

In order that small changes of temperature might be neglected and that subsidiary standards be tested quickly and accurately, Dr. Deville, the Surveyor-General of Dominion Lands, decided to design a secondary apparatus, shown attached to wall on left and right of Figs. 2 and 3 respectively. This apparatus is so constructed that the tape to be tested is suspended on a series of delicate pulleys, side by side with one of the laboratory standards. The pulleys (Fig. 5) are in pairs mounted on the same shaft and the set supporting one tape may turn independently of the set under the other. Microscopes are provided to make the comparison and as the length of the laboratory standard is known to a high degree of accuracy, very accurate determinations may be made.

The construction and method of using this apparatus enables determinations to be made directly for standard temperature. The only possible sources of error in comparisons of this kind would be due to: (1) Variation of

in Fig. 4. The wires imparting the tensions to the tape and standard by means of the attached weights are supported on separate pulleys mounted on ball bearings. The other end of the laboratory standard is fastened to a fixed point and the corresponding end of the tape is attached to a screw in such a way that the tape can be moved lengthwise to enable the various readings to be taken at different parts of the scale (Fig. 7). Horizontal adjustment is also provided to accommodate tapes of varying widths. A steel rod supported by ball bearings extends from one end of the apparatus to the other and when turned it imparts a motion to the adjusting screw by means of small gears. By this means the tapes may be set at any desired reading at any position along the tape-testing apparatus.

During the period in which the apparatus has been in use the results and accuracy obtained are all that could be desired. That a building of this nature is needed for

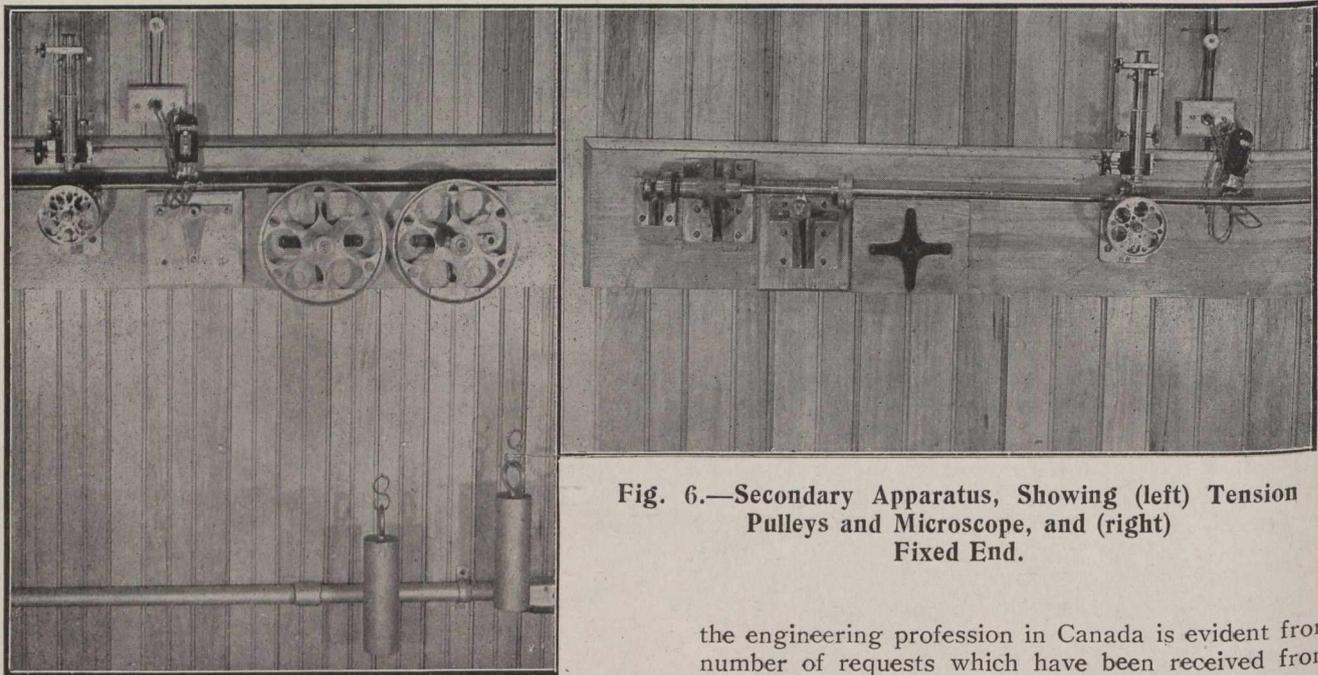


Fig. 6.—Secondary Apparatus, Showing (left) Tension Pulleys and Microscope, and (right) Fixed End.

temperature; (2) differential sag of tape and standard; (3) friction in the pulleys altering the applied tension. Due consideration was given to these points in the design of the apparatus. Any slight change in temperature affects both tapes to the same degree and may, therefore, be neglected. As the different tapes undergoing test are not all of the same weight per unit length as the standards there is a considerable variation in the sag of the two tapes, very often as much as $\frac{1}{4}$ in. with 66-ft. tapes supported only at the ends. This difference would cause an error of 0.00082 ft. in the final results unless a correction be applied. To overcome the necessity of using such a correction for varying weights of tapes the intermediate pulleys are used and spaced at such intervals that the alteration in length due to the difference in sag of the two tapes is so small that it may be neglected. After a series of careful determinations, the total friction of one set of pulleys for testing a 66-ft. tape, including end supports, proved to be but .014 lbs. This variation, when testing a 66-ft. tape under 10 lbs. tension, would affect the comparison of the length by less than 2 in 10,000,000.

The method of suspension is so delicate that it was necessary in order to keep the tapes steady during a reading, that the weights be attached to but one end, shown

the engineering profession in Canada is evident from the number of requests which have been received from engineers and surveying instrument dealers to have commercial measures verified. Although the building has been in operation but a short time, one hundred and fifty-three tapes have been tested for outside parties at their request.

HUDSON BAY RAILWAY.

The plant engaged on grading and bridge work, track laying and ballasting, for the Dominion Government Railway to Hudson Bay, consists of 3 steam shovels at Pas, and 2 at mileage 110; 13 locomotives; 100 Hart convertible cars and numerous box and flat cars, in addition to 2 passenger cars being operated as far as mileage 110. It is expected to have complete by the end of the year, track laying to the Manitou rapids of Nelson River, and grading from the Manitou Falls to within 110 miles of Port Nelson. Also the foundation work for a large bridge to be built at Manitou rapids, is to be finished this year. In connection with the terminals work in progress at Pas and at Port Nelson, two tracks have been laid at Pas, one from the roundhouse at Eighth Street, and another from the C.N.R., connecting with the bridge across the Saskatchewan River. Eight tracks are to be laid in the yards at once in such a manner that six additional tracks may be added as required. Though the complete details of track laying in the yards has not yet been worked out, it is expected to lay between six and eight miles of track in the yards during the summer. The work in progress at Port Nelson is of a more preliminary character.