RAILROAD GAZETTE

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Contributions.

The Utility of the Drop Pit in Car Yards.

FEBRUARY 21, 1895.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Recently I have noticed in railroad papers illustrations of transfer pits for removing wheels from under railroad cars, without withdrawing the truck from under the car.

In the February 27, 1880, number of the *Railroad Gazette* will be seen an illustration, very plain and clear, of a wheelpit, several of which were in use on the Lake Shore & Michigan Southern prior to 1875. That kind of a pit proved itself so useful that it was considered right that others should have an opportunity of trying it, hence the illustration referred to. Take, for instance, a loaded freight car having under it Wood trucks or the Fox pressed steel trucks with long pedestals and the kingbolt covered with the load, to remove which would be laborious; the same is true of the inside pair of wheels in the diamond truck, the body truss rods being in the way of getting the old wheels out and the new ones in. By the use of the pit the old wheels are dropped down and the new ones brought in and put in the place of the old ones with very little labor.

One of these pits is in use at exchange street passenger station, Buffalo, N. Y. Mr. James How, foreman of passenger car work at that station, with his men, have removed a pair of center wheels from under a sleeping car, replaced the old with new wheels, and had the car ready to be put in the train in seven minutes from the time the car was put upon the pit.

On one occasion Jay Gould came into the New York Central station, Exchange street, with his private car from New York. One of the journals had been running hot; the inspectors discovered the journal to be rough. The L. S. & M. S. Ry. Co.'s train had been held past time to leave. Mr. Gould was on his way to St. Louis to be present the next day at a meeting of the directors of the Missouri Pacific. The car was put upon the pit, new wheels put under, and from the time the switching engine hitched on to the car until it had replaced it in the train only 14 minutes elapsed. The reader can judge for himself how much time was occupied in doing the work of removing and replacing wheels. It is strange that such a useful and simple device is not in use in every yard where wheels are changed. The use of compressed air is an improvement on the double screw telescope jack.

Some useful devices I find illustrated in the old files of the *Railroad Gazette*.

Freight Rates and the Law of Diminishing Returns.

STANFORD UNIVERSITY, Jan. 28, 1895.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The farmer is invariably the most clamorous for low railroad rates. He cannot be blamed for being importunate in this matter. To him the railroad is impersonal, conscienceless and arbitrary. The market fixes the prices, to a certain degree, which can be obtained for his produce. The cost of production is inelastic in many ways, and the only item in the cost at which his produce can be placed upon the market which is in any way elastic, or which seems capable of change, is the cost of transportation. No wonder, then, that the farmer, looking at the question in a superficial way, should demand a reduction in transportation price when competition seems about to ruin him.

The farmer fails to see that his business is inelastic, and that there is a definite limit beyond which low rates will no longer induce increased volume. This is not true of most other industries. So long as transportation prices remain a factor in the market price of a commodity not affected by the law of diminishing returns, so long will reduced rates cause that commodity to be offered for transportation in increased volume. The productivity of an agricultural region is limited; its profitable working is influenced by the fact that there is a point at which the farm will not yield returns equal to the expenditure of labor and capital upon it. No reduction of rates can affect this; all that reduced rates can do for an agricultural community, which can already reach a competing market and which is producing its maximum yield, is to bring new regions under cultivation, owing to the greater area which the diminished price of transportation makes tributary to a market, and so bring a greater total yield to the market, which will probably result in a diminution of market price.

ROBERT DONALD.

A Formula for the Maximum Train Load.

Pennsylvania Company,
WELLSVILLE, O., Feb. 13, 1895.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I beg to submit the following method for loading trains to the maximum capacity of a locomotive.

The problem is, how to load a train so that it can just be pulled at the required speed on the maximum grade or at the place of greatest resistance. For the practical solution of the problem it is unimportant to analyze the resistance of a train into its elements. It is clear that the total resistance varies neither directly as the number of cars, nor directly as the tonnage. It is equally clear that it is affected by both. That is, a certain part of the resistance of a car varies directly as the weight and the rest is constant whether the car is empty or loaded. This rationally accounts for the fact that the resistance of a loaded car is found to be less per ton than that of an empty car.

If, then, the relation between that part of the resistance which varies as the tonnage, and that which varies as the number of cars is determined, a correct basis for loading trains can be established. To determine this relation take two trains, one loaded and the other empty, both offering the maximum resistance. The tonnage and number of cars of each of these trains, if not already known, must be determined by trial.

Algebraically the problem may be solved as follows:

Let W = the weight of the loaded train, exclusive of engine, tender and caboose.
" W_1 = the weight of the empty train, exclusive of engine, tender and caboose.
" N = the number of cars in the loaded train.
" N_1 = " " " " " " empty "
" K = the resistance per ton, independent of the resistance per car.
" C = the resistance offered by each car independent of the weight.

The resistance of the loaded train then is $K W + N C$.
" " " empty " " " $K W_1 + N_1 C$.

which both offering the maximum resistance to the engine are equal, then:

$$K W + N C = K W_1 + N_1 C,$$

and $K (W - W_1) = C (N_1 - N)$,

and $C = K \dfrac{W - W_1}{N_1 - N}$.

Let $L = \dfrac{W - W_1}{N_1 - N}$, the value of which is tons;

then $C = K L$.

Substituting in the first equation:

$$K (W + N L) = K (W_1 + N_1 L),$$

the two quantities in parentheses being equal and their value being tons, this value can be used as a basis for loading trains. In plain language, this basis is the weight of the train, plus L multiplied by the number of cars, and L is the difference of the weight, of the two trains divided by the difference of the number of cars.

This method is so easy of application that any one can understand it. For instance: On a certain division a certain class engine can haul 20 loads of iron ore, or 50 empties. The weight of a car is 13 tons, and of a car loaded with ore 43 tons, then

$$L = \frac{W - W_1}{N_1 - N} = \frac{860 - 650}{50 - 20} = 7 \text{ tons},$$

and $W + N L = 860 + (20 \times 7) = 1{,}000$ tons = basis for loading.

Instruction to yardmaster would then be as follows: "Add 7 tons for each car to its weight, including load, and give each train 1,000 tons." This basis may be varied for different kinds of weather.

Since $L = \dfrac{C}{K}$ its value will be different on different railroads, especially those having different grades, the value of K, including the resistance due to grade. It is best to determine the value of L on each division by experiment.

Most other methods have entirely neglected to consider partially loaded cars. With this method the proper share of resistance is allowed for each car, however it may be loaded, and I believe the application is simpler than that of any that has come to my notice.

L. G. HAAS.

Track Elevation in Chicago.

On the 18th inst. the City Council of Chicago passed, by a vote of 58 to 2, the ordinance providing for the elevation of the Galena Division of the Chicago & Northwestern Railway. This ordinance had been agreed upon by the representatives of the city and the railroad some two or three months ago, and had been pigeon-holed in committee since then. The only amendment to the ordinance as previously agreed upon was a provision for lighting the subways at the expense of the railroad company. The company has 30 days in which to accept or reject the ordinance, but it is believed that the ordinance will be accepted.

The conditions which have led to the adoption of this ordinance for the elevation of a small portion of one of the lines of the C. & N. W. Railway are well set forth in the report of Colonel Ellers, Consulting Engineer, on track elevation for the city, in his report to the mayor, dated Oct. 25, 1894. In this report Colonel Ellers says:

"The Chicago & Northwestern Railway Company owns and operates over 241 miles of track within the present corporate limits of the city of Chicago. It is the greatest railroad system within the city. . . . But comparatively a small proportion of the tracks forming its urban system is so situated as to be capable of elevation or depression, independently of the tracks of other railroads, which either parallel it, or that intersect and cross it at grade, or connect with it in all directions. This complicated condition finds an exception in that part of the main line or Galena Division west of California avenue, or of the Rockwell street yards, and extending to and beyond the western city limits. This portion of the system is entirely free of all complications, and hence the work of elevating its tracks and removing the crossings at grade between Sacramento avenue and West Fortieth street will be greatly simplified because the work can be prosecuted without disturbing the tracks of other railroad companies. East of Rockwell street the main line of the Northwestern is paralleled by the tracks of the Pittsburg, Cincinnati, Chicago & St. Louis, and the Chicago, Milwaukee & St. Paul railroads, the tracks of the latter company crossing at grade the tracks of the Northwestern between Diller street and Western avenue, from which point to the river but an imaginary line separates the tracks and right of way of the three companies. In view of contemplated improvements of an important character in this section of the city, it is deemed advisable, pending the same, to raise the tracks of that portion of the Galena Division of the Chicago & Northwestern Railway, situated between Sacramento avenue and West Fortieth street, a distance of 1.82 miles, which includes the length of the temporary ascending grade at the east end of the proposed work, and of the permanent descent at the western city limits. Through here are seven tracks which it is proposed to elevate from 10.5 to 11.5 feet above the surrounding streets and avenues. . . . Subways passing beneath the tracks, when the same are elevated as herein proposed, will be necessary, and will have to be constructed in Kedzie, Homan and St. Louis avenues, in Central Park Boulevard, in Hamlin avenue and West Fortieth street."

As stated in the report, the situation east of Rockwell street is complicated by the crossing of the Chicago, Milwaukee & St. Paul Railway, and the connections with and proximity of the P., C. C. & St. L. Ry., besides the branch of the Northwestern running to the Stock Yards and to its freight houses, elevators and yards between Fourteenth and Sixteenth streets, which diverges to the south near Rockwell street. East of Western avenue, half a dozen or more viaducts have been built carrying streets over the tracks of the Northwestern and other parallel roads. The construction of a few more viaducts would accommodate the street traffic fairly well in this region, so that it is doubtful if elevation of tracks will be undertaken on that portion of the line lying east of Western avenue. It has been suggested that the Western avenue viaduct be removed and the track elevation be continued a mile further east, but the details of this portion of the work have not been agreed upon, and owing to the complications previously mentioned it may be a long time before the track elevation is extended east of the limits provided in the present ordinance.

The ordinance as passed provides for the elevation of the railroad tracks 10 or 11 ft. above their present grade. Sub-ways are to be built at Kedzie, Homan, St. Louis and Hamlin avenues, Central Park Boulevard and West Fortieth street. Three of these avenues are to be 66 ft. wide between the abutments, and two of them 80 ft. wide. As the Central Park Boulevard is under the control of the West Park Commissioners, the details of the sub-way for its crossing are not laid down in the ordinance. The streets are depressed from 2¼ to 3½ ft. generally. In the case of West Fortieth street, which is crossed on the descending grade of the railroad, the depression is 6¼ ft. The clear head-room provided is generally 13 ft., but at Kedzie avenue it is made 13½ ft. to accommodate a trolley car line. It is thought that plans will be prepared immediately, so that with the opening of spring active work may commence. Between the subways the tracks are to be carried on earth embankments, and the subway floors are to be of the "solid" kind.

Two Recent Tests of Armor Plate.

The latest reported tests of armor plate furnished by the Bethlehem and Carnegie companies show great results.

One of these was at the proving grounds of the Bethlehem Iron Co., at Redington, Pa., Feb. 19. A curved, Harveyized, nickel steel plate, 15 in. thick, representing armor for the battle ships Indiana and Massachusetts, was subjected to two shots from a 10-in. gun at a range of 250 ft.

The first shot was a 500 lb., 10 in., Carpenter projectile, of chrome steel, fired with 161 lbs. of powder, and having a striking velocity of 1,539 ft. per second, and a striking energy of 8,219 foot tons. The projectile entered the plate about three inches and broke up. There was no sign of cracking the plate. A second shot, with the charge increased to 241 lbs. of powder, and having a striking velocity of 1,940 ft. per second, and 13,060 foot tons striking energy, penetrated about five inches, but did not crack the plate. This shot was fired with the heaviest charge of powder ever fired at the proving grounds. Both projectiles were shattered, and their points welded into the plate.

A test was made Feb. 21, at the Indian Head proving grounds, of a Carnegie plate. This plate had been forged