cated in Figs. No. 4 and No. 3. The falsework under the centre ribs was raised to a certain elevation and then a standard track was laid thereon for a distance of 360 ft. A 20-ton guy derrick was erected and placed in such position that it could erect steel at a later date, and by means of this derrick the material was unloaded and raised to a temporary track where two standard gauge tracks, operated by a 6-in. x 12-in., two-drum hoisting engine, carried same to a point which enabled the travellers to hoist the material to the floor level of the bridge. Although this method involved two operations, a small force of men were able to unload and distribute 130 tons in nine hours.

Sections of the falsework have already been shown in *The Canadian Engineer* in Figs. 1 and 5, September 28th, 1916, issue. Standard 20-ft. platforms were adopted. Caps and sills were also standard, consequently maximum service with minimum waste was obtained. Douglas fir was used exclusively, in sections 12-in. x 12-in. and 10-in. x 18-in. Five-eighth inch bolts were used throughout in bracing. Under each panel point provision was made for raising or lowering the ribs by means of jacks. The maximum reaction on the falsework under the centre ribs when certain steel sections were being placed was 160,000 lbs.

Erection travellers were used to a considerable extent in raising the falsework, but where this means was found impracticable a stiff-legged derrick was used. All bents were framed before being raised.

Fig. No. 2 shows the type of erection traveller which was used, one of these working on each end of the bridge. Each traveller is operated by an 8-in. x 10-in., four-drum hoisting engine and is fitted with two 60-ft. booms built in three sections. The centre section of 20 ft. was taken out when handling heavy loads. The 60-ft. booms had a lifting capacity of 12 tons in any position. After the centre 20-ft. section had been taken out, the 40-ft. booms had a capacity of 20 tons in any position. The centre to centre measurement of the trucks in cross-section was 18 ft. 6 ins.

The steel on the west 158-ft. span was placed entirely by traveller. For the 240-ft. spans the traveller was used in conjunction with a 20-ton guy derrick, as shown in Fig. No. 1. Owing to the length of these two spans it was necessary to raise a sufficient amount of steel at the westerly side of the spans by the aid of the guy derrick in order that the traveller could reach out far enough to form the complete arch.

Settlement had to be taken care of from time to time, dudgeon hydraulic jacks being used, those of 70 tons capacity being operated in pairs, while those of 80 and 90 tons capacity were operated individually.

All of the steel in the Don Section, excepting the centre span, which is a 281-ft. span, will be in position before the end of this year. The centre span will be erected from each side simultaneously, using only travellers.

The bridge crosses the C.P.R., G.T.R. and C.N.R. systems, but the work to date has been carried out without in any way interfering with traffic on any of the three systems. Under the east 240-ft. span special care had to be taken to protect six of the Ontario Hydro-Electric Power Commission's high-tension lines, carrying a total of 78,000 volts.

Railway electrification work is planned by the Great Northern Railway, according to reports from Washington. The company intends to alter to electric traction all its lines in that State at an estimated cost of $16,000,000.

PARTITION OF LOAD IN RIVETED JOINTS.

RIVETED joints occur in many types of construction, and it is, therefore, of considerable practical importance to determine the exact manner in which they act, in order that a rational basis may be given for their design. The subject has attracted the attention of many experimenters, their investigations being mainly directed to a determination of the resistance of joints to rupture and of the frictional resistance to slip. Attempts have also been made to determine the tension in the body of a rivet due to its contraction on cooling, and Frémont has made an exhaustive study of the actual process of riveting and its effects upon the strength of the joint. None of these experiments, however, have indicated very clearly the action of a riveted joint under working loads; *i.e.*, before permanent deformations of the plates or rivets have occurred. Very few attempts have been made either experimentally to determine or theoretically to estimate the partition of the load among the rivets under working conditions. It is usually assumed, in designing a riveted joint, that the load is equally divided among the rivets. That this cannot be true in joints as usually designed has been generally recognized by writers on bridge design, and illustrated by experiments on the distortion of lath and india-rubber models.

The attention of Mr. Cyril Batho, assistant professor of applied mechanics at McGill University, was directed to this subject by the results of a few readings taken with a Howard gauge on the cover plates of a large riveted splice tested by Prof. H. M. Mackay, of McGill University, for the Quebec Bridge Commission. These appeared to indicate that the rivets in the end rows received by far the greater portion of the load, and suggested to Mr. Batho that the actual partition of the load in any joint could be determined by extensometer measurements on the cover plates of the joint. It was first necessary for him to determine whether or not the strains of the outer surfaces of the cover plates could be used to obtain the mean strains in the cover plates. This was shown to be the case by experiment, and further experiments were commenced upon a series of butt joints having a single line of rivets. While making these experiments it occurred to Mr. Batho that the results might be interpreted and the partition of load worked out theoretically by means of the Principle of Least Work. This proved to be so, and further experiments verified the theory in every particular.

The results of these experiments and the theories based upon them, or confirmed by them, are outlined in full in an admirable and exhaustive article by Mr. Batho which appears in the current number of the valuable journal of the Franklin Institute of Philadelphia.

The article is divided into two parts. Part I. shows how, by means of the Principle of Least Work, a series of equations may be obtained, giving the load carried by each rivet in any form of riveted joint in terms of a quantity K, which, if the rivets are in shear, depends upon the manner in which work is stored in the rivets; or, if they act by frictional hold on the plates, depends upon the work stored in the parts of the plates thus held. Part II. gives the results of a series of experiments upon different forms of joints having a single line of rivets and loaded in tension, which confirm and illustrate the theory and show how the quantity K may be determined.

(Continued on page 400.)