. Underneath the engine are two movable girders. To make them strong enough to handle modern engines requires a pretty heavy affair, and that is one of the things I tried to bring out, that the handling of these girders is an expensive operation. It requires five or six men to take a pair of wheels out of an engine. When the drop table has once been put in you can operate it for about one-fourth the cost.

MR. J. E. HAYNES: I have seen these drop pits in use at the Erie Shops, Wilson avenue, Cleveland, O., and have operated them in the B. & O. R. R. shops at Newark and Lorain, and have put wheels under consolidated engines with main rods up ready to set valves in one hour and fifteen minutes.

MR. WM. ELMER: How many men?

MR. J. E. HAYNES: Five.

MR. WM. ELMER: Another question was in regard to the engineman's report. The enginemen are required to make reports but we find that their reports are more or less perfunctory. Enginemen cannot see all the things the inspectors are supposed to see. They do not have an opportunity of getting under the engine in the pit and we naturally rely more on the inspector's report than on the engineer's. The enginemen can tell the conditions developed under road running which the inspectors cannot detect. So the two work together and each supplements the other.

Inspectors are responsible for rods and all other defects which they could and should see.

With reference to some of the subjects I did not discuss, the subject of the paper is "*Some* Engine House Auxiliaries." I did not undertake to include them all and there are hundreds which might be brought up.

In regard to opening front ends, it is the practice of the division with which I am connected to open front ends of passenger engines after every trip, and of freight engines once a week.

We inspect stay bolts once a week, and at the time the stay bolt inspector is in the firebox making his inspection of stay bolts he is also required to examine the fireboxes, to detect any cracks or defects which should be examined when the fire is out.

As to renewing staybolts or taking the engine out of service, our rules are printed. They require that an engine must have the bolts renewed if one bolt is found out broken in the top row; if two are broken together in any part of the fire box; if three are broken in a 2 ft. radius. That ties the thing up so that you do not have to depend on any person's judgment.

We test the boilers every six months with hydraulic pressure 25% greater than working pressure, and we use hot water.

I do not know of any point on the Pennsylvania where they handle engines into the round house with the winch. We are fortunate enough to have secured four-wheel saddle tank engines for each of our round houses, so that settles the question of handling the engines dead. They are also convenient for shop shifting. We do have winches on transfer tables. You are, of course, familiar with that service.

In regard to wires for operating turn tables, we bring the cables in underground. They have to come in under ground to connect with the center at any rate, and the cable is kept under ground.

In regard to checking up engineers' reports with inspectors' reports, I do not know that we can say that there is any check made between the two to see that one man omits to report something that the other man does report, because very often the engineman will report on what road experience tells him is defective, while the inspector, of course, can not know those conditions. And the engineman can not be expected to report on defects which could only be found by an examination with torches and a pit, where he has not had an opportunity to examine. But we expect each one to supplement the other.

In regard to preventing engines from running into the pit, we have a very simple device which seems to have answered the purpose. It is a steel casting which we call a track skate. It has a thin edge which lies on top of the rail and the flange keeps it from shifting sideways, and the end is turned up 6″ or 8″ so that in case the engine goes to move into the pit the tender wheel rides on this track skate and pushes it along and it acts as a very effective brake.

The question was asked how long it is from the time the engineman gives up his engine until it is in the house. That depends a good deal on the condition of the fire. If the fire is an average fire, which takes ten or twelve minutes to clean, we give four minutes for inspection, two minutes to move the engine from the inspection pit to the ash pit, twelve minutes for cleaning the fire, three minutes for the operation of taking coal, three minutes for the sand and water, two minutes for moving to the turntable, two minutes for turning and putting the engine into the house. That is about 28 minutes. I should say that is about a fair average for the time it should take, unless it is blockaded or an unusual condition of a rush of power all at once.

MR. A. W. CROUCH: I think I express the sentiment of the members present by moving that we extend a vote of thanks to Mr. Elmer for his very able paper. It was very instructive.

The motion, being duly seconded and put to vote, was carried unanimously.

There being no further business,

ON MOTION, Adjourned.

In Memoriam

MR. CHARLES A. BRAYTON

Again has the Angel of Death visited our ranks, and yet another time are we assembled in sadness and sorrow to mourn the departure of a fellow member.

Charles A. Brayton died at his home in Cleveland on December 24th, 1908. In his death the Railway Club loses one of its well wishers and most hopeful members. While denied, by reason of non-residence in Pittsburgh, of attending the monthly meetings, his never failing interest in the Club's welfare lent encouragement to its officers and enthusiasm to its members. It is a pity he could not have been with us more often. His affectionate nature craved ever friendship as well as the presence of congenial fellowship, diffused itself throughout all his private life, gave sincerty to all his hospitalities, kindness to his eye, warmth to the pressure of his hand, and flowed out with the simplicity and playfulness of childhood. Such a character is one to be loved, and Charles Brayton was loved. He sided with the weak and friendless, and with a willing purse gave alms. With loyal heart and with ready hands he faithfully discharged all friendship's trusts. He believed happiness was the only good, humanity the best religion and love the truest minister. He added materially to the sum of human joy and were every one to whom he did some loving service to bring a flower to his grave, he would to-night sleep beneath a bower of beauty. While this Club realizes to the fullest extent the great loss it has suffered in the death of Mr. Brayton, yet we feel we have a rich heritage in his life and the good deeds he has performed in the years of his useful existence.

To the members of his family, whose loss is irreprievable, we extend our warmest sympathy, to the officers and members of this Club we commend his life as one worthy of emulation. As his friends, we will ever cherish his memory.

Resolved, That these resolutions be spread upon the minutes ot the Club and a copy thereof furnished to his family.

J. D. McILWAIN,
F. J. LANAHAN,
S. L. SMITH,
Committee.

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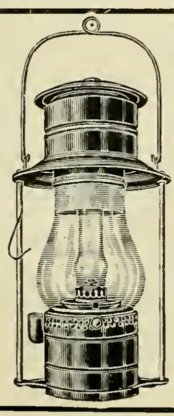

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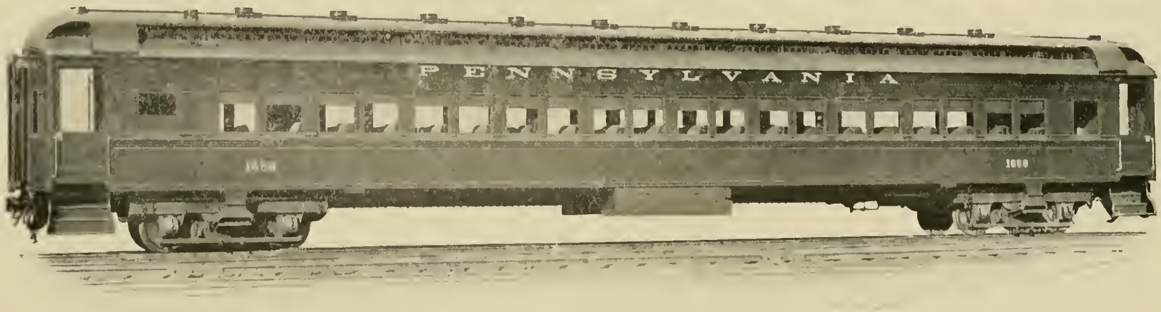

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Vol. VIII. February 26, 1909 No. 4.

SUBJECT: "STEEL RAILROAD BRIDGES,"

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of the

Railway Club *of* Pittsburgh.

ORGANIZED OCTOBER 18, 1901.

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Published monthly, except June, July and August, by the Railway Club of Pittsburgh, C. W. Alleman, Secretary, General Offices P. & L. E. R. R., Pittsburgh, Pa.

Meetings held fourth Friday each month, except June, July and August.

PROCEEDINGS OF MEETING, FEBRUARY 26, 1909

The meeting was called to order at the Monongahela House, Pittsburgh, Pa., at 8 o'clock, P. M., with President D. J. Redding in the chair.

The following gentlemen registered:

MEMBERS.

Ackenheil, J. D.
Alleman, C. W.
Atwood, J. A.
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Gies, Geo. E.
Green, H. W.
Grewe, H. F.
Gulick, H.
Gutierrez, S. J.
Haas, Ben.
Hall, C. W.
Harrigan, P. J.
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Howe, D. M.
Huyett, E. G.
Jenny, Jacob.
Kennedy, Jas.
Keyser, R. H.
Kinter, D. H.
Knickerbocker, A. C.
Krause, Julius.
Krepps, W. K.
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Lambert, G. J.
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Long, R. M.
Loudenbeck, H. C.
Lynn, S.
Metcalf, H. E.
Miller, John F.
Murphy, W. J.
McFeatters, F. R.
McKee, D. L.
McNulty, F. M.
Oates, Geo. M.
Painter, Joseph.
Peach, W. M.
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Shannon, Chas.
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Smith, A. D.
Snyder, F. I.

Stark, F. H.
Starkey, Samuel.
Stucki, A.
Swartz, H. E.
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Winter, F. W.
Woodworth, R. B.

VISITORS.

Allison, John.
Auchmutz, H. L.
Baird, W. F.
Barnett, Stephen D.
Barth, John W., Esq.
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Fray, Samuel.
Hettler, R. C.
Huber, H. G.
Manning, R. G.
Martin, John M.
Moore, Philip W.
Moss, J. E.
McGrory, Percy.
O'Connor, Charles.
Rhodes, P. S.
Slocum, R. S.
Smith, Sion B.
Stark, W. H.
Sweney, M. V.
Thomas, T. H.
Tolan, C., Jr.
White, H. F.

The reading of the minutes of the last meeting was dispensed with, they being in the hands of the printer.

The Secretary presented the following applications for membership:

Allison, John, Chief Engineer, Pittsburgh Equipment Co., Glassport, Pa. Proposed by J. D. Conway.

Clark, C. C., Sales Department, Pressed Steel Car Co., Pittsburgh, Pa. Proposed by F. H. Stark.

Coho, O. C., Engine House Foreman, Penna. R. R., Youngwood, Pa. Proposed by C. J. Halliwell.

Dette, R. E., Machine Shop Foreman, Penna. R. R., South Pittsburg, Pa. Proposed by M. A. Malloy.

Karns, W. H., Division Operator, Penna. R. R., 1013 Penn Ave., Pittsburgh, Pa. Proposed by Chas. J. Isler.

Knight, Harry A., Patent Attorney, Pressed Steel Car Co., Pittsburgh, Pa. Proposed by A. Stucki.

Pfarr, Jacob, Motive Power Inspector, Penna. R. R., 28th St. Shops, Pittsburgh, Pa. Proposed by C. J. Halliwell.

Rowan, W. R. C., Manager, H. W. Johns-Manville Co., 951 Liberty Ave., Pittsburgh, Pa. Proposed by C. J. Geary.

Simpson, M. S., Salesman, Pressed Steel Car Co., Pittsburgh, Pa. Proposed by F. H. Stark.

Ward, Charles E., Oil Inspector, Pittsburgh Coal Co., Castle Shannon, Pa. Proposed by F. H. Stark.

PRESIDENT: As soon as these applications have been favorably passed upon by the Executive Committee the gentlemen will become members of the Club.

If there is no further business to come before the meeting, we will listen to the reading of the paper of the evening, on "Steel Railroad Bridges," by Mr. R. G. Manning, Engineer, of the American Bridge Company. I have the pleasure of introducing Mr. Manning to you.

MR. R. G. MANNING. Mr. President, Officers and Members of the Railway Club of Pittsburgh and Gentlemen:—I do not know whether or not I can give the usual greeting that "I am glad to be here to-night." In the course of twenty years' experience, most of us make mistakes and get into trouble more or less, and sometimes even our friends with good intent get us into difficulties. And so it is with me tonight through my old friend, your Past President, Mr. F. H. Stark, whom I have known for nearly sixteen years, that I am here.

STEEL RAILROAD BRIDGES.

BY MR. R. G. MANNING, ENGINEER, AMERICAN BRIDGE CO., AND MEMBER AMERICAN SOCIETY OF CIVIL ENGINEERS.

In presenting a paper on bridges before such a representative body of men as the Railway Club of Pittsburg, it is difficult to determine just how it should be treated. What should be the aim in reading a paper on this subject? Not because it is a new thing, and you want to know something about it, as bridges are as old as history, and each of you has had more or less to do with them in one capacity or another. Not because there is a dearth of literature on the subject, as there are enough books, periodicals, articles and printed discussions to fill many stacks of book shelves. Not to merely occupy so much of the time of the writer in pleasant pastime in preparation, and then to entertain the hearers for an evening, as you may be sure that leisure hours for such pastime are wanting, and you have come here to add something to your store of knowledge, as well as to have pleasant social intercourse. Not to give a history of the development of bridge building, as that is a matter of record. Not that the subject is one that will admit of brief and exhaustive treatment, and could be discussed and laid aside as finished, as the complete analysis of so small a part of a bridge as a bolt or rivet would require more time than can be devoted to a paper of an evening. And so on with a long list of "nots."

Then why should we write and add more to the volume already contributed to the subject? I have thought of it in this line; probably each one here has something to do with bridges directly, and a great deal more indirectly. The question is a broad one, and has many divisions and sub-divisions. We have to do in our every-day life, perchance, with only one of these divisions, such as the field work, the design, the manufacture, or the maintenance. Few can hope to have a technical and intimate knowledge with all of these, so that whatever is brought before us should not be technical, but of a general character that all can readily comprehend. It will be the aim, then, in the course of the paper to present a few items of general interest, relating to the present-day practice. An interchange of experiences will enlarge our horizon, quicken our understanding to some degree, enable us to better perform our several duties, and cause us to render more efficient service in our respective fields of labor. With this thought in mind, and with the hope that some general principles may be brought out that will make our future work more uniform, more intelligent and more enduring, I have undertaken to present the paper.

The manufacture of iron and steel bridges as a commercial industry is a development of the present generation. Many of the pioneers in the industry are still living. Those who are to-day at its head grew up with it and developed as the business developed. Perfection has not been reached, but advances have been made, and it is only as we stop and consider the practice, condition, character and magnitude of the industry to-day as compared with a decade ago, that we realize what strides have been made. We cannot at this time allow ourselves to even think of this phase.

For the sake of convenience in treatment and discussion, the subject will be divided into ten natural headings, namely: Location, Type, Loading, Specifications, Design, Fabrication, Inspection, Transportation, Erection, and Maintenance. Some of these divisions will be passed over with scarcely a remark, as I am not familiar with that part of the work. Others here may have a good point to present on those particular divisions, which would be helpful to someone else. Again let me state that the aim is only to present items of a general and practical character, and in a sense to sow a little seed, so that if it takes root, the reaping may be in some future time when we have a problem to solve that may involve some one of the points presented herein, or brought out by the discussion.

(1) LOCATION.

The location of a bridge and its foundation will be passed over lightly. The location is usually determined by the alignment of the road and local conditions which may not admit of much choice. At the same time the careful consideration of conditions may affect largely the cost of a bridge, by determining its style and design. Again, it may be desirable to change the alignment of the road to affect a more favorable crossing.

As far as possible, avoid skew crossings. It will be more economical wherever possible to increase the length of span to avoid the skew. Every operation in the building of the bridge becomes more expensive after the location is determined, if it is a skew. The drawings alone of the simplest type of a skew bridge, say 150-foot span, will cost about $150 more than the same bridge if built square, and so on for each of the various items. If it is impossible to avoid the skew, the next best thing is to square up the end stringers, so the moving load strikes the bridge squarely; this will avoid racking the structure.

Under "Location," as well as "Design," attention should be called to the adoption of standard span lengths as far as possible; especially is this important on new lines. This is not only economical on new construction, but to a greater degree so on renewals and substitutions. The variation in span length of a foot or two from an even length of, say 150 feet, which so often occurs at present on account of old masonry conditions, could be avoided if a system of standard lengths were adopted for all new construction. The condition causing limiting span lengths to the foot or inch can usually be overcome.

A striking example of standard lengths is found in railroad construction in foreign countries. Orders for many spans of a kind are placed at one time, and these same spans are often ordered at subsequent times. Another illustration of this is the adoption of standard spans by the Harriman Lines. There is little doubt of the advantage of this standardization in the original construction, and it will prove still more advantageous in the future, as renewals from one cause or another develop. Lighter bridges can be replaced by heavier ones, and interchange made without excessive cost.

We will grant that large systems can do this where smaller ones cannot: also the conditions of the past have not been favorable for such action, but it does seem that through the railroad associations of the present, such a plan could be promulgated and adopted by a combination of railroads as well as by a larger system. Bridges are to be built for renewals and extensions for the centuries to come, and a general step in this direction would prove of great future economical value. Is it not time for the railroads to get together along this line?

Use end floor beams for all spans. If end floor beams are not used, rest stringers on steel pedestals, and not on a stone or concrete pedestal, as these are subject to cracking, due to the force of the impact of the load as it goes upon the bridge.

Under this heading, and the heading of "Maintenance" it should be mentioned that the placing of steel pedestals under girders, to keep the ends out of the dirt, is desirable.

(2) TYPE.

The next step after the location is determined, is to adopt the type of bridge which may be built—girder, riveted span, pin span, deck or through, etc. The type of bridge must be considered in conjunction with the location, as the ultimate economy of the structure depends on the relation of these two items.

In general, a plate girder design can be carried any length, to the limit of transportation. The efficiency and economy of maintenance of this type of bridge are high, and it gives very general satisfaction to the engineer and the railroad man in general.

The riveted bridge is generally used up to 150 foot span, and this length is often exceeded. There is a general tendency to use this type of bridge for longer spans. There are being built now at the Ambridge Plant of the American Bridge Company, six double track riveted spans, 180 feet long.

For swing bridges, the riveted type is used for all lengths, with certain combinations of pin members.

The pin connected bridge[*] is used when the span length is more than that desirable for the riveted bridge.

(3) LOADING.

The fixing of the live load to be used in determining the stresses in the structure is a matter for the railroad engineer to settle. This in the past has been a most difficult task, in the face of the rapidly advancing heavier rolling loads, in connection with the necessity of rigid economy. Can it be determined very accurately what the limit of loading will be for the future? A decade ago bridges were being designed for loading about one-half that of the present. Long ago it was thought the limit of loading was being reached; still they are increasing every year. Bridges built only a few years ago are being taken out and replaced by new ones of a heavier type.

In a large measure bridges are being designed for the loading of to-day, and almost before they are erected and put into service they are called upon to carry heavier loads than that for which they were designed. Steel deteriorates from various causes, and when the two elements of heavier loading and deterioration in the material begin to operate together to depreciate the efficiency of the structure, it will not be long before the structure is actually deficient. What is being done in any large, comprehensive measure to avoid this? Are the designer of the locomotive, the designer of the cars, and the department that has to look after the bridges, working together, or independently? I ask this question as a matter of information, as I do not know what is being done by the railroads in this respect. If nothing, surely steps ought to be taken to bring about a proper understanding and co-operation between these departments.

A loading and specification for unit stress consistent with due economy should be used that would look well to the future, even with the heavy loading of to-day. An illustration or two will suffice:

An engineer of one of the southern roads, which builds the heaviest bridges to-day, so far as the writer knows, once remarked that they built their bridges heavy as they found it more economical to do this than to replace them every dozen years. These bridges are so heavy that it almost makes the manufacturer blush to put in the material called for, and yet I do not know but that the railroad is in the right.

In December of 1898, Mr. H. T. Porter, Chief Engineer of the Bessemer and Lake Erie Railroad Company, sent out specifications for a plate girder span, calling for a loading of two 202 ton engines, followed by 6,000 pounds per lineal foot. This was in 1898, not 1908, and is nearly equal to Cooper's E-60 loading of to-day. Unit stresses of 10,000 pounds for tension flanges were used. This bridge was to replace one built six years before, which had been well taken care of, and was in good physical condition. So far as known, there had been no engines built as heavy as that, and the loading specified was considerably in advance of the practice of the time. Was not this wisdom, foresight and economy?

The double track Pittsburg and Lake Erie bridge now being built by the McClintic-Marshall Construction Company over the Ohio River at Beaver, Pa., is designed for Cooper's E-60 for the floor system, and E-54 for the trusses, with proper impacts, unit stresses of 16,000 pounds as a basis. This will be one of the heaviest bridges of its kind.

It is said that a fence at the top of a precipice is better than a hospital at the bottom; so a little more money expended in a heavier structure to-day to make it more enduring, will prove more economical than a scrap heap a few years hence.

Another reason for looking to the future in making structures heavier, is the conservation of our natural resources. Have we the right to use up these resources simply because it figures that a road can afford to build a lighter bridge to-day and replace it a dozen years hence? Is there not an opportunity here for the railroads and their departments to get together?

(4) SPECIFICATIONS.

The specifications of a structure are for the purpose of defining the general features, loading, material, unit stresses, details of design, workmanship, testing and inspection which will be used in its construction. Most specifications are written with the intention of setting forth requirements that shall conform to the general practice and equipment of the various bridge shops at which the work may be fabricated. When the specifications are boiled down and the instructions for the workmanship are put upon the drawings, they all look very much alike. The work that is turned out of any one shop and, in fact, of a group of shops of a class looks very much alike. It seldom has the ear marks of a particular specification. It would seem that there is hardly the call for such a great variety of specifications. The manufacturer, more than anyone else, has to adapt himself to the various requirements. He has the one shop, the one system, the same men to which these requirements must be made to suit. It is readily seen that the more uniform these requirements are, the easier and cheaper can the work be accomplished.

There is a tendency in the direction of uniformity of specifications. The conditions are more favorable for it now than ever before. A long step forward was taken when the American Railway Engineering and Maintenance of Way Association adopted the general specifications for steel railroad bridges in 1906. These, as finally adopted in 1906, cleared up many indefinite points that were in its first draft, and which were common to most specifications. They set forth the requirements in a very definite form. The very wide adoption of these specifications by the railroads has greatly simplified the work of design and manufacture, and it is hoped that the work of unifying and perfecting them will be carried still further in the future.

Attention will be called as a matter of illustration to a few items that are commonly indefinite or unsatisfactory in specifications :—

The usual camber clause calling for an increase in length of the top chord of ⅛″ in ten feet does not suffice for all spans. For spans up to 150 or 200 feet with parallel chords, this rule will do. Above this length a more exact method should be employed.

A clause calling for rivets carrying strains and passing through fillers to be increased 50 per cent in number is indefinite and too general. The thickness of filler, the character of member and connection must govern.

The results of the work of a shop should be the test of the method employed. Many clauses of specifications have been copied for a number of years from one specification to another, calling for particular methods of doing work, while the results may be secured in some shops by more up-to-date means or in a more economical way. For example: A clause calls for the planing of stringers and floor beams to length after connection angles are riveted on. Just as accurate and satisfactory results are obtained in some shops by milling the main section of the member to the finished length and then setting the connection angles to this milled length and riveting them on.

The general clause calling for field connections to be reamed where the parts are assembled in the shop is usually indefinite, unnecessary and expensive, except for chords and spliced members. The requirement calling for a riveted truss to be assembled and reamed in place is a great hardship to a shop, as it requires a great deal of space which cannot be easily set aside for this purpose. Reaming to templet is usually sufficient. The assembling of one half the truss to insure proper fit is a test of the workmanship, and all that should be required.

Reaming clauses are often indefinite, calling for the reaming of unimportant parts, such as tie plates, lattice and small details, when this is not intended.

In the absence of specifications for building work and other structures, railroads often use their railroad specifications, calling for unnecessary refinement of shop work.

It is a mistake to write a specification to cover every known class and type of work, and then blindly call for all classes of work to be made under these specifications, without setting forth the requirements of the particular piece of work.

(Remarks on drawbridge specifications.)

A requirement which is often copied from one specification to another is that web plates of girders without covers should not set more than 1-16″ below the backs of the flange angles at any point. This can hardly be lived up to and is never given much attention. This clause should state that the web should be ordered ¼″ less in width than the distance back to back of angles. For girders with covers, this could be ½″ less than distance back to back of angles, and the usual practice of the mill and shop will govern for the straightness of the material.

It is coming to be recognized as good practice to use two rows of rivets in cover plates of plate girders up to 16″ and even 18″ wide. When ties rest on the girders this simplifies their framing and should be looked upon with favor by the maintenance of way engineer.

These general principles should be recognized: Specifications should be definite on all points. While demanding first-class workmanship they should not require such refinements as not to be easily accomplished in the best class of shops. Unnecessary refinement adds expense that is not returned in efficiency and could better be put into extra material.

A certain line of practice in a shop that is used to getting results by its established methods is better than doing the work another way simply to follow the specifications. Results are what is wanted.

The manufacturer can tell you of railroads from which they must receive more money for their work than for corresponding work of other roads, simply because of unnecessary requirements of workmanship. They will also tell you that these railroads do not get enough better work to pay for the extra expense incurred.

Before closing this section, I might mention that in a series of tests recently conducted at Ambridge to determine the value of beam seats on columns of building work, ¾" rivets sheared at an average of about 33,000 pounds per rivet, or 75,000 pounds per square inch. The conditions of this test conformed as nearly as possible to the actual conditions that would exist in the building.

(5) DESIGN.

If the preceding items have been properly taken care of, the design, which includes preparation of the stress sheet and the detail drawings, can be intelligently developed. The detail shop drawings should be made by the drawing room connected with the shop at which the work is fabricated. This will result in more economical cost in both drawings and shop work, as that drawing room knows the practice and requirements of the shop better than any other set of men.

Each shop drawing should have notes giving the workmanship required for the members shown on that sheet. The drawings are the instructions to the shop for executing the work.

As noted under "Specifications," it is more economical to add metal than require undue refinements of shop work. It is also better to put extra metal in the parts that are subject to exposure to gases and provide for the deterioration in the material therefrom.

The deflection of long spans is not a sign of weakness, but the vibration therefrom tends to shorten the life of the structure. This can be provided for by additional metal to overcome extreme deflection.

It should be kept in mind that the addition of material to take care of future heavy loading, undue deflection, or deterioration of exposed parts does not increase the cost of the structure in proportion to the increase of metal. The addition of 50 per cent of metal does not mean that the cost is increased 50 per cent. The flat cost of the additional material and a little more for other items is the only extra cost. Heavy work can be furnished at a less unit cost than light work; straight work at a less unit cost than crooked work.

A highway bridge with a slightly different loading for the two trusses, due to a sidewalk on one side, should have both trusses built like the heavier one.

As noted under "Type," plate girders should be used to the limiting length of transportation.

Avoid designs calling for a number of small pieces. Concentrate in larger members.

In solid floor construction the I-beam type is preferable.

(6) FABRICATION.

During the past ten years there has been a great increase in the number of structural shops. For the most part, these are small shops which manufacture light work of a miscellaneous character. For the manufacture of high-grade bridge work some large new shops have been constructed, and several others of the older ones have been renewed and enlarged. The aim of these shops has been: First, facilities for doing first-class work; second, reduction in cost of manufacture; third, ability to deliver large tonnage. In all of the above points, the shops of to-day are greatly in advance of those of ten years ago, when all conditions are taken into account.

To illustrate: About December 1st, 1908, a contract for a 400-foot single track swing bridge was taken by the American Bridge Company, to be delivered in three and one-half months. This involved making the shop drawings and getting them approved, ordering material, making patterns and castings, and doing all the machine and structural work. In two and one-half months the loading girders, drum and all machinery at the centre had been finished, set up in the shop, and ready to take down and ship. Not only was this accomplished in this time, but the character of the work was of the highest class, and was done in the most approved manner. In the meantime, the fabrication of the material for that part of the structure above the drum was being pushed to completion. This order required 65 detail shop drawings, 24 x 36″.

Quick delivery of work often depends upon ability to get out the drawings. One case of a very crooked piece of work which had to be delivered in a short time required about one hundred and ninety detail drawings. Six weeks from the time the order was received, all material was ordered, drawings made, checked, approved and in the shop complete. In present day practice, the making of drawings includes the ordering of material, figuring weights, making the shop and shipping bills, and blue printing, in addition to making the detail drawings themselves.

The importance of the preparation of good drawings is often lost sight of. The economy of fabrication is dependent to a considerable degree on the character of the drawings. Information on indefinite points must be secured, and complications of various kinds straightened out. Every detail should be definitely determined before the drawings are commenced. If this is not done there will be trouble and delay, and the cost of drawings greatly increased. Indefinite information invariably causes high drawing cost. This occurs more frequently on building and miscellaneous work.

Some things of apparently small import often affect the cost of manufacture. For example, take a lot of seventy-foot girders, where the flanges are made up of three or four thicknesses of metal, rivets ⅞″ in diameter, holes punched small and reamed. If holes are required to be punched 11-16″ in diameter and reamed to 15-16″ diameter, this will require the use of ⅝″ bolts in fitting up the work. Very slight inaccuracy in the punching makes it difficult to put a ⅝″ bolt into the holes without drifting, and a great many of them are required to draw the work together. If the holes are punched 13-16″ in diameter and reamed to 15-16″, ¾″ bolts can be used in fitting up, slight inaccuracies in punching do not affect the entering of the bolt as much, and fewer bolts will draw the work together. It takes about twice as much time to fit up girders with holes punched 11-16″ as it does those with holes punched 13-16″ in diameter.

The manufacturer must have some liberties to adapt the work to his equipment, and for this reason the working drawings should be made by the drawing room in connection with the shop, as it alone knows these requirements fully.

Whatever gain there is in economy of operation is for the benefit of both the manufacturer and the purchaser: more largely, I should say, for the purchaser.

(7) INSPECTION.

A few remarks relative to shop inspection may not be out of place.

Shops which fabricate first-class bridge work maintain their own corps of shop inspectors. It is well known that the shop is responsible for the character and accuracy of its work, and the fact that work has had inspection by the purchaser's representative does not relieve the responsibility of the manufacturer. He must pay for the mistakes of his shop. The shop also takes pride in maintaining a high standard of work. Constant vigilance and rigid discipline must be maintained to obtain it. This is not easy to do, as human nature is one of the variable quantities that the manufacturer must use to obtain results. To get every man in the shop to do his work as it should be done, as the superintendent desires it done, and to get and maintain that spirit in each man that will impel him to do his work right, and not shove it onto some one else, is a difficult task. Proper inspection assists in attaining and maintaining a higher standard in these respects. The shop inspector is a necessary part of the organization. If a customer does not have a representative at the shop, it does not mean that his work is not carefully inspected, or that it will be slighted. Proper inspection by the customer's representative is welcomed by the manufecturer, as it assists him in the attainment of high-grade work.

Proper inspection is obtained by having a man look after the work who has had a fair amount of experience, good judgment and common sense, and who recognizes that mistakes will occur and must be fixed up. He should be a good enough man to have authority to adjust the various questions that arise, and not have to refer everything to his superior. The manufacturer is always ready to go more than half way to make things right. A reputable manufacturer does not want an inspector who thinks and feels that he is being taken advantage of every time his back is turned, that the shop man is trying to slight the work and not live up to the requirements, and who feels that his duty is to cause all the trouble he can. The practice of the best shops to-day is ahead of the common run of specifications, and the customer gets better work than his requirements demand. It is merited reputation for good work that is desired by a shop, and whatever assists to bring this about among the workmen of a plant is desirable. Wise and common sense inspection does this.

Some inspectors seem to think that their whole duty is to use more force in hammering a rivet loose than was employed in driving it, and if they can mark up a lot of rivets which they call loose, but which no one else can detect as being loose, they have fulfilled their mission. This is exertion and not inspection.

(8) TRANSPORTATION.

In designing and detailing work, the possibilities of transportation must always be taken into account. It is a matter of common occurrence to take up with the transportation company the question whether this or that piece can be shipped riveted up, or whether it must be shipped "knocked down."

In export work, where shipment is by boat, greater care is necessary to reduce the bulk of the piece, and to see that danger of distortion by handling or piling is reduced to a minimum. We distinctly remember seeing, in the shipping yard, a lot of cylinder piers which were built for export, that were riveted up complete, before it was discovered that shipping in that form was prohibited. It is needless to say these piers never took the foreign trip.

A singular accident in transportation occurred in the shipment of a riveted-up plate girder span of about 60 feet in length. This was loaded on two cars, and was going from Toledo toward Cincinnati. When the train reached a division point, everything was alright, but the plate girder span was missing. It was found back in the country where it had slid bodily off the cars without causing any damage to the train. No remarks about the manner of loading are necessary.

(9) ERECTION.

The erection is too large a question to touch on here, but the designer of the structure, and the engineer in charge of the detail drawings must have a good working knowledge of the erection requirements. Most of the erection features must be known and determined at once, with such aid as can be secured. Material cannot be ordered or drawings commenced until most of these points are decided.

When the work is being erected, and the detailing has been done in such a way that it is impossible to place the material, the detailing is at fault. If, however, the erector finds that he could have erected the work a little cheaper, if the material had been built a little different, he has no right to claim an extra for this. This would be like asking a thousand dollars more for a contract on a furnished design, because the successful bidder could re-design it so as to cost one thousand dollars less. We find that one erector wants an extra because certain lugs are riveted on, and are a little in his way. The next erector wants an extra because the same lugs were loose and he had to rivet them on.

It is desirable to have the flanges of intermediate posts of through bridges turned in, so the floor system can be erected either before or after the placing of the trusses, as the conditions of erection may demand.

It is desirable to make the details so that the trusses or the girders need not be spread during erection.

The length of field rivets is a troublesome question, where so many erectors are doing the work. Where the manufacturer does his own erection he has no trouble, as standard riveting outfits are used. With outside erectors there is enough variation to cause considerable annoyance. It is desirable in such cases to have the length of field rivets approved.

(10) MAINTENANCE.

Many items that might properly come under this heading have been touched upon under previous sections. Let me repeat one or two of these:

Two rows of rivets in cover plates, where ties rest on them, would make it easier to frame the ties. Cast pedestals under girders will keep the ends out of the dirt.

Fill recesses, such as bottom of posts, that collect water or dirt, with concrete or other waterproof material. Drain holes soon become stopped up.

Sufficient attention is not paid to the inspection and oiling of swing bridge and turntable machinery. Do not forget that these portions of a structure are machine parts and require attention the same as the working parts of any other machine.

I have only one thing to say on the subject of painting, and that is, keep the bridge properly painted with some kind of paint. This is not a new demand, and I will close with a reminiscence on the subject of painting that occurerd some fifteen or eighteen years ago. I was in Benton Harbor, Michigan, and while strolling around I came upon a small highway bridge of about forty foot span, low truss type, and in a very out-of-the-way place. There was nothing unusual about it except the name plate. It was a neat oval-pattern name plate. Around the top of the oval was the name of the designer. Around the lower half of the oval were these words: "Paint every leap year."

PRESIDENT: Gentlemen, this paper is now before you for discussion and it is hoped that many of you will take part in it. I will ask Mr. J. A. Atwood to open the discussion.

MR. J. A. ATWOOD: I have made a few notes as the speaker proceeded and I want to call attention to a few things. In the first place, I am not one of the few the speaker refers to as technical bridge engineers. I do not profess any knowledge as a technical bridge engineer.

With reference to the design of the bridge, some bridge engineers design their bridges in such a way as to leave pockets holding water and dirt. That is a mere detail, but it is desirable to have as few of these places as possible.

What the speaker said in regard to standard lengths I heartily concur in. So far as I know his suggestion has not been the practice on railroads generally heretofore, but I can see how readily it will lend itself to the economical maintenance of bridge structures in the future.

With reference to load, there are some things that tend to hold the limit of load or the maximum loading at a certain figure. It is my opinion that we have pretty nearly reached the limit of loading in Cooper's E-60 with 6,000 lbs. per running foot following. One reason for this is that drivers, spaced 5′ apart with 60,000 lbs. per axle will give us 12,000 lbs per running foot, and drivers spaced 6′ apart with 72,000 lbs. per axle will give us 12,000 lbs. per running foot, and drivers spaced 7′ apart with 84,000 lbs. per axle will give 12,000 lbs. per running foot. It, therefore, is not probable that engine loads greater than 12,000 lbs. per running foot will be used.

Another thing which tends to limit loads is that our rails under a load of 60,000 lbs. per axle have about all they can do to stand up under the service. The present condition of the art of rail making is such that loads much greater than E-60 are not desirable. The American Railway Engineering and Maintenance of Way Association is devoting a good deal of attention to the study of the material of the rail and of rail sections, the proper design of a rail to stand up under E-60 loads at 60 miles per hour. They have not solved the question yet and I think it will be several years before they make their final report.

One other thing, with reference to loading. Recently at a meeting of the Committee of Maintenance of Way Engineers of the New York Central Lines they were called upon to express their opinion as to the maximum loading which the bridge engineers of the New York Central Lines should use in designing bridges, and the recommendation was made that stresses of 18,000 lbs. per square inch be used in providing for Cooper's E-60 and 6,000 lbs. per running foot and no more. The words "and no more" were emphasized in that recommendation. That recommendation is for present practice in bridge construction, and it was for the purpose of enabling the bridge engineers to use stresses up to 18,000 lbs. per square inch in order that they might make economical designs for bridges. Heretofore much lower stresses have been used to provide not only for the factor of ignorance but for the factor of growing loads. Twenty years ago we were using loads half of Cooper's E-60. From that time to this loads have been increasing greatly and bridge engineers have found it necessary to use low stresses in order to provide for the future of loading. Now that the stresses entering into a bridge due to various causes are better understood and definitely provided for and that the probable maximum loading has been reached it was thought proper to use the high stresses indicated.

PRESIDENT: Mr. Barnsley, can we hear from you?

MR. GEO. T. BARNSLEY: Mr. President and Gentlemen: Most of you know that I have been out of the bridge building business for three years at least, consequently I have not kept up with the many changes which are continually taking place. I was very much interested in Mr. Manning's paper, and I think that paper a great success. He carried out in general the specifications with which he started and covered all the points in his own way.

I want to commend one point that he made, especially, regarding the specifications. It is such a mistake to have the specifications cover everything under the sun, as he remarks. Specifications should cover the particular job of work that you have on hand and should state briefly and concisely just what is wanted, without introducing something which has no bearing on the particular case whatever. I was indeed much gratified that he brought that point out, because every one who expects to get a good job will write specifications that way. It is the fellow who doesn't know exactly what he wants that tries to introduce a number of things, hoping to cover points not clear in his mind.

I might talk to you to some extent regarding shop inspection, but as I ate dinner with Mr. Manning this evening and found him such a good fellow I don't like to say a word in criticism. But some of us would possibly think differently on that point. It is a matter of difference of opinion. He rather spoke from the manufacturer's side, I thought. The railroad company that has a particular piece of work under way wishes to have a representative, an inspector, to look after the work and follow it as the manufacturer is getting it out. Naturally there is somewhat of a difference of opinion between the two interests.

As I said before, I have not been thinking or talking along bridge lines, but I have been trying to accomplish something to help the railroads by building smooth highways so that the people may get their freight to and from the railroad station and thereby increase business. I hope that idea will be carried out all over the United States, because improved highways are greatly needed. A railroad without facilities for the people to reach its stations and sidings at all seasons is handicapped. Railways and highways are two things which must go hand in hand so they will be of mutual benefit in the development of our great country.

MR. R. G. MANNING: I want to explain my point regarding inspection, which I think Mr. Barnsley did not catch. You will not find in this paper any complaint on the part of the manufacturer against inspection by the purchaser's representative. We invite inspection, desire it, and would not want to build bridges without it. What we want is the kind of inspectors I have spoken about. We do not desire inexperienced men who will not use common sense judgment in making a decision simply because the specifications call for a thing to be built so and so, when the specifications are evidently in error.

MR. GEO. T. BARNSLEY: I am glad Mr. Manning brought that out because all men of experience dislike to have boys inspecting something which they don't know anything about. Inspection, of course, must be carried out by experts. That is the only true way to do it. I have always been very much opposed to inexperienced men in the inspection of work. You must have the very best talent to get results in any kind of inspection whatever, whether it be of steel, of cement, or of any sort of material.

PRESIDENT: Does any other gentleman wish to discuss this question?

MR. A. STUCKI: Mr. Manning stated in the beginning of the paper that he wrote it for the railroad men more so than for the bridge engineers, and in this he has certainly succeeded well. His remarks on inspection I enjoyed especially, as they were right to the point. Mr. Manning must have been brought up in a car shop or else the conditions in a bridge shop and car shop must be very much alike, and I wish to emphasize again, that a good inspector, one who uses good judgment and common sense, is considered a help in an establishment, is well treated and well liked. I would like to hear from Mr. Gulick on that point.

Another important question is the standardizing of the spans. This is the very thing the M. C. B. Association has been doing for a good many years, and we all know how much benefit is being derived from such a course. This way the interchange of cars has been made possible, their building has been facilitated and their first cost and that of repairs has greatly been reduced, and I consider it complimentary to the M. C. B. Association in adapting their principle also to the length of spans in bridges.

MR. H. GULICK: If I were going to say anything in regard to inspecting I believe it is a question of the personal equation. It should call not only for knowledge in regard to the matter, but it calls for judgment, and I have yet to find the manufacturer who will not meet the inspector who knows his business fully half way. In fact, I have yet to find the manufacturer who will object if you condemn everything he has made, if you show him why you can not take it. If the inspector in the shop thoroughly knows his business and knows where to ignore the specifications and where to insist on them, for, as Mr. Manning said, you can not make specifications to be absolutely followed, whether you are building a bridge or whatever you may be doing. Of course, there are limits as far as the tensile tests are concerned, and limits one way and another as to analysis, that are plainly specified. But when it comes to judgment on a piece of work it is not a question of specifications, in car construction or anywhere else. There are many parts in a car, for instance, where, when they are put together, they make up a certain distance if they are not machined, but are rough surfaces, and it is a question of experience to know when that is done in a satisfactory manner.

I may say again on the question of inspection, that I have yet to find a manufacturer who will refuse to meet the inspector half way when he is showing facts.

MR. R. G. MANNING: I want to emphasize one or two points about indefinite specifications by giving an example. Not many years ago we had a bridge to build according to certain specifications and a submitted plan on which were written specifications that did not conform to the printed specifications in regard to reaming. The drawings were made and sent for approval to the firm that got out the plans and specifications. They came back, changing the requirements as given on the drawing to those of the printed specifications. We were not satisfied with this, and the drawings were sent back, saying that according to the plan the drawings were correct. They came back again with instructions that the printed specifications were to govern. We were not yet satisfied and sent the drawings back again, and then they were returned with a letter written by a member of the firm, saying that we were right, that the office boy had answered the previous letter, and that the specification requirements were only general and were not supposed to be followed to the letter. General specifications are a good guide, but should not be used without modification for the specific work in hand.

I want to add another word on the standard span length. The Harriman Lines have been ordering twenty, thirty, or forty spans of sixty, seventy and eighty foot girders, but when the order diagrams are received, it is difficult to know what arrangement the railroad is trying to carry out. One bridge may have six or eight spans already in place an another eight or ten, these spans having been erected from a previous order. The order now in hand may have three or four spans for the first bridge and six or eight spans for the other, but not enough to complete the bridge. We do not know how they are to be used, and it does not concern us. The railroad company evidently has a plan which it is working out, for they want some here and some there. You can readily see how a standard span length helps the railroad man to meet the conditions under which he has to do his work.

Japan, China, the Philippines and other foreign countries are ordering bridges in large numbers of standard spans. The Harriman Lines only recently came to a position where they could use the standard span length advantageously. We can remember when they started this standardization. There were several divisions of the road to line up, certain details of the standards were faulty. When corrected and submitted for approval, one division would accept the correction and the other would not. This confusion was eliminated when Mr. John D. Isaacs was appointed Consulting Engineer of the Harriman Lines, and the plans approved by him. It has taken several years of hard work to get the standard span system in the proper working order. A combination of railroads working together would be able to accomplish the same thing. You could not have done this a few years ago, because your organizations were too young and not co-operative. To-day the railroad organizations are working together and can take up a question of this kind. To illustrate this in another way: At the Ambridge Plant of the American Bridge Company, which has been running five or six years, the working force was made up of men from the various plants and drawing rooms from different sections of the country. They had had varied conditions and different experiences, and it was a pretty difficult matter to get them organized into a unit. The drawing room especially was a problem. Within the last year we have started a plan of having typical drawings made, which the men in the drawing room are to follow in making drawings. The drawings are to be made like the typical drawings in arrangement, in the amount of material that goes on the sheet, and in the way the figures are to be given, the main characteristics all uniform. Four years ago we could not have done this at all, because there were too many men with ideas all different, and they all thought their own were the best, and one fellow would not give in to the other. To-day it is working out in a most satisfactory and harmonious manner and to the advantage of both drawing room and shop. So is not the time ripe for similar conditions to be worked out through the railroad organizations which were not possible a few years ago? This is the point I want to bring out, that now is the time to start the organization of working along this line. We should look, not at the next few years, but twenty, thirty, forty years in the future.

Mr. R. H. BLACKALL: The measure of success of a paper is usually gauged by the amount of discussion that is brought forth, and, judging from the amount of discussion here to-night every one has been very much pleased with the paper presented by Mr. Manning. I, therefore, move that the Club extend a vote of thanks to Mr. Manning for his very interesting paper.

The motion, being duly seconded and put to vote, was carried unanimously.

There being no further business,

ON MOTION, Adjourned.

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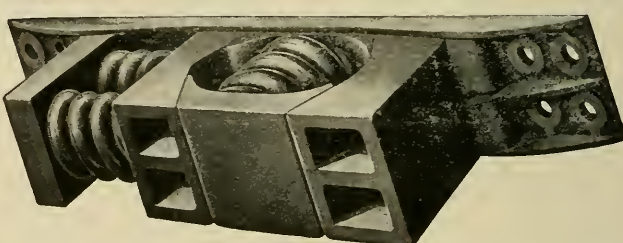

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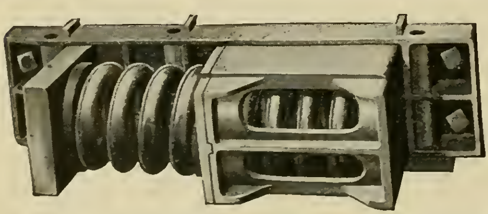

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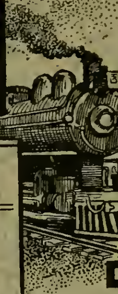

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REPORT OF STANDING COMMITTEE ON REVISION OF M. C. B. RULES OF INTERCHANGE.

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OFFICIAL PROCEEDINGS

of the

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Meetings held fourth Friday each month, except June, July and August.

PROCEEDINGS OF MEETING, MARCH 26, 1909

The meeting was called to order at the Monongahela House, Pittsburgh, Pa., at 8 o'clock, P. M., with President D. J. Redding in the chair.

The following gentlemen registered:

MEMBERS.

Alleman, C. W.
Allen, James P.
Allison, John.
Bailey, Robt. J.
Bealor, B. G.
Berg, Karl.
Bigham, C. G.
Brownscombe, G. J.
Clark, C. C.
Cline, W. A.
Coulter, A. F.
Courson, C. L.
Courson, J. F.
Cunningham, J. D.
Curtis, H. C.
Davis, G. H.
Dette, R. E.
Dickinson, F. W.
Dyer, Joseph.
Falkenstein, W. H.
Frost, John B.
Gallinger, Geo. A.
George, M. E.
Gies, Geo. E.
Gulick, H.
Hindman, S. M.
Howe, D. M.
Huyett, E. G.
Jefferson, E. Z.
Jenny, Jacob.
Johnston, L. S.
Karns, W. H.
Kennedy, Jas.
Kinter, D. H.
Kleine, R. L.
Knox, Wm. J.
Knight, E. A.
Krause, Julius.
Kull, W. A.
LaMar, A.
Lobez, P. L.
Lynn, S.
Mercur, H. T.
McAndrew, R.
McKee, Ira E.
McNulty, F. M.
McVicar, G. E.
Noble, D. C.
Noland, J. J.
O'Neal, J. E.
Painter, Joseph.
Porter, H. V.
Pratt, Howard A.
Rauch, T. T.
Redding, D. J.
Reese, E.
Reeve, F. J.
Reilly, Robt.
Rowan, W. R. C.
Rutzky, B. E.
Sellers, C. E.
Shannon, Chas.
Simpson, M. S.
Sitterly, W. H.
Sitts, Lewis S.
Smith, A. D.
Smith, M. A.
Stark, F. H.
Swann, J. B.
Sweeley, G. P.
Walker, J. W.
Walther, G. C.

Warne, J. C.
Warnock, H. R.
Wood, W. H.

VISITORS.

Barnett, Stephen D.
Barth, John W.
Blake, Clyde.
DeVore, E. L.
Donnelly, D. B.
Earner, J. P.
Elverson, Howard W.
Evans, J. K.
Hettler, R. C.
Huber, H. G.
Jefferson, H. F.
Krause, Robert A.
McDermitt, W. W.
McIntyre, S. B.
Neean, E. J.
Norris, W. B.
O'Neal, Wm. J.
Russell, H. H.
Schaff, John.
Shadle, O. F.
Singleton, A.
Slemmer, W. M.
Smith, Sion B.
Snyder, J. Rush.
Stark, J. L.
Wegener, Henry.

The minutes of the last meeting, being in the hands of the printer, the reading of them was dispensed with.

The Secretary read the following applications for membership:

Barth, John W., Rep. Sterling Steel Foundry Co., Lemington Ave., Pittsburgh, Pa. Proposed by Frederick W. Winter.

Brunker, A. R., Sales Agent, American Steel Foundries, Chester, Pa. Proposed by H. W. Green.

Bucher, C. A., Rep. Celfor Tool Co., Frick Building, Pittsburgh, Pa. Proposed by D. J. Redding.

Dudley, F. L., Engr. Drawing Room No. 2, American Bridge Co., Ambridge, Pa. Proposed by A. C. Knickerbocker.

Earner, J. P., General Foreman, B. & O. R. R. Co., 2020 Lytle St., Hazelwood, Pa. Proposed by A. F. Coulter.

Huber, H. G., Asst. Master Mechanic, P. R. R. Co., Phillipston, Pa. Proposed by W. H. Sitterly.

Krahmer, E. F., Agent, Penna. R. R., Charleroi, Pa. Proposed by J. H. Huggans.

Martin, John M., Engr. Drawing Room No. 5, American Bridge Co., 318 McKinley Ave., Avalon, Pa. Proposed by A. C. Knickerbocker.

McGrory, Percy, Engineman, Wabash-Pittsburgh Terminal Ry. Co., 533 Main St., Carnegie, Pa. Proposed by H. F. Grewe.

O'Connor, Chas., District Manager, Continental Iron & Steel Co., Farmers Bank Bldg., Pittsburgh, Pa. Proposed by H. E. Swartz.

O'Neal, Wm. J., Inspector, Union R. R. Co., Port Perry, Pa. Proposed by A. F. Coulter.

Rhodes, P. S., Salesman, Homestead Valve Mfg. Co., Homestead, Pa. Proposed by W. R. Schuchman.

Shadle, C. F., Engr., Snyder Railway Specialty Co., Fulton Bldg., Pittsburgh, Pa. Proposed by H. V. Porter.

Slemmer, W. M., Inspector, Union R. R. Co., Port Perry, Pa. Proposed by A. F. Coulter.

Slocum, Roy L., Foreman, Universal Portland Cement Co., 755 Hill Ave., Wilkinsburg, Pa. Proposed by W. R. Schuchman.

Snyder, J. Rush, President, Snyder Railway Specialty Co., Fulton Bldg., Pittsburgh, Pa. Proposed by H. V. Porter.

Tolan, Clarence, Jr., Sales Agent, American Steel Foundries, Pittsburgh, Pa. Proposed by H. W. Green.

PRESIDENT: As soon as these applications have been favorably passed upon by the Executive Committee the gentlemen will become members.

If there is nothing further we will proceed to the discussion of the Report of our Standing Committee on M. C. B. Rules of Interchange. I will ask Mr. R. L. Kleine, the Chairman, to read the report.

Report of Committee of the Railway Club of Pittsburgh on Revision of M. C. B. Rules of Interchange.

Mr. President and Gentlemen:—

In compliance with the custom of previous years the Secretary sent out a printed circular requesting the members of the Railway Club of Pittsburgh to forward to the Chairman of your Standing Committee on the M. C. B. Rules of Interchange any recommendations for changes in the rules of interchange, in reply to which we received suggestions from Mr. F. R. McFeatters, Superintendent of the Union Railroad Company, and from Mr. Robert J. Bailey, Car Accountant of the Monongahela River Consolidated Coal & Coke Company, which suggestions were carefully considered in the revision of the rules, and we give below the changes or additions recommended unanimously by your committee.

We also received a request from our President to consider the subject: "Abuse of the M. C. B. Repair Card," which was taken up at our meeting, thoroughly discussed, and we append the result of our deliberations on this matter.

Your committee also desires to express their appreciation and thanks for the arrangements made for their stay in Pittsburgh while considering the rules and for the entertainment provided.

CHANGES RECOMMENDED IN THE M. C. B. RULES OF INTERCHANGE.

RULE No. 3.

Omit last two sentences beginning on the eighth line with *The end of the car* and insert the following: *The end of the car towards which the cylinder push rod travels shall be known as "B" end and the opposite end shall be known as "A" end.*

All cars offered in interchange must now be equipped with air brakes, therefore, the designation of "B" or "A" end by means of the brake staff has become obsolete; furthermore, on some cars the push rod travels toward the deck brake whereas on other cars it travels toward the tunnel brake, which is a source of confusion to inspectors and repairmen in determining the "A" or "B" end of cars. The above suggested change simplifies the matter and is applicable to all cars.

A further modification of this rule is also suggested with a view of conforming to arbitration decision providing that not more than one journal bearing can be charged applied to the same journal of a car during any one trip. At present there is no rule to designate the journal and in order to provide for same the following recommendation is made:

Add after the word *exist* in eighth line the following: *and in the case of journal boxes and contained parts the location on side of car.* Also at the end of paragraph the following: *Facing the "A" end of car the journal box on the outside wheel to the right shall be known as AR1 and the journal box on the inside wheel to the right as AR2, on the left side the journal box on the outside wheel as AL1 and the inside wheel as AL2. In the same manner facing the "B" end of car the outside and inside journal boxes on the right side shall be known as BR1 and BR2, respectively, and on the left side as BL1 and BL2.*"

RULE No. 5.

Change word *may* in fifth line to the word *must.*

This is in line to overcome the abuse of the repair and defect card. The receiving road must require that the defect card be tacked to the car before the car is moved from interchange point, otherwise the car owner will be billed for such repairs as missing material which are delivering company's defects when offered in interchange.

RULE No. 10.

Change to read: Worn flange: Cast wheels under cars of less than 80,000 pounds capacity, with flanges having flat vertical surfaces extending more than 1 inch from tread, or flange 15-16 inch thick or less, *according to gauge shown in figure No.* 1. Wheels under cars of 80,000 pounds capacity or over, with flanges having flat vertical surfaces extending more than ⅞ inch from tread, or flange less than 1 inch thick, *according to gauge shown in figure No.* 1. (For method of gauging see Figs. 4 and 4-A.)

Worn Flange: Steel or steel-tired wheels with flanges having flat vertical surfaces extending more than 1 inch from tread, or flange 15-16 inch thick or less, *according to gauge shown in Fig.* 1. (For method of gauging see Figs. 4 and 4-A.)

The above changes are suggested so as to make the rule clear as to the gauging of the thickness of the flange above the tread.

RULE No. 11.

Change dimension 1 11-32″ in fourth line to 1 19-64″, to agree with maximum flange thickness gauge for 1907 cast iron wheels, shown in M. C. B. Standards, Sheet 12, as well as to harmonize with gauging distances from throat to back and back to back of mounted wheels.

RULES Nos. 18 and 20.

Combine Rule 18 with Rule No. 20 and make the chipped flange a delivering company's responsibility in all cases. It is now difficult to distinguish between owner's responsibility and delivering company's responsibility for the reason that nearly all flanges that are chipped extend past centre of flange which is caused by track conditions.

RULE No. 20—Fig. 2-A—Page 9.

Change dimension of 1 11-32 inches in Figure 2-A to 1 19-64 inches to harmonize with the standards of the association. The dimension of 1 11-32 inches now shown is incorrect for maximum flange thickness and if used will not provide for the proper gauging distances from back to back and throat to back of mounted wheels.

RULE No. 30.

Eliminate *torn air hose* from owner's responsibility.

Inasmuch as a torn air hose is the direct result of allowing air hose to pull apart instead of separating them before cars are parted, they should not be charged to the owner. When couplings are slightly out of gauge, the pressure required to separate them by pulling apart is detrimental to the train line and strains the hose proper, therefore, it is essential that hose should be separated and not allowed to pull apart; furthermore, in winter months hose couplings are liable to be rigid on account of ice, the hose itself is sometimes covered with ice, thus rendering it more liable to tear at the nipple when couplings are pulled apart.

RULE No. 33.

Cars equipped with air brake hose other than M. C. B. standard (Owners Responsible).

Except cars offered in interchange, where delivering company is responsible. (Delivering Company Responsible.)

The reading of this rule has been changed to bring it up to date.

RULE No. 34.

Incorporate Rule No. 37 under Rule No. 34 as follows: *All freight cars offered in interchange must be equipped with air brakes and have 1¼ inch train line and angle cocks.*

This will incorporate under one rule the requirements for the air brakes and the 1¼ inch train line and angle cocks which are now covered in two separate rules.

RULE No. 35.

Change *Missing air-brake hose* in first line to read *Missing or torn air-brake hose.*

This change to conform to modification suggested under Rule No. 30.

RULE No. 37.

Substitute for present Rule No. 37, which has been included under Rule No. 34, the following: *Cars not originally equipped with retaining valve, owners responsible.* Omit this requirement from Rule No. 38.

This change is suggested so as to incorporate all parts of brakes under the general heading of "Brakes."

RULE No. 38.

Add the words *Door fastenings* before the word *Locks* in first line.

The door fastenings should receive closer attention by owners to facilitate manipulation of doors at loading points, besides insuring the security of same during transportation. The locks heretofore have been construed to mean door fastenings, but they refer to individual locks used for certain kinds of lading as an additional safe-guard to the seal commonly used.

RULE No. 49.

Omit the words *Combined front and back coupler stop.*

This is a very common defect where weak coupler stops are used, and being concealed is not discovered until taken down and, therefore, should not enter into combinations of damage. Where coupler stops of proper design are used they are not broken. In repairs the broken stops are very often not replaced, and by making them an owner's responsibility it will tend to strengthen this important part of the draft arrangement.

RULE No. 51.

Omit this rule on account of the recommendation contained under Rule 49 to omit combined front and back coupler stop from combinations of damage.

RULE No. 53.

Omit the words *Combined front and back coupler stop.* For the same reason as given under Rule 49.

RULE No. 56.

Change the first note under this rule to read: *The word "coupler" in the above rules,* 49 *to* 53, *inclusive, means the coupler body.*

On account of the more frequent failures of knuckles and the ease with which replacement is made they should not enter into the combinations of damage.

Change third note under this rule to read: *It will be assumed that a missing coupler and attachments are* NOT *damaged unless shown to the contrary.*

When coupler and attachments are pulled out they are universally found not to be damaged. When a car reaches the shop with these parts missing delay is caused in tracing to ascertain the condition of the missing parts.

RULE No. 59.

Change first line to read: In repairing damaged *or defective parts of* cars.

The above addition is recommended to make the reading of the rule clear.

Add an additional paragraph to this rule reading as follows: *When necessary to renew brake beams any metal brake beam meeting M. C. B. specifications may be used, provided that the beam applied is as strong as the beam standard to the car and does not require any change in hangers or other details.*

Since the M. C. B. Association has adopted specifications and tests for metal brake beams as a standard we believe the above should be incorporated in the M. C. B. Rules of Interchange which will facilitate repairs and at the same time protect the owner of the car in the exchange of metal brake beams, insuring a beam of equal strength being applied for the one removed.

RULE No. 63.

Add to the end of second paragraph of Rule No. 63 the following: *Where it is necessary to remove a load to make repairs to parts as specified in Rule No.* 106 *it must be plainly stated on repair card and stub.*

To avoid the return of bills where the labor charge is added for removing load to make repairs and no notation made on the repair card or stub that the car was loaded.

RULE No. 65.

Change first paragraph to read: *Draft timbers must not be spliced. Longitudinal sills may be spliced at both ends. Not more than two adjacent sills may be spliced at same end of car.*

Inasmuch as centre sills may be spliced at both ends of car there can be no valid reason why the other longitudinal sills should not be spliced at both ends, providing that not more than two adjacent sills are spliced at same end of car.

RULE No. 65—Second Paragraph—Page 28.

Add to the end of this paragraph: *The thickness of each splice piece must not be less than the thickness of the web of the section spliced.*

This suggestion is in accordance with the Recommended Practice of the Association and should be incorporated, inasmuch as splice pieces of less thickness than the web of section spliced are sometimes applied in repairs.

RULE No. 72.

Add after the words *restencil the car,* in the sixth line, the following: *which must be clean before reweighing.* Also add after the word *charge,* in sixth line, the following: *in accordance with Rule No.* 106.

To provide for the cleaning of the car before reweighing.

RULE No. 75.

Change to read: When two or more cars chained together *with switch chains and couplers blocked out with metal spacing blocks* are delivered at an interchange point, the receiving road shall deliver to the delivering road at the time, an equivalent number of switch chains *and metal spacing blocks* of the same size as the chains *and blocks* used on the cars delivered, or in lieu thereof furnish a defect card for such chains *and metal spacing blocks.*

The metal spacing blocks are now a standard of the M. C. B. Association, and as the wooden blocks are crushed behind the horn of the coupler disarranging the twin or triple load, necessitating shopping of cars in transit, the metal blocks have become an absolute necessity, and, therefore, the roads using same should be protected in interchange.

RULE No. 76.

Change the word *shall* in second, seventh and twenty-fourth lines to the word *must.*

This recommendation is in line to prevent the abuse of the repair card.

Omit reference to brake shaft for designating "A" or "B" end of car as explained under Rule No. 3.

RULE No. 85.

Omit reference to brake shaft for designating "A" or "B" end of car as explained under Rule No. 3.

RULE No. 87.

Change to read: *Bills may be rendered against car own-*

ers for the labor only of replacing couplers and brake beams that have been lost on the line of the company making the repairs; also coupler yokes, springs and followers, when they have been lost with the couplers; and brake heads, shoes, shoe keys, key bolts, brake pins, jaws, hangers, brake levers, lever guides, top and bottom brake rods when they have been lost with the brake beams.

This change to permit material charge for missing brake levers, guides, top and bottom rods when beam is not missing for the reason that these parts are missing, generally due to being broken.

RULE No. 88.

Change to read: In making bills under these rules, the information *called for by the headings of the columns must be inserted* on the following forms, whether the same is made as a bill or a statement to accompany a bill.

To avoid present practice of bulking material credits at bottom of bill to insure details being shown in their respective columns.

RULE No. 88—Page No. 39.

We would suggest that the column headed *Shop Marks on Wheels and Axles* under *Wheels and Axles Removed* and under *Wheels or Axles applied* be omitted from the Wheel Statement form.

This information is considered unnecessary and, furthermore, cannot be distinguished, as a rule, on wheels and axles removed.

RULE No. 89.

Price of one 33″ cast iron wheel second-hand be reduced from $7.00 to $6.00.

The price suggested we believe to be a more equitable price for the service that can be obtained from a second-hand cast iron wheel.

Present Rule No. 89 does not cover the exchange of wheels, both cast iron and steel or steel tired, as equitably as we think it could be arranged, inasmuch as the personal equation enters too deeply into the decision as to whether cast iron wheels removed are second-hand or scrap, and, furthermore, the charging and crediting for exchange of steel and steel tired wheels should be based on tire or tread thickness and second-hand prices eliminated from the price list. In order to obtain the conditions prevalent over the largest area we believe it would be well to refer the entire question to the M. C. B. Committee on Car Wheels with a view to revising present Rule No. 89, and the following suggestions are made to give expression to our views in the matter:

"A."—That the second-hand and scrap prices for cast iron wheels be omitted and substitute therefor an average credit price for wheels based upon the actual average number of wheels withdrawn from cars which must be scrapped and those good for further service. This would eliminate the personal equation in determining whether wheels removed are scrap or second-hand, inasmuch as the judgment of the inspector at the time of removal is often reversed by the inspector at the wheel press. Sometimes the inspector at the repair point decides that a wheel is scrap whereas the inspector at the mounting press finds that it can be used for further service, but more often the wheel is credited as second-hand and is condemned at the mounting press. To eliminate these irregularities a uniform credit price for wheels removed from service would be the most satisfactory to all parties interested.

"B."—That separate prices be shown for the different weights of M. C. B. Standard Wheels.

"C."—Separate average prices be inserted for solid rolled steel wheels and steel tired wheels, new and scrap. Second-hand prices to be omitted. The value for loss of service metal to be revised and the difference in tire thickness between wheels removed and applied adjusted on the basis of a table giving the corrected thickness of tire according to the flange thickness of wheels removed and applied.

When this has been done we would suggest an addition to the present rule on the following lines:

Where steel or steel tired wheels are changed by a foreign *road on account of an owner's or delivering company's defect, the road making repairs is responsible to the owner for the loss in service metal of the tire, between the wheels removed and applied, based upon the normal thickness of flange when new. The intermediate road making repairs on defect card is responsible to the owner for the loss in value of service metal. The thickness of tire of wheels removed and applied must be shown on wheel report and forwarded to car owner in each case.*

When steel or steel tired wheels are turned on authority of defect card the cost of turning and loss of service metal shall be charged for on both wheels in repairs although only one wheel may be defective.

RULE No. 94.

We would suggest that normal weights of all M. C. B. standard castings be shown on account of the wide variations in the weights charged for the same castings, and that such castings either be charged by the price per pound at normal weights or a net charge be stipulated. The Committee on Standards and Recommended Practice should be requested to specify the normal weights.

This would greatly facilitate billing and equalize charges.

Angle cock handle change to read: *angle cock handle, plain.*

Add price for *Angle cock handle, self locking,* $0.30.

Journal bearings, brass or bronze, lined or unlined, per pound, applied. Change charge from 20 cents to 16 cents and credit from 15 cents to 12 cents.

Journal bearings, filled brass or bronze shell, per pound, applied. Change charge from 15 cents to 13 cents and credit from 11 cents to 9 cents.

Add: *Steel, structural, 2½ cents per pound, credit ½ cent per pound.*

RULE No. 97.

Omit this rule since structural steel has been included in list of prices under Rule No. 94.

RULE No. 98.

It is suggested that this rule be allowed to remain, as there is no special provision in the rules of the Association of American Railway Accounting Officers to govern the handling of freight car repair bills, while it is very necessary to have a uniform rule to expedite the payment of such bills. In accordance with the rules of that association, it is the practice to settle interline freight reports, interline ticket reports and interline per diem reports as rendered, making any necessary adjustments in later accounts. In view of the common errors in freight car repair bills, it is only reasonable that there should be a somewhat similar rule to expedite the payment of these bills.

In our opinion the advantages of M. C. B. Rule No. 98 are much greater than the objections to it, and we believe the great majority of roads are in favor of its provision. When car repair bills are returned on account of common errors, the payment is usually delayed about two months longer than if the bills had been passed for prompt payment instead of being returned in such cases. Nearly all large bills have errors in them and in the numerous cases where a small amount is involved, we believe the most practical method is to settle the difference by countercharge instead of holding up the entire amount of the bill. To eliminate the present rule would probably result in the payment of about 50% of all bills being delayed about two months longer than at the present time.

However, that part of the Rule providing that credit shall be allowed in the next month's bill, is somewhat impracticable, it being the general practice of furnishing authority for countercharge in such cases, and we suggest that this rule be amended accordingly.

RULE No. 106.

Add item: *Truck tie bar, blacksmith shop labor, repairing,* 1 *hour.*

Add item: *Truck tie bar, removed and replaced when arch bars are not removed,* 1 *hour.*

Add item: *Door, side, applied on authority of defect card,* 1 *hour.*

Add item: *Door, end, applied on authority of defect card, ½ hour.*

Add note to the following: Coupler, with pocket attachments, etc. *This does not include coupler stops riveted, which should be charged for on a per rivet basis in addition to cost of removing and replacing coupler when this is necessary to do the riveting.*

	Ord. Cars.		Refr. Cars.	
Braces, side or end, one renewed....	3	hrs.	6	hrs.
Braces, side or end, each renewed, when associated with the renewal of posts....................	1½	"	3	"
Posts, corner, door end or side, each, renewed on empty car..........	3	"	6	"
Posts, corner, door, end or side, each, renewed, when associated with renewal of side or end plates....	2	"	3½	"
Posts, corner, door, end or side, one renewed on loaded car.........	4	"	6	"

These changes are suggested for the reason that the charges can be more readily referred to if shown in a group, and furthermore, embraces combinations of repairs similar to the arrangement under sill labor charges.

Weighing and restencilling car, per Rule 72. Change prices as follows:

50 cents net for stock cars.

30 cents net for other cars.

Omit last paragraph under Repairs of Steel or Steel Parts of Composite Cars reading as follows: *Credit for scrap material removed from cars constructed of pressed steel or structural steel, ½ cent per pound.*

The above has been included under Material, Rule 94.

RULE No. 107.

Add after the words *brake-shoe keys* in fourth line, the following: *Side and End Doors.*

In order to permit labor charge for applying side and end doors on authority of defect card as there is no scrap to offset the labor.

RULE No. 112—Page 57.

Add after *Cylinder cleaned, oiled, tested and stencilled 33 cents* the following: *including obliterating old stencil marks.* This should also be added under details at top of page 58.

RULE No. 112—Page 61.

The first item at top of page 61 be changed to read: *Retaining valve repaired, labor charge, 25 cents,* and the following details added:

Retaining valve handle R. & R.	.02
Retaining valve case R. & R.	.01
Retaining valve ground in	.05
Retaining valve cock key ground in	.15
Retaining valve cock key and spring R. & R.	.02
	.25

RULE No. 113—Pages 64 and 65.

Change paragraph beginning at bottom of page 64 to read: When cars are equipped with metal centre sills *or metal centre draft underframe made continuous from end to end of car in combination with metal needle beams,* $40.00 shall be added to the values of bodies for cost of such metal centre sills *or metal draft underframes.*

To provide for continuous metal underframes for which extra expense owners should be reimbursed.

ABUSE OF REPAIR CARD.

The present provisions in the Interchange Rules in regard to carding cars for repairs made are ample and should be strictly followed on all occasions; and that the proper railroad officers in charge of the yards or repair points must see that the making out and application of the cards to the car before being moved is strictly enforced.

Further, that the present misuse of the repair card is largely due to the officers in charge of the shops and yards not seeing that the provisions of the rules governing the application of the repair card to cars are carried out.

The failure to apply defect cards before moving cars from interchange points results in owners being charged for repairs in such cases as material missing from cars, which repairs should have been made by the delivering line, or failing to do so, they should apply a defect card to the car when offering the same in interchange.

The present Rules of Interchange cover these matters very thoroughly and if complied with there would be no cause for complaint.

Respectfully submitted,

G. E. Carson,	W. J. Knox,
S. A. Cromwell,	A. La Mar,
G. N. Dow,	S. Lynn,
F. W. Dickinson,	F. M. McNulty,
G. H. Davis,	F. J. Reeve,
J. Krause,	J. B. Swann,

R. L. Kleine, *Chairman.*

The report of the Committe was adopted without discussion, except as follows:

RULE No. 3.

MR. ROBERT J. BAILEY: As a matter of information, why do you call them inside wheel and outside wheel? Would it not be better to call them first and second journals on the different sides of the car?

MR. R. L. KLEINE: I believe it is a little clearer to repairmen and car inspectors to designate the wheels as inside and outside, as this is a term in general use by them.

MR. F. H. STARK: I believe in practice on M. C. B. repair and defect cards they simply use the letter and figure, and do not undertake to write it out in full, inside or outside.

RULE No. 59.

MR. BAILEY: I would suggest an alteration in the wording of the clause. Where it reads, in the third line, metal brake beam meeting M. C. B. specifications, would it not be better to say *metal brake beam of M. C. B. standard specifications?* and then at the end, after *details,* add the words *in use on and standard to car.*

MR. KLEINE: I cannot see any special objections to that, though I think the reading as presented is entirely clear. It is really the brake beam which must meet these specifications. The specifications, it is true, are a standard, and the brake beam must meet the specifications by test; therefore, it is only a standard insofar as meeting the tests. For this reason I believe the present reading probably a little better than that suggested. Furthermore, I do not see that the suggested addition to the end of the paragraph will make the rule clearer.

MR. JOS. DYER: Isn't it necessary already to use a standard brake beam in making repairs to a brake beam which is standard?

MR. KLEINE: While there is no arbitration decision on this case, it is considered necessary at the present time to replace in repairs the exact make of beam with which the car is equipped. The recommendation of the committee is in line to permit the use of any brake beam which meets the specifications in replacing a brake beam in repairs, and where no change in hangers or connections is necessary. For the last couple of years we have tried to get something of this kind into the M. C. B. Rules of Interchange, but it was not acted upon favorably by the Arbitration Committee, for the reason that we had no M. C. B. standard specifications for brake beams. Last year we adopted M. C. B. standard specifications, and for that reason we renew the suggestion.

PRESIDENT: It does leave a loop hole for the man repairing the car to put on a cheaper beam than the one originally on the car.

MR. KLEINE: The owner may be justified in asking for a defect card in the cases cited, and it is to avoid technicalities of this kind that the above recommendation is made.

RULE No. 89.

PRESIDENT: How will that loss of service metal, based on normal thickness of flange when new, work out?

MR. KLEINE: The point involved is this: A steel or steel-tired wheel is removed from a car having a flange thickness of 1¼" and a certain tire thickness, and is replaced with a wheel having a 1⅜" flange and a certain tire thickness. In order to ascertain the loss of service metal between the wheel removed and the one applied it will be necessary to determine how much the 1¼" flange when turned up will reduce the tire thickness; in other words, it will be necessary to ascertain the thickness of the tire of the wheel removed when the flange is turned up to 1⅜" in thickness and the thickness of the tire of the wheel applied with the 1⅜" flange, and the difference in thickness of tire between the two wheels will be the tire metal for which settlement is made. It will be necessary to work out a table and place same in the rules, so that anyone can readily determine the loss of tire thickness for certain thicknesses of flanges.

PRESIDENT: Will that not leave quite a loop hole for unfair practice, for instance, reporting that the tire removed had a thickness of only 1⅜" when it really was 1¼"? Of course, the wheel is liable to come home and the owner will see it.

MR. KLEINE: The man who would report that would be dishonest, and the M. C. B. Rules of Interchange are based on common honesty. The same party could take out a wheel and report it as scrapped when it is good for further service. The same thing also applies to combinations of defects. We must all be honest in what we do.

When the original rule was made providing for an exchange of steel or steel-tired wheels it was thought that the wheel would be removed from the car, turned and replaced in the same car which would not require any adjustment for thickness of tire, excepting loss of service metal. In actual practice, where cars are loaded with perishable or rush freight, it is necessary to immediately replace the wheels removed with another pair of wheels, and, therefore, adjustment must be made. The suggested method by your committee, we believe, will cover such cases.

RULE No. 94.

MR. BAILEY: What is the basis on which the Committee made the reduction on journal bearings, brass or bronze, lined or unlined, per pound applied from 20c to 16c and credit from 15c to 12c? Is it not a fact that M. C. B. Rules are supposed to be based on market prices? If so, why not make it the market prices?

MR. KLEINE: It must not be forgotten that material prices given in the rules include freight charges, handling and storing of the material. By a careful perusal of the rules it will be noted that market prices are omitted as far as possible, in order to avoid contention in returning bills. One party obtains his journal bearings 500 miles distant, whereas another shop purchases the bearings in the immediate vicinity. To the cost price of the actual material must be added the freight charges, certain storehouse expense, shop charges, interest on investment and depreciation. It is, therefore, self-evident that the best thing to do is to make an average price that will be uniform throughout the country, otherwise endless controversy will arise.

MR. BAILEY: Yet as a matter of fact I have prices from different makers of bronze, the highest of which is 14c per pound and running down to 12½c, and yet you recommend a charge of 16c, and 2c a pound on a 5 x 9 journal would be 40c above cost price in the open market.

MR. KLEINE: This includes the cost of labor, removing and applying the bearing. It is an arbitrary figure which includes the labor charge, inspection, etc., and is not the actual price or net cost of the material.

MR. DYER: Is that not too much of a shop credit? If you can buy them new for 12 to 14c why should you allow 12c for scrap credit?

MR. KLEINE: It is necessary to place an average price on the scrap material, and the one given is about as close as we could figure, when you take into consideration the handling and transfer of material from one place to another. It is not simply the selling price of the scrap material, but the labor charges for handling, etc., must also be taken into consideration.

MR. DYER: Shouldn't that depreciate the amount of the scrap credit, then? It costs you that much to get the market price out of the scrap material.

MR. J. C. WARNE: It seems to me it is just a question of a ratio of reduction from existing figures on both renewals and credits.

RULE No. 106.

MR. KLEINE: The subheading "Braces and Posts" should be inserted above the detail combinations of Braces and Posts the same as is done in the present rules above the sill combinations.

RULE No. 108.

MR. BAILEY: In regard to applying an M. C. B. coupler on account of a broken or missing knuckle, instead of allowing the usual charge for replacing a coupler, I would like an expression from you as to what the Committee thinks of that change.

MR. KLEINE: I might ask Mr. Bailey why he thinks the labor charge should be cut down 75%? If it is necessary to change a coupler, due to not having the proper knuckle in stock, why should the party making that change lose three-fourths of the labor cost?

MR. BAILEY: I only wanted an expression of opinion.

The report of the Committee having been fully presented, Mr. Bailey moved the adoption of the following Resolution on Abuse of the M. C. B. Repair Card:

"The present provision in Interchange Rules in regard to carding cars for repairs made are ample, and are strictly followed on all occasions at the present time by all railroads represented in the Railway Club of Pittsburgh. The proper railroad officers in charge of the shops, yards or other repair points must see that Rule 76, requiring the making out and application of the cards to the car before being moved is strictly enforced.

"Further, that the present misuse of the repair card is largely due to the lack of enforcement, because of added work entailed and necessary expense of same to the railroad making repairs."

MR. BAILEY: What is the use of a Committee of this Club making a recommendation for adoption by other railroads of something which they are not willing to acknowledge that they are doing themselves? If you are observing the rule yourself, it comes with good grace to make a recommendation to the Arbitration Committee that you want other roads to do it; but if you are not, what is the use of making that recommendation?

MR. J. KRAUSE: There is some reason for some of these cards being lost off. Some of the cars are very old, and you have to use very long tacks to make them stick.

MR. J. B. FROST: There was a suggestion made, called the publicity clause, which, to my mind, would settle very largely this contention on the repair card, and I regret very much that the Committee can not see their way clear to recommend it to the M. C. B. Association. It would bring out very plainly those who are disregarding the M. C. B. Rules, and would show them up as they ought to be shown. We are perfectly willing to pay for all repairs that are made on our cars. Sometimes we object to certain charges, and correspondence or personal interviews may show that we are wrong. But when we are right we feel that we should be protected in some way by these Rules. But the publicity clause is something everybody seems afraid of, why, I cannot understand. It is all very well to say that these rules are founded on honesty. I will agree that the officials of the railroad companies do not want any dishonest billing; nevertheless, it is being done every day, and there should be some steps taken to put a stop to it. That publicity clause, I think, would be most effective.

MR. BAILEY: Mr. President and Members of the Railway Club of Pittsburgh:—The Monongahela River Consolidated Coal & Coke Company have seven mines on the Pittsburgh & Lake Erie Railroad and four mines on the Monongahela Division of the Pennsylvania Railroad from which they make shipments of coal by rail. The annual production at all of the mines of our company equals about 7,000,000 tons, and about one-third is shipped by rail and two-thirds by water.

In 1905 they bought 600 steel gondola coal cars and rebuilt 16 wooden hopper coal cars at a total cost of about $600,000.00. These cars were bought because we did not receive a sufficient number of cars with which to fill the orders of our customers. In 1905, 1906 and 1907, even with our own cars, we lost 1,284 days time at all of our rail mines because of lack of cars. This lost time, representing so many hours time consumed daily at our various rail mines, and for which we pay our day labor full time, was equal to a dead loss of $256,800.00 in three years for the one item of day labor alone.

During the period covered by March 1st to December 31st, 1907, 68 per cent of our cars were loaded at P. & L. E. R. R. mines and 32 per cent were loaded at mines on the Pennsylvania Railroad. The total car repair bills for this period was $13,260.00, and of this total we paid the P. & L. E. R. R. 16 per cent for repairs to our cars, the Pennsylvania R. R. .05 7-10 per cent and the Penna. Co. Lines .07 5-10 per cent. We received mileage of six-tenths of one cent per mile, and paid out for repairs to our cars forty-seven one-hundredths of a cent.

The average earnings per car for the year ending December 31st, 1908, was $25.02. During the same period the average repair bills per car was $24.85. At seven mines on the P. & L. E. R. R. we used 64 per cent of our equipment during the year, and the repair bills from that road was 23 per cent of the total amount. On the Pennsylvania R. R. we loaded 36 per cent of our equipment at four mines, and their repair bills was equal to 5 per cent and the Penna. Co. Lines 8 per cent of the total amount paid for car repairs. This shows poor service in the handling of our cars on one road as compared to the service on the other two roads for the past two years. These figures do not give the cost due to interest on money and to depreciation and other causes. Adding together all items of expense each of our cars cost about $50.00 annually more than they earn.

Our company did not know of any method of relief through their individual efforts from the many excessive and unjust repair items charged to them. For this reason, and also in an endeavor to increase the earning capacity of this investment, it was through their efforts that the Individual Car Owners' Association of the United States was organized in November, 1907.

At the meeting of the M. C. B. Association at Atlantic City request was made in letter to their Secretary, under date of June 18th, 1908, for such amendments to their present Rules of Interchange as would give relief to private car owners generally. By previous arrangement with the Arbitration Committee of the M. C. B. Association a Committee of the Individual Car Owners' Association was heard on this subject at a meeting in Chicago, September 5th, 1908. The Chairman of the Arbitration Committee, Mr. Hennessey, at that time requested that we present for their consideration such changes in their present Rules as would give private car owners needed relief. The changes asked for are embodied in the circular letter sent to Mr. Jos. W. Taylor, Secretary, M. C. B. Association, under date of February 2nd, 1909. A copy of this circular letter has been furnished to all members of the Committee on Rules of Interchange of the Railway Club of Pittsburgh by request of Mr. R. L. Kleine. It is our purpose to ask members of this Club to discuss these changes at this meeting, and we shall present a resolution to that effect.

In a letter to the Secretary of the M. C. B. Association dated October 30th, 1908, the attention of the Arbitration Committee was called to the rough usage our River Coal Cars received, and the bills for repairs we were compelled to pay because the Rules made it obligatory on our part to do so.

It was then shown that in a period covering repairs made during one year the P. & L. E. R. R., Erie, Lake Shore, Pennsylvania and Pennsylvania Co. Lines had applied to our cars 242 wheels and axles, 365 couplers, 392 brass journal bearings and 700 new M. C. B. air hose. In a number of cases the couplers on our cars were broken while the loaded car was on our mine siding, and after it had been reported by our employees as being in good condition to be forwarded.

There are a very large number of our cars now in use equipped with the couplers placed on them when built in 1905. This shows that only ordinary care in handling them is necessary in order to avoid breakage and subsequent repairs at the owner's expense. From June, 1907, to date there has been 589 couplers broken on 378 of our cars. On the other 222 cars none of the couplers complete were damaged or repaired.

We also gave an example of two new air hose applied to same end of one of our loaded cars, and our request for refund of the amount paid refused. One was applied the day after car left mine, and the second one two days later at delivering point about 70 miles distant. In a number of instances we have paid for the application of two and three air hose to the same car within a period of one year. On one car five air hose were applied from February 5th, 1907, to March 19th, 1908, three at B end and the other two at A end. We are told by experts on this subject that the ordinary life of air hose should be not less than two years.

The attention of the Arbitration Committee was called to the language used by them in their decision relative to case 726 and to the same idea as used in case 736, as follows:

"Your committee might state here that the whole basis of the Rules of Interchange—the idea itself—is based upon the facts that all railroad companies are honest, as without honesty slid flat wheels, cut journals, bent axles, etc., would never be reported as existing upon a foreign car, and the whole plan would be nothing more nor less than a farce."

Commenting on the language used in these decisions, we said:—"If the foundation of your Rules of Interchange is based upon the fact that all railroad companies are honest our experience is a sad commentary on the solidity of its foundation. However much those who give orders may desire it, no statement of good intention will overcome the actual dishonesty of the men hired by railroads to do the actual work performed. The law says that ignorance is no excuse for the commission of an unlawful act, and on the same principle the subscribers to your Rules are dishonest where any employee of a railroad is guilty of practices which involve an unjust charge made to any foreign car, whether car belongs to a railroad or is one of private ownership. There is a difference however in the extent of the damage done. The railroad unjustly charged can even up on the basis of reciprocity, but the private car owner has no means at his command of obtaining redress."

In a paper read at the December meeting of the Western Railway Club at Chicago, Mr. J. J. Hennessey, Chairman of the M. C. B. Association Arbitration Committee, read a paper on "The Abuse of the M. C. B. Association Repair Card." It was published in the Railroad Age Gazette in their issue dated December 18th, 1908. Here, in part, is what he said:

"At its annual convention of 1896 the Master Car Builders' Association incorporated into the Master Car Builders' Rules of Interchange, effective September 1, 1896, the following:

"'Section 16, Rule 4.—When repairs of any kind are made on foreign cars, a repair card shall be securely attached to outside face of intermediate sill between cross tie timbers. This card shall specify fully the repairs made, reasons for same, date and place where made and name of road making repairs, etc.'

"This requirement has remained in the Rules of Interchange every year since 1896, and is still required under Rule 76 of the present code. In revising the Master Car Builders' Rules of Interchange September 1, 1897, and since that time down to the present day (excluding the exceptions noted in last line of Rule 4), intermediate or delivering lines were relieved from responsibility of wrong repairs not made by them. The 1897 amendment referred to renders the use of the Master Car Builders' repair card all the more necessary, as, in relieving the intermediate or delivering roads from responsibility of wrong repairs not made by them, it 'boiled down,' so to speak, the matter of adjustment to two parties only, viz.: the car owner and the road who actually made the wrong repairs. If, as required by the Master Car Builders' Rules, the road which did the incorrect work applied a Master Car Builders' repair card covering the item objected to, its identity would, of course, be immediately known, and the adjustment of the account would then be a very easy matter. The application of the repair card in all cases of repairs to foreign car equipment as required by the Master Car Builders' Rules, is not, I am very sorry to state, being done, and the fact that these repair cards are not being applied brings to us a very difficult problem for solution. The road with which I am connected has cases coming up every day where our cars are offered home to us with wrong repairs to sills, trucks, draft gear and other very expensive parts of our equipment, and the expense of correcting same is enormous, and we cannot afford to bear it. The repair card is invariably missing, and we are then forced to the only method of ascertaining by whom the repairs were made, and this leads us to that same old story of tracing with its attendant voluminous correspondence, loss of time and expense, to say nothing of the burdens placed upon the office forces of our motive power and car accounting departments. This difficulty has been growing worse from year to year, until now it presents to us a very serious condition with no apparent relief in sight. It is to be deplored that this particular rule is so flagrantly violated. Here we are, an association of master car builders, organized for the purpose of concerted action in various lines, the most important of which is the successful interchange of freight cars. To thoroughly understand each other in the workings of this particular branch of the business, we have agreed upon a code of rules, the carrying out of which necessarily means that railways must be honest, otherwise the plan would be a complete failure. . . . I also believe that the universal suffering among railways and private lines due to the non-application of repair cards, makes the subject one which should be taken up by all the railway clubs in the country and thoroughly discussed, which will undoubtedly result in advancing some proposition that will bring about the desired condition."

It will thus be seen that the speaker was not far out of the way when writing as he did. If Mr. Hennessey found it to be necessary in such a public manner to call members of the M. C. B. Association to account for repairs to the cars owned by the C. M. & St. P. Ry., there must be pretty good grounds for complaint on the part of private car owners in the abuses to which their cars are subjected.

It is noted that recommendation is made by our Club Committee to a more specific identification of the location of the parts of the car to which repairs have been made—more particularly as applying to repairs to wheels and journals. The Lake Shore Railway has for some time, and in present practice, gives the journal to which repairs are made. The advantages to the owner of the car repaired are apparent in a letter we sent to the Auditor of the Lake Shore in relation to journal brasses applied to eleven of our cars. The repair cards received with their bill for repairs show on their face that wrong repairs were made, and offset authority asked for was furnished. Our bill for refund was at once paid, because their repair card was made properly. There are other roads, also, whose repair cards furnish this information.

On January 10th, 1908, we shipped R. C. 1550 loaded with coal to one of our customers at Olean, N. Y. On January 13th a brass journal bearing was applied to B end of car at Shire Oaks Shop, one at Coleman January 15th, one at Phillipston January 16th, one at Emlenton January 17th, one at Kennerdel January 18th, all five having been placed on same car at B end. On January 28th two second-hand wheels on second-hand axle, with two journal bearings was also applied to same end of car at South Oil City Shop. The repair card did not give the location on B end of car of the journal to which bearings were applied, and the reply made to our letter was that there were four journals on each end of car.

If it is good practice for the Lake Shore road or the Erie or any road, to locate in an exact manner on repair cards where repairs are made on a car, whether of railroad or private ownership, why is it not equally good practice on the Pennsylvania or all other roads? Is there any good reason why honest repairs, when properly made, should not be so indicated on repair card as to allow from the information contained on its face the most rigid and careful examination of the part of the car repaired? I might also ask another question here: Can any one here name any other business interest which would bear with such patient endurance similar damage or destruction of property as that so often inflicted on freight cars, and when the bill is received pay to the one doing the damage the expense of making necessary repairs? That is what present M. C. B. Rules compel our company to do.

It can be readily understood that any road making a general practice of misusing or abusing cars and taking advantage of present advance prices for repairs to parts affected will strenuously object to any reduction in the present M. C. B. prices of second-hand wheels, couplers or journal bearings. There is also entirely too large a percentage of profit in present prices of air hose as compared to quoted prices in the open market.

On the question of finding a remedy for the present general practice of the omission of a repair card to the car repaired, the suggestion of publishing to all members of the M. C. B. Association the names of those who offend should commend itself to all those interested in the perpetuation of honest recommended practice. In the absence of any better recommendation to this Club by any of its members, the publicity clause as suggested by Mr. F. H. Stark, one of the oldest active members of the Railway Club of Pittsburgh, must command the attention of its members in a most favorable manner. The clause, as suggested, does not in any way affect the honest road in any manner, shape or form. To the repair man who makes repairs that he is ashamed of, whether brought to his attention by the owner of the car or by the man who hires him, and for whose work the responsibility for repairs must rest, publicity is the very last thing desired.

The principle that might makes right is an old one. It is as old as the hills, and antedates any recital known in history. It is still known and is too often practiced in present day experience. The bigger the fellow is now-a-days too often seems to give him the opportunity to give the other man a body blow. There is a growing disposition, however, in these later days of applying the honest dogma that "The right is mighty and will prevail."

In conclusion let me remind the members of this Club that in any matter of present day practice, as has been shown in past history and experience, "You can fool all of the people sometimes, and some of the people all the time, but you can't fool all of the people all the time."

I would, therefore, Mr. President, offer for the consideration of our members, the following resolution:

Resolved, That the Railway Club of Pittsburgh recommends to the Arbitration Committee of the M .C. B. Association for adoption by the Association at its next annual meeting at Atlantic City in June, 1909, the suggested changes in present M. C. B. Rules of Interchange as contained in printed circular dated February 2nd, 1909, addressed to Mr. Jos. W. Taylor, Secretary of the M. C. B. Association, previously referred to and a copy of which was furnished to all members of our Standing Committee on Interchange Rules.

MR. KLEINE: Before that question is voted upon I would like to say a few words. Mr. Bailey brings forward a number of suggestions which to railroad men of experience are impracticable. We considered the recommendations for changes in the rules honestly, fairly and conscientiously. We have worked under this book of rules for a good many years, and while there is no question that there has been a large abuse of the repair card by different roads, and further, every railroad member of this Club can cite isolated cases of irregular practice, at the same time I do not feel that we should throw these rules overboard and substitute a publicity clause. I believe there is necessity for tightening up so as to insure the repair cards being placed on the cars. As Mr. Bailey has said, it is not the management of the railroads that do not want the cards placed on the cars, but it is the individual who is too indifferent to follow the rules and tack the cards to the car; but I do not believe—as intimated—that the cards are left off the cars with the view of closing up the other man's eye. We considered all the suggestions presented by Mr. Bailey, and I believe your committee spent an entire half day discussing the repair card situation and the best method of insuring the cards being placed on the cars, and our conclusions are contained in the report. I am not in favor of the publicity clause. It would require a corps of inspectors to follow the matter up, and before we would get through with it I believe Mr. Bailey himself would be sorry he suggested it. Why, there would be a chance for such inspectors to make a mistake, which would result in an injustice to the party publicly reported, and I believe a single case of that kind would do more harm than the publicity clause could offset in getting the cards applied to the cars. I believe in individual effort and following the matter up to obtain the desired results.

MR. STARK: In regard to Mr. Bailey's motion, I infer that there is more irony than compliment in his proposed amendment, and he does not wish to convey the idea that the roads in the Pittsburgh district have complied with the rules as covering the application of M. C. B. repair cards. Neither do I believe that we are ready for a radical change in the method of interchange of cars. We have worked under the M. C. B. Rules for a great many years and there has always been more or less trouble incident to the execution of the same. Some of us that were connected with the car departments from twenty to twenty-five years ago well remember the difficulties experienced. It was no uncommon occurrence to have cars delivered and a large percent rejected and returned by the receiving road on account of minor, non-essential and imaginary defects. Inspectors were indued with the thought that self-preservation was the first law of nature and that the interest of his employer, as to the condition of cars, was paramount to all others; and while he was always on the alert under the protective system then in vogue, it was not with the spirit of dishonesty, but rather supposed self-protection. In those days cars were returned for a door hasp, brake, shoe, some loose siding or roofing boards and scores of other unimportant conditions which could have been corrected by the receiving road with very little cost. Cars were rejected on account of the paint being damaged by coming in contact with some obstruction, longitudinal sills slightly defaced on account of coming in contact with the car wheel or a check in the sill on account of the location of the floor spike or knot, and innumerable alleged wrong repairs. It was charged that defect cards were demanded for minor defects and alleged wrong material, and the renewal or replacement of same was frequently never executed by the road securing the defect card, and that bills were made which were contrary to the spirit of the rules.

Frequently blockades would occur at interchange points. Management of the roads interested would get the transportation and mechanical heads together, when investigation would prove that there was some personal feeling between the interchange inspectors. The differences would be adjusted, the blockade removed and the interchange of cars would continue under a more conistent interpretation of the rules. These conditions would develope here and there until it became such a serious matter that the Chicago roads took the matter in hand and established a new policy; hence the Chicago agreement was inaugurated which provided that cars should be passed on notation, and all roads a party to the agreement would receive their own cars home with various defects which are supposed to develope under fair handling. This policy worked most admirably, expediting the movement of cars and saving in transportation cost. In 1896 it was introduced and became a part of the M. C. B. rules and has been modified from year to year since.

For a number of years the railroads were absolutely honest with each other, but human nature is much the same the world over, resulting in some omissions and commissions which are quite familiar to us all. Thus we are confronted with a condition which must be corrected.

Referring to the disadvantages to the private car owner: This organization, or M. C. B. Association, is not in a position to make redress, for the same book of rules must govern the interchange of private as well as railroad cars.

The fact that private cars are operated at a serious loss resolves itself to a question of proper compensation and relief, which will have to come through the American Railway Association.

I am not strictly a representative of the private car owners, neither am I wholly prejudiced against the present code of Interchange Rules. When the principle of the Chicago agreement was about to be adopted by the M. C. B. Association, in an article which appeared in a railroad journal in 1896 I forecasted the present conditions and suggested that car owners be made responsible for, but not chargeable with, the renewals or repairs of various defects that might be agreed upon as developing under fair handling. In order to protect the receiving road, the owner was to attach a defect card covering the existing defects, so that in case any of the defects developed, making repairs necessary, the road having the car in its possession could make the repairs and make bill on the defect card. Such a policy would insure the prompt return of cars to the owner, for the reason that the borrowing road could not make repairs at the owner's expense (except on defect card) and thus avoid unjust charges against the car owner, and the more prompt return of cars to the owner. I readily appreciate that this policy, while it would work out to the advantage of the car owner, is subject to question. Principally the fact that some railroads, or private car owners, would let their equipment deteriorate, jeopardizing safe transportation, unnecessary transfer and frequent damage to freight on account of the depreciated condition of the equipment in general. It would lack the force of the measure now existing, leading the car owner to maintain its equipment or have the repairs made by others and charged to the owner.

Referring to questionable charges made by one road against another reminds us of the former conditions regarding the practice of mileage returns. The Car Accountants at their frequent association meetings made accusations that roads were withholding mileage and the owner had no means of protecting his interests. It was known that the mileage was not a proper compensation for the use of cars. All of this led to the adoption of Per Diem and a penalty for the misuse of cars. Therefore a more practical and business-like method must be evolved regarding the repairs and billing against car owners. If the auditing departments take charge of the billing and checking of same they will have a large proposition on their hands, but they will insist on some system of checking which will involve a great deal of red tape and be far worse than any suggested publicity clause which, in the way of explanation, I will add that inspectors would be employed under the jurisdiction of the M. C. B. Association, who will travel over certain territory and report any violation of the rules, much the same as the Interstate Commerce Commission inspectors or the Joint Weighing Inspection Bureau inspectors, whose duty it is to see that the billing covers commodity contained in the car and billed at the proper weights, etc.

If we are to perpetuate the present policy of interchange and repairs, some measures will have to be taken to protect the integrity of our system.

Your Committee's report is worthy of commendation. The personnel of the committee are practical men who have to meet existing conditions. The report, as usual, is the result of many hours of serious deliberation, and I am quite sure will receive favorable consideration at the hands of the Arbitration Committee.

The motion offered by Mr. Bailey was then put to vote and was lost.

The motion to adopt the report of the Committee was carried by unanimous vote.

MR. KLEINE: Mr. Bailey seems anxious to have the Club consider the recommendations which he made to the Committee. I might again say that the Committee went through those recommendations item by item, and Mr. Bailey will recognize that the report of the Committee concurs with a number of his recommendations. The other suggestions the Committee did not see fit to approve or include in their report. If it is the pleasure of the members, the Committee has absolutely no objection to taking up the suggestions seriatim.

PRESIDENT: So far the recommendations have not been read to the Club.

MR. BAILEY: Rule No. 94 of the present M. C. B. Rules says: "M. C. B. coupler complete, new steel, 5 x 5 shank, $8.75; M. C. B. coupler complete, new steel, 5 x 7 shank, $9.50." The change suggested is that M. C. B. coupler complete, new steel, 5 x 5 shank, be made $8, a difference of 75c, and 5 x 7 $8.50, a difference of $1.00. A number of coupler makers were asked to give us prices, and here is the results: 5 x 5 shank, $14.75 per pair; 5 x 7 shank, $15.25 per pair. Another $14.50 and $15.00; another $16.00 and $16.50; another $14.50 and $14.75; here is another price of $15.00 per pair for 5 x 5 shank coupler. The M. C. B. prices are $17.50 for 5 x 5 and $19.00 per pair for a 5 x 7 shank coupler, or a difference in the highest quoted price over prices charged for repairs of 75c on each 5 x 5 shank coupler applied and $1.25 on a 5 x 7 shank coupler.

MR. A. LAMAR: I would like to ask the gentleman, first, whether the price quoted is for couplers which are subject to the M. C. B. requirements and test, and, second, whether the price quoted is f. o. b. Pittsburg or San Francisco?

The prices for couplers in the Rules of Interchange are arbitrary for Boston, Portland, or down in the South, or up in Canada. Railroads situated directly on the line of the manufacturer in this territory will obtain couplers at lower cost than they could out West, or down South, and the prices set in the M. C. B. Rules are to meet all conditions, and I doubt very much whether the gentlemen representing the Private Car Owners' Association considered this point.

I have been told indirectly that couplers which fail to meet the M. C. B. requirements and test, and are refused by railroad inspectors, have been sold by the manufacturers at a sacrifice to obtain a market for them, because there would be more profit in this than throwing them into the scrap.

MR. BAILEY: The price quoted was for standard M. C. B. specifications f. o. b. at a certain point in the immediate neighborhood of Pittsburgh. While I do not want to discuss the right or wrong here as to how the M. C. B. Association shall regulate prices, it does seem to me a very nonsensical idea that the man east of the Mississippi River must regulate his prices to conform to some man out in Denver or San Francisco who has to buy his goods in Pittsburgh and ship them out there; that the price for repairs made in Pittsburgh has to be regulated on the basis of the prices paid for material by the railroad out there.

PRESIDENT: Yet if you do not the Rules will not cover the entire country.

MR. BAILEY: But is there any other business so regulated? Is it common sense? Why not make a price for one district without making a price for the whole country based on prices paid by railroads way out in the West who cannot get goods at the same price you can?

MR. S. M. HINDMAN: The M. C. B. Rules are based on equity. The member who lives in Colorado or the Far West is just as much a member of the M. C. B. Association as the member in Pittsburgh or the Far East, and, to my mind, to attempt to formulate prices for the member in the East, Middle West and Far West, would make a book, as Mr. Krause says, as large as Webster's unabridged dictionary. I firmly believe that the prices as given in the M. C. B. code of Rules are just as fair, from an equitable standpoint, for us as the members who are on the Santa Fe and different roads where the freight charges are heavier than ours, and to attempt to set prices for the different parts of the country would be out of the question.

PRESIDENT: As I understand it, Mr. Bailey, you had submitted all these recommendations to the Committe and they were considered?

MR. BAILEY: Yes, sir.

PRESIDENT: Inasmuch as the Club has voted the adoption of the Committee's report, are we not wasting valuable time?

MR. WARNE: I think there ought to be a little sympathy extended to Mr. Bailey because he is arguing from the owners' standpoint, whereas you are arguing from a different standpoint. He is the under dog, and all you fellows are against him.

MR. KLEINE: I do not think the Committee is against Mr. Bailey at all. The fact that the Committee adopted some of Mr. Bailey's suggestions shows that they are in sympathy with him, but the Committee could not go as far as Mr. Bailey desired. Unfortunately, Mr. Bailey considers the price of the coupler at the manufacturing plant. Furthermore, he does not maintain large shops and organizations to take care of the car repairs, which costs must be considered in fixing a price for material.

MR. BAILEY: There is one of the Rules which says that you cannot take this M. C. B. book of Rules in homeopathic doses; you have to swallow the whole thing. Why don't you railroad people follow your own rules relative to repairs by putting repair cards on the cars you repair?

MR. KRAUSE: Why don't you private car owners have your own shops and do your own repair work?

MR. BAILEY: I wish we did and had the repairing of your railroad cars.

MR. KLEINE: I believe the railroad companies would wish that Mr. Bailey would carry that into effect and repair his own cars. That would be an ideal condition, gentlemen. He read a nice lot of figures in regard to the maintenance of his cars, and if a railroad company could maintain its own cars at the prices at which Mr. Bailey claims it is costing for the maintenance of his cars we would be more than pleased. We would certainly show a large saving.

MR. BAILEY: There is one point I am reminded of, and that is the matter of statistics relative to the cars owned by the Pennsylvania Railroad. There are about 166,000 freight, passenger and other cars on your road, and included among them are about 74,000 old cars that you don't run on your road; they are out in the West. You also have 37,300 odd railroad coal cars of your own. In addition to that there are located industries along your lines which own 22,000 private coal cars, not including one or two large coal concerns, the number of whose cars is not given. You repair those cars. The larger number of your own cars are new steel cars and do not need much repairing. There are some features about these repair bills that look as if there possibly might be more than appears on the surface:

MR. KLEINE: I would like to have Mr. Bailey explain fully what he intends to convey by that expression.

MR. BAILEY: It is susceptible of explanation in view of what I have stated. You have a large number of private coal cars on your road and those private cars very frequently need repairs. You apply, for instance, a coupler to a private car and you buy the coupler at the market price as given in the figures I have quoted. I do not care particularly what your figures are; I only know what ones have been quoted to me. And here is the M. C. B. Rule that says this is the standard price which you are allowed to charge the owner of the car for a coupler applied. You make as a profit the difference in price, and the car owner pays the bill. If the majority of the cars you repair are foreign cars, or private cars, it is not very hard to see why you desire the Rules to name higher than the market prices on material needed for repairs.

MR. KLEINE: That is an erroneous conception. The price figured is an equitable one. If we charge a railroad a given price the other railroads charge the same price. We do not make the price, and if the prices should be slightly in advance of actual figures there is no harm done, in that the charges are reciprocal; but the individual car owner does not get the advantage of the reciprocal charges, for the reason that he does not repair railroad cars. On the other hand, where the railroad repairs the individual car, and the price provided in the Rules is lower than the figure for which the material can be bought or the labor performed, the railroad loses money, and the individual car owner reaps the benefit.

MR. BAILEY: Show me that case?

MR. KLEINE: There are lots of cases in the rules where railroads actually lose money on the M. C. B. prices.

MR. BAILEY: Do they on air hose?

MR. KLEINE: No, they do not on air hose, but you must take the thing as a whole. If you consider carefully the individual prices one may be a little high and another a little low, but on the average you will come out all right.

MR. BAILEY: That is a matter of view point.

MR. LAMAR: At one time we were paying from $42.00 to $43.00 per thousand feet for Southern pine, f. o. b. Cincinnati. This material was being placed on foreign and individual cars and charged at 3 cents per foot, or $30.00 per thousand. In addition our road was put to the expense of freight from Cincinnati and unloading, stacking and framing this material and the interest on the plant.

This is but one price that I could mention of many in which the cost is considerably in excess of that mentioned in the M. C. B. Rules of Interchange, in comparison with the lower price that can be obtained on couplers in the Pittsburgh district.

MR. BAILEY: In reply I would state that our cars are built of steel. There is no Southern pine used in their construction or repairs. For this reason we are not directly interested in the prices paid for lumber for repairs to cars.

MR. HINDMAN: In reply to Mr. Bailey, relative to the repairs to foreign and individual cars, I would state, from a railroad man's standpoint, that there are a large number of items in Rules 94, 106 and 112 in the M. C. B. Code of Rules, that the railroads are making repairs to foreign and individual cars where the balance, instead of being on the credit side, is on the debit side of the ledger for making such repairs.

MR. STARK: I want to add just a few words, that is, to thank the President for the part he has taken in this.

He was anxious lest there should not be any discussion, so he made previous arrangements. It reminds me of the three fellows who had been drinking together, and one of them wanted to get away. So he said to a bystander: "My partners are in there and I want to get them out of there. How can I do it?" He said, "You go over there and open the door and holler out 'To h——l with the Irish.'" Then the trouble began. I think the President arranged for somebody to draw things out, and we are indebted to him for this entertainment.

ON MOTION a vote of thanks was extended to the Committee for their arduous labors and for the splendid result they attained in the report they have presented.

ON MOTION, Adjourned.

OFFICIAL PROCEEDINGS

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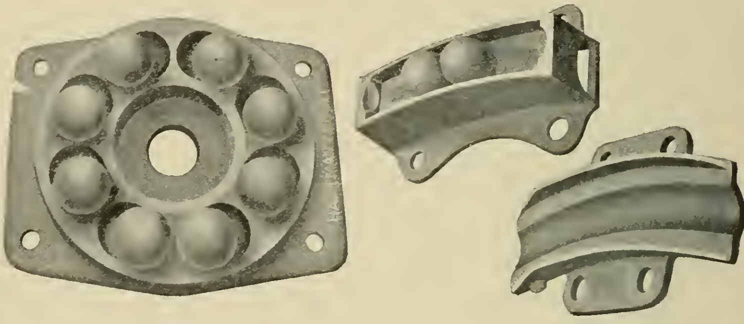
SUBJECT: "TITANIUM ALLOY IN RAILS AND CAR WHEELS"

By Mr. Charles V. Slocum, Pittsburgh.



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of the

Railway Club *of* Pittsburgh.

ORGANIZED OCTOBER 18, 1901.

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Meetings held fourth Friday each month, except June, July and August.

PROCEEDINGS OF MEETING, APRIL 23, 1909

The meeting was called to order at the Monongahela House, Pittsburgh, Pa., at 8 o'clock, P. M., with President D. J. Redding in the chair.

The following gentlemen registered:

MEMBERS.

Alleman, C. W.
Amsbary, D. H.
Ault, C. B.
Barnsley, Geo. T.
Barth, John W.
Becht, Harry K.
Brown, John T., Jr.
Clark, C. C.
Cline, W. A.
Cole, Jewett.
Conway, J. D.
Courson, C. L.
Courtney, D. C.
Craig, E. A.
Crouch, A. W.
Cunningham, J. D.
Dawson, W. J., Jr.
Elmer, Wm.
Falkenstein, W. H.
Fettinger, H. O.
Foller, Chas. S.
Foreman, Jacob E.
Gray, C. B.
Grose, J. H.
Gulick, H.
Halliwell, C. J.
Henderson, J. W.
Hilberry, H. H.
Howe, D. M.
Huber, H. G.
Hughes, J. E.
Kennedy, Jas.
Kerr, Edward.
Kessler, D. D.
Keyser, R. H.
Kissinger, C. F.
Koch, H. J.
Krause, Julius.
Krepps, W. K.
Kull, W. A.
Lincoln, L. P.
Lindstrom, Charles A.
Lobez, P. L.
Long, Robert.
Mason, Stephen C.
Mercur, H. T.
McClumpha, H. E.
McFeatters, F. R.
McIlwain, J. D.
McNulty, F. M.
Oliver, W. H.
Patterson, C. C.
Porter, H. V.
Redding, D. J.
Reeve, F. J.
Reilly, Robt.
Rutzky, B. E.
Ryan, W. F.
Schreiner, W. C.
Schuchman, W. R.
Searles, E. J.
Shuck, Wm. C.
Sitts, Lewis S.
Slocum, Charles V.
Smith, James.
Smith, A. D.
Snyder, J. Rush.
Stark, F. H.
Stucki, A.
Swartz, H. E.
Sweeley, G. P.
Tolan, C., Jr.

Unger, J. S.
Walther, G. C.
Warne, J. C.
Warner, E. O.
Whited, Willis.
Woolley, W. S.

VISITORS.

Benn, Harry W.
Edwards, A. D.
Griswold, Chas.
Haynes, J. E.
Hosack, S. L.
Johnson, B. S.
Jones, Jesse L.
Lander, Percy W.
Lewis, J. D.
Martin, Archworth.
Norris, G. L.
Pastre, Jno. P.
Schell, J. W.
Slocum, A. N.
Smith, J. Kent.
Smith, Sion B.
Uhler, J. Lloyd.
Williams, H. C.
Wilson, John W.
Wilson, N. V. F.

The reading of the minutes of the last meeting was dispensed with, they being in the hands of the printer.

The Secretary read the following list of applications for membership:

Brown, Arthur A., Rep., Westinghouse, Church, Kerr & Co., Union Bank Bldg., Pittsburgh, Pa. Proposed by J. D. Conway.

Donnelly, D. B., Mech. Supt., Post Publishing Co., Pittsburgh, Pa. Proposed by Howard A. Pratt.

Gowdy, H. K., Chief Engr. Power Stations, Pittsburgh Railways Co., Philadelphia Co. Bldg., Pittsburgh, Pa. Proposed by A. W. Crouch.

Manning, R. G., Engr., American Bridge Co., Ambridge, Pa. Proposed by Richard Khuen.

Richardson, Chas., Engr., B. & O. R. R., Pittsburgh, Pa. Proposed by W. F. Ryan.

Russell, H. H., Asst. Engr., A. V. Div., Penna. R. R. Co., 1013 Penn Ave., Pittsburgh, Pa. Proposed by S. M. Hindman.

White, J. D., Salesman, Crucible Steel Co. of America, Frick Bldg., Pittsburgh, Pa. Proposed by W. K. Krepps.

Williams, H. C., Asst. Claim Agent, Wabash-Pittsburgh Terminal Ry. Co., Wabash Bldg., Pittsburgh, Pa. Proposed by D. M. Howe.

PRESIDENT: As soon as these names have been favorably passed upon by the Executive Committee the gentlemen will become members.

The Secretary announced the death of Mr. Raymond B. Brown, one of the early members of the Club, whereupon the President appointed Messrs. F. R. McFeatters, Geo. N. Riley and W. B. Klee a Committee to draft suitable memorial resolutions.

PRESIDENT: We will now listen to the reading of the paper of the evening on "Titanium Alloy in Rails and Car Wheels," by Mr. Charles V. Slocum. It is a subject in which, I am sure, a number of our members will be very much interested:

Titanium Alloy in Rails and Car Wheels.

BY MR. CHARLES V. SLOCUM, PITTSBURGH.

The public announcement on March 3, 1909, by Mr. W. C. Brown, President of the New York Central Lines, that a large portion of the 101,000 tons of steel rails recently ordered by that road would be treated with titanium alloy, and that the rails are to be the best the company has obtained in twenty years, has awakened so much interest and inquiry among railroad men that a few words concerning titanium and its alloys may be appropriate at this time.

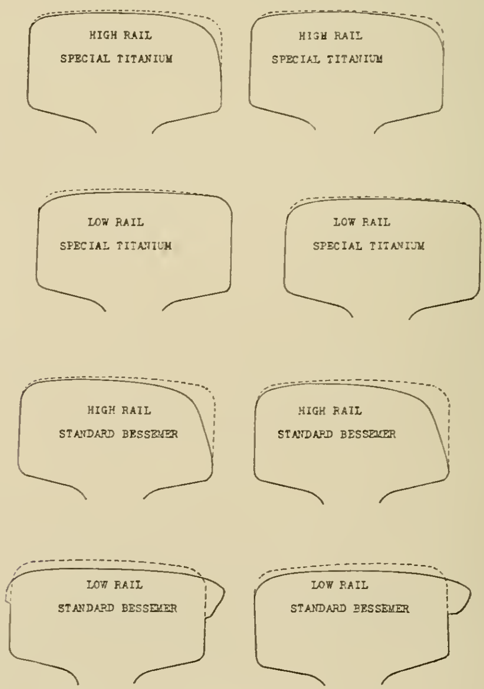
Titanium itself is an element found in iron in large quantities and varying percentages throughout many of the iron ores of the world. It is found in the United States, in Canada, Norway, Sweden, etc. Mr. Frank L. Hess, of the United States Geological Survey, describes a very large deposit of this ore in Wyoming. Dr. Thomas L. Watson, of the University of Virginia, has investigated an immense deposit in Ashe County, North Carolina, along the New River, while authority is no longer necessary for the statement that thousands of acres of iron ore in the Adirondacks of Northern New York State are impregnated with titanium, since it is a fact known to railroad men that hundreds of thousands of tons of this ore are now being shipped annually to eastern smelting furnaces. Fifty years ago or more these ores were mined and shipped to Troy, New York, where iron was produced that for a long time was second to none in strength and ductility. When the war of 1861 came on the mining was stopped that all concerned might take part in the hostilities that followed, and these operations were not again vigorously taken up until about the first of this century. Presumably the ores containing less than 15% of titanium are the ones now being used in the blast furnaces, since the researches of Dr. Rossi have shown conclusively that with slight changes in the flux titaniferous ores as high as 10 to 15% in titanium may be readily smelted.

Some of this Adirondack ore runs as high as 43 per cent in titanium and is therefore a titanium ore with iron as an impurity and the supply, both in the Adirondacks and elsewhere, is simply inexhaustible.

To bring the subject of titanium alloy more directly down to date, I will merely state in this connection that researches concerning titanium, its qualities, uses, etc., have been practically the life-work of Dr. Auguste J. Rossi of New York. It was not until 1903, however, that Dr. Rossi built a small experimental furnace at Niagara Falls and began the series of experiments with the aid of electricity, which resulted in almost instant success in making an alloy which would combine readily with either iron or steel, and by the reaction, purify, strengthen and improve the physical properties of both metals. The organization of a company, and a long series of tests to meet exacting conditions of manufacture, etc., brought the actual date of placing the alloy on the market down to October, 1907.

The first trials of the alloy on a large scale were made at the works of the Maryland Steel Company in November and December, 1907. Rails made by them are still undergoing one of the most comprehensive trials to which it was possible to subject such material, viz., the test of actual service. As evidence of our confidence in the alloy the attention of the railroads of the country was directly called to the test started on

October 7, 1908, (and still in progress) on Kessler's Curve, Cumberland Division, Baltimore & Ohio Railroad, so that all who cared to do so might watch this trial. Kessler's Curve is a 9 degree curve, 6½ inch elevation, 90 pound rails, 0.55 carbon in the plain Bessemer rails and 0.48 carbon in the treated or titanium rails. The actual wear of these rails to date of last diagram, February 12, 1909, was 4.18 pounds per yard for the plain Bessemer and 1.45 pounds per yard for the treated or titanium rails, or nearly 300% in favor of the treated rails up to date named. As illustrated in the diagram, the treated rails show what might be termed healthy wear with every indication that the steel is perfectly solid and homogeneous, while the untreated rails have "flowed" seriously, showing excessive wear and the usual indications of segregation, etc. The indications



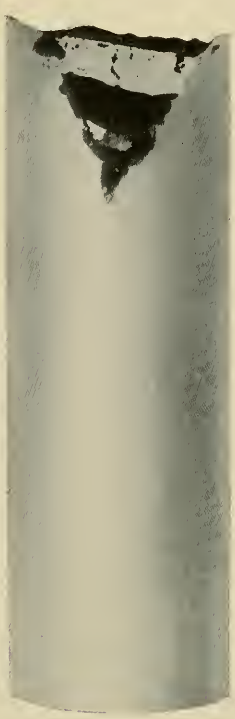
Comparative wear in 17 weeks on Kessler's Curve, Cumberland Division, Baltimore & Ohio R. R. Wear, Titanium rails, 1.45 pounds per yard; standard Bessemer, 4.18 pounds per yard. Heavy traffic, 9 degree curve, 6½ inch elevation.

are also that the Bessemer rails will soon have to be removed, while the titanium rails are apparently good for at least several months to come.

In an interview with Dr. P. H. Dudley, the Metallurgical Engineer of the New York Central Lines, published by the "Iron Age" in the issue of March 25, 1909, Dr. Dudley gives a very clear statement of the results obtained from titanium-treated rails as compared to the standard Bessemer rails covering a period of some 18 months. He gives a diagram showing six months' wear from metal treated with ferro titanium to be 1.01 pounds metal per yard, while four months' wear of the standard Bessemer showed 3 3 pounds of metal worn off per yard. Hence, "in six months the titanium rails have lost from flange wear less than one-third of the amount of wear occurring in four months with the ordinary 1907 rails which preceded them," or more than four and a half times as much wear of the Bessemer rail in favor of the titanium-treated rail. This test was made on the 56th Street Cross-Over of the New York Central Lines, Grand Central Station, New York. Both were 6 inch, 100 pound rails of Dudley section. Dr. Dudley figures that the expense involved in obtaining this more than 450% increased wear is but $2 per ton of rails. It must be borne in mind, however, that the cost varies with the different percentages of alloy used, which may run from about half of one per cent up to one and one-half or two per cent, equivalent to about .05 ti. in the former percentage and .20 ti. in the latter. In our experience one per cent of alloy (0.1 ti.) gives the best all-round results, as this proportion will absolutely remove all blow holes and segregation from Bessemer steel. On this basis, allowing for discard, etc., the additional cost would be about $3.50 per gross ton of rails, and as this moderate cost will insure, to put it mildly, at least three times the wear of the ordinary rail, we believe it fair to assume that this small amount is alone paid for in the saving of three renewals. It is easily demonstrable therefore that one-third ton of titanium rails is at least equivalent to one ton of Bessemer rails. Taking the cost of three tons of Bessemer rails at $28 equals $84 and one ton of titanium rails at least the equivalent of the other as $28 (the extra cost of $3.50 having been compensated by the saving of three renewals), which is certainly not overstating the case, it may be seen at once that the saving of one ton of titanium rails as against three tons of Bessemer rails is $56.00. Hence the following remarkable statement:

Saving	by	using	1	ton	titanium	rails	$56.00
"	"	"	10	tons	"	"	$560.00
"	"	"	100	"	"	"	$5,600.00
"	"	"	1000	"	"	"	$56,000.00
"	"	"	10,000	"	"	"	$560,000.00
"	"	"	100,000	"	"	"	$5,600,000.00

Thus a railroad which orders 100,000 tons of rails at a time, as is not unusual with some of the larger roads, can save the princely sum of $5,600,000.00 in one order of this size by using the titanium-treated rails. Lest this statement be considered overdrawn, I call your attention to the figures furnished by the



Titanium Bessemer Ingot.

Plain Bessemer Ingot.

New York Central Lines themselves in the interview with Dr. Dudley given in the "Iron Age," as already mentioned in this paper, where he admits that the saving is more than four and a half times instead of three times as we have mildly claimed, for it must be admitted that we would have been justified in naming figures at least 50% larger than those quoted above.

An improvement in the chilled iron car wheel is a subject which I am sure is also of great interest to railroad men, for it has long been the cheapest wheel in cost and by far the best, actual investment and scrap value considered. The addition of one per cent of titanium alloy has the effect of making the metal closer grained, free from blow holes, stronger in flanges, rims, plates, etc. According to Booth, Garrett & Blair, Chemists, of Philadelphia, the chemical change is merely a reduction in combined carbon of about 0.50 and an increase of graphitic carbon of the same amount. This change reduces the chill somewhat, but improves its wearing qualities. This improvement is explained by the fact that the metal, being more free from impurities, heats less under the application of the brakes and therefore has less expansion and contraction to strain it. A number of trial lots of wheels are in service, but owing to the long period required to fulfill the wheel guarantee sufficient time has not yet elapsed for a thorough demonstration. The condition of the wheels, however, has been noted from time to time, and freedom from chipping or cracks of any kind is very marked. The cost of the alloy in car wheels varies, of course, with the weight of the wheels, but may be said to add to the cost from 75c up to $2 per wheel only, including the wheel manufacturer's labor and profit. Stronger and safer metal and better scrap for re-melting are some of the other advantages thus far noted in the use of titanium alloy in car wheels.

A trial of the alloy in iron recently carried out by one of the largest corporations in the West illustrates as plainly perhaps as anything which might be said one of the great contributing causes of the remarkable improvement which titanium gives in both steel and iron. The company referred to made a couple of iron ingot molds for use in making steel ingots and treated the iron with less than 1% of titanium alloy. These molds, when in use after dusk, could be picked out at once from all the other molds in service; the latter became red hot from the molten steel, while the two treated molds remained almost perfectly black. One of these molds was broken after it had made twice the service usually obtained from the ordinary mold, while the other treated mold is still in service and likely to last indefinitely. This fact of less absorption of heat and consequent less expansion and contraction is true of everything in which titanium is used. A treated casting heats less under the tool, a tool treated with titanium heats less while in service, and, what is fully as remarkable, is the fact that metal treated with this alloy is much more free from rust, since it removes all the oxides of iron, and "oxides are necessary for rusting," according to Prof. W. H. Walker, of the Massachusetts Institute of Technology. We believe it to be well within the possibilities that this alloy, which increases the heat of molten iron or steel, which absolutely removes all blow holes, prevents segregation, etc., will not only give the Bessemer process a renewed lease of life, but seems destined to become as great a benefit in all steels as any other factor possible to mention, not excepting the use of the electric furnace in connection with the open hearth process.

In conclusion I quote, by permission, from the following unsolicited letter signed by Mr. John J. Cone, of the widely known engineering firm of Robert W. Hunt & Co., New York and Chicago:

"Several of our railway friends have consulted us respecting the use of titanium in steel, and we have strongly recommended the metalloid because of its own intrinsic worth, as borne out by certain tests we have made in both our Eastern and Western laboratories."

PRESIDENT: Gentlemen, the paper is now before you for discussion, and Mr. Slocum will be glad to answer any questions you may ask.

MR. F. J. REEVE: Some time ago Mr. J. Kent Smith read a paper before this Club on "Vanadium," and I remember that one of the peculiar characteristics of Vanadium in steel was its action as a scavenger. I would like to have Mr. Slocum explain a little more fully what Titanium does to increase the strength and wearing qualities of steel, also the chemical change it produces in cast iron.

MR. J. LLOYD UHLER: I have had practically no experience with Titanium; our work has been along the line of Vanadium. Titanium also acts as a scavenger, the same as Vanadium does. But as to removing all the oxides and nitrides from the steel, I have my doubts. Its quality to prevent rust is a thing in its favor. A great many articles have been published stating that it is practically a preventative from rust, and if it accomplishes this it is a wonderful alloy; because all the alloys I have ever seen or used do not do it entirely. Some of them do reduce the rust to a very great extent. We tried a test along corrosive lines with wrought iron, carbon steel and vanadium steel, and after treating with acids, giving as nearly atmospheric conditions as we could get for a week, we found that the rust on the vanadium steel was very slight, and on the wrought iron was also slight, but the carbon steel was fairly great. That, of course, is natural, because cast steel does not receive the working that you have in the ingot that is rolled into rails. When we make a casting the only treatment that it ever receives is simply annealing, and that is simply to remove the internal strains by reducing the large crystal of steel to small crystals, which not only gives it strength and ductility, but also increased life. I saw one of the representatives of the American Locomotive Works the other day, and he said that their experience with Titanium, while at first the results from it were very poor, but as he learned how to use it the results increased in goodness, so to speak. But, as far as I have ever known, I have never heard of it being used for steel frames or the manufacture of driving wheel centers or anything of that kind made in the form of steel castings.

MR. J. D. CUNNINGHAM: As Mr. Slocum has said, the use of Titanium in car wheels is only recent. The wheels have not been long in service and we have no data to arrive at any definite conclusion. But I can agree with Mr. Slocum that the wheels in service have not shown, so far, any cracks or chipped flanges. We have some wheels in service on an electric railroad where we have had some trouble with chipped flanges in the past. At the time of my last call the wheels had been in service six months, and they showed absolutely no signs of wear or chipped flanges.

MR. J. W. HENDERSON: I would like to ask what the increase in tensile strength in Titanium cast iron is with reference to cast iron car wheels?

MR. WM. ELMER: I would like to ask Mr. Slocum to explain the process by which Titanium alloy is obtained. I am free to admit that I know very little about Titanium, and a few words about the method by which the material is prepared for the market would be interesting.

MR. J. D. CONWAY: I feel sure my friend, Mr. Slocum, will not object to a mild criticism of some of his figures. In his table showing a saving on one to one hundred thousand tons on Titanium rails, as compared with the Bessemer rails, it will be noted that he shows $56.00 saved for each ton of Titanium rails used, or by using 100,000 tons Titanium there would be a saving of $5,600,000.00.

It is customary, I believe, to arrive at proper costs to consider credits, and I would analyze his figures as follows: Three tons Bessemer rails cost $84.00, assuming they are good for relaying at a value of $22.00 per ton, which is even low, we would have a credit of $66.00, or a net cost on the three tons of Bessemer rails of $18.00; and the ton of Titanium, costing $28.00 with a credit of $22.00 value of relayer, makes the net cost per ton $6.00, so it will be seen that for each ton of treated rails used the saving would be the difference between $18.00 and $6.00, or $12.00, instead of $56.00.

MR. H. E. McCLUMPHA: You heard what Mr. Cunningham said. I made the wheels he referred to. I will only say in addition to what he said, that Titanium alloy is a great scavenger. When I was making those wheels I had in my ladle probably 800 lbs. of molten metal, the temperature of which would be described by foundrymen as being on the hot side. I very carefully skimmed this metal so that the surface of the metal was perfectly free from slag and other impurities, and on adding 1% of Titanium alloy and stirring it thoroughly I was very much astonished at the amount of dirt that floated to the top of the ladle. This must all have been contained in the iron at the time the alloy was added. Titanium alloy is certainly a splendid scavenger and purifier of cast iron.

MR. J. D. LEWIS: The gentleman who last spoke referred to the alloy as a great scavenger in cleaning up iron. I would like to ask if it would be possible to use the alloy in the cupola without loss in Bessemer steel practice, where it is customary to use the cupola to make the mix for re-carbonizing? I would like to have Mr. Slocum touch on this point.

MR. F. H. STARK: If Titanium increases the life of car wheels and rails in the proportion stated in the paper it would seem to me that the steel manufacturers better invite Mr. Slocum to take a trip abroad or they will have to go out of business. It seems strange that 2-10 of 1% would purify all the iron and still have enough left to make it last so much longer. However, I am not a chemist; but I met a chemist today and asked him what he knew about Titanium. He said that he had used it in connection with the manufacture of high-grade machinery castings. He had found that gray iron could be made just as strong by the addition of manganese, so far as transverse strength is concerned, but when it comes to tensile strength or resistance to shock Titanium did increase the strength very materially. And he had some very complimentary things to say about it.

I would like to have Mr. Slocum inform us whether he can make a car wheel that will have ductility, and whether it will not affect the chill in the tread and flange. There has been a wonderful improvement in the manufacture of car wheels. I can remember when I was an inspector, if I did not find a cracked car wheel nearly every day I thought I was getting careless. But there are hundreds of car wheel inspectors today who never found a cracked wheel plate of hub in their life. Hence, aside from heat cracks at the throat of flange, the failure of wheels are less frequent. If further improvement is accomplished there will be some hope for the cast chilled wheel.

MR. J. KENT SMITH: I am much obliged to Mr. Slocum for the very interesting address he has given to us to-night, and to this Club for having so courteously granted to me the privilege of hearing it. It is gratifying to find that theoretical deductions as to the great increase in service properties given to steel by its thorough scavenging are amply fulfilled by what Mr. Slocum has told us tonight. I think it is an admitted fact that the chief use of Titanium is found in its powerful scavenging properties, and the consequent elimination of those deleterious bodies, the oxides and nitrides from steel. But it is certainly a revelation to be told to what an extent wear in service is due to this point, and to this point almost entirely.

That Titanium treatment also makes a steel much less liable to rust is an absolute confirmation of theory and of past observation in other directions. The rusting of steel is without doubt largely due to what I may crudely term a "galvanic action," and while the ordinary constituents of steel are electronegative to iron (I regard as ordinary constituents sulphide of manganese, possibly a little sulphide of iron, sulphosilicate of manganese, carbide of iron and carbide of manganese, etc.) the oxides and probably the nitrides are of the opposite "polarity," viz., electro-positive to iron. Impurities are present only in comparatively small total proportion, let us say, for argument, .5% of the metal. But we have as a result of galvanic action in the first case solution of .5% of the material in "rusting"; but in the other case where we have opposite "polarity," and instead of .5% being attacked and leaving 99.5% unattacked, we have the 99.5% dissolving from the action and the remaining .5% unattacked. Mr. Law, of London, England, has written a great deal lately on this very subject, and he will be interested, I know, in finding further unsolicited testimony supporting his records.

As some of you may know, I myself am interested in the metal Vanadium, which is also a wonderful scavenger. It is an unique scavenger because it not only scavenges thoroughly from oxides and nitrides, but it has the further advantage of removing the impurities in a very fusible form readily separated to slag. But scavenging represents only one-third of its action, for at the conclusion of this it enters upon two further stages of useful work.

As to the pictures of the two ingots shown in the paper, I would like to know whether they are exactly of the same composition save for the addition of the Titanium to one, whether they were cast in the same size molds, whether one or both or neither of them was bottom cast, and whether the "Titanium" ingot had water put on its top previously to stripping and before it had thoroughly solidified, as the "plain" ingot undoubtedly had from the nature of its pipe.

If none of these differences occurred, it is certainly a fact hitherto unknown to the steel metallurgist that the "Brinell Type" of the ingot is so completely changed, all other things being equal, by the addition of a little Titanium, and that a very undesirable type of soft steel ingot can be changed into a good type of "tire" or "forging" ingot by such means alone.

I would also like to ask Mr. Slocum to what he attributes the increase in temperature of the iron by the addition of the Titanium. I can readily understand that the action of the Titanium on the oxides is exothermic, like the action of aluminum; but I should not think it would give any very great actual increase in temperature because the quantity of oxide is so small and consequently the amount of heat generated is but little in comparison with the heat contained in the total mass. Are we really confounding "heat" with "fluidity"?

Again, sir, I thank Mr. Slocum for his interesting paper.

MR. G. L. NORRIS: Mr. McClumpha spoke about the impurities coming to the top after adding Titanium. I would like to ask if he had this analyzed and knows what it is, also whether it continued to come up after skimming?

MR. McCLUMPHA: No, I did not. I do not know that it was.

MR. NORRIS: From experience I have had I believe you will find this dirt or slag is made up of Titanium and manganese. I think you will find that the Titanium will take the manganese out of your metal, and that the iron will not be as clean as it would be if no Titanium was used.

MR. McCLUMPHA: Grant that that is so, that the Titanium and the manganese both go out of the metal; the metal is still superior to the untreated metal. It is not so much the holding of the manganese and Titanium in the metal and being able to find it there by analysis that is essential, as is the result we obtain. Speaking broadly, I do not care whether there is any manganese left in the iron or not; what I care for is the relative percentages of combined and graphitic carbon. The size of the crystals of the graphitic carbon determines the grain of the iron, and it must be neither too open nor too close. What we all want is strength.

MR. NORRIS: I have had similar slags analyzed and found large percentages of Titanium and manganese in them.

MR. EDWARD KERR: I would like to ask Mr. Slocum if he knows what effect Titanium has on copper, or copper alloys. Some ten or twelve years ago I tried an alloy of copper and Titanium, but the heat required to melt the Titanium was so great that I gave it up.

MR. C. A. LINDSTROM: I would like to ask Mr. Slocum if he has placed himself in communication with the Master Car Builders' Association and Wheel Makers' Committees on Cast Iron Wheels. These two committees have been working very hard for the last year to suggest changes in design and composition which will improve the cast iron wheels. There have been a number of meetings, and at one of them the subject of the use of Titanium came up. One of the members had heard of Titanium, but there was no information to the effect that Mr. Slocum had taken the matter up with the Committee.

If the cast iron wheel can be improved by the expenditure of $2.00, and thereby be made as good as a rolled steel or steel-tired wheel, it will be money well expended.

As to the tests: The American Car & Foundry Company and the Griffin Car Wheel Company have made special wheel testing machines in which wheels may be tested in regard to their strength in about a week's time, and it is not necessary to wait for wheels to be placed on the road and run two or three years and get the guaranteed service to find out whether they are better than other wheels or not.

If Mr. Slocum has not already done so, I would suggest that some tests be made with Titanium wheels on these machines, so that the results obtained, if favorable, may be communicated to the Master Car Builders' Association Committee before the meeting at Atlantic City next June.

If a better wheel can be obtained by using Titanium it will be a great boon to the continued use of cast iron wheels, for it looks very much as if cast iron wheels will be superseded by steel wheels, at least for heavy cars.

MR. A. STUCKI: This whole subject seems to resolve itself into a question of final economy in the wheels, rails and railroading. At present about 40 per cent of all the wheels removed from service are removed on account of worn flanges, and it stands to reason that a similar wear takes place on the rails. Mr. Slocum now suggests a better wearing material, thereby prolonging the life from 3 to 4½ times.

Another also effective way is to prevent the cause of the trouble as much as possible, and with this point in view we should stop to use the wheels as grindstones against the rails. An old saying is, "An ounce of prevention is equal to a pound of cure," and it certainly applies well to our case. One of our foremost railroad companies has reduced their percentage of worn wheel flanges from about 39 per cent to about 2 per cent by using antifriction side bearings, thereby allowing the trucks to swivel freely, and some other roads obtained similar results in the same way. One important feature of this method is that the additional outlay is insignificant in proportion, and I feel that we not only should improve the material but the conditions in service as well.

Would also like to ask Mr. Slocum as to the results with Titanium for tool steel.

MR. J. C. WARNE: It seems to me we have drifted away from the important part of the paper to the wheel question. Is there no one here who can say something about rails? The rail end of the paper is the great point that was brought out. The day is a little too young to give any positive data as far as the wheel end of it is concerned.

MR. REEVE: The reason we are all talking about wheels is that we can get rails that will wear, but, sometimes, we have trouble in getting car wheels that will wear.

MR. HENDERSON: The facts are that it is not impossible to make a cast iron car wheel that will stand the service and the ability to make it is not the trouble with the cast iron wheel,—I know.

PRESIDENT: If there are no further questions, I will ask Mr. Slocum to close the discussion.

MR. CHARLES V. SLOCUM: There have been so many questions that I may not be able to reply to all, but I will do the best I can.

One of the first gentlemen who spoke said his experience was more with Vanadium, and mentioned incidentally that he had had no experience with Titanium, consequently his statement scarcely requires particular attention. I might say that the American Locomotive Co., whom he mentioned, has had 25 lbs. of our alloy within the last 30 days; neither quantity nor time enough to thoroughly try it.

As to the matter of the alloy increasing the heat of the dull iron, we have not assumed that we are in business to perform miracles or to overcome bad foundry practice. What we are talking about in every instance is good normal practice. I know of one instance where the foreman made the statement that the alloy dulled the iron. It eventually developed that his test iron which had no alloy in it was dull iron, and the test piece which had the alloy in it was perfectly good and poured from hot iron. But we do not claim to do that regularly. That is not what we sell it for. But we will go into any man's foundry on any day and undertake to improve the iron, no matter what process he uses or how good his iron is, if he makes it up to his best standard methods, processes and materials.

Several tests were made for the Carnegie Steel Company. We made a test at the Duquesne Steel Works in December, 1907, and their officials showed me some of the finest steel they said they had ever made in their works. Their metallurgical engineer made photographs of some of these ingots, broken for the purpose, and he said their absolute freedom from blow holes was something remarkable in the manufacture of Bessemer steel. Other tests have been made at some of their other plants, but their results have not been finished far enough to publish. It was at one of these places that the two ingot molds mentioned in the paper were made.

Referring to Mr. Conway's figures, I would call attention to the statements published broadcast throughout the country, and I recall the date of one, the Scientific American of May 18, 1907, when they published a statement compiled from data of the New York State Railway Commission showing 2899 steel rails broken during the previous season of 1906-07, which they stated was an increase of more than 360% over the previous season. If conditions in Pennsylvania are anything similar to what they are in New York those rails, for which Mr. Conway would like to have credit, would be much better in the scrap heap and melted over and treated with Titanium or Vanadium or anything elese that would prevent 2899 of them breaking in one winter in one state.

The figures which I have presented as to saving are not based upon any data of my own compiling, but upon data furnished by the metallurgical engineer of one of the largest trunk lines in the world, viz., the New York Central Lines. If I am wrong, he is wrong; if he is right, I am right.

In this connection let me call your attention to a paper published by the American Society for Testing Materials, Volume VI, 1906, in which were shown photographs of Bessemer steel ingots, where on all four sides of every ingot, cut open for the purpose of photographing, they were lined from top to bottom with blow holes. I will go into any Bessemer plant tomorrow and furnish the alloy for the test, and if it does not remove the blow holes I will give up and make a public apology before this Railway Club.

I want to call particular attention to the fact that Mr. Auguste J. Rossi was a graduate of the University of France at 19 with four university degrees. He is now about 70 years of age and his life work for more than 30 years has been to delve into this metal (Titanium) and find out how it acts and what it will do. I have known him personally since 1892 and have never known him to deviate one iota from the exact truth, and if he is correct the half of the good that Titanium may do in both steel and iron has not yet been told.

Concerning the use of the alloy in the cupola, I have seen it done on two occasions; one was in the making of 60 car wheels. These wheels stood the drop and thermal test better than the wheels made in the same heat without the alloy, and showed an increase in deflection, that is the bending of the test bar before it broke, of some 24 per cent in favor of the Titanium. These wheels are in service, and much as I regret that it is not satisfactory to some of the members or visitors here tonight, I am not able to force the proceedings; they insist on making the guaranty before they will tell me what the wheels will actually do. As to the improvements necessary to save the life of the chilled iron wheel, it would be scarcely fair for me to advocate the chilled iron wheel without first admitting that I was interested for nearly twenty years in its manufacture and am still interested in it. I believe that every fair-minded railroad man will admit that it is more to his interest to improve this wheel, which costs on an average one and a half cents per pound only, and keep his investment down to some $75 or $80 per car, than to make the steel wheel as perfect as possible, which will cost anywhere from two to three times as much per car. The interest on that investment for a year is something enormous. I will only say that we are doing what we can to improve the chilled iron wheel and are taking it up with the people we can readily reach.

Concerning the cause of the increased heat of the metal produced by adding the alloy, I am not a chemist and make no pretensions to giving the technical terms of the cause of such action. But I have stood by the hour at the pyrometer gauge and seen the temperature taken of steel rails (passing through the rolls some two hours after the metal was poured) and in every instance that metal in the treated rails was not less than 15° hotter than in the ordinary rail which was made at the same time, and even ran as high as 30° hotter. Mr. Smith, whose comments I admire very much, would be better able to answer that question than I. But as a matter of results, this audience is not interested particularly in the answer to the question of what causes the increased heat, but what they want is better rails and better car wheels, and whether we get it by increasing the heat of the metal or by throwing stones at it is of little consequence, provided we DO it.

Mr. Stucki spoke of making the rails last longer. The comment is very pertinent. It was my good fortune this afternoon to receive the latest reading of the diagrams of the rails in service at Kessler's curve on the Cumberland Division of the B. & O., taken April 1st, covering the period of seven weeks from February 12th, the date of the previous diagram, and the Titanium rails have increased their lead over the Bessemer nearly 750% for that period. It seems to me we are going in the right direction.

I trust I have answered your questions fairly satisfactorily. I have done the best I could.

ON MOTION of Mr. Elmer a vote of thanks was extended to Mr. Slocum for his very interesting and able paper.

ON MOTION, Adjourned.

In Memoriam

MR. RAYMOND B. BROWN

It is with deep regret and profound sorrow that we have to record the death of our much beloved member, Raymond B. Brown.

Mr. Brown passed peacefully away on March 29th, 1909. He is survived by his wife, Lillian Lee Johnson Brown and two children, his Father, Mother, three sisters and brother.

Mr. Brown was Superintendent of the Duquesne Reduction Co. of Pittsburgh for the past twelve years, and his strict integrity and high sense of duty have won for him a very warm place in the hearts of all his friends and business associates. Mr. Brown was born in Philadelphia thirty-five years ago, and received his education in Chester, Pa., moved to Pittsburgh with his family in 1895.

We sincerely mourn his loss and his memory will be ever dear to his friends.

GEORGE N. RILEY,
F. R. McFEATTERS,
WM. B. KLEE,

Committee.

OFFICIAL PROCEEDINGS

RAILWAY CLUB OF PITTSBURGH

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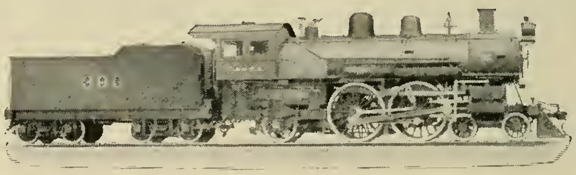
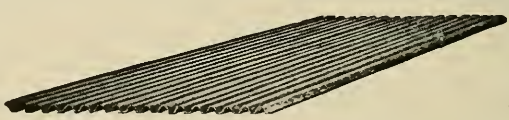
Vol. VIII. — May 28, 1909 — No. 7.

SUBJECT: "PRACTICAL EDUCATION FOR RAILROAD SERVICE"

By Mr. L. H. Turner, S. M. P., P. & L. E. R. R., Pittsburgh.





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Meetings held fourth Friday each month, except June, July and August.

PROCEEDINGS OF MEETING,

MAY 28, 1909

The meeting was called to order at the Monongahela House, Pittsburgh, Pa., at 8 o'clock, P. M., with President D. J. Redding in the chair.

The following gentlemen registered:

MEMBERS.

Alleman, Chas. W.
Allison, John.
Amsbary, D. H.
Anderson, J. B.
Bailey, R. J.
Baker, J. H.
Barnsley, Geo. T.
Barth, John W .
Bealor, B. G.
Becht, Harry K.
Bennett, Robt. G.
Berg, Karl.
Blackall, R. H.
Brownscombe, G. J.
Burry, V. J.
Clark, C. C.
Cline, W. A.
Conway, J. D.
Coulter, A. F.
Cox, P. L.
Crouch, A. W.
Cunningham, J. D.
Curtis, H. C.
Dawson, W. J., Jr.
Dette, R. E.
Dorr, C. O.
Elder, Thos. W., Jr.
Elmer, Wm.
Gies, Geo. E.
Gilg, Henry F.
Gray, C. B.
Griswold, W. W.
Gulick, H.
Gutierrez, S. J.
Haas, Ben.
Hackenburg, J. H.
Hall, C. W.
Hall, W. G.
Haring, Ellsworth.
Harrigan, P. J.
Henderson, J. W.
Hood, D. G.
Howe, D. M.
Huggans, J. H.
Humphrey, A. L.
Irwin, O.
Kennedy, Jas.
Kessler, D. D.
Kinter, D. H.
Kissinger, C. F.
Knight, E. A.
Krause, Julius.
Krepps, W. K.
Kull, W. A.
Lanahan, Frank J.
Lehr, H. W.
Lindstrom, Chas. A.
Lobez, P.
Long, R. M.
Lynn, Samuel.
Malloy, M. A.
Mason, Stephen C.
Metcalf, H. E.
Miller, F. L.
Milliken, I. H.
Mitchell, A. G.
Murphy, W. J.
McClumpha, H. E.
McGinnis, B. B.
McIlwain, J. D.
McKee, D. L.
McKee, Ira E.
McNulty, F. M.
Neison, W. J.

Oates, Geo. M.
Oliver, W. H.
O'Neal, J. E.
Painter, Jos.
Phelps, W. H., Jr.
Porter, H. V.
Postlethwaite, C. E.
Proven, John.
Pulliam, O. S.
Rauch, T. T.
Redding, D. J.
Reeve, F. J.
Richardson, C. A.
Richardson, W. P.
Riley, J. W.
Rinehart, H. W.
Rutzky, B. E.
Ryan, W. F.
Sager, W. B.
Scheck, H. G.
Schreiner, W. C.
Schuchman, W. R.
Slocum, R. L.
Smith, D. W.
Smith, M. A.
Stark, F. H.
Stuart, Malcolm D.
Stucki, A.
Sweeley, G. P.
Tamkins, B. L.
Taylor, H. G.
Thomas, C.
Tucker, John L.
Turner, L. H.
Walker, J. W.
Walther, G. C.
Warnock, H. R.
Weisbrod, J. F.
Wilson, W. J.
Woodworth, R. B.
Woolley, W. S.

VISITORS.

Benton, W. W.
Bowman, A. D.
Cox, Harry A.
Cross, C. W.
Dempsey, H. J.
Gardner, H.
Gumbes, Jos. H.
Hayes, W. L.
Kimberlane, W. H.
Knowles, Chas. R.
Lace, Thomas C.
Long, Herbert M.
Long, S. C.
Macoubray, R. J.
Mees, Otto.
Mummuclthey, F.
Mustin, Burton H.
McGinness, Geo. H.
Newman, John.
Pinson, J. H.
Radcliffe, J. R.
Roberts, W. P.
Smith, Alan Wood.
Smith, Sion B.
Stephens, David.
Tiedge, Herman.
Timmis, Arthur E.
Wagstaff, Geo.
Wholey, T. P.
Wilson, C. T.
Wilson, N. V. F.

The reading of the minutes of the previous meeting was dispensed with, the Proceedings having been printed and distributed to the members.

The Secretary read the following list of applications for membership:

Cordner, A. C., Rep., Bemis & Call Hardware and Tool Co., Springfield, Mass. Proposed by H. V. Porter.

Darlington, H. B., Rep., Union Spring & Mfg. Co., Farmers Bank Bldg., Pittsburgh, Pa. Proposed by Charles Gifford.

Stuart, George S., Rep., Franklin Mfg. Co., Franklin, Pa. Proposed by H. V. Porter.

Wilson, John W., Sales Manager, Snyder Railway Specialty Co., Fulton Bldg., Pittsburgh, Pa. Proposed by C. C. Patterson.

PRESIDENT: As soon as these applications have been favorably passed upon by the Executive Committee the gentlemen will become members of the Club.

The Secretary announced the death of Mr. E. Reese, Train Master of the P. & L. E. R. R. and a member of the Club, whereupon the President appointed Messrs. G. B. Obey, C. Thomas and C. L. Hinsdale a Committee to draft suitable memorial resolutions.

PRESIDENT: If there is no further business to come before the meeting we will listen to the reading of the paper by Mr. Turner.

Practical Education for Railroad Service.

BY MR. L. H. TURNER, SUP'T. MOTIVE POWER, P. & L. E. R. R., PITTSBURGH.

Upon being invited by your President to present a paper before this meeting, my first thought was: "Are there any subjects left that have not been discussed before railway clubs?" We recently had presented to us by Mr. Cross, Superintendent of Apprenticeship Instruction of the New York Central Lines, a very able paper on the bringing up of one class of employees, and it occurred to me that if this treatment was good for the apprentices, it would also have a beneficial effect on men making up equally, if not more important, branches of the service, and so I am going to say a few words on the subject of "Practical Education for Railroad Service." And why a distinction is made for railroad service is hard to explain, unless it is caused by the fact that this is a railway club, and largely made up of railroad men, but the fact remains that the same stable qualities are just as essential in all men, whether they are railroad men, grocery clerks, or ministers of the gospel. And to guard against the possibility of the title of this paper being considered a misnomer, it should be stated that Webster defines the word "practical" as "Capable of being turned to use, fit for doing or performing," while Herbert Spencer has said of education "To prepare us for complete living is the function which education has to perform," and this is why I must ask your indulgence for introducing some qualities as making up a part of a practical education that are usually classed among the moral virtues.

In our attempts to reach any much-to-be-desired position in life, it is the usual process to begin at the bottom. As far back as we can remember, we have been told by our good counsellors, when they were striving to arouse our ambitions and expand our energies, that there is "always room at the top," and this axiom is particularly true when applied to men of affairs, who, in their official capacity, control the hours of labor of large numbers of men. And, in the matter of a practical education, it seems to me that we must depart from the time-honored custom and begin at the top, and be sure that our system of education is based on the right lines and that those who are to promulgate this system are familiar with it and in full sympathy with the ideas we wish to convey.

I do not believe that we sufficiently realize that every man who directs the movements of other men is an educator, for either good or bad. The human race are naturally and instinctively "imitators," and the man who, through his own ability, force of circumstances, or environments, has attained a commanding position, assumes along with the honors of the position a very grave responsibility as to the effect his principles, policies and daily life will have upon those who naturally look to him for guidance; and, if he is one whom they admire, and sometimes we admire qualities we should not, his very speech, actions, and even walk, will be imitated by those by whom he is surrounded, and it is easy to foresee the influence for good or bad that will be spread through the manner in which this man conducts the affairs of life, and the capacity for absorption of good or bad ideas by those with whom he is associated.

We are living in a remarkably fast country, in a remarkably fast age, and for the last decade our energies have been almost wholly devoted to extracting from the men and the machine the last particle of their earning value, and in doing so we have lost sight of the fact that, while our country, industrial interests and railroad operation have developed in a wonderful degree, and that all lines in the business world are carried on on a much higher plane of activity and intellectuality, we have failed most dismally to bring up the producing class of men, either by precept or example, to the same high standard that the interests they must serve have reached and demand. This is proved most conclusively by the fact that so few men develop sufficiently to make themselves eligible for positions of trust, and the thought I want to impress on you tonight is that railroads, manufacturing interests, or as a nation, we are making a most grievous error in not endeavoring more earnestly to raise the standard of the producing classes.

All men have within them some latent qualities and powers than can be developed by the proper cultivation, and this cultivation can only be carried on through the efforts of the "man at the top." Practical education does not only consist of training the brain and hands to do certain routine work, but it is of equal or greater importance that the training is of a nature that makes the men truthful, temperate, orderly, prompt and persevering. Let any man at the head of one of our large industrial concerns, or one of the great railway systems, who himself possesses all the qualities necessary to make big men, issue an edict that the officers in charge of the various departments shall not only themselves, but make it their specific duty that all subordinate officials conduct their work and handle their men so as to instill in the mind of each employee not only the necessity but the advantages to himself, his family and associates that accrue by being truthful, temperate, orderly, prompt and persevering, and when this spirit permeates the entire organization good results must follow, slow at first, possibly, but they must come. We must not conclude because a man runs our locomotives, conducts a train, or is a mechanic in our shops that he is not capable of absorbing ideas and truths that go to make the man morally, mentally and physically better. Some of the brightest minds the world has ever produced have been brought out of the depths of obscurity, and many more are there, as yet undiscovered. But we are not believers in Lord Palmerston's dogma, "That all children are born good." If this statement be true, there seems to be an inconsistency between our natural desires and our religious training, for every honest soul will confess that from early childhood to maturity, and even after, he has found it so much easier and pleasant to do things that are considered sinful than to do those we are taught to be in keeping with the standard rules of morality and right living, and hence the necessity for including in our curriculum for a practical education those qualities and examples for the man who was deprived of them as a child, through the environments of his childhood and the possible lack of them in his parents.

I have no quarrel with our universities or the more modern innovation of apprentice instruction, but the trouble lies in the fact that they do not go far enough. The college graduate seldom gets into our shops or factories, as a workman; the apprentices do not make up more than 3 or 4 per cent. of the total number employed, and so it is readily seen that at least 95 per cent. of the force has to get along without any instruction, except such as they receive from their foreman in order to get out as large a day's work as possible. We have only to look across the water and note conditions as they exist in Europe to-day, between Labor and Capital, where lock-outs and bread riots are the rule and not the exception, to satisfy ourselves that something is radically wrong, and that the methods pursued there should be avoided by us, unless we wish to reach the same condition. By a strange irony of fate a portion of the immense fortune amassed by the late Russell Sage, and, as is claimed by some, by questionable methods, is being used to found a "Society for Sociological Research," led by Professor Robert Coit Gilman. The society, at this time, announces as a result of a most careful investigation, all of which has been recorded in the books of the society, that $800.00 per year is required to furnish a family of the average number with a normal standard of living. It is, of course, understood "a normal standard" contemplates an intelligent expenditure of their resources. It is no secret to those who are intimately associated with the people that cannot command high wages, that if, by some happy circumstance, they come into possession of a few extra dollars that came easy, they are more than apt to invest them in cheap jewelry, enlargement of their photographs, purchase of gaudy apparel, or dissipation, than they are to lay it aside to be used in case of sickness or when times are dull. We must all concede that more trouble, evil, disease and shortened lives occur through the improper use of money than from any other cause. The surest way of securing comfort, or even wealth, is by taking care of what you have, and if this one principle can be injected into our producing classes, it will go further than anything else to enhance the prosperity of ninety per cent. of our people.

To my mind the most important lesson to be learned in a practical education is the principle of economy, and none of us are too well versed in this science. I am not in favor of an inflated system of prices for either labor or products, but do feel that they should be sufficiently high to enable the manufacturer to get a fair and reasonable return for the money invested and maintain his factory in an efficient and sanitary condition. The railroads that haul his products have enough for reasonable dividends and maintain their property in a manner to meet modern requirements, and enough left for the workman, that he may support and educate his family in a manner becoming to this great country of ours.

Our shores are constantly being flooded with emigrants from all parts of the civilized world, due to one cause only, as was stated by Mr. W. W. Finly, President of the Southern Railway Company, in his address to the Traffic Club of Pittsburgh, in quoting Ralph Waldo Emerson, when speaking of the United

States, who said "Here is bread, and wealth, and power, and education for every man who has the heart to use his opportunity." In this vast multitude coming to us yearly we find many who have within them the material necessary for the making of good citizens, and we find some who are inherently bad and have been exiled from their own country because they were undesirable, and there are enough of this class to sow the seeds of dissention and scatter inflammatory doctrines among those who are naturally well disposed but easily led to cause this country and its people much trouble. We have no time or place in this country for Black Hand Societies, or Red Flag processions, and in order to avert them we must instill into the minds and lives of the masses the principles of industry, veracity, temperance, order, promptness and perseverance, and when they have these they have the foundation upon which all substantial and law-abiding citizens are built.

Too much importance cannot be placed upon the class of emigration coming to us or their treatment and education. The idea seems to prevail among American-born families that it is undignified and not in keeping with good social ethics to produce large families. The children that are now being brought to our shores by their parents and those to be born to us through them in the future, will in less time than we now think make up the majority of our population, and as a nation is measured by the intelligence and substantiality of its people, it behooves the nation to cultivate the masses and not the few, and only in this way can this country attain and maintain its position as a World Power in intellectuality and prosperity.

The time must come when the employee, instead of resorting to force to gain his ends, will meet his employer upon a common footing, the one with his labor to sell, and the other with the money to buy. Labor occupies the same position in the market as any other commodity, the law of supply and demand invariably governs the amount purchased, and those offering the best grade of goods make the quickest sales and at the best prices. The employee must learn that business is obtained on a competitive basis, and that by an intelligent and economical use of his time and the material placed in his hands, he can to a great degree assist his employer in obtaining the business and then turn it out at a profit, and he must not expect to have steady work at good wages unless the employer has a steady business, transacted at a profit. The employee must learn that, in order to make his services valuable and to be desired, he must take a live interest in the affairs of the company that employs him, and realize that any waste of time and material spoiled is a dead loss to the company and must be paid for by someone. The company must have a fair return upon the money invested or go out of business, and the loss is usually made up by the payment of low wages or reduction in wages.

If the amount of money irretrievably lost each year through the carelessness and indifference of workmen could be saved and paid to the workmen, the cry of low wages, suffering and hard times would never be heard. Inasmuch as 95 per cent. of the producing classes have little or no education and could make but little use of it if they had it, I claim that a practical education consists of one that makes the man fair in his dealings with his fellow-man, makes him realize that in order to make himself valuable and his services in demand, that he must be temperate, industrious, prompt at his work, and in following all directions and in doing this he is not only profiting himself, but by his example is giving to others the most useful and substantial practical education that any man can receive.

I have said that our universities do not go far enough, I might have said also that some of the methods employed might be criticized by those who have not been fortunate enough to be trained by them. As an illustration, I could never understand what particular advantage it was to the two or three thousand students enrolled to have some particular eleven in the school who were well developed physically, especially trained for a football team, unless it was for the purpose of furnishing the opportunity for two or three hundred studious minded young men, with red socks and hat bands, to follow a bass drum through the middle of the street swinging triangular banners and shouting "Rah! Rah! Rah!" The same lack of understanding applies on my part to college hockey teams and mandolin clubs. This is not to be understood as decrying the value of the gymnasium. I fully understand that the brain and body must be developed at the same time, but one whose aim was to give the greatest good to the greatest number would believe that: First, the department should be in charge of men who thoroughly understand what each particular student required for his personal benefit. Physical culture is similar to intoxicating liquors and ice water; detrimental results are obtained from taking too large quantities of either. Second: Every student should be required to spend a certain amount of time daily in the gymnasium doing exactly what he was told to do by the instructor.

Under present conditions it is safe to say that not to exceed 10 per cent. of the total number enrolled receive any appreciable benefit from physical culture while in school. Another matter worthy of most careful consideration is the lack of restraint over the actions of students while beyond the reach of the parents, but within the control of the college faculty. A case came under my personal observation. I was under the impression that too much progress was being made in some directions and not enough in others. Inasmuch as I was paying the bills, I felt justified in making inquiry and learned that the young man had acquired a knowledge in some matters in five years at school that had taken me considerably over one-half of a lifetime to get, and he would have been better off had he applied his energy in other directions. Upon suggesting that a different policy would be pleasing, I was informed that according to the standards of measure of the student body his rating was such as to leave me no cause for complaint.

As long as the world stands there will be different opinions and methods of instruction, but all are working to the same end, viz,: to improve the man. This paper can be closed in no better manner than by quoting from one of the brightest oratorical gems of the generation, the address of Mr. J. F. Deems, General Superintendent of Motive Power of the New York Central Lines, before the American Railway Master Mechanics' Association at Atlantic City, June, 1907, in which he says:

"A legacy has been bequeathed us by the generations that have gone before, a legacy for which all preparation has been made, a legacy of opportunity which looms large in the future, and awaits with rich reward the man who is prepared—the man who is prepared. We have received; what shall we give? We have inherited; what shall we bequeath? What shall we leave to aid in solving the problems of the future, many of which may be much more perplexing than those we are called upon to solve to-day? We may work in brass and steel, and leave the most perfect mechanism; we may develop and improve and evolve methods and practices until nothing more can be desired; we may reach perfection in all these, in mechanism, structure, and method, and yet our bequest be a failure and itself a burden unless we provide that which is paramount, which is over and above the sum total of all this, and for which even to-day events throughout the world are crying aloud—the man. A man prepared, experienced, earnest, hopeful and happy; consecrated to his work and ready to the hand of the future.

"This, my friends, as I see it, constitutes our great opportunity, our most imperative, our most sacred duty. If the man is provided, the machine will cease to be a burden, and methods will come forth as the buds at the kiss of spring. Our own future, and the hope of that larger future which lies beyond, depends on our efforts and our success in providing those who are to help us to-day, and upon whom at no distant day must fall our duties, our opportunities, our honors, and our failures. Have we any greater, grander, more sublime obligation than this? Can we justify a pride in our life-work if we fail in this? If I can but bring to you this single message, if I can inspire you with this one thought, I am content."

PRESIDENT: Gentlemen, the paper is now before you for discussion and I hope you will not hesitate to speak on the subject. I will ask Mr. Stark to open the discussion.

MR. F. H. STARK: The author has given us a most interesting and instructive address, on a very important subject, setting forth conclusions reached through his long service of practical experience, and by his works he is known. It is generally conceded by the railroad people in general that the P. & L. E. R. R. rolling stock and shop facilities, in proportion to its equipment, is better equipped and maintained than possibly any other road in the country. The author has given a great deal of attention to organization and administration. He is a good judge of human nature, and consequently has gathered around him a staff of assistants that is a credit to their chief and the road by which they are employed.

When considering any live subject, whether it be as to who can make the most palatable bread, whether a little good whiskey is injurious to the stomach or whether marriage is a failure, in making our deductions we are influenced by our personal experience, environments, tastes, etc. We unconsciously reach conclusions with no intention or desire to be prejudiced, hence we must discipline ourselves and take a neutral position when considering an argument, pro and con.

In selecting young men for railroad service, care should be exercised to obtain persons with as many favorable qualifications as is possible, depending of course on the nature of the proposed employment. Then, too, the law of supply and demand has more or less to do with the ultimate results. The available material to draw from varies in different localities, consequently the same results cannot be obtained in one section as compared with another.

Application for employment preference should be given to relatives of employees, and thus unite the interests of the employer and employee. Applications from young men from the country or small towns should receive favorable consideration, not that we want to discriminate against the city boys unjustly, but experience has demonstrated that the country boy has acquired frugality in one sense or lack of bad habits in another, which works out to his advantage. There is also a marked distinction between the rich man's boy and the lad of moderate or humble parentage. The boy with a fair common school education makes the most satisfactory average mechanic. His expectations are not so high. He is not so easily discouraged, consequently more contented. If he is studious and progressive, acquiring more or less theoretical knowledge along with his practical experience, he is so much better equipped for his duties or for a supervising position of the ordinary character. The young man that masters theoretical and practical knowledge simultaneously has the advantage, except that he must sacrifice time, comfort and pleasure for a time. It is a well-known fact that shop drawings made by a practical man are much more easily executed and, as a rule, with less expense.

Prof. W. F. Goss, one of the best known and practical educators known in the railroad world, in his most instructive paper before the Western Railway Club, very ably treats the subject of the technical graduate. He estimates that twenty-five hundred graduate annually in civil, mechanical and electrical engineering and only a small per cent take up railroad work, fully explaining his views as to the reason, and makes an earnest appeal to the railroads to avail themselves of the opportunity to secure a higher class of men. I fear that Prof. Goss overestimated the need of technical men in railroad shops. It is true that a limited number are essential for designing, etc., but for the ordinary duties in the motive power drafting room or shop, the work will be performed by men of less technical training, and I believe that I am safe in saying for less actual net cost. There is more demand for college men in connection with manufacturing plants where more expert skill is required in experimenting and designing. With large plants the specialization of operations is the order of the day. By the aid of improved or automatic machinery men of very limited experience or ability are utilized to perform certain work. With this practice more expert supervision is required, consequently it is only natural that the field is larger. It is often declared that the college graduate is not treated fairly, and I presume that is more or less true; and then, too, many of them are unable to adapt themselves to the new environment, and conduct themselves with an independent and haughty air which naturally would cause more or less feeling. Some have secured their positions through influence, which only adds to the difficulties. To say that higher education is a failure would be a sad mistake. There is far more in this life than simply fitting one's self for a livelihood. To more thoroughly enjoy life in all its aspects is only possible through mental training. The college man is capable of more scientific work, is more polished, with trained mind and hand, hence is better qualified if he is endued with good administrative talent to fill executive positions. One of the few disadvantages is that the college man comes on to the field at a more mature age and considerable of his early life is spent in preparation, and he does not enjoy an early start in life's work. The man entering the verities of actual service at twenty-eight or thirty years of age is reluctant about starting at the bottom and will not wait as patiently his turn. He banks too much on his superior knowledge. He will not take hold of the ordinary work with the same zeal and tenacity. He is liable to expect favors, and in many ways does not give as satisfactory service. He does not know what it is possible to accomplish. In some cases he sacrifices the output for system and finish. He is unable to determine what part of the work can be left in a comparatively rough state and what must receive greater attention. He is not apt to ask of the men what looks impossible to himself, especially as regards work requiring physical endurance. My impression is that a limited number of college men may enter railroad mechanical services with as good or better prospects of ultimate attainments than in almost any other line of work. The compensation, perhaps, is somewhat less, but that removes competition and promotion will more rapidly follow. For positions as mechanics, foremen and possibly master mechanics, the young man that acquires his theoretical and practical training will do quite as well and be more contented, while for a higher position, as mechanical engineer, superintendent of motive power and all higher executive offices, the college man, if made of the right stuff, will be the most successful. I thank you.

PRESIDENT: May we hear from Mr. S. C. Long, General Superintendent of the Western Pennsylvania Division of the Pennsylvania Railroad?

MR. S. C. LONG: Mr. President and Members of the Railway Club of Pittsburgh: I came here hoping to be unobserved, as the guest of our Honorable Master Mechanic, Mr. Malloy. This question of practical education is a live subject all over the country. Mr. Turner referred to the movement of the Southern Pacific, who have started the ball rolling by publishing a pamphlet in which is set forth a system of education modeled somewhat after the curriculum in colleges and universities, in which they devote so many months to this subject and so many to that; make the men write theses, and examine them by a head of department, or a board of experts, to ascertain whether they are competent and fitted to take the next step, etc., this through a period of about three and one-half years, the company paying them for the first period $80.00 per month to master these studies, for the second period $85.00 per month, and so on until the final period, the last four months of which term they receive $100.00 per month to learn how things should be done. This is very good.

That is the theoretical end of the proposition. The subject under discussion to-night, as I understand it, is the practical education of the railroad man. I believe in practical education more than in too much theory and too little practice. I belong to that unfortunate class that evidently does not stand high in the estimation of Mr. Turner. I had four years in college to learn a little, and to learn how to learn more.

I do not know much, but the little I know I learned to learn by going to college. I may be getting off the subject, but I was attracted by the announcement of Mr. Turner's paper, and desired an invitation to be here, because I wanted to know the points of view of as many men as I could, and, particularly, the view of so successful and practical a man as Mr. Turner, on practical education.

Men go to college to learn a little and acquire the habit of learning, as well as how to do things. They become apprentices to learn how things should be done, to learn how things ought to be done and how to do them. We go into the Accounting Department to learn how accounts are and ought to be kept; we go into the Yard Master's Office to learn how to classify trains and switch cars promptly and economically, and to see that cars do not have a yard detention exceeding four and one-half hours, etc. These, and all other active functions of railroad operation, are matters which we are trying to teach aspiring young men how to do; but after all that, after the aspiring young man has learned how things have been and ought to be done, I gather from Mr. Turner's paper, he thinks the young man ought to do the thing itself—exercise the mental and manual effort to accomplish. That is what we believe we are after. He cannot do everything, nor can any one man learn thoroughly any dozen things. Life is too short. He can learn something about everything, and considerable about many things, but he cannot learn everything about all things. Possibly the question of practical education resolves itself into this. Shall a man, after he has had a college education, or a high school education, or a common school education, try to learn as much as possible about a dozen different things, or shall he make himself an expert in one thing—learn all he possibly can about accounts, or about designing and building a locomotive, or about handling a freight or passenger yard business efficiently, economically and promptly? Does practical education consist in learning as much as possible about everything pertaining to the total activities and successful operation of railroads, or in learning some one thing and learning it well, trusting to general merit that if he learns that one thing so much better than any other fellow learns it, he will eventually be selected to be the head of the whole proposition.

Would Mr. Turner, if he were President of the great New York Central Railroad System, prefer to be surrounded by Vice-Presidents, General Managers, General Superintendents of Motive Power and General Superintendents of Transportation who have considerable knowledge of everything pertaining to railroad operation, or men who in a particular department are absolutely the best in their line of business?

Therefore, if a practical education means the making of experts, that should be the proper course to follow. If practical education means that every man shall learn considerable of everything, or as much of everything as he possibly can, that should be the course to be pursued.

In regard to the matter of doing things, the expert knows how to do things. It is an age of specialties. The practitioner who cured everything from a sore toe to appendicitis is, to use a slang phrase, "not in it" any more. If you have anything the matter with your ear, you go to an ear and throat specialist; if you have anything the matter with your eye, you go to an oculist; if you want something special done in electrical activities, you go to the best electrical engineer you can get; if you want to know something special about coal mining, you hunt up the best mining engineer you can find. An age of experts, an age of specialists.

To my mind, it is a question each man has to solve for himself, and, possibly, the Railway Club, as a body, may want to declare its attitude. Do you want to have an army of experts practically educated in their particular line of business, or do you want a whole lot of men on the railroad, every one of whom assumes he knows nearly everything about all things pertaining to successful operation? I thank you.

MR. THOS. LACE: The word "Technical" is derived from a Greek word of several crooked letters, and signifies the making or bringing forth of material objects and things. May we not have misconstrued this word and taken the meaning as making or bringing forth mental objects instead of things material, or, in plain words, flights of imagination or thought where the manufacturing processes are taken into consideration?

Nevertheless, technical means also the training and instruction of apprentices.

Technical education dates from the days of Tubal Cain, the first instructor of every artificer in brass and iron, and we are not making too broad an assertion when we say that all of our material progress has dated from that period.

In the past ages, we may say centuries, colleges, schools and universities were devoted to branches of learning which, with the exception of medicine and surgery, had very little in common with our material necessities. We will admit that the study of natural phenomena and cause and effect are a help to material progress, but at the same time are aware of the fact that the institutions mentioned are the advertising end of a business and are not the originators of knowledge if they are the disseminators.

A handicraft or trade is not acquired in these places, but is the experience of many generations of workmen crystallized and taught in manufactories and out-of-the-way corners and places? Now, in teaching, we should be as capable of demonstration as the surgeon or professor at the head of the dissecting table. This is indispensable.

The teacher of a mechanical occupation must be in his line equal to the M. D., and to use a little thieves' slang, must be able to produce the goods. He is therefore a handicraftsman in the full sense of the word.

Knowledge acquired in a technical institution is not abreast of that acquired in a manufactory; processes, modes, etc., are changeable. Practical and theoretical knowledge are rarely combined. The theorist is usually an indifferent mechanic, and the mechanic, as a rule, dispises theory. This is on a parallel with capital and labor.

Now let me ask the question: Are we doing the proper thing when we send our young men to be treated in the way of learning and knowledge as the goose is crammed to furnish the material for Strasburg pates?

Are we attempting to raise an aristocracy of labor by placing what we call the higher education in the hands of the succeeding generation?

Taking into consideration the number who graduate annually from the institutes and schools devoted to techincal education, and, moreover, that each graduate believes he will be president, manager or foreman of some manufacturing concern, we will have very few to spare to apprentice to the trades.

And why this? The course of instruction has inculcated a distaste for manual labor which is taken to mean menial labor, therefore, the trades are not recruited and placed upon a proper footing as they should be placed at all cost, and are therefore passing into the hands of foreigners who do not know how to say "I cannot dig, to beg I am ashamed." Thus the fable of the substance and the shadow is exemplified.

The dignity and importance of the college professor is magnified, and the voice of his henchman, the pedagogue, is heard throughout all the land.

MR. WM. ELMER: I have a very great hesitancy in appearing after the able remarks of my immediate predecessor, though I have to confess that I differ from him most decidedly in some respects. He certainly belittles to a considerable extent the advantages of a college education. I am also in the class of unfortunates with my superior, Mr. Long. I think Mr. Long put it most aptly when he expressed himself as he did, that a college education means an opportunity to learn how to learn. I had the very good fortune to sit for several years under the instruction of Dr. Cyrus Brackett in the Princeton Electrical School, and I think if I ever amount to anything it will be because he did his best, and to some extent succeeded, in impressing on me that there is an art of thinking and teaching me how to think. I believe he gave me the best instruction which could be given in that institution which has turned out some very good men.

Possibly there is a good deal of truth in the remark of my predecessor that the feeling of superiority which possibly goes with a college education is a wrong feeling. I think there can be no question about that. But the fact that a man has an opportunity to go to college should be prized by him as the greatest opportunity which can come into his life. The collection of talent in the persons of the professors in a modern institution, especially in a technical school, is an asset which any young man should be very glad to have the privilege of participating in. The libraries which are collected in those institutions and the physical and technical apparatus which is provided for the education of young men certainly give a position of advantage which a man who has not that opportunity cannot enjoy.

The next lower stage in educational institutions, perhaps, after the colleges and universities, might be the trade schools, and as these are quite largely given to the education of the young men who have not the advantages in a financial way that would allow them to take a college or university course, I think they are of a very great importance to this country. There are many young men born in humble circumstances, whose parents perhaps in the immediately preceding generation came to this country as poor immigrants and are unable to give their children the education which their children's children will undoubtedly get. These trade schools, which are endowed by wealthy persons and state governments, give these young men a chance to learn and obtain opportunities which they could not have except for the generosity of those who have founded these institutions. I think in that way state governments and some of the wealthy people in this country have done a great deal to help carry out the work which Mr. Turner so ably outlines as of the utmost importance.

The problem of the training of the hordes of foreigners coming to this country every year is certainly one of the great problems which the American people are facing to-day. As has been said, they are usually men of a low moral strain, and the only way they can be made of service to the country is to have the degree of education which they have never been able to obtain in the lands from which they came. The whole uplift of these people is largely a question of education, and in the training which these young men receive in the technical schools and in the trade schools they will also be trained by the example of their superiors in matters which will be of great use to them in their life.

Possibly an outline of one of the institutions which the Pennsylvania Railroad has recently founded may be of interest to some of the members of the Club, and I will describe in a brief way the work which the Altoona Railway Club is doing. It was felt by the officers in Altoona that a good many of the young men who were coming to the railroad and who were growing up to take the reins of government in the future were more or less unknown, and it was decided to found an organization where these young men could be brought together and learn about the work of other departments than those in which they were individually employed. The Club was organized and compulsory attendance was enforced. The work of the Club is divided among a number of committees, so that the men were chosen to positions on these various committees and thus obtained an opportunity for learning matters about which their co-laborers knew a great deal but which were not in their direct line. That club has now been in existence about a year and I have had the pleasure of attending some of its sessions, and I must say that as an educational institution it ranks second to none. Its field is not as wide, perhaps, as other institutions which are more largely known, but the character of the papers presented is a striking proof of what can be accomplished by a body of earnest, energetic men who are interested in their work and who can take the time to go into the various subjects which are given to them for investigation.

MR. C. W. CROSS: Mr. President and Gentlemen of the Railway Club of Pittsburgh: The paper by Mr. Turner touches the subject from an angle that is unusual. The average speaker handles this subject generally from one of three view-points. If he happens to be a man with a liberal and complete "cultural education" he is likely to advocate some refinements in the educational training of everybody without regard to the vocation they expect to follow to earn a living. If the speaker is the other extreme, that is, a man who has been fairly successful in his life work by sheer force of native talent and energy, with only a meager education obtained under unfavorable circumstances, he is likely to discount the advantages of any special training and advice, relying solely on energy and force of character to accomplish successful results. The third view-point is the alert, energetic, observant, experienced man, educated in every sense of the word from books, from travel, from actual work in the rank and file of workmen. Such a person is our friend, the author of the paper of the evening. Mr. Turner has had exceptional opportunities for observation and experience that has qualified him to give opinions on the subject of the evening that are especially valuable. Mr. Turner has just completed 40 years of continuous, successful service with the New York Central Lines, having risen from the position of apprentice to that of Superintendent of Motive Power of the P. & L. E. R. R., one of the most important lines in the combination.

Mr. Turner is of the forceful type of personality, tempered with kindness of heart, which qualities have earned for him the enthusiastic support of those who have been associated with him in the railroad business, either as subordinates, equals or superiors. He is a man who does things, and does them vigorously, but at the same time he keeps in mind a regard for the rights and feelings of others. He is the very opposite of the type of man who is so desirous of avoiding criticism or unjust censure that he says nothing, does nothing and is nothing. That is a sure method of avoiding getting into trouble, and is also a sure method of avoiding advancement.

Somebody has said that genius is not so much a matter of inspiration as it is of perspiration.

The forceful man goes ahead and does things sometimes, because he does not know any better; if he had been notified certain things had been tried and found impossible he might be afraid to attempt them.

At this time we could not do better than quote from the able paper of Mr. G. M. Basford, read before the American Railway Master Mechanics' Association Convention of 1905, entitled "The Technical Education of Railroad Employees—The Men of the Future," in which he said in part: "The suggestion is that recruits in shops (and this applies in principle, though not in detail, to other service), should be taken in as apprentices. They should be given shop training which will increase their earning capacity to the utmost, and they should be placed under the direction of men of such character and moral influence as to lead them to form correct, broad and honest views of life and bear proper relations with other men and their employers. Parallel with the shop training, attendance during working hours at a school, provided and maintained by the road, should be required; and for this a new kind of school must be developed as a new kind of apprenticeship must be developed—the kind that will meet the individual cases. They must be dealt with in classes or by fixed rules. The school must be one wherein the shop and the studies go hand in hand. While the shop hours are taken for the school, home work should be rigidly required also."

There has been a tendency lately in connection with various organizations to seemingly lower the standard of efficiency of the men. I believe that a system such as has been outlined is one of the steps to offset that tendency and raise the standard permanently for the future, as it should be raised, so that instead of going through our shops and comparing the present class of men with those of 15 or 20 years ago and commenting as we do now that they are not up to the old standard, that we may in five or ten years from now look through the shops and find the standard constantly improving, and so that others may look to the railroads as an example of the best methods of raising the caliber and the general standard of mechanics.

MR. GEORGE WAGSTAFF: Being associated with the Secretary of the New York Railroad Club and being a member of the Central Railway Club as well as having access to your Proceedings, I know more about you, probably, than you do about me. I assure you it is a great pleasure to me to be acknowledged by your Chairman in this public way. The author of the paper I know, and I think it is fair to Mr. Turner to say that I believe it was far from his thoughts to convey the idea that education is not necessary. As our two friends have told us, we go to school to learn to think things out. And, as Mr. Cross has said, this subject appears differently to us, according to our training.

The same is true in regard to the education of the railroad man. It depends in what department we are interested. If we are mechanical men, we do not care so much for the education of the trainman. If we are engineers, we do not care so much about the education of a shopman. That is human nature. But those of us who have had shop experience and have been associated with boys for any length of time, I think, will agree that there is not the interest taken by the boys of today in their life work. I think, perhaps, that is what Mr. Turner had in mind, more than anything else, when he wrote this paper. If, through the influence of this paper or any of the remarks that may be made this evening, we get more interested in having the young men more concerned about their life work, we will be doing a very good work.

Gentlemen, if I could only say the right word to impress upon your minds the necessity of doing all you can to help the boy to make a success of what he is going to do for his life-work, I am sure I would feel fully repaid for my presence. It is not a thing to laugh at or pass along in an unnoticed manner. It is a very live subject indeed, and none of us can give too much attention to it or to the young man who wants to become somebody. I thank you, gentlemen.

MR. C. A. RICHARDSON: You will pardon me if I attempt to make a few remarks right here. While I realize full well that silence is golden, and I may find it out before I get through, the subject that has been introduced here to-night by Mr. Turner is a grand one. We will assume the position that when a man seeks admission in any society, whether political, religious, social, scientific or educational, he is actuated by some particular purpose. I haven't the least hesitancy in telling you why I sought admission into this Club. It was simply to get an education. Impressed so much was I by reading the papers that have been presented here, the thought occurred to me that this would be the grand body for an ordinary locomotive engineer to seek admission into. Hence I appreciate very highly the fact that you admitted me into your body.

Education is a grand thing. I never held political office but once in my life, but the one to which I was elected is one of the highest within the gift of the American people, in my estimation, and that is the office of School Director. I had not the opportunity of an education myself, having to start out in this world when I was but ten years old. Like the gentleman who wrote the paper, I have seen forty years in the railroad service, and while I have not perhaps arisen to as high a position as he, however if I have attained a degree of efficiency in my calling that is satisfactory to the company that I am employed by I am to a reasonable extent satisfied.

The gentleman has stated several points that are worthy of discussion. Immigration. The great State of Pennsylvania put on its statute books a few years ago a law that will compel foreigners, as well as all others, to send their children to school and educate them to a position that will fit them to become American citizens. As has been intimated, the Americans will have a hard time to hold their own. If a law of this kind were enacted in every State, and enforced, the future of this country would not look so gloomy.

It was intimated that a college education was not entirely necessary. I want to tell you, gentlemen, that it is. We have got to have lawyers, we have got to have doctors, we have got to have financiers; hence we must have colleges and young men fitted for these positions. We have got to have blacksmiths, and we have blacksmith shops for them to educate themselves to a degree of efficiency in that particular trade. These things, gentlemen, are easily understood when you get at them properly. And there is no excuse for any man being uneducated in this great country. In our great city, and in all the cities of the country, there are institutions of learning in which one can acquire an education at a very small cost, and it is no disgrace to a man, even after he has attained the years of manhood, to spend a few dollars and go to these institutions and get himself an education, theoretical as well as practical. Both go hand in hand. I thank you, gentlemen.

MR. C. A. LINDSTROM: I have listened with a great deal of interest, not only to Mr. Turner's paper, but to everything that has been said about it, and I am convinced that technical education and practical education must go together, like one hand washing the other, to get the best results. They cannot be successfully separated. I am, however, of the opinion that it is not always best to send a young man to college first, for when he comes out of college he is, in many instances, disinclined to go into the shop.

We receive a number of inquiries from graduates for positions, and they generally state they are ready to take any kind of position, and want to know what salary will be paid and what the chances are for promotion. Ordinarily such men are not worth anything in the beginning for practical positions, but are frequently, however, employed as students at a salary of $25.00 per month, and if they amount to anything their salary will be increased as efficiency has been shown. A good many of these young men will, however, not stay long enough until they do learn something, but get discouraged and decide to take up something else, which frequently leads to employment in other lines of business where, perhaps, neither technical nor practical educations are of very much importance.

I am in favor of giving a high school education to a boy, and then send him to a trade, that he may select, and give him two or three years at that trade; and then, if his parents can afford it, send him to a college, when he will better be able to understand what he is studying and what it is good for. Generally, when a young man enters college he does not understand what uses can be made of what he is taught. On the other hand, if he goes to the shop first, and then to college, he has received a useful education prior to entering college, and when he graduates he is fitted for a more responsible position and can demand a better salary than would be the case if he had not the shop experience. A mistake is often made in not giving proper attention to the young men, perhaps sons of workingmen, who grow up in the shops and learn their trade. Frequently there is too much favoritism shown to graduates of colleges, and they are in many instances put into positions they are not fitted for, and in which they would not be placed except for the influences behind them.

Young men going through the shops, and who have obtained a thorough knowledge of shop conditions, if given the opportunity to obtain a technical education, not necessarily a full college course, such men would frequently prove of more actual value than many graduates from colleges who have no practical experience, and who perhaps do not care to obtain it after graduation.

MR. R. H. BLACKALL: I would like to say a word about red socks and 'Rah! 'Rah!

I was interested in hearing the different speakers and the different interpretations they put on Mr. Turner's paper. I have not the least idea that Mr. Turner does not believe in higher education, and the proof is that he is now paying the bills of somebody for that education. My understanding is, however, that he does not believe in college education for locomotive engineers, machinists, carpenters and general tradesmen of the shop.

In regard to the football team, I think I am safe in saying that you will find on the football teams of the country fewer mechanical men than those in the general courses, and for this reason: There is not a man who goes through a good technical school who can get through and do his work creditably and acceptably under an average of thirteen hours' work a day. If that is the case, he is working harder than he usually does when he gets out of college, and he has little time for football and frivolity.

I think Mr. Turner is right that there is a good deal of foolishness about college life, but aside from that there is also a great deal of good. A man leaving college is up against a great big stone wall of prejudice represented by the idea of a great many people who have never had a college education. A college man, as a general proposition, has the idea when he leaves college that all he has is simply a kit of tools to work with, whereas he is received by those who have been in actual mechanical service as a man who ought to be able to go up against anything in the way of a mechanical problem. Well, he is not, and he does not have any idea that he has anything more than a kit of first-class tools.

I think what Mr. Lindstrom says about going through the high school, then to work and then to college is right in a way, and wrong in a way. I happen to be one of those who learned a trade after I left high school, and then went to college. I have been up against a lot of hard propositions since I left college, but I never was up against so hard a proposition in my life as when I went to college after four years in the shop and with a mind unused to study and a preparation dimmed, to say the least.

If a young man, when he leaves the high school, is studious in his habits it is all right for him to go to college while his mind is accustomed to study and while he is fresh with his preparation, and let him get his shop experience in the summer vacation months from school. Take a young fellow who is up to his ears in athletics and, in that case, a year or two in the shops will be a good thing, as he will then realize better his need for a better education in order to rise faster and more surely.

A general rule for all can not be made; you have to size up the boy and have him go to college, or first spend some time at work, according to the boy.

Another thing, when college boys go out from college it often happens that self-educated men will compare the boys with men of experience and expect them to cope with mechanical propositions far beyond their abilities.

Statistics show that about one per cent. of men who go into business are a success; by this is meant those that accumulate, not simply make a living. If this is so, what reason is there for expecting that every boy who graduates as a mechanical engineer is going to be a successful one? All will be in better shape for earning a living than they would without the education, but there are many who take a mechanical course who are absolutely unfitted for the work. It is like this: Some boy, who has no special preference for a particular course, sizes the matter up as a general proposition and often takes a course for which he has no aptitude because he thinks that particular field is good, or he takes it because a friend of his expects to.

Do not expect that just because a young man has graduated in a technical course he is going to be a success; you must expect a lot of failures, as in other things; but bear in mind that a lot of money has been spent on these men that has put a kit of tools in their possession with which they will be able to give a much better account of themselves than they would have otherwise.

Of course, there are a lot of self-made men who are the peers of a large percentage of those who have received a technical education; but compare the average of both, and the balance will be found very largely in favor of the technically educated man.

When you see the self-educated man who is a grand success would it not be better to think of how much easier he could have accomplished this success, and how much farther he could have gone with the same effort, had he received the advantages of a technical college education.

MR. W. J. NEISON: I just wish to express my admiration for the paper we have heard by our worthy ex-president.

The question, as I understand it, is technical education and practical education. Now, I wish to state that my first experience in the railroad business was forty years ago when I started in, and my experience then was with a technical man. He had the theory, and all he required was a man to put it in practice. My idea is that a college education is absolutely necessary, that is a technical education, for a railroad man to be successful in any branch, that is to reach the top. And there is no man that has reached the top except by the assistance of some technical education that he has obtained or that he has learned from those men that have had this superior education. The very fact that all the railroads built in this country have been built by men with a technical education, and practically have been run by men of technical education, with very few exceptions—and these men have only reached the top by their experience under the teaching of these men of technical education—proves the point.

I have not had the experience of a technical education myself. I was fourteen years and a half old when I went into an office out of school, and any education I have received since that has been by attending night schools or experiencing the education of men who have had the practical teaching of a college. I have to render my tribute to these men.

MR. HENRY GARDNER: Mr. President and Gentlemen: After a careful study of Mr. Turner's paper I am convinced that the principles which he upholds will be endorsed by all thinking persons who have been confronted with the ethical and educational problems met with in training men for railroad service. Since the mechanic comprises quite a large percentage of the men employed by railroads, I have outlined a brief description of the best means presented today for accomplishing the practical and technical education which is so necessary for his success. This special education may be obtained through the medium of apprenticeship trade schools or industrial schools.

We all know about the apprenticeship system which ordinarily takes young men at the age of 17 and gives them shop and school training at the same time. Such a system brings the boy into close contact with commercial life, the life of the real shop, where men are working for a living and are manufacturing articles for sale in competition with others.

Trade schools are owned and controlled by individuals or combinations of capital, and are not subject to state law or supervision. They provide some practical instruction for the mechanic, and he is taught reading, writing, arithmetic and how to apply his knowledge of elementary mathematics to his trade. The trade school is not strictly commercial, although some of them accept orders from manufacturers and pay a small wage for student work.

Industrial schools are public institutions owned and operated by the state. They are not designed to teach any one trade, but rather groups of trades. Industrial schools have all the machinery and appliances necessary for training mechanics, and at the same time give rather advanced work along academic lines. A boy can profitably enter an industrial school at the age of 14 years, which is three years earlier than he would be admitted into any trade school or as an apprentice in a shop. This feature provides for bridging over that somewhat dangerous period in the lives of young men, the period between their completion of the grammar school grades at 14 and the time for their admission to the shop or trade school at 17.

Let us now consider a boy wishing to become a mechanic, and, having finished the grammar school grades, would at the age of 14 enter a public industrial school. Having remained there three years he would then be of an age and stature proper for his admission either to a trade school or as an apprentice in some factory or railroad shop. He does not enter a public high school upon leaving the grammar school, since such a course would only improve his academic knowledge and would add very little to his training for a mechanic. After four years of trade school or apprentice work the boy would be 21 and ready to take the place of an experienced journeyman.

From a careful survey of these different ways by which mechanical training may be obtained, the fact remains that all but one lack that most important element "commercialism." No matter how severe the laws and rules of the trade school or industrial school, there is always lacking the incentive to work for pay, and the strict discipline, and the constant surveillance of foremen and inspectors which is found in the shop or factory. More than this, the fear of being discharged is ever present, and a certain and generally large quantity of work is required each day.

A modern apprenticeship system, such as is now in successful operation in the shops of the N. Y. C. Lines, comprises all the features necessary for the development of thoroughly technical and practical mechanics. It is true that this apprenticeship system does not provide for the boy between the ages of 14 and 17; and since 14 is the average age limit for compulsory education, such boys who leave school at 14, either from choice or necessity, must wait three years before being admitted to that work. They can, however, be employed in many shops as messenger boys, rivet heaters or office boys, and in several shops on the New York Central Lines there are a number of boys waiting for enrollment as apprentices.

Railroad superintendents who have adopted an apprenticeship system feel that no trade or industrial school can supply the qualifications necessary to make good journeymen and foremen for their shops, and it is my opinion that an up-to-date apprenticeship system fully meets the conditions imposed by the great demand for skilled workmen in our shops and factories.

MR. A. STUCKI: Aside from the specific question of schools, Mr. Turner has touched so many other vital points, showing how men can be uplifted and made more useful for the common good. I especially remember one remark he made, and that alone would repay me for coming here tonight. He spoke about encouraging the men in the shops.

No matter how humble a position a man may fill, take, for instance, one who handles material in the yard or one who runs a machine, or anybody else, let them know that you expect the work done well and speedily, that you don't want any unnecessary handling, unnecessary operations, and that you expect him to guard against all that. Then, if this man has any suggestion to make, listen and treat it with consideration. Let him feel that he is a link in the chain, and you will get his best efforts and his good will, and often he will study up matters for himself. This way you will have the maximum happiness amongst your men and the maximum efficiency in your shop, your railroad, your firm. Some try to obtain this efficiency by a detailed system of discipline. Discipline we must have, just as well as rules and laws, but it will not bring success unless you touch that certain human element.

In regard to physical culture and football, we dare not forget that one is sport and the other is a necessity. The body should be developed harmoniously and kept in a healthy, active condition, thereby forming a sound foundation for the mental development brought about by study; but, as to football, I can not enter into that, I have no boys at colloge. If I had, I might have an opinion on that point.

MR. A. L. HUMPHREY: Mr. Chairman and Gentlemen: I have been very much interested in Mr. Turner's most excellent paper; also in the remarks that have been made with reference to the same. It appears to me that many have taken issue with Mr. Turner on an issue that he did not advocate, for I did not hear anything in Mr. Turner's paper in opposition to technical or college education. If I understood the paper correctly, it was not his intention to encourage practical education alone, but to advance his ideas, to illustrate what in his opinion should be accomplished along this line. While it is true that he made use of a little humor regarding college athletics, I believe that most of us that have contributed towards defraying the expenses of the young men attending college appreciate to a large degree the truthfulness of his remarks.

Looking at this subject from a broad point of view, it is not so much whether our boys, or the sons of those that we are well acquainted with and that can afford to educate their sons, are receiving college educations or technical educations, but it is what we can do for those that are not fortunate enough to be able to attend college, and that have to strive hard to get a little practical education, such as is absolutely necessary in order for them to cope with others that have been more fortunate.

This subject, therefore, resolves itself down to a question of aiding those that need help along this line, for it is to them that we must look for assistance in our future work. It is from this class that our shop workmen are drawn, and unless we have intelligence and education in this class of workmen we will necessarily have poor work.

As for those that are fortunate enough to be so situated as to enable them to get a college education, the question as to what they should do, is, in my opinion, no longer debatable. Mr. Long spoke of the necessity of going to college to learn "how to learn;" in other words, a college education is a proper foundation for most any structure that may be desired to be built upon same in the future. It does not mean that in some instances very good structures have not been erected on somewhat flimsy and shaky foundations. Nevertheless, no one appreciates better than I, who did not have the good fortune to prepare the foundation, the absolute necessity of preparing a structure that will stand firmly at all times without showing weakness, without such a foundation as has been referred to.

Speaking for the Westinghouse interests, with which I am somewhat familiar, we have what is known as special apprentices, who are college graduates, and practical apprentices, who are boys that enter our shop for the purpose of learning practical trades.

The special apprentices are supposed to serve a term of two years in the shop, after having obtained the technical training or foundation of which I spoke a moment ago. After that if they will be content to go into the shop and dirty their hands as the practical workman does, you can depend upon it that in time these men are going to distance in the work the practical man that has not had the advantage of the education. The trouble we have experienced has been that the technical apprentices do not want to remain in the shop work, but would rather take up a line of engineering or commercial work, with the result that many of the positions that pay high salaries, and which should be filled by a technical man, are filled by men that have gone through the practical end of the work and have reached positions higher than many a technical man who has waived his opportunity on account of the work being distasteful to him.

This whole matter, after all, revolves itself down to the individual himself; if it is in the young man he is going to make good whether he has to start in the shop to learn his trade and obtain his education by burning the midnight oil, or whether he is fortunate enough to have his expenses paid while going through college. If he is not made of the right stuff he will not be a success in anything that he undertakes. I remember listening to a talk before this Club by Mr. George A. Post some time ago, during which he stated that it would be difficult indeed to draw specifications of a successful supply man. He might have gone further and said that it would be quite difficult indeed to draw specifications of a successful man in any line of business. It depends entirely upon the man himself; if the stuff is in him he is going to "get there;" if it is not in him all the education that can be crammed into him will not make a successful man of him, and if he has the determination and ambition to succeed, he is going to succeed whether he is blessed with a college education or not, for it is possible for him to reach the educational goal without going over the college course.

One of the greatest difficulties we have experienced has been the tendency on the part of some of our special apprentices to become discontented so that they feel, shortly after taking up the special work, that they are not making the progress that they might make elsewhere, resulting in seven or eight out of every ten special apprentices quitting before they have become familiar with the practical end of the work they have undertaken to learn. As a consequence they find, after trying for a situation, that outside of the foundation they have obtained in the way of a technical training, they are very little prepared to cope with the practical man, who enters the shop with the determination to learn the greatest amount in the shortest period of time. As a usual thing, however, when a technical man does settle down he will reap the harvest for the time which he spent in college.

In selecting the young men that we take into our works as practical apprentices, we give the preference to sons of employes, orphans, or those who have widowed mothers of ex-employes depending on them. We do not pay special attention to whether the practical apprentices have very much education or not, when entering our employ. We indenture them for four years. During that time they must go to school which we provide for them, for a term of nine months, at least 8 to 9 hours every week during the four years' course. The subjects taught include Mechanical Drawing, Arithmetic, Algebra, Elementary and Advanced Geometry, Physics, and English. Instructors are employed especially for this purpose, and the apprentices are paid full time the same as if they had worked the same number of hours in the shop. At the end of the four years when they have completed their trade, we intend that they shall have a practical education that will permit them to go into any shop and carry on intelligently the class of work that they have been fitted for. In some instances young men after serving their time as apprentices in our works, have left us to attend technical schools, the only preparation having been what was obtained in the school which we provided for them during the time they were engaged as apprentices in our works.

In this way we aim to reach the boys that are not prepared to go to college, and we find that young men who have received a training as described are, as a rule, better prepared and more contented when advanced to positions such as superintendents, shop foremen, etc., than those that have received a technical education before taking the shop term. I might add that we have some rules governing the reports of our apprentices, both as to their shop work and school work, as is customary in all technical schools. A report showing the standing of the apprentice is forwarded either to the parents or guardian, as well as to the shop superintendent, thus enabling those most interested to keep familiar with what the apprentice is doing. At the end of the term of the apprenticeship service a diploma is furnished for school attendance, as well as for the trade that has been learned.

PRESIDENT: If there are no further remarks I will ask Mr. Turner to close the discussion.

MR. L. H. TURNER: I am certainly indebted to the gentlemen present for the cordial manner in which this paper was received. I do not think, however, that I made my point clear, as it was far from my intention to attack either the colleges or the graduates from these institutions. Technical men, to a reasonable number, are necessary, and we must have them, and I was simply trying to say something in behalf of the ninety-five per cent. of the men who make up the rank and file of the employees of railroads and large manufacturing concerns, who did not have opportunities for a college education, and who could make no practical use of such education had they received it.

I am going to make the bold statement that in many instances, probably in the majority, that if a man who had received superior educational advantages was forced to hold a position as a common workman, and accept the wages usually paid for such service, his life would be ruined. He would have higher aspirations, more cultivated tastes, and his inability to gratify his desires for luxuries above his position in life, would render hm discontented and unhappy.

Industrial and commercial conditions of the present day make it necessary to have a large body of what can be termed the working classes, and it is simply impossible for them to be paid an amount sufficient to provide them with the material things of life, which are really luxuries, but which are regarded by those of larger means, who have enjoyed opportunities of travel, etc., as necessities.

If the mechanic in your shops can place a piece of work in his machine quickly and accurately, and turn it out as rapidly as the capacity of the machine will permit, you can provide him with no sort of education which will make a better man of him so far as his qualifications as a workman are concerned, than the one which will teach him to perform the work required of him in the best manner possible. The same is true of the locomotive engineer, fireman, conductor, brakeman, or any other of the multitude of positions which can be filled well by the man with a grammar school education, or even less than that, and the best education which can be given this large class of men is the one which will make them temperate and industrious, and in doing this we have made better employees and better citizens.

It is an unfortunate condition of affairs, but one that is nevertheless true, that railway and manufacturing conditions do not require that over five per cent. of the men engaged in their service have a superior education, and while the remark I am about to make will probably bring out a howl of protest, I do not hesitate to say that I believe it is a crime to educate a man above his position, and create in his mind ambitions and desires which he does not stand one chance in a hundred of gratifying during his lifetime, and in closing, I will say that the best possible training which can be given the masses, is the training which makes them proficient in the positions they fill, and renders them satisfied to live under conditions which are forced upon them, and which neither they nor any one else is able to correct. By doing this, we may avert many unpleasant features which foreign countries are suffering from today.

MR. LINDSTROM: I would move a rising vote of thanks to Mr. Turner for his very able, thoughtful and instructive paper.

The motion was carried by unanimous vote.

UPON MOTION, The meeting adjourned and a very pleasing entertainment was presented, as follows:

Opening Selection....................."America"
By Orchestra and Everybody Present
Song.....................Mr. Burton H. Mustin
A Few Stories.................Mr. Jas. Bennett
Song.......................Mr. David Stephens
Some Dancing................Shack & McVeigh
Song.....................Mr. Burton H. Mustin
Song.......................Mr. David Stephens
Music Luncheon

NOTE:—VOLUMES 5, 6 AND 7 OF THE CLUB PROCEEDINGS ARE NOW BEING BOUND AND UPON COMPLETION CAN BE FURNISHED MEMBERS AT 50 CENTS PER SINGLE VOLUME. WE ALSO HAVE A FEW VOLUMES, NUMBERS 1 TO 4 INCLUSIVE WHICH CAN BE HAD AT THE SAME PRICE. ANY OF THE MEMBERS DESIRING SAME ARE REQUESTED TO PLACE THEIR ORDERS NOW.

In Memoriam

MR. ELIAS REESE.

Whereas; It has pleased God in the dispensation of His all wise providence to remove from our midst our fellow member, Elias Reese, and while we bow in submission to the divine will, believing He doeth all things well:

Resolved; That we shall miss his kindly presence from our midst. He was an honest, upright and conscientious citizen, and loving husband and father, enjoying the respect and affection of the community in which he lived, and particularly the affection and regard of his business associates, and of the members of this organization to whom he was sympathetic and helpful.

Resolved; That this organization, conscious of the solemnity and sadness of this visitation of death, directs that an expression of its sorrow and sympathy be spread upon the records, and a copy be engrossed and sent to his family with its sympathy and condolence to them, and the hope that He that comforteth will bring strength and consolation to their sorrowing hearts, and bind up the wounds made by this most sudden dissolution.

G. B. OBEY,
CLARE L. HINSDALE,
C. THOMAS,

Committee.

OFFICIAL PROCEEDINGS
RAILWAY CLUB OF PITTSBURGH
$1.00 Per Year 20¢ Per Copy

Vol. VIII. September 24, 1909 No. 8.

SUBJECT: "THE TECHNICAL SELECTION OF RAILROAD OILS AS APPLIED TO COST REDUCTION."
By Mr. A. D. Smith, Supt., The Canfield Oil Co., Coraopolis, Pa.


THE RIGHT WAY.
TO STAY ALL LOCOMOTIVE FIRE BOXES
TO OBTAIN GREATER SERVICE RESULTS
TO OVERCOME STAYBOLT BREAKAGES
TO LESSEN COSTS OF FIREBOX REPAIRS
IS TO
SPECIFY-ORDER-APPLY
The Tate Flexible Staybolt
TO ALL FIREBOXES
IN USE ON OVER NINETY RAILROADS
Its Function is to hold the Firebox Plates Securely together and Accomodate itself to the Unequal Expansion of the Plates in Service
"The Perfect Stay"
Flannery Bolt Company.
PITTSBURGH, PA, U.S.A.
GENERAL OFFICES FRICK BUILDING.
B.E.D. STAFFORD - GENERAL MANAGER

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OFFICIAL PROCEEDINGS

of the

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ORGANIZED OCTOBER 18, 1901.

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Meetings held fourth Friday each month, except June, July and August.

PROCEEDINGS OF MEETING,
SEPTEMBER 24, 1909.

The meeting was called to order at the Monongahela House, Pittsburgh, Pa., at 8 o'clock P. M., with President D. J. Redding in the chair.

The following gentlemen registered:

MEMBERS.

Alexander, J. R.
Alleman, C. W.
Allison, John
Anderson, J. B.
Bailey, Robert J.
Barnsley, Geo. T.
Bealor, B. G.
Bihler, L. C.
Bixler, H. C.
Brown, John T.
Chapin, E. S.
Clark, C. C.
Cole, Jewett
Conway, J. D.
Coulter, A. F.
Cunningham, J. D.
Curtis, H. C.
Davis, G. H.
Deckman, E. J.
Elder, T. W., Jr.
Fleck, J. S.
Gilg, Henry F.
Gowdy, H. K.
Gutierrez, S. J.
Hilberry, H. H.
Howe, D. M.
Huber, H. G.
Huyett, E. G.
Kaup, H. E.
Kennedy, Jas.
Kinter, D. H.
Knickerbocker, A. C.
Knight, E. A.
Krause, Julius
Krepps, W. K.
Kull, W. A.
Lehr, H. W.
Lobez, Pierre L.
Long, R. M.
Lynn, Samuel
Mason, Stephen C.
Metcalf, H. E.
McClumpha, H. E.
McFeatters, F. R.
McNulty, F. M.
Noble, D. C.
Oates, Geo. M.
Redding, D. J.
Robison, F. M.
Sattley, E. C.
Scheck, H. G.
Schreiner, W. C.
Shuck, Wm. C.
Smith, A. D.
Smith, M. A.
Smith, Russell
Stafford, Samuel G.
Stucki, A.
Tamkins, B. L.
Tate, R. H.
Taylor, H. G.
Walther, G. C.
Warne, J. C.
Weigel, F. S.
Williams, H. C.
Winter, F. W.
Young, W. W.

VISITORS.

Bannerot, Fred G.
Beatty, E. A.
Billings, E. J.
Bishop, J. B.
Cassiday, C. R.
Henderson, J. R.
Hickey, A. F.
Lemen, W. W.
Mason, A. B.
McCabe, H. Dallas
Nelan, E. J.
Noble, H. S.
Robinson, J. R.
Smith, Sion B.
Toomey, J. J.
Vincent, F. B.
Whalen, J. A.

The reading of the minutes of the last meeting was dispensed with, the Proceedings having been printed and distributed to the members.

The Secretary read the following proposals for membership:

Clements, W. M., Chief Clerk to S. M. P., B. & O. R. R., Wheeling, W. Va. Proposed by A. W. Crouch.

Faber, T. W., Mechanical Engineer, Standard Steel Car Co., New Castle, Pa. Proposed by A. D. Smith.

Montgomery, H., Master Mechanic, Penna. R. R., Oil City, Pa. Proposed by H. G. Huber.

Noble, H. S., Motive Power Inspector, Penna. R. R., Union Station, Pittsburgh, Pa. Proposed by J. B. Anderson.

Pinson, J. H., care H. K. Porter Co., 4636 Center Ave., Pittsburgh, Pa. Proposed by B. L. Tamkins.

Roberts, W. P., Material Inspector, New York Central Lines, General Office, P. & L. E. R. R., Pittsburgh, Pa. Proposed by C. W. Alleman.

Smith, Alan Wood, Asst. General Yard Master, P. & L. E. R. R., Girard, Ohio. Proposed by C. Thomas.

Smith, W., Asst. Round House Foreman, B. & O. R. R., Benwood, W. Va. Proposed by C. W. Alleman.

Timmis, Arthur E., Chief Draftsman, Motive Power Dept., P. & L. E. R. R., General Office, Pittsburgh, Pa. Proposed by C. W. Alleman.

Wrenshall, C. W., Supt. Pressed Steel Car Co., McKees Rocks, Pa. Proposed by J. B. Rider.

PRESIDENT: These applications will be referred to the Executive Committee and upon their approval the gentlemen will become members.

This is the meeting at which nominations for officers for the ensuing year should be made, and I will announce as the Nominating Committee, Messrs. L. C. Bihler, Traffic Manager Carnegie Steel Co.; F. M. McNulty, S. M. P. & R. S., Monongahela Connecting Railroad, and E. C. Sattley, Manager, Page Woven Wire Fence Co. I will ask that these gentlemen get together and report at the close of this meeting.

We will now listen to the reading of the paper: "The Technical Selection of Railroad Oils as Applied to Cost Reduction," by Mr. A. D. Smith, Superintendent, The Canfield Oil Co., Coraopolis, Pa.

MR. A. D. SMITH: Mr. President and members of the Railway Club of Pittsburgh:—I wish to thank you for the honor and privilege of addressing this body, and while it may seem somewhat out of place for an oil man to advise a policy of retrenchment on the subject at issue, it seems to me that a saving in one direction means money for development in another, which in this mechanical age will work out sooner or later in the consumption of oil, so that possibly we may both profit by the application of the paper.

THE TECHNICAL SELECTION OF RAILROAD OILS AS APPLIED TO COST REDUCTION.

BY MR. A. D. SMITH, SUPT., THE CANFIELD OIL CO., CORAOPOLIS, PA.

The "Report of the Commissioner of Corporations on the Petroleum Industry," in the issue of August 5th, 1907, stated that 94 railroads paid out the enormous sum of $4,068,557 for lubricants during the period of one year, in or about 1905, and that the Pennsylvania System alone spent $385,933 for a similar purpose during a like interval. With these figures before us, it certainly becomes of prime importance to determine the factors whereby they may be reduced, and while the latter doubtless number legion, it would seem that they might all be grouped under one of three general headings, i. e., competitive buying, careful technical selection of the oil in question, and an intelligent application of the same.

Decreasing the cost of oil consumption by competitive buying is a matter to be worked out by the Purchasing Department of the road, based on recommendations from either the Engineer of Tests or Superintendent of Motive Power, and is foreign to the scope of this paper. It might be noted, however, inasmuch as advices to purchase oils meeting certain tests, could only properly come after a careful technical consideration of these oils, that the first method of cost reduction (without in any way lessening its importance) is to a more or less degree dependent on the second.

The third proposition of reducing oil consumption by the intelligent application of the oil by the man actually using the same, is of great importance; and where, as has been demonstrated in a series of tests conducted by the Norfolk & Western in 1905, that one engineer would use twice as much of the same oil as another, on the same engine, under similar conditions of load, steam pressure, etc., it is very evident that a wide field for saving exists along these lines, if we are to accept the results of these tests as typical of conditions in general, and I think we safely may, as each man using oil has his personal equation the world over. While an interesting paper might be written on this subject, it is clearly not a part of the present article, unless it is possible to show that a proper technical selection of an oil can overcome or balance the personal equation of the man actually using the same, so that an ultimate reduction in consumption is effected. That this is possible along certain branches of the service, I intend to prove later, in the meantime passing to a more general consideration of the proposition at issue.

What constitutes a proper "technical selection" of an oil? I would define it as the selection of an oil that from among all the grades offered by one company, or by several companies, best meets the actual service conditions imposed upon it, ultimate cost considered, but irrespective of any physical or chemical tests; and as a secondary definition, an oil whose inspection agrees with the important tests (previously determined) of the oil known to give satisfaction. This method of selection, i. e., buying on tests, is particularly adapted to the purchase of burning and signal oils, as standards once established, their combination may be so framed as to render substitution impossible. On the other hand, it is extremely difficult, though possible, to frame a set of specifications so as to ensure delivery of oil of the same lubricative value as originally contracted for, and close attention to actual service results should be the rule. The reasons for this difference in control by the two respective classes of standards lie in the nature of the oils themselves; for while both burning and lubricating oils are essentially a complex mixture of hydrocarbons, the former grade may be easily separated by a simple distillation process into its approximate constituents; these latter differing so widely in their physical constants, that considered in conjunction with the usual tests for gravity, flash and burn, the combination renders substitution of other grades of the same apparent tests at once recognizable. On the contrary, lubricating oil, being composed principally of high molecular weight hydrocarbons which differ but slightly in their physical constants, is separable into its approximate constituents with difficulty, as especially in the heavier gravities, several thousand isomers and closely related compounds are chemically possible, all undistinguishable by the usual tests of gravity, flash and fire. This uncertainty as to composition places serious limitations in the way of the chemist in declaring the identity of two oils from a lubricative standpoint, since the latter quality, like burning power, is a function of chemical composition. Fortunately for the consumer, however, the different grades of lubricating oil are made from the same crudes, and by the same refining process wherever possible, and under these circumstances the usual physical tests of gravity, flash and burn may be safely regarded as indicative of lubricating power as well; that is, two oils made from the same crude by the same refining process, of similar tests, will be of the same lubricating power. While it is therefore possible to control lubricating deliveries by simple tests in these cases, no refiner can guarantee the continuity of a certain crude supply, and a change in base is apt to cause a variation in lubricating power, corresponding to the difference in chemical composition of the respective crudes. I say "is apt to cause a change," because variations in refining methods, necessitated by the difference in crudes, may counteract this tendency and the resultant oil be of the same lubricating value as formerly. On the other hand, the refiner may not be able to produce from the new crude the identical combination of tests desired and admixture is resorted to, thus introducing a new disturbing factor, which is almost certain to affect the lubricating value. Whether for better or worse, as has been brought out in the discussion of isomerism, would evidently be a hard matter to decide by laboratory test, and I think you will agree that the caution to pay close attention to actual service results in the case of lubricating oils is well founded.

It has been stated that standards once determined, it is an easy matter to check deliveries of burning oil. What then should constitute a technical selection of a burning oil for railroad use? How much should the cost enter into the matter? It would seem to me that, in view of the comparatively small consumption of this grade, and from the far reaching results, loss of life, property, etc., which might result from the failure of a lamp in a block or switch light, that the only feature that should be considered would be the obtaining of the best oil possible. That the New York Central Lines had this in mind is quite evident from the specifications which are appendixed which are substantially the ones they have established for a seven-day burning oil.

Seven Day Burning Oil Specifications.

Flash.—The oil must not flash under 110° F. in the Elliott Cup, nor burn below 160° F. in the open Tagliabue Cup; the heating of the cups being so regulated that the temperature of the oil will rise 2° per minute, the torch being applied every 2 degrees. beginning at 100° F.

Spec. Gr.—The specific gravity of the oil shall not be lower than 47.3° Be., or 0.07896 Sp. Gr.

Color—The oil shall be strictly W. W. in color.

Cold Test—The oil must show no cloudiness when subjected to a temperature of zero degrees F., and maintained there for 10 minutes.

Flock—After subjection of a sample of the oil to a temperature of 260° F. for eight hours in an open flask, no flock or deposit must appear.

Samples—All samples must be taken from bbl. with a thief bottle.

Reaction—The oil must be perfectly neutral to litmus paper in reaction.

S. D.—The percentage of sulphur must not exceed 0.05%.

Distillation—All samples must undergo a distillation test, and distillate must burn no better than original sample. The distillation shall further show no residue exceeding 5%, boiling above 560° F.

Service—The oil must burn steadily and clearly in a suitable lamp with a minimum incrustation of wick for 120 hrs.

General—Samples will be taken from carloads or part carloads, and condemned or accepted according to results of tests.

The above form an excellent example of the combination of specifications spoken of that preclude substitution. Consider the test demanded in the first place, which practically amounts to 165 burn. Such a test is not needed for safety, as the ordinary 150 oil is safe enough for all purposes, and many authorities consider the 120 oil in the same light. Pass to the gravity, which must not be under 47.3 Be. This by itself would shut out undesirable Western and Southern oils of smoke forming tendency, but it would not shut out certain Eastern crude oils of inferior burning quality, as will be shown shortly. When, however, the high test, gravity, and the minimum residue of 5% boiling over 560° F. are all considered together, it becomes exceedingly difficult to produce such an oil in commercially profitable quantities but from one crude source, which is another way of saying the oil will be always of the same chemical composition and, incidentally, equal burning quality. No chance is taken on methods of refining, as W. W. color is demanded, ensuring absence of undesirable decomposition products that are produced during distillation. A cold test of zero degrees signifies an easy handling of the oil in filling lamps, etc., in all weather of except unusual severity, and would help the burning quality as well. Flock is a product probably unfamiliar to many, and I will briefly state that it is a mixture of certain metallic salts (principally iron and aluminum), of sulphonic acids or substituted sulphur ethers, and first exists in solution. Under certain conditions it may precipitate and greatly injure the burning quality of the oil, and its presence is always undesirable, and often indicates inferior oil, hence the flock test is a most important one from two points of view. The reaction test ensures absence of chemicals used in treating, and although present in nearly every specification for burning oil extant, it is questionable whether an oil showing other than a neutral reaction has been found. The service test is obviously of great importance and together with the distillation test forms the crucial test of the oil, although the latter, in conjunction with the other tests of gravity and flash, will generally foretell the service test, and vice versa. It was stated in an earlier paragraph that a simple distillation test, in conjunction with common tests of flash and gravity would determine the approximate constituents of an oil and render substitution at once recognizable. Consider the appendixed distillation tests on two oils of the same gravity and test. Up to this point they might be considered identical. It is true a service test, if not at once, would quickly show that No. 1 was the poorer oil, and to one familiar with oil testing the cold test would likewise, but it seems to me nothing could indicate more plainly than the following tables how utterly unlike in composition No. 1 oil is from No. 2, and it would scarcely require a chemist to prophecy their burning qualities would be different, yet many judge a lubricating oil by flash and gravity, and expect because these qualities are identical their lubricating qualities are also, although we have lately seen a far greater chemical difference can exist in lubricating oils of the same tests than is possible in burning oils. Note the high percentage of light and heavy "ends" in sample No. 1, the greater uniformity in No. 2. A service test on No. 1 would show a tendency almost immediately for the high boiling material (22.3% boiling over

560°) to decompose at the top of the wick from the heat due to the flame, and deposit a hard layer of coke that would prevent capillary action and cause a drop in luminosity. Thus we see why the limit of 5% for high boiling material was put in the specifications, and how the minimum incrustation clause checks the former. In short, it would be very difficult to improve on the specifications of the New York Central Lines for the purposes required, although demanding a 48.0 gr. oil would undoubtedly secure a freer burning fluid, but the cost might be sufficiently higher to possibly offset the advantage, as the present specifications as before noted could scarcely be improved on.

Distillation Tests on Samples of W. W. Oil of 47.3 *Gr. and* 120 *Flash.*

No. 1.		No. 2.
1.5%	Start — 300° F.	0.0%
12.3	300 — 350	10.1
25.7	350 — 400	20.1
15.2	400 — 450	23.0
6.5	450 — 500	17.5
6.2	500 — 550	13.8
10.3	550 — 560	11.0
22.3	Above — 560° F.	4.5
100.0%		100.0%

In like manner, we might discuss suitable standards for high test signal oils, but they are along the same lines, demanding in addition certain percentages of animal oils, which have been found to give satisfactory results, so it would seem best to consider lubricating oils as the next proposition.

In the technical selection of a lubricating oil for a certain specific purpose, as has been previously indicated, actual service results must play a most important part in the choice. Wells and Taggart have recently shown in an article appearing in *Power,* issue of July 27th, the lack of correlation between the usual tests (flash, fire, gravity, viscosity) as applied to lubricating oils, and their real lubricative values; and have further demonstrated the unreliability of checking lubricative deliveries by these tests. The truth of their proposition depends upon the fact, possibly not generally recognized, that there is no such thing as one oil being a better lubricant than another until conditions of its use are specified, and by a "better" lubricant is meant better from a practical standpoint, which is obviously the point of the consumer. Thus, it is not an uncommon occurrence to find an oil of high viscosity purchased with the idea of its being a better lubricating oil than one of low viscosity, and so it may—if the machine in question demands a high viscosity oil—otherwise its unsuitability would be soon shown, probably in the heating of some bearing, and we would be justified in calling the high viscosity oil a poor oil; the matter being one of conditions of use, and the tests incidentals. In like manner, as Wells and Taggart brought out, there are certain ideas about gravity and flash quite rooted in the minds of many as bearing a relation to lubricating value, when this factor, as we have seen, depends on conditions the oil is subjected to. It is true that, through long experience in handling oils and access to service reports, many dealers can advise the proper oil for a certain purpose, the expert department maintained by many oil companies being able to render invaluable service in suggesting specifications. The true import of these specifications must not be misinterpreted, however; for they are indicative of lubricative value (what the consumer is paying for), only so far as the oil is made from the same base and by the same refining process, and that it is perfectly possible for another oil to have equal lubricative power and be of different tests when made by different methods and from different crudes; hence the need of a service test.

The latter conducted in all its details by a road using several grades of oil is a somewhat formidable undertaking, but the sums spent for lubrication warrant it. Journals, brasses, eccentric straps, piston rings, etc., must be calibrated and the wear for a given period determined, personal equation eliminated as far as possible in the actual consumption of the oil, and, in short, a hundred and one matters must be taken into consideration in judging of the merits of two oils. Testing machines are of great value if they represent working conditions, for here personal equation in consumption may be largely eliminated. A common mistake is to use one machine for testing car oils, coach oils, cylinder oils, etc., under some standard speed of revolution. I call to mind a case of this nature where a Thurston Testing Machine was so used; and valve, engine, and car oils all tested on the one machine at some certain speed, and from the frictional resistances developed one oil would be declared to be the better of its class. As I recall the figures, the car oils, from a lubricative standpoint, proved to be the best of all, and the natural conclusion of a layman would be to discontinue the purchase of the high cost valve oil and use car oil instead under all conditions—manifestly absurd. What the tests really showed was the lubricative value of the oils in question for the machine itself under the conditions of speed observed. I think it will be equally clear that comparing oils of a certain class, for instance two valve oils, is an absurdity, for it assumes the lubricative values are proportional to the difference of the machine from the conditions under which the oils were intended to work. In valve oils especially, where the action of steam in emulsifying the oil may have great influence on the value of the oil, it is manifestly impossible to make any sensible deduction from such a type of instrument as to the action of the oils in cylinders under working conditions. The machine will show very quickly which is the best oil, as far as being suited for the instrument itself, but in comparing two valve oils this is not at all the information desired. The Thurston machine is a most excellent instrument for determining relative lubricating values, as applied to difference in chemical composition, in the relation of viscosity, etc., and I mean rather to bring out the abuse of the machine than to criticise it, although it obviously has its limitations. It may, however, become of practical value if developed to meet actual service conditions, and by "actual service conditions" is meant the carrying out of the latter to the minutest detail—journals of the same size and running at the same speed, brasses of the same width and metal, initial compression identical, etc., etc. With these hints, it would seem to me possible for the Testing Department of a road to work out a series of testing machines of real practical value, and very likely many departments have already done so.

In the early part of this paper it was stated that a proper technical selection of an oil ought to overcome personal equation in certain branches of the service and reduce lubricating cost. I had in mind locomotive service, where 94 railroads, about 1905, had as an average 70.8% of the total invoice cost of oil charged to this branch; and it occurred to me that, with the comparatively small number of men actually using oil in this division, and the high relation its consumption bore to the whole lubricating cost, that it might be well to keep a record, as far as possible, of the oil used by each engineer; and then determine, with the aid of some practical testing machine as suggested, if a certain type of oil could not be more advantageously used by one engineer than another and vice versa. It would seem possible to have, say, two grades of oil, one for the engineers using a large quantity and one for those using a small quantity. However, I am not a railroad man, and the scheme might be wholly impracticable; but the saving that should result, if it could be successfully inaugurated, would pay for considerable research along these lines, if conditions as existed on the Norfolk & Western in 1905 are general at present.

From many causes we have seen the desirability of a service test in determining lubricative value, and it now remains to be seen how far specifications should influence the choice of an oil. It was pointed out that the usual tests of gravity, flash, fire, and viscosity bore no true relation to lubricating value; but when the conditions under which the oil in question is to be used are known, certain conclusions as to its general suitability for the purpose in hand may be derived emperically from a consideration of the tests as a whole. Thus experience has shown a good all around cylinder stock must stand at least 525° F. flash, and must not burn under 600° F.; and that engine and car oils must not flash under 300° F., nor burn under 400° F. Other general specifications to ensure quality are certain minimum standards of tarry matter permitted, after the oil has been mixed with 88° gasoline, in the proportion of 1 part oil to 19 parts gasoline, and the mixture allowed to settle for one hour.

These vary in the specifications of different roads from 0 to 5% in cylinder stocks and valve oils, to a general 5% in engine and car oils. The undesirability of any excessive amount of foreign matter in an oil intended for lubrication is too obvious to discuss, but I would call your attention to the fact that it is not only its presence that does harm, but its significance; for an inferior base, or carelessness in refining, or both, is indicated. In cylinder stock, an amount over 1% is a pretty sure sign of the oil having been subjected to an excessive temperature in refining, in which case compounds would be apt to be formed which, though soluble in gasoline, would be very apt to break down under actual service conditions in the cylinder and cause deposits. While 5% may be allowed in other oils, in the selection of cylinder lubricants I would recommend a minimum of 1% in the matter of deposit. As to percentage of animal oil and the kind desirable in compounded stocks and valve oils, the general opinion is that 15-20% of acidless tallow makes the best mixture. If the mechanical equipment is in any way run down or very hard service is demanded, the higher percentage of tallow should be specified, bearing in mind, of course, that it increases the cost proportionately. In either case the tallow used should not show over 1% acidity. Some roads demand a certain viscosity of their stocks and valve oils, while others omit such a specification, and I will say right here that the latter class are as likely to get as good an oil as the former. Understand that this is not because viscosity is not an important test, but because it bears no relation to lubricating power—what the consumer is buying. When it is known that a certain oil is doing the work required in a satisfactory way, it is well to insert a viscosity specification as a check on future deliveries; that is to use it emperically, and while some may claim to be able to do this in the first instance without the service test, I would not omit the latter on this account. Cylinder stocks and compounded oils should flow easily at 60° F. for general railroad use. While a better cold test is desirable, its cost soon becomes prohibitive without corresponding benefits. Compounded oils should be free, of course, from lumps of tallow, and the greener the oil the better.

In the matter of engine oils, experience has shown the best oils lie between 27 and 31 gravities; and with a flash of 300° F., it is perhaps just as well that too much stress not be laid on a viscosity specification for reasons mentioned under cylinder oils. It is more often the case under engine oils that a higher viscosity signifies a better oil from a lubricating standpoint than in the case of cylinder oils, and while a minimum value had best be inserted, a great deal of importance should be attached to service results and proper viscosities for future deliveries be derived from these sources. It is customary to compound engine oils with 10 - 50% of animal oils, and what is said of cylinder and valve oils in this connection applies here also. A good engine oil for general use should have a summer cold test of 15°, and a winter test of 5°.

Car oils should have the same general specifications as to gravity, flash and fire tests as engine oils before the latter are compounded. Possibly it is wise to include a minimum viscosity specification, but this should be worked out ultimately from service results; and it is hardly necessary to state that the color of a car oil or percentage of tarry matter will be equal to an engine oil, as the difference in price is too great to expect it.

In a similar manner we might discuss suitable specifications for other lubricants incident to railroad use, but it would be practically a repetition of the general scheme as above outlined. While we have seen that checking deliveries for lubricating quality by agreement with specifications of the order just considered will not always ensure the same quality, it will often enough to place a great deal of reliance on them as indicating this feature. By studying the relations existing in a given oil between the constants of flash and fire, flash and viscosity, fire and viscosity, sulphur content, action of concentrated sulphuric acid at high temperature, and (in engine and car oils) distillation tests, etc., etc.; a chemist will soon be able to decide if a change in base or refining method has been made on some particular delivery, as under such circumstances the constants just referred to will be the first to vary in their relations. If there is reason to suspect this condition, the actual service results should be closely watched, and tests conducted on some practical testing machine if possible. The results may necessitate a complaint or refusal of similar deliveries, the oil may be of the same value as before, or its quality may be improved—in either case valuable information has been obtained. In short, the whole scheme of selecting a lubricating oil should be: Service first, then standards, tests, and then service.

In conclusion, it might be said that, while this paper was primarily intended for railroads, it applies with equal force to all consumers of oil.

PRESIDENT: This very interesting paper is now before you for discussion, and in order to open the discussion I am going to call upon Mr. W. W. Lemen, who was with the Norfolk & Western Ry. as Engineer of Tests at the time the tests referred to in this paper were made.

MR. W. W. LEMEN: Mr. President and gentlemen:—I am with you tonight, not through any desire to say anything but to learn something. The subject of machinery lubrication is one which, I believe I may safely say without relegating myself to obscurity, I with a great many other people know very little about. In fact I just know enough about it to know that I do not know anything and that there is a great deal to be learned. I would like to say that I believe my information has been very much added to by hearing this paper. Some points were brought out which were very interesting to me as a laboratory man, in connection with my practical experience as a railroad man. And it would seem very proper to emphasize the point that laboratory determinations are not always reliable in informing us of the results that may be obtained from lubricating oils in practical service. Whereas we may have made many tests in the labortory the results of which would indicate the most desirable characteristics that could be obtained, yet contrary results are often found when the oils are put to service. The results that have been obtained from lubricating oils in service is the knowledge that we want, regardless of anything or any information that may be obtained in the laboratory. If we know that a certain oil in the market has been for years giving certain desirable results in service, all the laboratory determinations we may make of that oil in comparison with other oils cannot change our conclusions.

Speaking from my own railroad experience and from my knowledge of the experience of others, I believe we may safely say that there are oils in the market that give uniform results in service. I hesitate to refer to the Norfolk & Western, as the engineer of tests got such a black eye in that paper. But I believe I can submit gracefully to the criticisms and admit that many of them are just. I made those same criticisms myself in regard to the tests. I would like to say, though, that the experience on the Norfolk & Western regarding the personal factor does not represent standard or universal conditions. Those tests were conducted for the purpose of determining what results might be obtained with the minimum amount of oil to obtain satisfactory lubrication and no more. You can well see that under those conditions the personal factor of the man applying the oil is a very important one, and one which after much effort we found it hard to control. But we did demonstrate to ourselves that it is possible to control that element.

Particular reference was made to the fact that one man was using twice the quantity of oil that another engineer was using on the same locomotive in the same service. We remonstrated with this man personally. He was an oil crank. You, railroad men, know what I mean by that. He was an excellent engineman but he had never educated himself to be a proper lubricator of his machine. He would buy oil out of his own pocket. We urged the propriety of removing this man from his engine in the test, to demonstrate to him what could be done in the way of lubrication. We transferred another engineman running the same class of engine on heavier service, and he demonstrated that the consumption could be greatly reduced. In fact, on returning this man to his engine again he was able to cut his consumption in half with just as successful operation of his machine.

Those conditions, I say, do not exist in service today because, knowing that we can get a lubricant of established uniformity, most railroads that I am acquainted with have been able to establish an arbitrary amount of oil to be used on a certain class of engine. Consequently it would seem hardly practicable to me to endeavor to meet the various ideas of the various individuals operating machines with different qualities of oil. In fact, on questioning the enginemen we found that to make a hundred mile run one man would claim that he must have, say, 6 pints of engine oil and 1½ pints of valve oil; another would say 4 pints of engine oil, but he must have 2 pints of valve oil, and so on. We can conclude at once that it would hardly be desirable to try to meet the ideas of those men in the way of increasing the quantity and reducing the quality in order that the cost might remain the same. We have found that it is not only more desirable, but we can educate the men as to the quantity of the oil he is using.

Take for comparison a power plant. We know that we have been operating that plant for years on a given quantity of oil. We change oilers—not engineers, oilers. We would make no attempt whatever to meet the vagaries of the new oiler by changing our quality of oil or quantity either, but we would endeavor to educate the oiler to using the quantity we know he should use on that particular class of machines. That is being accomplished right along. I believe the same thing applies to electric traction, where we have fewer individuals to control and consequently less effort to control them. We know that we can make a certain mileage on a certain class of car equipment, and if a man is not capable of using a quantity of oil that will accomplish that with the desired consumption, we educate the man up to it. It is not the individual we are lubricating but the machine, and the machine does not demand more or less oil because of the man who is running it. The effort to meet the individual ability—for that is what it is—of the man would seem to me to encourage inefficiency. On the contrary, it is a constant effort to improve the efficiency of the man handling the machine. As a matter of fact it is not so much the quantity of lubricant, after that is known, though that is necessary, as it is the care and intelligence with which he makes application of the same.

PRESIDENT: Mr. J. R. Alexander, General Road Foreman of Engines of the P. R. R., might be able to tell us something of the intelligent education as worked out among the handlers of oil.

MR. J. R. ALEXANDER: I am much interested in the contents of this paper, especially in the discussion along the lines of its intelligent application, and while I am not at all familiar with the various questions connected with the technical selection of oils, I have something to do in trying to bring about a satisfactory and economical consumption of this material. I can heartily endorse everything said by Mr. Lemen, and might possibly add one or two suggestions. First, it should be the duty of some one on the railroad who is entirely familiar with the enginemen and inspectors' duties, to thoroughly investigate this subject and analyze the requirements of one division over another and be prepared to determine the amount of lubricant of the different kinds necessary per 100 miles day, or division run, as the case may be. When such data is once determined, it is then not a question of seeing how little oil a man can use, for it is of equal importance to the railroad company that they use a sufficient amount of oil. I have had more trouble in this line of work in getting good results from these economical fellows who do not use sufficient oil than any other one thing. There are a few men usually found in the chain gang who do not use a sufficient amount of oil to meet the requirements, but their neighbors who handle the same machine use large quantities of oil trying to again put in proper shape some neglected part of the engine.

The economical value of oil should not be estimated by the usual method of getting out on the road and making tests with the best locomotive on the most favorable daylight run, and it is hardly correct to say that all engines need the same amount of oil, it being well known that different machines may not require exactly the same amount of oil for the same kind of work, as the various parts to be lubricated may not be in the same condition, as, for instance, in the case of valve oil. Every little blow past valves or packing rings that should not be there will make necessary a different amount of lubricating oil over one that does not have that particular kind of defect.

There is one feature that has been developed in the last few years that is worth while bringing out in a discussion about the merits of lubricating oils. Fifteen or twenty years ago the consumption of oil and the number of hot parts were many times greater on a certain kind of power, or cars if you like, than is the case today. Some people say it is the quality of the oil that has made the difference, and while it is true the kind of oil used has been changed within that period, I feel warranted in making the statement that the good results obtained is due very largely to the intelligent application of the lubricant, and I would not be afraid to go back to the same oil as was previously used and expect to get just about the same results as today. I have in mind a Western road that has been using this summer a certain high-grade oil for locomotives, and a master mechanic on one of the divisions took a notion to try a more inferior grade of oil, which was done, and the only way any one else found it out was that after five or six months' time when the comparative monthly reports commenced to come in and it was noticed that this particular division was spending less money for oil, the difference being between the cost of one grade of Galena engine oil and another, thereby showing the benefit to be obtained by intelligent application on the part of enginemen and inspectors. This conclusion seems reasonable, as the modern car of today with journals the size they are and carrying the weight they do, to my mind require just as good a lubricant as will any part of the modern type locomotive.

Another point I thought would have been raised in this paper is the value of grease as a lubricant. We should recognize the fact that all machinery on railroads today is of much heavier type, and it is a question whether you are getting the best lubrication with any kind of oil, especially for journal bearings, and in fact grease has now been used for a considerable length of time, so that we should be able to say whether it is more desirable or not as a lubricant.

PRESIDENT: Can we hear from any others? If not, will Mr. Smith kindly close the discussion?

MR. SMITH: It was mentioned in the paper just presented that a separate article could be written on the intelligent application of oil, and I am glad to have had the pleasure of listening to the two last speakers discuss this idea.

In regard to where grease is suitable instead of oil, I will digress for a moment from the point at issue and state the following general proposition. Use for any piece of mechanism the thinnest oil that will stay in place and do the work. Possibly there is more trouble caused in lubrication by using an oil of too great viscosity than the contrary. We frequently find that a bearing will heat up say 30° above surrounding temperatures where a certain oil is used, and then establish a sort of equilibrium beyond which point no further rise in temperature will take place. This simply means that the viscosity of the oil has become less at the higher temperature, and the equivalent of a low viscosity oil is now being used.

Let us see how this applies to the use of grease. In the instance just cited the remedy would be obviously to use a thinner oil, that is, an oil of low viscosity in the first place, and in four cases out of five this will be all that is necessary. In the other case it will be found that through faulty design or condition of the bearing, over-load or some similar cause, that while the low viscosity oil lubricates perfectly, showing no rise in temperature, it will not remain long in the bearing, and to use oil under such conditions means excessive loss, while the high viscosity oil means poor lubrication. Under such circumstances grease becomes the ideal lubricant, as it is of low viscosity when melted, and if properly selected will melt only fast enough to supply the bearing. As it exercises its greatest friction reducing power only when a liquid; i. e., when it becomes an oil, the natural deduction is to use oil in the first place where possible. In general, it is wise to try out several grades of oil if one does not give satisfaction before turning to grease, although this does not apply where grease is used where lubrication, as the term is usually understood, is not the main object.

MR. E. S. CHAPIN: If it would be proper, I would like to have Mr. Smith give us a little resume of the different tests, flash, burning, etc., and how they are conducted.

MR. SMITH: The four tests most commonly applied to oils are the specific gravity, flash, fire and viscosity tests, and will be briefly described as follows:

By specific gravity is meant the relation of weight between equal volumes of oil and water, the value 1.000 being assigned to the latter. The test is commonly taken by an instrument called a hydrometer, consisting of a hollow glass bulb carrying a graduated stem, and is so weighted that it will sink in oil to a depth corresponding to the volume weight of the latter. By reading the graduation on the stem at the surface of the oil, and correcting for temperature, the specific gravity is thus determined. The Baume scale, which is used in this country almost exclusively in the oil trade, is an adaptation of the true specific gravity scale, and by substitution of whole numbers for decimal parts gives greater prominence to smaller divisions of the scale which are really of great importance.

The flash point of an oil is that temperature at which the oil evolves vapors which, if mixed with air, form an explosive mixture. The test (on lubricating oils) is commonly conducted by heating a small portion of the oil in question in a metallic cup, at about the rate of 10 degrees per minute, the temperature of the oil and rate of heating being determined by a thermometer immersed in the latter. A torch carrying a small flame is passed over the surface of the oil at stated intervals, a slight puff occurring when the explosive mixture referred to is formed, thus denoting the flash point.

If the heating of the oil be continued beyond the flash point vapor begins to be given off so rapidly that it will continue to burn when the torch is applied, thus constituting the fire or burn point.

Viscosity signifies the fluidity or internal friction of the oil and is determined in several ways, one of the more common being to allow a measured quantity of the oil to flow through an orifice of definite size, the time in seconds elapsing during the flow being taken as the viscosity. Another method is to determine the time necessary for a vane immersed in the oil and driven by a constant force, to make a certain number of revolutions. As viscosity varies greatly with temperature, to convey any meaning the temperature at which viscosities are taken must always be stated.

Tests on burning oil are identical in principle with the preceding, but are conducted with slightly different apparatus in certain instances.

MR. H. C. WILLIAMS: I noticed in the reading of the paper and the discussion that a very large percentage of the total cost of the oil used on the different railroads is consumed by the engines. What is the best way to educate these men in the use of lubricants? How are we best going to reach them?

PRESIDENT: Mr. Alexander, would you care to answer that question?

MR. ALEXANDER: On the railroad with which I am connected we give the engineman credit for knowing a good deal about the handling of the locomotive, both in the way of taking care of machinery and in the matter of lubrication. We first select and educate some one who is expected to know as much about the subject from an operating standpoint as the technical expert, and after the road man has well studied their methods of application as applied to the particular road on which he is employed, he will then ride with the different men, and usually it is to the advantage of the instructor, that is, road foreman of engines, traveling engineer, or whoever he is, for a time to keep busy watching the practice of the enginemen without making any suggestions, and in that way will often find some very good points that he never heard of before, but where the engineman is following some bad practice or using more oil than is considered wise from his point of view, he should take great care not to tell the engineman that he does not know anything about his business, but preferably will take some diplomatic way trying to show the engineman what, in his judgment, is the proper way to handle the engine or the right amount of oil to be used for that particular kind of service, and nine times out of ten Mr. Engineman will meet him half way and go one better when he understands the benefit and importance of the thing you are trying to explain. Yet it is a fact a locomotive in good condition can be handled so badly that neither quantity or quality of oil would maintain proper lubrication. I do not agree with a good many of the statements seen in papers that it is hard to educate a railroad man to do anything right, but I would hesitate a good deal to sign a general order, or see it go on the bulletin board until the matter had first been thoroughly tested out in service. In other words, as stated in the paper of the evening, service first, then standard, then service. The instructor being continually on the road with the men is the only method by which you can get the best results, that is, proper lubrication, with economy in both coal and oil consistent with the service, the reverse of this being sure where the efforts of economy lead to faulty or uncertain lubrication, as nothing else will so quickly increase coal consumption as improper lubrication. And again, the engineman is not the only sinner that must be educated, as it is the engine and car inspectors who are responsible for the preparation of waste and oil as packing material and for its application to journal boxes on both locomotives and cars.

One of our friends sitting here would like to ask Mr. Smith if there is any good reason why he recommends 300° flash oil instead of 400° for machinery purposes on locomotives. From my point of view I would say that 300° is entirely too light for the present type of locomotive, for during warm weather if you put 300° oil on the driving box of the ordinary locomotive you will see it smoke almost before you go out of the terminal, and that of itself is an indication that the oil is too near the flashing test and results in improper lubrication.

MR. SMITH: In reply to the question just raised, I would state that a flash test of 300° was not specified as the best test for an engine oil, but as the minimum flash that should be allowed, and doubtless in certain instances a higher flash oil would give better results. The test is, however, of not great significance until more is known concerning the composition of the oil. Thus certain inferior oils of 300° flash contain considerable percentage of volatile oil, while another of like flash will show no signs of smoking in the bearing. A consideration of the distillation tests of the two grades of burning oil recently discussed shows what in a similar way is possible of two grades of engine oil, and it is not strange that we find oils giving unsatisfactory results. In fact, it would be possible for a 400° flash oil to be really a more volatile oil than one of 300° flash, as the latter's flash might be caused by a very small percentage of low-boiling compound, which, when driven off, would leave the resultant oil of a higher flash than the 400° flash oil. In short, we cannot depend on one test in judging an oil, and a service run will be of great help in making deductions.

MR. S. C. MASON: I would move a vote of thanks to Mr. Smith for his excellent and interesting paper.

The motion was duly seconded and carried by unanimous vote.

MR. L. C. BIHLER: On behalf of the Nominating Committee I would report that the committee in considering this matter had in mind that some attention should be paid to faithful service. We realize that a club like the Railway Club, or any similar organization, can only be held together successfully by the efficient, careful and painstaking work of the officers. We have only nine meetings a year, and that is hardly enough to give a man a chance to get his chair warm. That has been a sort of guiding thought in the mind of the committee, and it is fully persuaded that it is sometimes well to follow precedent. In the past we have been fortunate enough to always have good officers, and we rewarded them by giving them another term, and your committee does not see any reason to deviate from this practice. In this we also feel that we convey the thought of a majority of the members, that the present officers should be continued for two years, and we therefore present the following as our idea for carrying out the thought which I have just expressed:

President,	D. J. Redding.
First Vice President,	F. R. McFeatters.
Second Vice President,	Wm. Elmer, Jr.
Treasurer,	J. D. McIlwain.
Secretary,	C. W. Alleman.
Executive Committee,	L. H. Turner, F. H. Stark, Geo. T. Barnsley.
Finance Committee,	D. C. Noble, Stephen C. Mason, C. E. Postlethwaite, A. B. Bellows, Geo. E. Gies.

Membership Committee,
- D. M. Howe,
- C. A. Lindstrom,
- W. V. Turner,
- A. L. Humphrey,
- M. A. Malloy,
- Geo. Gurry,
- Robert Finney,
- A. W. Crouch.

PRESIDENT: Gentlemen, you have heard the nominations. What is your pleasure?

MR. R. J. BAILEY: In view of the fact that there does not seem to be any opposition to most of the present incumbents, I move that the Secretary cast the ballot of the club for the election of all the nominees where there is no opposition.

The motion being duly seconded, was carried and the vote was cast accordingly.

There being no further business, on motion, adjourned.

MINUTES OF ANNUAL MEETING SOCIETY OF RAILWAY CLUB SECRETARIES, ATLANTIC CITY, N. J., 1909.

The annual meeting of the Society of Railway Club Secretaries was held at the Hotel Brighton, Atlantic City, N. J., on Saturday, June 19, 1909, Mr. James Powell, Chairman, presiding.

At roll call the responses were as follows:

NEW YORK RAILROAD CLUB—Mr. Harry D. Vought.

CENTRAL RAILWAY CLUB—Mr. George Wagstaff.

WESTERN RAILROAD CLUB—Mr. Daniel M. Brady.

NEW ENGLAND RAILROAD CLUB—Mr. George H. Frazier.

ST. LOUIS RAILWAY CLUB—Mr. B. W. Frauenthal.

CANADIAN RAILWAY CLUB—Mr. James Powell, Mr. Robert Patterson.

RAILWAY CLUB OF PITTSBURGH—Mr. C. W. Alleman.

RICHMOND RAILROAD CLUB—Mr. Mead T. Spier.

SOUTHERN & SOUTHWESTERN RAILROAD CLUB—Mr. A. J. Merrill, Mr. F. F. Gaines.

The Secretary-Treasurer submitted the following annual report, which, on motion of Mr. Frauenthal, was accepted with thanks for the exhaustive manner in which it had dealt with the various questions discussed, and for the recommendations made.

ANNUAL REPORT OF SECRETARY-TREASURER, 1909.

In submitting the customary annual report of his stewardship your Secretary-Treasurer has much pleasure in making a matter of official record the gratifying fact that whereas a year ago we were confronted with the unpleasant condition of a reduced membership, we have since recovered lost ground. In the event that it be your pleasure to approve a recommendation herewith submitted, and it is favorably received by those who will then be invited to avail themselves of the opportunity it presents, this Society will expand, and, thereafter, no further reason or occasion will be afforded for a repetition of the statement we have several times heard that our organization is not large enough to be taken seriously.

In this connection the thought suggests itself that even though we be not big in numbers, we are not without great individual and collective responsibility of vital import to all that concerns the best interests of the organization employing our services; that just in proportion to the extent of our being equal to that responsibility, and diligent as well as obviously otherwise efficient in the discharge of the duties imposed upon us, will every interest and those things which contribute to the success of a railroad club be conserved and properly promoted.

It has been aptly said that the secretary of a club is the "works" and it is, therefore, fair to assume that in our little Society we are the combined "work" which, when kept in good running order and not neglected nor forgotten, will furnish the right sort of power to keep the rest of the machinery in motion that is at least, in some measure, dependent upon it for effective operation. This is confirmed and emphasized by diversified benefits flowing from the initiative of our minds after we were organized and began to act in concert for the attainment of those ends. Economies that have saved thousands of dollars as compared with previous expenditures and business methods of conducting club affairs which our superior officers properly look to us to recommend and work out, if shown to be practicable, may be cited as among some of the resultants for which we are entitled to credit.

We are justified in pointing with pride to the undisputed and indisputable fact that it was through our united recommendation that the books of official proceedings issued by our respective organizations are of uniform size and that each club has a standard color that is its individual trade mark. The typography of these publications is, also, largely of standard style, character and design, and in gaining their admission to the mails as second-class matter because of the educative character of the literature thus circulated, we have made possible a saving in club revenue that is not to be despised. These are just a few of the good things that this Society has accomplished and prove that it has very substantial reasons for its existence. Our work in this regard has not and never will be finished while railroad clubs flourish and are recognized as they now are conceded to be, the most valuable auxilliaries of the Master Car Builders' and Master Mechanics' Associations, for the advance solution of problems that are thus simplified for their final settlement in the annual conventions of the larger bodies.

It is a matter of real regret that with engagements which demand their serious attention in other directions, we are deprived at our annual meetings of the attendance and, therefore, the valuable advisory co-operation of some of those who, by reason of their official status in the clubs, are associate members of this Society. Were it otherwise the effect in many ways and directions, it is needless to detail would be very helpful to ourselves as individuals as well as the important interests we represent. If there is any way in which this loss can be recovered it should be our business to find it out and then lose no time in applying the proper remedy. It is spoken of as a loss because it is such in more ways than one, in view of the well remembered fact that at the inception of our organization and for a time thereafter these gentlemen always met with us. They were enthusiastic as to the purposes in view and their esteemed counsel and advice as to measures proposed and later made effective by practical application, have been highly beneficial to the management of the clubs and in the cultivation of resources which contribute to their material advancement.

Mention previously made of the restoration of our numerical strength has reference to the promised renewal of affiliation by the Southern & Southwestern Club, which is reported to be again in a prosperous condition and in a position to meet its obligations; also, the admission to the Society of the Northern Railway Club, which has practically taken the place of the Northwest Club, whose adverse experiences robbed it of its existence. Our former co-worker, Mr. W. E. Rosevear, Jr., is understood to have a new club under way at Winnipeg for the growing Canadian Northwest, and, if successful in his efforts, he will, probably, be pleased to avail himself of an invitation already given to reunite with us. Attention is being given to a club that we are informed has been organized in Kansas City, and our former associate, Mr. W. W. Wheatley, who, you will be interested in knowing, has risen to prominence and influence in the traction world, is giving us his co-operation in that direction. The Pacific Coast Club lost its existence as one of the results of the San Francisco earthquake. With the rapid restoration of the city from the effects of that disaster, presumably those who were formerly active in its affairs will be led to resurrect that club, because railroad men have ever since been without any such organization west of the Rocky Mountains.

At our last annual meeting we devoted a number of hours to a recommendation of our Chairman, Mr. James Powell, to working out a proposition for standardization and uniformity in the blank forms used by the various clubs in the conduct of their business. It was the understanding that those agreed upon should be adopted, if approved by our respective boards of management. To each secretary represented in the Society was sent a set of these blanks, but all of them have not reported the action of their executive committees and, therefore, no further progress has been made up to this time. The only club prepared to make effective the action of last year is the Central Railway Club.

With respect to the New York Railroad Club, the matter has been placed in the hands of its finance committee, which will concur in whatever is decided upon by the other clubs.

Your Secretary-Treasurer at this time presents for your serious consideration the advisability of enlarging the scope of this Society to the extent of making eligible to membership the secretaries of other distinctively railway organizations. If this is done we should substitute for our present name that of the American Association of Railway Secretaries. It will, probably, be well to so amend our articles of organization that they will specifically name the railway organizations whose secretaries would be eligible to membership. If this idea appeals to you and the recommendation is adopted a sub-committee should be appointed with authority to work out the details and make the needed changes in our rules and regulations, the same to be promulgated when the minutes of this meeting are sent to each member.

Following an established custom, the usual Index of Subjects published under the auspices of the Society was again issued last year, the cost being substantially as before, through competitive bidding for the work. This expense, however, is likely to become greater in the future, especially if we open the door to other secretaries and the value of our Index be thus enhanced. With the assessment of the various clubs represented continuing at $10.00 there will remain but a small margin for other incidental expenses of the Society and it may not be sufficient for all such purposes. If our executive committees could see their way clear to consent to this assessment being raised to $15.00 a year it would keep us financially sound and obviate embarrassment. There might be occasion when we would have a sufficient balance to permit of a reduction in the amount. It is, doubtless, appreciated that the Society has never been extravagant but has always kept within its income through much work being done by individual members at the personal sacrifice of time and convenience.

Our total receipts during the past year, including a balance of $5.33 from 1907 and $160 for dinner tickets paid to the undersigned, were $285.33. Our expenditures were as follows:

On account of annual dinner	$160 00	
Printing	82 25	
Stenographer	10 00	
Miscellaneous	3 00	
		$255 25
Balance on hand June 19, 1909		$ 30 08

This balance shows an excess over last year by reason of the payment of arrearages from 1907 and the Canadian Railway Club having already met its obligation in this regard for next year.

Respectfully submittted,

HARRY D. VOUGHT,
Secretary-Treasurer.

In the discussion which followed, Mr. Frauenthal took occasion to say that he thought that the statement that the secretaries are the "works" of the club was highly proper and correct, because upon them largely devolved the carrying out of the manifold and important details connected with club work. If they are conscientious and faithful in the discharge of their duties, this in no small degree contributes to the success of the organization they serve. They are in constant touch with the work and the members, and, more than any other official, have their fingers upon the pulse and life of the club.

Mr. Frauenthal was of the opinion that this admitted of no argument and ought to be made prominent in the records of the Society and brought out clearly so that it might receive the attention it deserves from the officers and members of the various clubs.

He did not think in saying this he was assuming too much, and added in conclusion that upon the enthusiastic and active discharge of a secretary's obligations depended to a considerable extent the prosperity of a railway club and the preservation of its individuality in a way certain to make for its best welfare.

Mr. Gaines said he concurred very heartily in these sentiments. He knew from personal experience how true they were and he did not think that the secretaries should be at all modest in asserting themselves to this extent. He was personally familiar not only with the fact that so much of the work depended upon the secretary, but also with the added fact that with the demands made upon the officers by their other obligations, they were brought, of necessity, to depend upon their secretaries to give close and thorough attention to the minutae of club work, and just in proportion to the manner in which they did this were the clubs made prosperous and successful.

Mr. Merrill deprecated allowing the secretaries to undertake to be "the club"—to be, as it were "the whole thing." The history of some clubs had shown the error of this. While it was true, as had been stated, that very much depended upon the work and activity of a secretary, he should never be allowed to forget his subordination to those charged with the administration of the organization, but, at the same time, should be accorded merit and recognition proportionate to the fidelity with which he discharged his duties. He agreed that very much, as had been said, depended upon how the secretary met the exactions imposed upon him and he was confident that the gentleman who had the proper appreciation of his position would never undertake to assert himself beyond the bounds of propriety.

On a vote being taken the members present concurred in the statement of the Secretary-Treasurer with regard to what had been accomplished by the Society for the good of railroad clubs and also in the recommendations of the Secretary-Treasurer for broadening its scope and sphere of usefulness for the future.

It was ordered, upon motion of Mr. Frauenthal, that a committee be appointed to work out the recommendations and the chairman designated as such committee: Mr. C. W. Alleman, Pittsburgh; Mr. George H. Frazier, Boston; Mr. Harry D. Vought, New York; they to make their report at the semi-annual meeting.

In view of the increase in the current expenses of the Society and that it might have a few dollars in its treasury with which to meet any emergency that might arise, it was agreed, on motion of Mr. Merrill, that the customary assessment be increased to $15.00 per club for the ensuing year.

Sundry bills presented by the Secretary-Treasurer were approved and ordered paid.

The resumption of membership by the Southern & Southwestern Railroad Club was made the occasion of an expression of gratification by the Society.

It was agreed to hold the semi-annual meeting in January, 1910, in New York, subject to the call of the chair.

Reports received showed that the various clubs were gradually adopting the uniform blanks recommended by the Society as standards.

It was agreed that in future no earlier publication should be made of the proceedings of the Society's annual meeting or of any special papers presented than in the September proceedings of each club.

Election of officers was next in order and resulted as follows:

MR. B. W. FRAUENTHAL, Chairman.

MR. GEORGE H. FRAZIER, Vice-Chairman.

MR. HARRY D. VOUGHT, Secretary-Treasurer.

There being no further business the Society adjourned.

Respectfully submitted,

HARRY D. VOUGHT,
Secretary-Treasurer.

OFFICIAL PROCEEDINGS RAILWAY CLUB OF PITTSBURGH

$1.00 Per Year 20¢ Per Copy

Vol. VIII. October 22, 1909 No. 9.

ANNUAL MEETING, ELECTION OF OFFICERS, ETC.

Contains Constitution, By-Laws and List of Members.

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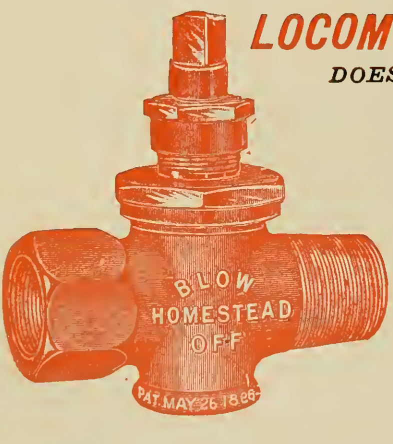

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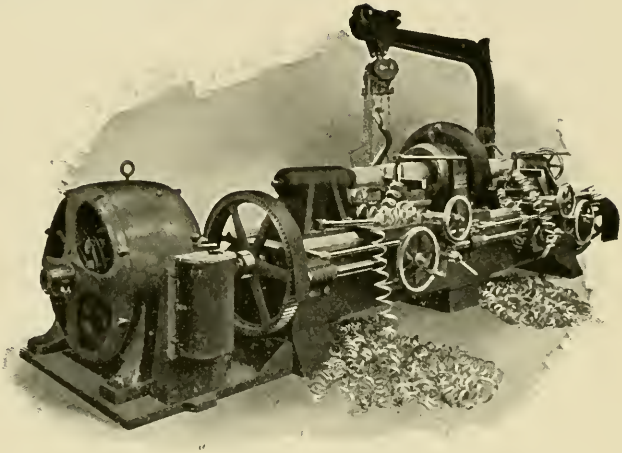

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Meetings held fourth Friday each month, except June, July and August.

PROCEEDINGS OF ANNUAL MEETING, OCTOBER 22nd, 1909.

The meeting was called to order at the Fort Pitt Hotel, Pittsburgh, Pa., at 8:30 o'clock P. M., with President D. J. Redding in the chair.

The following gentlemen registered:

MEMBERS.

Ackenheil, J. D.
Alleman, C. W.
Allison, John
Amsbary, D. H.
Anderson, J. B.
Baker, J. H.
Barnsley, Geo. T.
Barth, John W.
Bealor, B. G.
Benner, Jacob W.
Bihler, L. C.
Brand, Thos.
Brown, A. D.
Brown, John T.
Brownscombe, G. J.
Chittenden, A. D.
Clark, C. C.
Cline, W. A.
Colburn, Wm. W.
Cole, Jewett
Conway, J. D.
Coulter, A. F.
Crawford, H. M.
Crouch, A. W.
Cunningham, J. D.
Curtis, H. C.
Dambach, C. O.
Davis, G. H.
Davis, I. J.
Deckman, E. J.
Degener, Paul A.
Dorr, C. O.
Edmonds, J. F.
Eichenberger, J. J.
Elder, Thos. W., Jr.
Fettinger, H. O.
Field, Arthur W.
Forsyth, W. D.
Freed, Geo. F.
Gale, C. H.
Gallinger, Geo. A.
George, M. E.
Gies, Geo. E.
Graham, W. C.
Gray, Chas. B.
Grewe, H. F.
Griswold, W. W.
Gulick, H.
Gutierrez, S. J.
Hackenburg, J. H.
Hall, C. W.
Harrigan, P. J.
Henderson, J. W.
Hepburn, M. J.
Hilberry, H. H.
Howe, D. M.
Huber, H. G.
Huggans, J. H.
Hughes, J. E.
Huyett, E. G.
Jenney, Jacob
Kaup, H. E.
Kerr, Edward
Keyser, R. H.
Kinter, D. H.
Knickerbocker, A. C.
Knight, E. A.
Koch, Felix
Krepps, W. K.
Lewis, Jas. M.
Lindstrom, Chas. A.
Lobez, Pierre L.
Mason, Stephen C.
Matthews, J. A.
Maxson, H. W.
Mercur, H. T.
Murphy, W. J.
McClumpha, H. E.
McFeatters, F. R.
McGrory, Percy
McIlwain, J. D.
McKee, D. L.
McNulty, F. M.
Noble, D. C.
Noble, H. S.
Oates, Geo. M.

Obey, G. B.
O'Connor, Chas.
Oliver, W. H.
Orchard, Chas.
Patterson, C. C.
Pfeil, John
Phelps, W. H., Jr.
Porter, H. V.
Pratt, Howard A.
Proven, John
Quest, W. O.
Randall, E. J.
Rea, C. S.
Redding, D. J.
Reese, F. T.
Richardson, W. P.
Rider, J. B.
Rinehart, H. W.
Rowan, W. R. C.
Ryan, W. F.
Sattley, E. C.
Schreiner, W. C.
Schuchman, W. R.
Severance, F. W.
Shuck, Wm. C.
Sitts, Lewis S.
Slocum, Roy L.
Smith, A. D.
Smith, D. W.
Smith, Russell
Smith, W.
Snyder, F. I.
Stark, F. H.
Suckfield, G. A.
Swann, J. B.
Swartz, H. E.
Sweeley, G. P.
Tate, R. H.
Taylor, H. G.
Timmis, Arthur E.
Turner, L. H.
Van Horne, F. P.
Walther, G. C.
Warne, J. C.
Warnock, H. R.
Weisbrod, J. F.
White, Jas. D.
Whited, Willis
Woodworth, R. B.
Young, W. W.

VISITORS.

Amsbary, W. Bruce
Baldwin, G. C.
Beltzhoover, H. L.
Benton, W. H.
Berghane, A. L.
Binns, J. Y.
Bolig, R. S.
Cochran, Chas. C.
Cooper, G. E.
Dempsey, H. J.
Ecker, F. D.
Edmunds, Frank W.
Elden, Edward
Elverson, Howard W.
England, Alexander
Evans, F. D.
Gardner, K. C.
Geiger, R. H.
Gilmore, A. G.
Gridley, Sidney D.
Harper, Paul
Haynes, J. E.
Hartley, J. W.
Henderson, J. R.
Hindman, W. S.
Hornecker, Chas.
Hudson, Wm. A., Jr.
Hummell, W. G.,
Imhoff, H. B.
Jenkinson, R. D.
Kimberland, W. H.
Kipp, Walter E.
Knowles, C. R.
Lamb, C. M.
Lockhart, J. C.
Lockwood, B. D.
Love, Arthur
Lyons, Jas. K.

Matthews, W. R.
Major, Chas. G.
Merscher, John
Morgan, Irvin J.
McCartney, J. G.
McCloskey, J. C.
McMaster, R. J.
McNulty, Frank B.
Nelan, E. J.
Noble, L. C.
Oliver, H. C.
Patchin, S. Clark
Pechstein, Albert J. G.
Phillips, Samuel
Reed, C. R.
Robinson, S. R.
Roddy, E. G.
Rowand, Wm. H.
Scheller, A. C.
Schultz, Geo. H.
Severance, S.
Shelhart, Frank
Smith, Sion B.
Sowersby, F. E.
Vauclain, C. A.
Vivian, R. S.
Weisbrod, J. A.
Williams, W. W.
Wilson, N. V. F.

The reading of the minutes of the last meeting was dispensed with, they being in the hands of the printer.

The Secretary read the following list of applications for membership:

Bishop, J. B., Resident Inspector, B. &. O. R. R. Co., Pittsburgh, Pa. Proposed by C. W. Alleman.

Fray, Samuel, General Sales Dept., Carnegie Steel Co., Pittsburgh, Pa. Proposed by R. B. Woodworth.

Mackenzie, R. H., Clerk, Freight Train Master's Office, Penna. R. R., Pittsburgh, Pa. Proposed by B. E. Thompson.

Platt, J. G., Mechanical Representative, Hunt-Spiller Manufacturing Corporation, Boston, Mass. Proposed by D. J. Redding.

Venning, F. J., Supt. Overhead Construction, Pittsburgh Railways Co., Pittsburgh, Pa. Proposed by J. D. McIlwain.

Wheelhouse, S. H., Manager, Hamilton-Corliss Engine Works, Frick Bldg., Pittsburgh, Pa. Proposed by D. J. Redding.

Williams, J. E., General Yard Master, P. & L. E. R. R., Haselton, O. Proposed by Alan Wood Smith.

PRESIDENT: As soon as these names have been favorably passed upon by the Executive Committee the gentlemen will become members.

We will now listen to the reading of the annual report of the Secretary.

SECRETARY'S REPORT.

To the Officers and Members of the Railway Club of Pittsburgh:

Gentlemen: I have the honor to present to you the eighth annual report of the organization for the year 1908-1909.

I wish to thank the officers and members for the cordial support and encouragement extended during the year. The revenue derived from our loyal friends, "The Advertisers," in our Club Proceedings contribute to a very great extent the success of the club. They continued their support during the business depression and it is hoped their liberal assistance may be returned many fold.

While a majority of our members make prompt payment of their annual dues, there are others who are more or less tardy in doing so, and in consequence a large number have been suspended for non-payment of same, in accordance with the By-Laws.

The resignation of a good many of the members is due to the fact that they have moved from one section of the country to another. Notwithstanding, the club remains in a very healthy and prosperous condition.

Death removed from our midst during the year the following members:

Elias Reese,	Wilson Miller,
C. A. Brayton,	C. L. McGaughey,

Raymond B. Brown.

The papers presented before the Club during the year have been interesting and instructive and the general participation in the discussion which they provoked is evidence that they were of the same high standard as in preceding years. This, no doubt, accounts for the good attendance at our meetings.

The following is a summary of the membership, financial condition, etc., for the year up to and including this meeting:

MEMBERSHIP.

Reported last year	742	
Received into membership during year	103	
Reinstated	3	
	—	848
Suspended, non-payment of dues	77	
Resigned	43	
Loss of address	8	
Removed by death	5	
	—	133
		—
Present membership		715

FINANCIAL.

RECEIPTS—

In hands of Treasurer last year	$1,370 35	
From advertising	1,716 24	
From dues	2,016 00	
From sale of Proceedings and other sources	159 30	
	———	$5,261 89

DISBURSEMENTS—

Printing Proceedings, advance sheets, notices, etc.	$1,216 53
Hotel, luncheon, music, etc.	991 95
Postage for Journals, etc.	344 19
Secretary's trip to Atlantic City	50 00
Cigars for meetings	87 01
Stereoptican light	10 00
Stationery and supplies	84 45
Messenger service	29 75
Secretaries' Association dues year 1909-10	15 00
Reporting Proceedings	150 00
Entertainment	119 50
Miscellaneous	20 94
Binding Club Proceedings	72 25

Salary Mr. J. D. Conway, year 1906-1907...	500 00	
Secretary's salary, year 1908-1909........	500 00	
		$4,191 57
Balance in hands of Treasurer.......		$1,070 32

C. W. Alleman,
Secretary.

Approved:

L. H. Turner,
F. H. Stark,
Executive Committee.

PRESIDENT: We will now have the annual report of the Treasurer, read by the Secretary.

TREASURER'S REPORT.

Pittsburgh, Pa., October 22nd, 1909.

RECEIPTS—

Balance on hand from last year...........	$1,370 35	
Received from Secretary during year......	3,891 54	
		$5,261 89

EXPENDITURES—

Paid out on Secretary's checks............	4,191 57
Balance on hand....................	$1,070 32

Respectfully submitted,

J. D. McIlwain,
Treasurer.

Approved:

L. H. Turner,
F. H. Stark,
Executive Committee.

PRESIDENT: The next thing in the order of business is the announcement of the result of the election of officers, and I will call upon Mr. Barnsley, who helped count the votes, to announce the names of the officers for the ensuing year.

MR. GEORGE T. BARNSLEY: Mr. President and fellow members of the Railway Club:—I will make my announcement very brief, for it is something that you want to be soon over with, so that the more profitable and pleasurable portion of the evening's entertainment may be enjoyed. The count of the vote is usually something very serious, and I have tried to throw all the seriousness necessary into it.

I beg to say that in accordance with the Constitution and By-Laws, the ballots were regularly sent out, returns made, and the vote counted at the regular time. The result of the count shows that the officers elected for the year 1909-1910 are as follows:

President, D. J. Redding; *First Vice President,* F. R. McFeatters; *Second Vice President,* Wm. Elmer, Jr.; *Treasurer,* J. D. McIlwain; *Secretary,* C. W. Alleman; *Executive Committee,* L. H. Turner, F. H. Stark, Geo. T. Barnsley; *Finance Committee,* D. C. Noble, Stephen C. Mason, C. E. Postlethwaite; *Membership Committee,* D. M. Howe, C. A. Lindstrom, W. V. Turner, A. L. Humphrey, M. A. Malloy.

PRESIDENT: I learn from the Executive Committee who counted the votes that the new officers have been elected by quite a large majority, which is rather surprising (!) in view of the fact that most of them had no opposition.

But, nevertheless, on behalf of the officers-elect I wish to thank the members for their expression of confidence in our past efforts; also their expression of hope for our future welfare.

I also want to take this occasion to call the attention of the members to the fact that they can be of great assistance to the officers of the organization in building it up and making its work successful. About the first thing necessary for the success of a Railway Club or similar organization is that they have good papers, and sometimes it is a rather difficult matter to get them. There seems to be a strong disinclination on the part of a good many of you to get into the spot light. We have a great many members of this organization who are well qualified to write papers that would be of educational value, and I hope that during the coming year these members will voluntarily come forward, without urging, and whenever a member feels that he has something that would interest the Club, make that fact known to the Secretary. We have several good things in line for the winter, but there are a few open dates and we would like very much to have good papers for those meetings.

After the papers, the next important thing is to have good discussions. We know from experience that a lot of men, just like those who do not like to write papers, hate to get up and talk. I do not think you ought to feel that way in this organization. You are not under criticism, you are among your friends, and your friends are anxious and will be glad to hear from you. Many men come here and listen to the reading of the paper and go away without saying anything that the general audience can hear, and yet they get rid of a great many good ideas on the paper when they are seated around the table afterwards. If we could get those points in the printed Proceedings they would be much more valuable to all of us.

Then the final thing that makes the success of an organization such as this, is membership. There is no reason why we should not increase our membership. We have, according to the Secretary's report, something over 700 members now. Probably owing to the hard times, scarcity of money, cold weather and one thing or another, we did not gain very much in the last year. But we feel that we have a better place to meet this year, under better circumstances and better conditions, and times are good, everybody has money, and there is no reason why you should not get your friends to become members. There are a whole lot of people who are eligible to membership in this organization who are not yet in. Any man who is identified with railroad interests or the selling or manufacturing interests is eligible to membership, and if the members will exert themselves a little, there is no reason why we should not show a large increase in membership at the next annual meeting.

We do not want to take up very much time in talk on this occasion, because we have a very extensive program to carry out, but I think we ought to have a few words from some of the other gentlemen who have been honored by election, and I would like to start with our First Vice President, Mr. F. R. McFeatters.

MR. F. R. McFEATTERS: Mr. President and gentlemen: —I made quite a lengthy speech a year ago on a similar occasion and made some predictions that did not come true, so I think you had better excuse me.

PRESIDENT: I think the other officers in their regular order ought to say a few words before we proceed with the musical entertainment. Mr. Turner is the senior member of the Executive Committee.

MR. L. H. TURNER: I do not know that it is proper for me to say anything, as I understand our official orator, Mr. Stark, is going to say everything necessary tonight. But I want to say that I am fully in sympathy with the remarks of our President. They are very opportune. If the various members would come to the front and help get us good papers and help discuss them and help get a larger membership, there is no reason why we should not take the front rank among the Railway Clubs of this country. We have the territory and we have the people, and all we want is that everybody pull together and we will get there.

PRESIDENT: Mr. Stark has been designated as the official orator of the organization and I am sure we ought to hear from him.

MR. F. H. STARK: Mr. President and fellow members—I object to Brother Turner's ironical remarks. At our preliminary dinner reference was made to natural born railroad men. My advent into the Pittsburgh Railway Club officially was by accident. However, I am glad that you have taken charge of such a husky looking infant and trust with your patience I may develop into a worthy member. I appreciate the honor conferred upon me by the re-election as a member of the Executive Committee.

As suggested by our honored President, if we all do our part it will add to the success of the Club. It will make better acquaintance possible.

We must not come here simply to learn, but to take part and disseminate knowledge. The young men should take part at every opportunity, thus working together success is assured.

PRESIDENT: Can we hear from any of the other officers?

MR. BARNSLEY: A thought came to my mind a moment ago when I sat down after announcing the vote, which I would like to put before you. I, for one, am glad to-night that this meeting is in this location. It is a step forward. And I shall hope that our meeting here will cause a greater number of the members to attend the regular meetings and will stimulate and enthuse interest in this organization. And I am enough of an optimist to look forward to the time when this Club will possess a home of its own. The interests of Pittsburgh in the railway world warrant that. It is sufficient that this membership should band itself together in a closer union, if possible, with the idea of being the greatest Railway Club in the country, and that the Club shall stand forth above all others in the railway world in doing good to the railroad men. Now, there is a gentleman sitting not far from me who once called me a road engineer, and it may seem strange to you that I should be talking this way. But when I look back to the time when I was a young man and sat at the telegraph key to receive train orders, and having been engaged in railroad work up until a very recent time, not only in the engineering department but in other departments of the service, I want you to know that I am speaking from my heart and my interest is in the success of the railway men.

PRESIDENT: Are there any others who will add a word? If we can have no more speeches from newly-elected brethren, a motion to adjourn the business meeting will be in order and we will proceed with the entertainment.

ON MOTION the business meeting is adjourned.

PRESIDENT: The business meeting now stands adjourned and we will turn the entertainment over to Mr. Alleman, the Secretary.

The Secretary introduced and presented the following entertainers:

1. Overture .... Selected

Todd's Orchestra.

(Distribution of Programs, Pipes and Cigars.)

2. Baritone Solo .... Selected

Mr. R. H. Geiger.

3. Humorous Talk.................... Mr. W. B. Amsbary

4. Tenor Solo .... Selected

Mr. Paul Harper.

5. Song.......................... "I Wish I Had a Girl"

Orchestra and All Present.

Intermission, ten minutes. Luncheon.

(Popular Selections by Orchestra.)

6. Impersonations of Actors, Past and Present.......
.... Mr. Samuel Phillips

(Orchestra Accompaniment.)

7. Piano Solo....................... Mr. Irvin J. Morgan

(Formerly organist at Westminster Abbey, and at present organist and choir master, Trinity Church, Pittsburgh.)

(1) Concert Etude of Wollenhaupt.

(2) Murmuring Zephyrs of Yensen.

8. Recitation and Musical................ Mr. Arthur Love

(1) Railroad Story (Humorous).

(2) Violin Solo and Imitations.

FINALE

RAILWAY CLUB OF PITTSBURGH CONSTITUTION.

Article I.

The name of this organization shall be "The Railway Club of Pittsburgh."

Article II.

OBJECTS.

The objects of this Club shall be mutual intercourse for the acquirement of knowledge, by reports and discussion, for the improvement of railway operation, construction, maintenance and equipment, and to bring into closer relationship men employed in railway work and kindred interests.

Article III.

MEMBERSHIP.

Section 1. The membership of this Club shall consist of persons interested in any department of railway service or kindred interests, or persons recommended by the Executive Committee upon the payment of the annual dues for the current year.

Sec. 2. Persons may become honorary members of this Club by a unanimous vote of all members present at any of its regular meetings, and shall be entitled to all the privileges of membership and not be subject to the payment of dues or assessments.

Article IV.

OFFICERS.

The officers of this Club shall consist of a President, First Vice President, Second Vice President, Secretary, Treasurer, Finance Committee consisting of three members, Membership Committee consisting of five members, and three Elective Executive Members who shall serve a term of one year from the date of their election unless a vacancy occurs, in which case a successor shall be elected to fill the unexpired term.

Article V.

DUTIES OF OFFICERS.

Sec. 1. The President will preside at all regular or special meetings of the Club and perform all duties pertaining to a presiding officer; also serve as a member of the Executive Committee.

Sec. 2. The First Vice President, in the absence of the President, will perform all the duties of that officer; the Second Vice President, in the absence of the President and First Vice President, will perform the duties of the presiding officer. The First and Second Vice Presidents shall also serve as members of the Executive Committee.

Sec. 3. The Secretary will attend all meetings of the Club or Executive Committee, keep full minutes of their proceedings, preserve the records and documents of the Club, accept and turn over all moneys received to the Treasurer at least once a month, draw cheques for all bills presented when approved by a majority of the Executive Committee present at any meetings of the Club, or Executive Committee meeting. He shall have charge of the publication of the Club Proceedings and perform other routine work pertaining to the business affairs of the Club under the direction of the Executive Committee.

Sec. 4. The Treasurer shall receipt for all moneys received from the Secretary and deposit the same in the name of the Club within thirty days in a bank approved by the Executive Committee. All disbursements of the funds of the Club shall be by cheque signed by the Secretary and Treasurer.

Sec. 5. The Executive Committee will exercise a general supervision over the affairs of the Club and authorize all expenditures of its funds. The elective members of this Committee shall also perform the duties of an auditing committee to audit the accounts of the Club at the close of a term or at any time necessary to do so.

Sec. 6. The Finance Committee will have general supervision over the finances of the Club, and perform such duties as may be assigned them by the President or First and Second Vice Presidents.

Sec. 7. The Membership Committee will perform such duties as may be assigned them by the President or First and Second Vice Presidents, and such other duties as may be proper for such a committee.

Article VI.

ELECTION OF OFFICERS.

Sec. 1. The officers shall be elected at the regular annual meeting as follows, except as otherwise provided for:

Sec. 2. Written forms will be mailed to all the members of the Club, not less than twenty days previous to the annual meeting, by the three elective members of the Executive Committee. These forms shall provide a method, so that each member may express his choice for the several offices to be filled.

Sec. 3. The three elective members of the Executive Committee will present to the President the names of the members receiving the highest number of votes for each office, together with the number of votes received.

Sec. 4. The President will announce the result of the ballot and declare the election.

Sec. 5. Should two or more members receive the same number of votes, it shall be decided by a vote of the members present, by ballot.

Article VII.

AMENDMENTS.

Amendments may be made to this Constitution by written request of ten members, presented at a regular meeting and decided by a two-thirds vote of the members present at the next regular meeting.

BY-LAWS.

Article I.

MEETINGS.

Section 1. The regular meetings of the Club shall be held at Pittsburgh, Pa., on the fourth Friday of each month, except June, July and August, at 8:00 o'clock P. M.

Sec. 2. The annual meeting shall be held on the fourth Friday of October each year.

Sec. 3. The President may, at such times as he deems expedient, or upon request of a quorum, call special meetings.

Article II.

QUORUM.

At any regular or special meeting nine members shall constitute a quorum.

Article III.

DUES

Sec. 1. The dues of members shall be $2.00 per annum, $1.00 of same to apply to subscription for Club Journal, payable in advance, on or before the fourth Friday of September each year.

Sec. 2. Each member will be assessed $1.00 extra annually to provide light refreshments for each meeting.

Sec. 3. At the annual meeting members whose dues are unpaid shall be dropped from the roll after due notice mailed them at least thirty days previous.

Sec. 4. Members suspended for non-payment of dues shall not be reinstated until all arrearages have been paid.

Article IV.

ORDER OF BUSINESS.

1—Roll call.

2—Reading of the minutes.

3—Announcements of new members.
4—Reports of Committees.
5—Communications, notices, etc.
6—Unfinished business.
7—New business.
8—Recess.
9—Discussion of subjects presented at previous meeting.
10—Appointment of committees.
11—Election of officers.
12—Announcements.
13—Financial reports or statements.
14—Adjournment.

Article V.

SUBJECTS—PUBLICATIONS.

Sec. 1. The Executive Committee will provide the papers or matter for discussion at each regular meeting.

Sec. 2. The proceedings or such portion as the Executive Committee may approve shall be published (standard size, 6x9 inches), and mailed to the members of the Club or other similar clubs with which exchange is made.

Article VI.

The stenographic report of the meetings will be confined to resolutions, motions and discussions of papers unless otherwise directed by the presiding officer.

Article VII.

AMENDMENTS.

These By-Laws may be amended by written request of ten members, presented at a regular meeting, and a two-thirds vote of the members present at the next meeting.

MEMBERS.

Ackenheil, J. D.,
1506 Arrott Building,
Pittsburgh, Pa.

Alexander, J. R.,
Gen'l R. F. of E.,
Pennsylvania R. R. Co.,
Altoona, Pa.

Alleman, C. W.,
Clerk, M. P. Dept.,
P. & L. E. R. R. Co.,
Pittsburgh, Pa.

Allen, Harry L.,
Manager,
American Steel Foundries,
Alliance, Ohio.

Allen, Harvey A.,
care Pressed Steel Car Co.,
McKees Rocks, Pa.

Allen, Jas. P.,
Secretary,
Union Steel Castings Co.,
61st St. and A. V. Ry.,
Pittsburgh, Pa.

Allison, John,
Chief Engineer,
Pittsburgh Equipment Co.,
Glassport, Pa.

Altman, C. M.,
Asst. Foreman Car Insp.,
P. R. R. Co.,
R. F. D. No. 2,
Jeannette, Pa.

Amsbary, D. H.,
Manager, Dearborn Drug
& Chemical Co.,
House Building,
Pittsburgh, Pa.

Anderson, H. H.,
General Superintendent,
Schoen Steel Wheel Co.,
P. O. Box 1212,
Pittsburgh, Pa.

Anderson, H. T.,
Chief Draftsman,
Standard Steel Car Co.,
Frick Building,
Pittsburgh, Pa.

Anderson, J. B.,
C. C. to S. M. P., P. R. R. Co.,
Union Station,
Pittsburgh, Pa.

Armstrong, R. S.,
Mgr., West Disinfecting Co.,
16th St. and Penn Ave.,
Pittsburgh, Pa.

Arensburg, F. L.,
Rep., Vulcan Crucible
Steel Company,
Oakmont, Pa.

Atherton, Henry N.,
Yard Master, D. & H. Co.,
2004 Boulevard Ave.,
Scranton, Pa.

Atterbury, W. W.,
General Manager,
Pennsylvania R. R. Co.,
Philadelphia, Pa.

Atwood, J. A.,
Chief Engineer,
P. & L. E. R. R. Co.,
General Office,
Pittsburgh, Pa.

Ayers, H. B.,
Gen. Mgr., H. K. Porter Co.,
49th St. and A. V. Ry.,
Pittsburgh, Pa.

Bailey, Robert J.,
Car Accountant,
Monongahela River Cons.
Coal and Coke Co.,
8 Market St.,
Pittsburgh, Pa.

Baird, F. C.,
G. F. A., B. & L. E. R. R.,
Frick Building,
Pittsburgh, Pa.

Baker, Edwin H.,
Rep., Galena Signal Oil Co.,
26 Broadway,
New York, N. Y.

Baker, J. H.,
Clerk, M. P. Dep't.,
P. R. R. Co., Union Station,
Pittsburgh, Pa.

Baker, Jas. H.,
Forging Engineer,
316 Fourth Ave.,
Pittsburgh, Pa.

Baldwin, Stephen Y.,
Com. Frt. Agent,
D. & H. Co., Bessemer Bldg.,
Pittsburgh, Pa.

Ball, Geo. L.,
Sec'y and Treas.,
Ball Chemical Co.,
153 East Ohio St.,
Millvale, Pa.

Barnsley, Geo. T.,
County Road Engineer,
Pittsburgh, Pa.

Barth, John W.,
Rep., Sterling Steel
Foundry Co.,
Lemington Ave.,
12th Ward,
Pittsburgh, Pa.

Bartley, Milton,
President, American Nut &
Bolt Fastener Co.,
P. O. Box 996,
Pittsburgh, Pa.

Barwis, J. Mc.,
Fore. Insp'r., P. R. R. Co.,
Union Station,
Pittsburgh, Pa.

Basford, G. M.,
Ass't to President,
American Loco. Co.,
30 Church St.,
New York, N. Y.

Bateman, Paul,
Car Estimator,
Pressed Steel Car Co.,
57 Bryant Ave.,
Bellevue, Pa.

Bealor, B. G.,
Vice Pres. and General
Manager,
Althom Sand Co.,
421 Wood St.,
Pittsburgh, Pa.

Beatty, E. G.,
Rep., Galena Signal Oil Co.,
Franklin, Pa.

Bellows, A. B.,
Manager, Pittsburgh
Testing Laboratory,
325 Water St.,
Pittsburgh, Pa.

Belsterling, C. S.,
Traffic Manager,
American Bridge Co.,
Frick Building,
Pittsburgh, Pa.

Benner, Jacob W.,
C. E., Steam Power,
Carnegie Steel Co.,
Munhall, Pa.

Benner, Samuel A.,
Gen'l. Mgr. Sales,
Carnegie Steel Co.,
Carnegie Bldg.,
Pittsburgh, Pa.

Bennett, R. G.,
Inspector, M. P. Dept.,
P. R. R. Co.,
32nd and Carson Sts.,
Pittsburgh, Pa.

Berg, Karl,
Draftsman, Motive Power
Dept., P. & L. E. R. R.R,
General Office,
Pittsburgh, Pa.

Bigelow, Harry T.,
Rep., Hale & Kilburn
Mfg. Co.,
Fisher Building,
Chicago, Ill.

Bigham, Chas. G.,
Pass. Cond'r.,
P. C. C. & St. L. Ry.,
Room 107 Union Station,
Pittsburgh, Pa.

Bihler, L. C.,
Traffic Manager,
Carnegie Steel Co.,
Carnegie Bldg.,
Pittsburgh, Pa.

Bishop, J. B.,
Resident Inspector,
B. & O. R. R. Co.,
Water Street,
Pittsburgh, Pa.

Bixler, H. C.,
Ass't. Train Master,
P. R. R. Co., 15th St.,
Pittsburgh, Pa.

Blackall, Robt. H.,
1302 Farmers Bank Bldg.,
Pittsburgh, Pa.

Blest, M. C.,
Chief Draftsman,
Pressed Steel Car Co.,
17 Woodlawn Ave.,
Bellevue, Pa.

Bole, Robt. A.,
Manager, Manning, Maxwell
& Moore,
Park Building,
Pittsburgh, Pa.

Bolenius, H. C.,
Supervisor, Allegheny
Valley Railway,
Verona, Pa.

Booth, Arthur,
Asst. to Pur. Agent,
Philadelphia Co.,
435 Sixth Ave.,
Pittsburgh, Pa.

Booth, J. K.,
Genl. Fore., B. & L. E. R. R.,
Greenville, Pa.

Booth, Jas.,
Rep., Midvale Steel Co.,
Frick Building,
Pittsburgh, Pa.

Bostwick, W. A.,
Metallurgical Engineer,
Carnegie Steel Co.,
Pittsburgh, Pa.

Bowers, K. J.,
Mgr. of Sales, Acme White
Lead & Color Co.,
Detroit, Mich.

Boyd, Henry W.,
Rep. W. Va. Fire Clay
Mfg. Co.,
1700 Buena Vista St.,
N. S., Pittsburgh, Pa.

Brady, Daniel M.,
President, Brady Brass Co.,
95 Liberty Street,
New York, N. Y.

Brand, Thos.,
Train Master,
Montour R. R. Co.,
Coraopolis, Pa.

Branson, Craig R.,
M. P. Inspector,
Pennsylvania Co.,
302 West Berry St.,
Fort Wayne, Ind.

Brewster, Morris B.,
Rep., U. S. Metallic Packing
Co., 429 N 13th St.,
Philadelphia, Pa.

Brown, Arthur A.,
Rep., Westinghouse,
Church, Kerr & Co.,
Union Bank Building,
Pittsburgh, Pa.

Brown, A. D.,
C. C. to Genl. Manager,
P. & L. E. R. R. Co.,
General Office,
Pittsburgh, Pa.

Brown, E. W.,
care H. W. Johns-
Manville Co.,
951 Liberty Ave.,
Pittsburgh, Pa.

Brown, J. Alexander,
Vice Prest. & Gen. Mgr.,
Pocket List of R. R. Officials,
24 Park Place,
New York, N. Y.

Brown, John T.,
Vice Pres. and Genl. Manager,
Damascus Bronze Co.,
Allegheny, Pa.

Brown, John T., Jr.,
Supt. Duquesne Reduction Co.,
Farmers Bank Building,
Pittsburgh, Pa.

Brownscombe, G. J.,
Clerk, Union R. R. Co.,
209 Lobinger Ave.,
Braddock, Pa.

Brunker, A. R.,
General Sales Agent,
American Steel Foundries,
Chester, Pa.

Buchanan, E. G.,
Rep., Carbon Steel Co.,
30 Church St.,
New York, N. Y.

Bucher, C. A.,
Rep. Celfor Tool Co.,
414 Leopard St.,
Dunkirk, N. Y.

Buckley, J. T.,
Rep., Jenkins Bros.,
P. O. Box 1493,
Pittsburgh, Pa.

Buffington, W. P.,
C. C. to Supt. Trans.,
Pittsburgh Coal Co.,
Hussey Building,
Pittsburgh, Pa.

Burgher, R.,
Pres't., Kidd Bros. & Burgher
Steel Wire Co.,
Aliquippa, Pa.

Burkhard, A. A.,
Ass't. General Foreman,
N. Y. C. & H. R. R. Co.,
W. Albany, N. Y.

Burns, Robert C.,
Fore. Car Inspectors,
P. R. R. Co.,
718 Howard Ave.,
Altoona, Pa.

Burrell, J. E.,
Chief Pass. Clerk,
P. R. R. Co.,
Union Station,
Pittsburgh, Pa.

Burry, V. J.,
Draftsman, M. P. Dept.,
P. & L. E. R. R. Co.,
Pittsburgh, Pa.

Butts, G. W.,
Insp'r., P. R. R. Co.,
1402 Eighth Ave.,
Altoona, Pa.

Caldwell, J. L.,
Engineer,
P. & L. E. R. R. Co.,
406 Grove St.,
McKees Rocks, Pa.

Campbell, I. K.,
care County Commissioners' Office,
Pittsburgh, Pa.

Campbell, W. S.,
General Agent,
Wisconsin Central Ry.,
Park Building,
Pittsburgh, Pa.

Cardwell, J. R.,
Pres., Union Draft Gear Co.,
Monadnock Block,
Chicago, Ill.

Cargo, B. B.,
Master Mechanic,
Lake Terminal R. R.,
Lorain, Ohio.

Carson, G. E.,
Div. Master Car Builder,
N. Y. C. & H. R. R. R. Co.,
W. Albany, N. Y.

Carson, Robert, Jr.,
23 Terminal Way,
S. S., Pittsburgh, Pa.

Cassidy, D. E.,
Asst. M. M.,
P. R. R. Company,
1716 Middle St.,
Sharpsburg, Pa.

Chapin, E. S.,
Motive Power Inspector,
P. R. R. Co.,
1016 Lexington Ave.,
Altoona, Pa.

Charles, J. G.,
Yard Master,
Monon. Con. R. R.,
4734 Kansas St.,
Hazelwood, Pa.

Chislett, Wm. B.,
Pass. Condr., P. R. R. Co.,
Union Station,
Pittsburgh, Pa.

Chittenden, A. D.,
C. C. to Genl. Manager,
B. & L. E. R. R.,
Carnegie Bldg.,
Pittsburgh, Pa.

Christiansen, A.,
Chief Engineer,
Standard Steel Car Co.,
Butler, Pa.

Clancy, J. R.,
249 North Salina St.,
Syracuse, N. Y.

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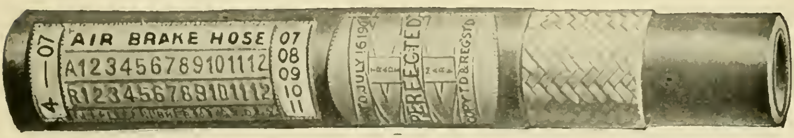

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