

At all comparisons they were used under the same conditions.

The results given in the last column of Table 3 are those ready for computation, in conjunction with those of the previous or following tests, as the case may be. Table 4 gives such a combination.

As a spring balance was used for applying the tension of 15 lb. during the measurement of the base, the same balance was used at the comparator tests, but one set of comparisons was made with the certificated standard balance, the results of which were compared with those of the working-balance, the true pull of which, having the known elastic extension of the working-tape, was thus obtained. Of course, as the same balance was used at the comparisons as was later used at the actual measurements of the base, no corrections were required as long as the differences between the standard and working balances were small; but for sections 8 and 9, and the auxiliary base, varying sag, &c., corrections were necessary as the pull of the working-balance weakened.

When evidence of the weakening of the spring balance became apparent, the comparisons were made with extra care in the following manner:—

Sixth Test.—Comparisons to determine the Value of Working-balance No. 1.

Comparisons of each chain-length of $\frac{1}{8}$ in. Invar tape No. 02 under a tension of,—

Chain-length No.					First: Standard Balance, 15 lb., True.	Second: Working- balance No. 1, 15 lb., Nominal.	Differences.
					Links.	Links.	Links.
1	..	..	..	..	+ .0039	+ .0039	.0000
2	..	..	..	..	— .0024	— .0029	— .0005
3	..	..	..	..	— .0033	— .0036	— .0003
4	..	..	..	..	— .0035	— .0039	— .0004
5	..	..	..	..	+ .0057	+ .0053	— .0004
6	..	..	..	..	+ .0055	+ .0052	— .0003
7	..	..	..	..	— .0035	— .0041	— .0006
8	..	..	..	..	— .0031	— .0034	— .0003
9	..	..	..	..	— .0026	— .0028	— .0002
10	..	..	..	..	+ .0042	+ .0038	— .0004
Mean difference					..	..	— .00034

The differences given in the last column are equivalent to the differences of pull between the standard and working balances, and

Mean difference per chain-length
Elastic extension per pound pull per chain-length = difference in pull of balance ;
equals $\frac{.00034}{.00184} = .1842$ lb.

The actual figures taken for the pull of working-balance at the sixth test were 0.185 lb. less than 15 lb.
At the fifth test were 0.090 lb. ..
0.275 lb.
And the mean = 0.1375 lb.

The working-balance was pulling less than 15 lb. for all measurements between the fifth and sixth tests.

To avoid possible temperature-errors, as long as pure steel tapes are used for laying down comparators it will be desirable that they should be laid down when the temperature is as nearly as possible 62° Fahr., the standard temperature of the reference tape, and this was done whenever practicable.

FIELD MEASUREMENTS.

At the base measurements the *personnel* was as follows : One contact-observer at the rear end, which position Mr. H. J. Lowe occupied for the latter half of the measurements ; one scale-reader and recorder at the theodolite or forward end ; one tape and tension adjuster at the forward end ; and three men for lining in supports, placing tapes properly on supports, and assisting to carry tapes forward.

When starting actual measurements after the necessary comparator tests have been made, the first matter to be attended to is the adjustment of the rear tripod contact-mark over the terminal point of the line, or other starting-point for the day. To do this the theodolite is carefully centred over a fine brass tack in a substantial peg, which has previously been fixed at right angles to the line, and about 15 links from it. A tripod is at the same time being centred by plummet over the base mark, every care being taken that it is made as rigid as possible. The base point is then intersected by the wires of the theodolite, and a vertical plane ranged out to the tripod-head, where a fine needle-point mark is made on a lead insertion in the gun-metal at E, Fig. 7. The instrument is reversed, and the operation repeated : if there is any discord with the first point, the mean position is taken, the telescope clamped to it, and the contact-mark on the tripod-head is then adjusted to correspond. When closing down for the day this operation is reversed, the contact-mark on the finishing tripod being then depressed,