

surveys, it is not indispensable for azimuth observations in Old Ontario, where accurate standard time can be had at any railway station which has a telegraph operator. The Dominion tables are calculated for sidereal time 0 hours to 24 hours and not, as is so often the case with such sets of tables, for mean time hour angles, *i.e.*, the angle between the star and the meridian east or west. With the Dominion tables the azimuth of the star is given in degrees, minutes, and decimals of a minute for every ten minutes of sidereal time, so that with the azimuth of the Pole star written in the tables $359^{\circ}-36.3'$ or $1^{\circ}-49.7'$ it is impossible for that simplest of all errors in azimuth observations to be made, *i.e.*, the placing of the meridian on the wrong side of the star.

To conclude, might I suggest that a committee of the association be appointed to decide on the form such a set of tables should take to be of the greatest amount of use to the greatest number of our members, the information they should contain, and the frequency of publication necessary, and that a resolution be passed by this association authorizing the publication of such tables in the form recommended by the committee and their distribution to all the members of the association.

Discussion.

Mr. Dobie—Mr. President, I am very glad to hear Mr. Jackson bring up that subject, and treat it in the manner he has done. I have had some idea of preparing a paper along that line myself for some time. Now I guess I will have to look for another subject. But the use of these tables is something that, I have found amongst surveyors, is not as general as it should be; there are not nearly as many of them used as there should be. The Department of the Interior have gone to a very great deal of trouble to prepare these tables, covering a couple of years in advance, and distribute them gratis to anybody that wants them. I send in myself at the first of every year and ask the Surveyor-General to send me a set of them, and he always does, and with these tables and a sidereal watch the taking of an observation, if Polaris is visible, is the simplest possible matter, and it can be done with a very small telescope. I have a small transit with a four-inch circle and three-quarter inch object glass, and I have frequently taken observations with that telescope just after sunset, when Polaris and the picket on the line were both quite visible, so there was no necessity for using a candle or artificial light around the object at all. Those tables he speaks of, unfortunately, are compiled for Dominion land purposes only, and they start at the 49th parallel, and the interpolations are for township numbers and start at zero, and the next is township twenty and township forty, and so on, so that they are hardly suitable, without some modifications, for use in the older parts of Ontario. The Topley Company, of Ottawa, a few years ago published a small pamphlet containing those same tables, and they were prepared in different forms; they were prepared for surveyors in the other parts of the Dominion, and my recollection is that they started with latitudes 43, 45, 47 and 49, so that you could interpolate in between, the information obtained in this way being very much more valuable from our standpoint in Ontario than information supplied by the Department of the Interior. For some reason, I understand, the Topley Company has discontinued the publication of that little pamphlet. I wrote to them for it at one time, and they sent me a copy, and said they were preparing these at their own expense and distributing them free of charge, and whether they would continue to publish them or not would depend on whether the surveyors throughout the province appreciated them enough

to keep up the demand, and I presume the fact that they discontinued publishing them is probably due to that cause. However, I quite agree with Mr. Jackson that some steps should be taken whereby every member of the association should have a copy of the azimuth tables prepared, so that an azimuth observation on Polaris can be taken at any time. These tables have the azimuth for every ten minutes of sidereal time and have a list of about twenty first and second magnitude stars, and so that no matter where a man is, or at any hour of the night when he can see a star, or usually on in the afternoon when a star is visible, he can check up his watch and take an observation. With the assistance of those tables it is not any more difficult than taking an ordinary sight on the line. I know I have one or two cases. In one case, I remember, in running a base line, in working along in the afternoon, there was a big rock; it was one of these sloping things; you couldn't get set up on it, just a shoulder that stuck out over the line. I had these tables in my pocket, and I ran up to that rock and put the picket on the top and moved my transit around to the other side and set it up, sighted on Polaris, and then went right on with the work. That one sight alone saved me enough time to repay me for all the time I had spent to send and get them. A sidereal watch is not absolutely necessary, but it is a great convenience; the Waltham people have a very fine one. I have one that cost me \$45; I check that thing up right along, and it is never out more than ten or fifteen seconds in a month; that is all it has ever varied. In taking your watch and taking the observation it is such a simple thing, and the information in those pamphlets is so valuable, it seems to me the surveyors should be supplied them. I don't think it would cost very much. We got a set of tables one time that were prepared by Mr. Blake—I have one of them yet. That was some years ago. The declination of Polaris changes from year to year, and they are only applicable to certain months in the year. The change is not very great, but still it is enough to necessitate practically the preparation of tables from time to time. I don't think the preparation of a set of those tables and the publication of them and the distribution of them to each member of the association would entail very much expense on the part of the association. I believe it is something that would well repay the association for whatever little bother or expense it would be put to. I would take great pleasure in moving that Mr. Jackson's paper be received and printed in the proceedings, and that he be congratulated on the manner in which he has treated that subject.

Mr. Le May—I have much pleasure in seconding that motion. I represent, perhaps, a different class of work to that represented by Mr. Dobie, but I can assure you that in Toronto we would feel the benefit of a set of tables of that kind quite as much as they do in the outside. These new sections of the Survey Act require observations, and anything that will help and enable us to get those observations more easily is a thing very much to be desired.

In a paper read before the July meeting of the Diesel Engine-Users' Association, Mr. Philip H. Smith suggested the following dimensions for Diesel engine crankshafts, D being the diameter of the cylinder: Tensile strength, not less than 34 tons; ductility, not less than 25 per cent. in 2 in.; diameter of pins and journals, 0.525 to 0.54 D; length of main bearings, 0.75 to 0.8 D; length of big-end pin, 0.525 to 0.54 D. Thickness of webs not less than 0.32 D, but centre to centre of cylinder made minimum possible, and any excess over the proposed length of pin and journal to be put into the webs.