simplified:

$$T = \frac{82{,}263 + 262.5\ L}{165{,}000 + 5{,}000\ L}$$

Or, in round figures:

$$T = \frac{82{,}000 + 265\ L}{165{,}000 + 5{,}000\ L}$$

From consideration of the above it will be seen that the coefficient of traction varies from a maximum of $.75 \times .25 = 18.75$ per cent. for spans of from 0 to 32 ft. to $.7 \times .25 \times \frac{1{,}500}{5{,}000} = 5.25$ per cent. for a span of infinite length.

There is a possibility of the driving wheels of a locomotive skidding when the brakes are applied and the engine reversed. This would increase the coefficient slightly, and the effect would, of course, be greatest on the shorter spans. It would therefore seem reasonable to take a coefficient of 20 per cent. for spans up to about 60 ft., reduced for spans above this in accordance with the formula given above and as shown on Plate 1.

The assumed maximum value of 25 per cent. for the coefficient of brakeshoe friction was obtained in the experiments of Westinghouse and Galton for very low speeds (about 1½ miles per hour) immediately after the application of the brakes. The value decreased to about .17 five seconds after the brakes were applied, and to about .12 fifteen seconds afterwards.

The values given by the formula are therefore maximum values, and would only be obtained for an instant after the maximum brake pressure had suddenly been applied to a train which is moving very slowly, a condition which seldom occurs in actual practice.

Since the efficiency of the brakes is based on the unloaded or tare weight of the car, with a given tare weight per lin. ft. of car, it follows that the total tractive force on any given span will be the same, whether the cars are unloaded or loaded.

The full line on the attached diagram shows the coefficients for spans from 60 to 500 ft., computed from the formula derived above, the dotted lines representing values for spans under 109 ft., calculated from the brake efficiencies and weights given in the beginning of the paper.