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A New Method of Rating and Loading Engines in Freight Service.

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The C.P.R. put in effect on Oct. 1 last a new method of rating & loading engines in freight train service. This Co. was one of the first to adopt the tonnage basis for rating & loading its engines—using actual tons, except in the case of empty freight cars, to the weight of which an arbitrary addition was made—but experience of this, what may be called "actual" tonnage system, especially in connection with the larger capacity car & the resulting greater variation in the weight of "contents," & consequently in the proportion of "tare" of cars, demonstrated:

1.—That the haulage capacity of engines should be based on a uniform proportion of tare weight to gross weight behind the tender.

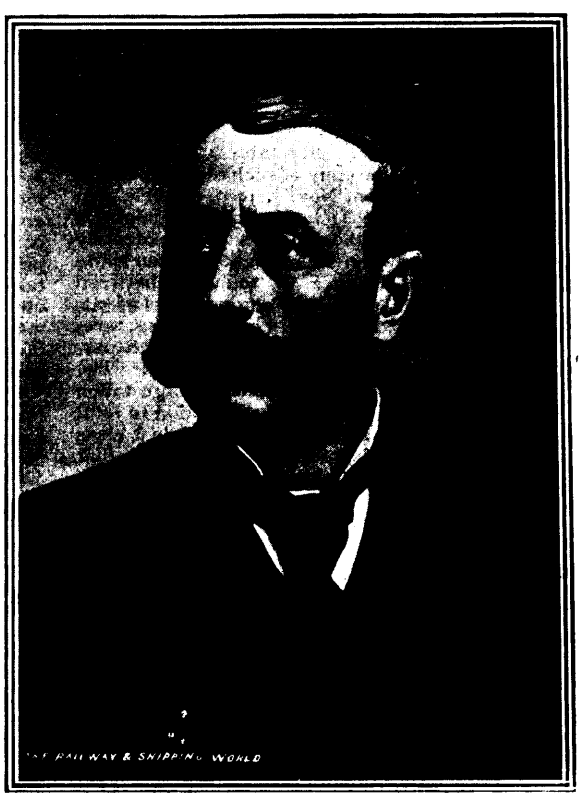
2.—That in loading engines the resistance of every train, as compared with that of a train having this uniform proportion of tare, should be determined.

After investigation it was decided to adopt one-third (two tons of "contents" to one ton of "tare" weight), as the uniform proportion of "tare" weight to "gross" weight behind the tender to be used in the new schedules of haulage capacity of engines in freight train service. These schedules of haulage capacity of locomotives in freight train service show the number of tons which each class of engine can take from station to station in each direction in a train, the tare weight of which is one-third the gross weight behind the tender. Table 1 on page 67 gives the figures for the Havelock section.

The engines are classified according to their haulage capacity—(see tables 2 & 3 on pages 67 & 69)—each class being designated by its percentage of haulage capacity—the standard 10-wheel freight engines being termed "100%" engines; more powerful engines "140%," "150%," etc.; lighter engines "60%," "65%," etc. Five per cent. of haulage capacity represents approximately a draw-bar pull of 1,000 lbs. at 7 miles an hour, which is the speed over grade summits on which the haulage capacity of engines has been based. The draw-bar pull which any engine can exert is thus easily ascertained if its percentage of haulage capacity is known or vice versa. In these schedules the ruling grade on each section is clearly indicated, as is also the increased tonnage (passing load), if any, which can be taken if the train does not stop at a station (see figures in italics, table 1 on page 67).

A dynamometer car was used to determine the relative haulage capacity of the different classes of engines, & the grade & curve resistance from station to station in each direction; the tonnage in the schedule being the results in many cases not of one or two, but of many tests with this car.

These schedules are accompanied by a "chart," reproduced opposite page 80 (suggested by a graphic chart prepared by Mr. McHenry, of the Northern Pacific), to be used by those whose duty it is to make up trains, for the purpose of calculating the resistance of each train (having regard to the proportion of "tare"), so that the proper load for the engine may be determined. This chart has been compiled on the basis that empty cars require 30% more power to haul them than the same tonnage in loaded cars, the "contents" of which weigh twice as much as the "tare." It takes the form of a pyramid—the "tare" tons or scale being shown along the base, & the "contents" tons or scale up the side, & the operation of finding by it the resistance of any given number of cars, loaded or empty, or both (having regard to the proportion of "tare"), is quite simple; the figures where the "contents" & "tare" tonnage lines meet on the chart being the resistance or equivalent tonnage of the train. For instance, if it is desired to make up a train for an engine scheduled to haul 900 tons over the ruling grade on the section, the "tare" & "contents" of sufficient cars to equal together about 900 tons are ascertained. It is found that the "tare" is 400 tons & the "contents" 500 tons; opposite 400 on the scale of "tare" tonnage at the base of the pyramid, & opposite 500 on the scale of "contents" tonnage on the side is found 945—45 tons too much load for the engine, due to the large proportion of "tare." If, however, the "tare" had been found to be 300 tons & the "contents" 600 tons, or the "tare" 410 & the "contents" 430 tons, in the same way, the figures where the "tare" & "contents" tonnage meet are found in both cases to be 900—exactly the right load for the engine—the actual tonnage in the latter case being 60 tons less than in the former case owing to the larger proportion of "tare."



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The resistance, in tons, of a train, as shown by this chart, is termed the "equivalent tonnage," & the actual weight of the train behind the tender the "actual tonnage." By this method of rating & loading engines every engine is given its approximately correct load—having regard to the proportion of "tare" weight to gross weight behind the tender, & by the use of the "equivalent" ton mileage more fair comparisons of fuel & other performance of engines & men can be made than with the "actual" ton mileage.

The main benefit, however, derived from this system of rating & loading engines is that advantage is taken of every opportunity arising out of the use of larger capacity cars, fully or well loaded (small proportion of "tare"), to increase the tonnage of freight trains. As the conditions change, owing to the continued increase in the average capacity of cars, it may become advisable to use a different basis in the compilation of these schedules of haulage capacity of engines & of the chart for calculating the resistance of trains.

The full loading of engines in the direction of the balance of tonnage is closely supervised. Superintendents are debited with the equivalent tonnage their engines should take over the ruling grade on each section, & are credited with what they do take. They are only charged 90% ("B" rating) of full schedule load on fast freight trains, such as provision, stock & competitive merchandise trains; 93% ("C" rating) on ordinary freight & 88% ("D" rating) on fast freight trains if rail is bad or temperature between 10° above to 20° below zero, & 88% ("F" rating), & 85% ("G" rating) respectively, if temperature colder than 20 below zero—& a special rating is fixed by the master mechanic in case of an engine in bad condition—just out of the shop, etc., or by the superintendent during snow or