



FRIDAY, MARCH 13, 1903.

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The office of the Railroad Gazette is now at 83 FULTON STREET, at the corner of Gold Street, east of Broadway.

Contributions

The Big Bend Tunnel.

Roanoke, Va., March 3, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

We note in your issue of February 20 a description of the ventilating plant completed at Big Bend Tunnel, on the Chesapeake & Ohio Railway, and that no reference is made therein to the contractors, Messrs. B. F. Sturtevant Company, who installed the plant, or to their representative, Mr. H. S. Grisby, of Atlanta, Ga. As these gentlemen rendered efficient aid in elaborating the plans for this work, as well as conducted its installation, will you not kindly publish this letter so that they may receive due credit?

CHAS. S. CHURCHILL,  
C. C. WENTWORTH.

Trouble in Shrinking Driving Wheel Tires.

Central of Georgia Railway Company,  
Savannah, Ga., Feb. 27, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

We recently changed tires on a few consolidation engines having 21 in. x 32 in. cylinders, and weighing 196,000 lbs. Previous to the change the engines were in service about a year, riding easy and comfortable, and in every way satisfactory. After changing tires they were rough, uncomfortable, and quite unsatisfactory in their performance. Examination showed no cause, so it was decided to test the wheels, and they were found to be out of round. This can only be accounted for by the shrinkage having more effect on the open half of the wheel; the opposite half being almost solid with the counterbalance.

After placing the wheels in the lathe and turning them true, the engines worked as formerly, riding easy and comfortable. This is the first case where we have discovered this effect in changing tires without turning them after being shrunk upon the centers. I mention this in the hope that I may be enlightened by those who may have had similar experience and possibly have found a remedy other than turning the tires on the centers in all cases after re-tiring. It has proved to be a very convenient and speedy method to turn the tires independently, replacing the worn ones while the wheels remain under the locomotives. Previous to the above experience we had only cast-iron centers, while the difficulty we have discovered was with cast-steel centers.

THEO. D. KLINE.

It will may be that some differences of opinion may be found among motive power officers as to the cause of Mr. Kline's trouble, but our own notion is that the trouble was most likely caused by the eccentricity of the tire.

That is to say, every point in the circumference of the tread is not equi-distant from the fit on the wheel center. It is general practice on many roads to turn both the inside and outside of every new tire, otherwise it is almost impossible to prevent eccentricity. We do not know the character of the machine on which the boring in this case was done, but we might suggest that a possible cause of error may be due to the non-rigidity of the lathe.—EDITOR.]

The Comparative Wear of Heavy and of Light Rails.

Sparrow's Point, Md., Feb. 20, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In an editorial of Jan. 30, 1903, "Concerning the Rail Situation," you state as a "matter of general knowledge," that the railroads "do not get service enough to compensate for the money paid for the additional weight," in the heavy sections. While this is true in some instances I believe that a sweeping statement of this kind, from such a source, does the heavier rails an injustice in a great many cases, to one of which I wish to call your attention in this short article.

If service were all that is to be gained, by heavier rails, then this complaint of the railroads is well grounded, but very often they lose sight of the fact that the extra metal of the heavier sections does not, in a great many cases, to one of which I wish to call your attention in this short article, and hence increased weight does not

responding increase of metal in the head, there has been very little just cause of complaint.

While it is not my desire to discuss rail sections, it is entirely in the scope of this article to point out the influence that the shape of these two heads had on their wear. The 68-lb. rail having a deeper head, and larger radius of the upper fillet offered more resistance to wear. This is more readily seen when we appreciate how a rail wears on curves, and it is on these that we have all our complaints, it being the exception to hear any complaints against rails on tangents. On curves the rail wears to such an extent that they take the radius of the fillet on the flange of the wheel, and hence it would seem that 1/2 in. radius would mean less wear, to the side of the rail, than the 3/4 in. radius of the 80-lb. rail.

From the above, I think, I am justified in saying that a great deal of the disappointment felt, by some, in the heavy section, is very often due to the lack of appreciation of the simple fact that putting down heavier rails, or in this case 80-lb. rails, could not mean any more wear, but only meant that the 80-lb. rail was more of a girder, thus increasing the strength of the rail, and making a better roadbed.

In my inspection of rails that have been complained of as not wearing well, I have invariably found them on curves running from 4 deg. to 15 deg., and where the tonnages have been the same I have found that the greater wear is always on the sharper curve. This is very clearly brought out by the accompanying diagrams, of rails now in track, all of which were taken by a "rail indicator." In Fig. 2, diagrams 1 to 6, inclusive, were taken on rails from the same mill, the others coming from different mills.

SIMON S. MARTIN.

Electric Interlocking at the Lake Shore-Rock Island Terminal.

[WITH AN INSET.]

The Taylor Signal Co., Buffalo, N. Y., has taken the contract for making and installing the switches and signals at the new and enlarged passenger terminal of the Lake Shore & Michigan Southern and the Chicago, Rock Island & Pacific Railroads, at Chicago. The apparatus is to be the Taylor "all-electric" and a diagram of the yard is shown on an inset accompanying this issue. It will be seen that the number of functions is large. The most distant switch is over 2,000 ft. from the cabin, and there are slip switches more than 800 ft. away.

The total number of functions provided for in the machine is 169; there are 192 spaces and 133 levers. Ten of these levers are for high signals, 75 for dwarf signals, 46 for switches and two for two scotch blocks. The signals inside the train shed are supported from the roof, but each stands on its own base. There is a footway leading to all these shed signals. The caution signals governing inward movements, at the outer end of the train shed, are operated by track circuits flowing through the rails within the shed.

The contract shows that the motors at the switches and signals are worked by currents from Willard storage bat-

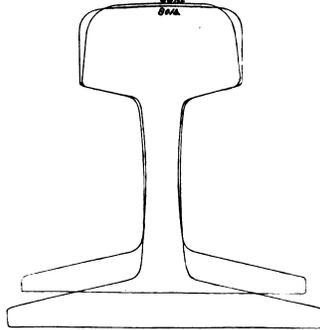


Fig. 1—Sections of 68lb. and 80lb. Rail.

Table No. 1.—Comparison of 68-lb. and 80-lb. Rails.

	Head.	Web.	Flange.
68-lb.	3.20	1.261	2.229
80-lb.	3.30	1.615	2.910

	Head.	Web.	Flange.	Radius of upper fillet.
68-lb.	1 33/64	2 3/16	49/64	3/4
80-lb.	1 1/2	2 1/8	1/2	5/16

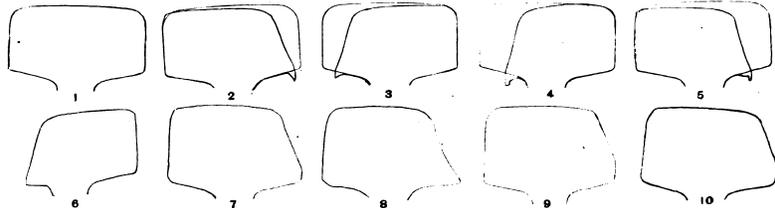


Fig. 2—Sections of Worn Rails.

TABLE NO. 2.—WEAR OF RAILS.

No.	Reduction of area in head.	Loss in pounds. Per yd.	Weight of rail. Lbs.	Loss. Per cent.	Approximate tonnage.	Loss per yd. per 10,000,000 tons.	Alignment of track.	Time in track.
1.	0.015	0.153	80	0.19	16,000,000	0.102	Tangent	28 months
2.	0.499	5.000	80	6.25	19,821,400	2.722	4 deg. curve	37 "
3.	0.610	6.220	80	7.78	19,821,400	3.139	5 1/2 deg. curve	37 "
4.	0.850	8.680	80	10.83	19,821,400	4.374	6 deg. curve	37 "
5.	0.900	9.170	80	11.47	19,821,400	4.631	6 1/2 deg. curve	37 "
6.	0.890	9.070	80	11.34	15,535,700	5.843	7 1/2 deg. curve	29 "
7.	0.470	4.790	85	5.84	Not known	...	15 deg. curve	7 "
8.	0.600	6.110	85	7.19	Not known	...	15 deg. curve	7 "
9.	0.410	4.180	85	4.92	Not known	...	15 deg. curve	7 "
10.	0.410	4.180	85	4.92	Not known	...	15 deg. curve	7 "

necessarily mean increased life of rail. This was very forcibly brought to my attention, a short time ago, by the complaint of a railroad that their heavy rails were not giving them any better service than their old light rails. I had the pleasure of personally investigating this complaint, which was in this case based on the claim that they were not getting any more service from their 80-lb. rails than their 68-lb. rails.

Fig. 1 and its accompanying table tell very forcibly why the 68-lb. rail wore as well as the 80-lb. rail.

On referring to the table we find that while the 80-lb. rail has 12 lbs. more of metal in it per yard, the head has only a little over one pound more of metal in it than the lighter rail. Knowing this, could the railroad reasonably expect increased wear? This is no exceptional case, being a matter of common experience in a majority of the complaints against the so-called heavy sections, and when increased weight has meant a cor-

teries, there being 55 cells of 100 ampere hours each. A generator of 3 k.w. capacity, situated in the power house of the Lake Shore road, beneath the tracks, at Harrison street, supplies the current to charge the storage battery. Both generator and batteries are provided in duplicate, so that all functions can be performed by either set alone. All of the semaphores are lit by electric lights of 4 c.p. each, arranged in multiple. On the signals the lamps are enclosed in Adams & Westlake round-body steel semaphore lamps. The circuits for lighting the semaphores are divided into three sections, each serving a defined part of the yard. The light circuit is independent of the switch and signal circuit. Track circuits are provided for the protection of all switches and derailling switches south of Stowell street. Track relays are provided with a screw hand-release, like that used on the Chicago, Milwaukee & St. Paul for electric locking. The track relays have large, blunt carbon points opening 1/2 in. Gravity batteries are

used for track circuits. The rails through which circuits are run are bonded with two wires, and at the ends of circuits 24-in. Weber insulated joints are used. The battery chutes are of iron, 7 ft. deep and 10 in. inside diameter. The signal posts are of iron tubes and, with the fittings, conform to the Lake Shore road's standard. The semaphores are designed for a movement of 60 deg., with "continuous light" spectacles with three openings. The semaphore blades will be of iron, No. 18 gage, with enamel colors.

The cabin is 15 ft. x 40 ft. and three stories high. The first story is 8 ft. between joints and the second is 6 ft. 6 in. On this floor the batteries are kept. The third floor, the operator's room, is 9 ft. high and has no ceiling, the sheathing being placed on the rafters. The building is of brick to the top of the second story and above this is covered with corrugated galvanized iron. The floor of the first story is of cement and that of the third has steel beams to support the machine.

#### Improvements on the Pennsylvania Railroad.

BY S. WHINERY, C.E.

Among American railroads the Pennsylvania has always occupied, in the public mind, a front rank in the matter of superior construction, broad policy, and able management. For a whole generation it has furnished the model and set the pace for American railroad practice. Its policy during all that time constantly and consistently has been to spend money freely to increase the earning power of its properties and to improve its service to the public. The results have fully justified the faith and far-seeing sagacity of its management, and confirmed the wisdom of the policy. It is not surprising, therefore, to find that at no period in the history of the company have improvements been projected and vigorously carried out upon a scale so vast and bold as at present. So quietly and so rapidly have these great projects been planned and entered upon that the busy railroad man has hardly been able to keep pace with them, or to realize their magnitude and importance as a whole.

The development and growth of the railroad transportation business in this country has been so rapid and so stupendous that even the Pennsylvania Railroad, noted as it is for far-sighted provision for the future, has been scarcely able to keep abreast of the rising tide.

Along with the great growth of the passenger business has arisen a demand for speed and comfort which the company has made every effort to meet, and the extensive rectification of the alignment, which will be partially described, has had, as one of its objects, the meeting in the most liberal manner of this demand.

It is, however, the phenomenal development of the freight business in the last few years that has presented the most difficult and perplexing problems for the management, and it is for the solution of these problems principally, that many of the present improvements and extensions are being pushed to completion with the utmost vigor. One of the most troublesome incidents of the present freight situation is the congestion of tracks and yards in the large cities through which the main lines of the Pennsylvania pass. In these cities the yard and track capacity, notwithstanding the liberal scale on which it had been provided, has been found inadequate, and the conditions are such that it is found almost impossible to secure room within the cities for such extensive enlargements as the business now demands, and attention is being given to plans for carrying through freights around rather than through some of these cities. This is notably the case at Pittsburgh, Harrisburg and Philadelphia, as will be described later. The problems relating to the handling of both freight and passenger business in the great cities of Philadelphia and New York are being worked out with a degree of thoroughness and completeness, and upon a scale unheard of heretofore in the railroad world.

It is proposed in this article to outline briefly some of the more important of the improvements in progress, as well as those made within the last few years and those projected and intended to be carried out in the near future, the general plans for which are now practically completed. In doing this, it will be convenient to begin at Pittsburgh and proceed eastward, along the main line, to New York.

The improvements in the city of Pittsburgh, completed about a year since, have been fairly well described in the railroad periodicals, and need not be dwelt upon in detail here. A magnificent modern Union Station has been erected, and the great yard just east of this station, as well as the main line through the city, has been completely remodeled and rebuilt, including the elevation of the tracks, so as to avoid many street grade crossings.

Some idea of the extent and value of these improvements may be formed from the following data: The new Union Station with its train sheds has cost \$2,185,526. A new power house was erected at a cost of over \$250,000; there was expended in remodeling and raising the grade of the yard in the vicinity of the new station the sum of \$832,035, and for the interlocking system in this yard, \$95,139. The total expenditures for improvements in Allegheny County (most of which was expended in the city of Pittsburgh) during the five years ending with December 31, 1901, was over \$4,600,000.

In addition to these improvements, already completed, it is planned to build a very commodious freight station at the extreme western point of the city of Pittsburgh, on the site of the historic Fort Duquesne, for the better and

more prompt handling of Pittsburgh local freights. This portion of the city is now reached by surface tracks down Liberty street which it is proposed to abandon. A new double track elevated road will be built down Duquesne Way along the south bank of the Allegheny river, from the main line near where it crosses the river to the new freight station at Duquesne Point, referred to above. The elevated structure will be over one mile long. This improvement is estimated to cost about two million dollars. When completed it will not only be of great benefit to the shipping interests of the city, but will largely relieve the present troublesome congestion of the local freight business in Pittsburgh.

From Pittsburgh the Pennsylvania lines spread out fan-like to the west, the northwest, and the north, with the result that all the business of these lines between the east and the west is concentrated into a great vortex at Pittsburgh. These conditions early produced a state of congestion at that point which it was absolutely necessary to relieve. The remedy decided upon was to carry through freights around Pittsburgh rather than through the city. In pursuance of this plan a connection was some time since completed around the south side of the city by way of the bridge over the Ohio river at Brunot's Island, and of the Pittsburgh, Virginia & Charleston Railroad up the Monongahela Valley, and to the main line at East Liberty. This, while offering great relief, has not proved adequate to the demands of the situation.

It is therefore proposed to provide another connection around the city over which through freights may be carried without passing through the greatly congested yards

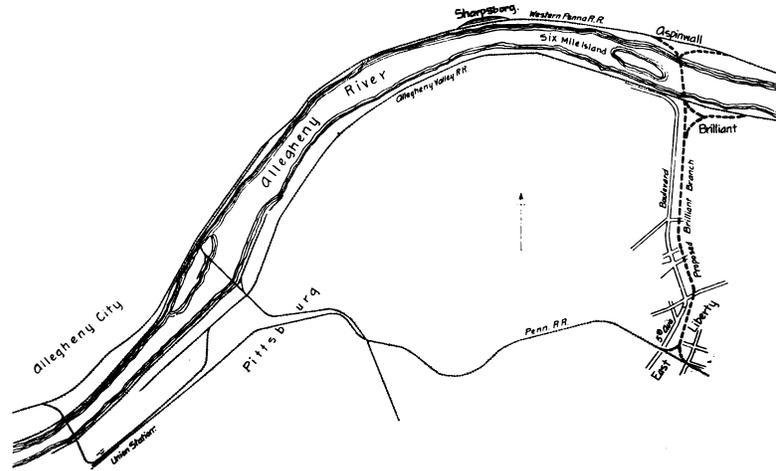
or are in progress on the main line between Pittsburgh and Philadelphia, the following may be noted:

The rapid growth of the residence and manufacturing suburbs east of Pittsburgh has created a large number of street crossings at grade, and it is intended to get rid of these as rapidly as possible. The work of eliminating these grade crossings through Wilkings and through Swissvale will be proceeded with at once. The magnitude of the work is indicated by the estimated cost, which is \$576,000.

At Irwin, twenty-two miles east of Pittsburgh, a change of alignment has been made nearly two miles in length by which the distance is shortened 1,000 ft. A uniform thirty-three-minute curve for the whole distance is substituted for three curves, one of six degrees, one of four degrees, and the other of five degrees. At the same time the gradients were materially reduced and the track elevated to avoid grade crossings of streets. The grading for the new line was heavy and expensive, and the new right of way costly.

Beginning at Radebaugh, 29 miles east of Pittsburgh, a new low-grade freight line will be built to Millwood on the main line, 46 miles east of Pittsburgh, for the purpose of securing lighter grades and obviating the use of helping engines over this stretch. The new line will be about one and one-half miles longer than the present line, which will continue to be used for passenger service. The new line has been located, and construction will be begun this spring, and it is hoped to complete it within one year. The estimated cost of this new line will be about seven million dollars.

Just west of Latrobe, 40 miles east of Pittsburgh, an-



The "Brilliant" Connection Around Pittsburgh.

in the heart of the city. Contracts have been let for the construction of a new line from East Liberty northward to and crossing the Allegheny river, connecting with the Allegheny Valley road at Brilliant on the south side, and with the Western Pennsylvania Railroad at Aspenwall on the north side of the river.

The distance from East Liberty to the river is something more than two miles, but the new line with its various connections will require more than four miles of new construction. It will be four tracked throughout.

The Allegheny river will be crossed by a steel bridge about 1,200 feet long having one channel span of 500 ft. and two spans of 200 ft., the balance being plate girder construction. The clear space under the bridge at high water will be about 60 ft. The total cost of this improvement will be about two million dollars. Fig. 1 shows this improvement in outline.

In connection with this new line it is proposed to build and equip a very extensive freight station and yard at Sharsburg, which is estimated to cost, exclusive of real estate, at least one million dollars. Extensive yards will also be built at the connection of this new line with the Allegheny Valley road, and a new yard built at East Liberty for the further accommodation of Pittsburgh local freight.

With these improvements completed a large part of the through freight will be moved from Allegheny City along the north bank of the river to Sharsburg, where necessary reclassification will be made in the Sharsburg yard, and it will then be forwarded to Aspenwall, and over the new connecting road to the main line at East Liberty.

With the completion of this Brilliant connection the Pennsylvania Railroad will have a complete belt line around the city of Pittsburgh. It may be noted here in connection with this Brilliant extension that the Western Pennsylvania Railroad from Pittsburgh to its junction with the main line at Bollier, 58½ miles east of Pittsburgh, is to be improved by reducing its eastbound grades to 15.8 ft. per mile and the double track extended over the whole distance. This will provide an alternative low-grade freight line from Pittsburgh eastward.

Without undertaking to notice all the numerous changes in alignment and grade that have been made

other change of location was made for a distance of two miles by which six curves varying from 5 deg. to 50 min. were thrown out and a long compound curve substituted, which, in its sharpest stretch, does not exceed a 54 min. curve. At the same time the distance was shortened one thousand feet and the gradients decreased. Following this change, the line was elevated sixteen feet through Latrobe, thus avoiding crossing six streets at grade. This changed line will become a part of the New Endeavour-Millwood line, just described, though, being already completed, its cost is not included in the estimated cost of that line.

Just east of Millwood occurs a stretch of eight miles of road, passing through "Pack Saddle Gap," which, because of topographical and other difficulties, continues to have two tracks only. It is now intended to at once four-track this section and at the same time improve the alignment, at a cost of about \$300,000.

Perhaps the most important and expensive changes of alignment that have been undertaken occur on the western slope of the Allegheny Mountain between Johnstown and Cresson. The whole character of the location has here been so changed as to make it practically a new line throughout.

Between Summer Hill and Wilmore a new line has been located and constructed for a distance of about two and one-half miles, with a saving in distance over the old line of 1,800 ft. The old line, following closely the course of the Little Conemaugh river, was a succession of curves varying from 1½ to 5½ deg., while the new line has no curve exceeding one-half deg.

The elevations at the beginning and end of this change being fixed by the old line the gradient was slightly increased, but this was more than compensated by the great reduction in curvature.

The grading work on this new line was very heavy and expensive. One and a half million cubic yards of excavation and 29,000 cu. yds. of Arch Bridge masonry were required, and the cost of the whole improvement was about one million dollars. One remarkable feature of the work is an open cut of considerable length one hundred and sixty feet deep. This improvement was completed and put in service in October, 1902.

About three miles eastward from the end of the change