

INSTRUMENTS

THE NEW REPETITION THEODOLITE

OF WILD T. I ⁽¹⁾

(Der neue Repetitions - Theodolit Wild T. I)

by

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The firm of WILD A.G. at Heerbrugg (Switzerland) has brought out a new repetition-theodolite which is here briefly described.

1) *Measurement of the angles.* — The model T. I theodolite is designed for topographic surveys; as a result all the angles should be capable of being measured in every case with an accuracy of 1^c. It provides a direct reading of the degrees (400^g or 360°) and the minutes, and permits an estimation to tenths of minutes (10^{cc} or 6"). The figure (1) shows two examples of the reading of the two circles.

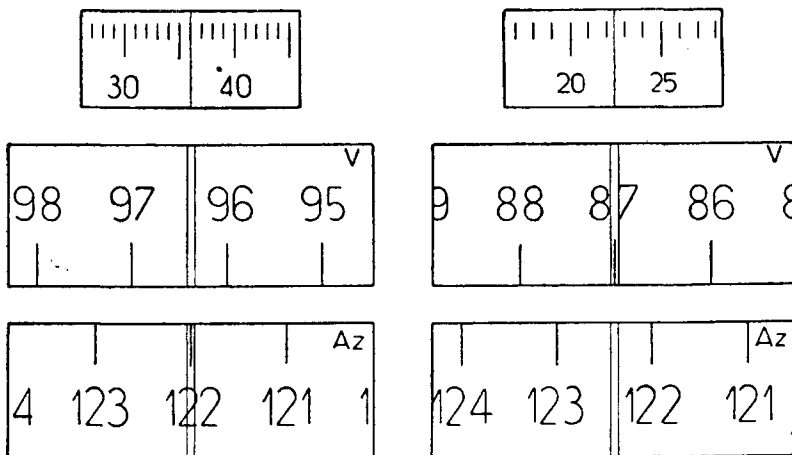


FIG. 1

In accordance with the principles adopted by the firm of WILD at Heerbrugg, the reading of the two circles is accomplished by means of a single microscopic ocular lens placed alongside the eye-piece of the telescope.

The images of the horizontal circle, the vertical circle, as well as the micrometric scale, all appear in the same field of vision. The illumination is obtained by means of a single mirror, arranged on the mounting on the left of the instrument. In order to read one of the circles it is necessary to turn the button of the optical micrometer until the division of the

(1) See *Hydrographic Reviews*: Vol. IV, N° 2, p. 210; Vol. XII, N° 1, p. 148; Vol. XIV, N° 1, p. 116; Vol. XIV, N° 2, p. 229.



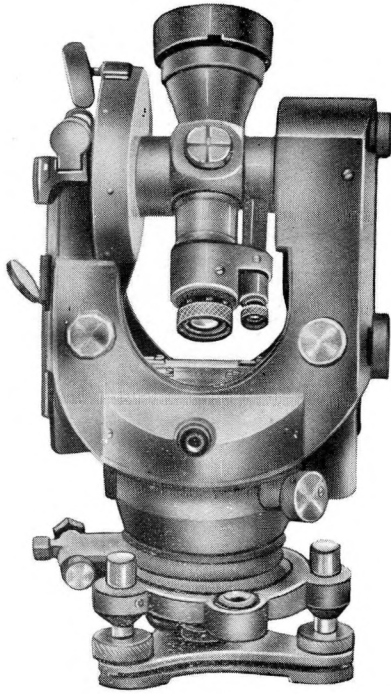


FIG. 2.

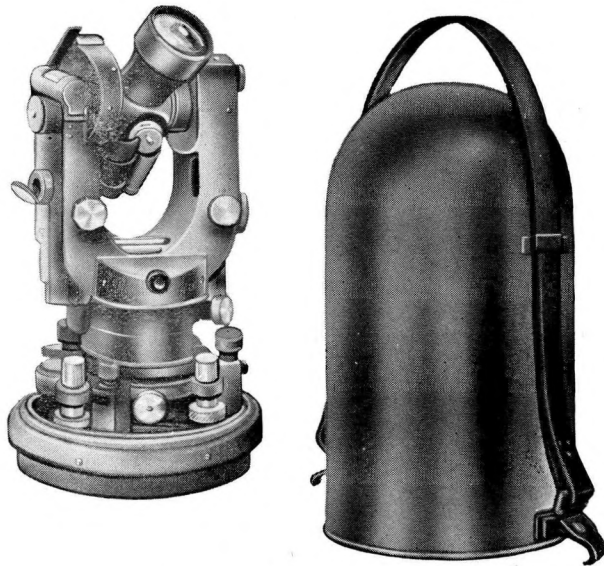


FIG. 3.

Wild repetition theodolite.

circle which is approximately in the center of the field appears exactly between the two black marks. We then read the degree on the same mark, while the micrometer scale in the upper part of the field gives the minutes and allows and evaluation of the tenths of minutes. In passing it may be noted that for each circle the reading is made at one place only and not, as ordinarily, at two places diametrically opposite each other on the circle. The constructor has been able to bring about this simplification, because the errors due to the graduation and to the excentricity are so small that they can be neglected in practice. In case of necessity this last-mentioned error may be completely eliminated by observing with the eye-piece in the two positions.

2) *Vertical Circle.* — Its diameter is 70 mm. while that of the model T I, as well as the pieces pertaining to it, have been simplified. Ordinarily use is made of a system of prisms which bring about the coincidence of the two images of the bubble in the level. These prisms have been abandoned in the model T I instrument and replaced by a simple graduation engraved on the level. This division can be observed through the eye-piece of the reading glass by means of a moveable mirror immediately above the level, without the necessity of the observer moving to another position.

All of the parts of the vertical circle, with the exception of the level and its mirror, are completely enclosed in the mounting on the left and are thus protected from dust and shock.

3) *Lower part.* — The lower part of the theodolite consists of a plate rigidly connected to the assembly of the vertical axis. This plate may be secured to the tripod by means of a particular device brought into play by turning a marginal screw on the horizontal axis. This permits us, in the case of accurate polygonal pointings, to lift the instrument from the tripod and to replace it by a target without changing the location of the tripod.

4) *Measurement of Distance.* — With the idea of giving the operator the possibility of measuring the distance by the method which he might prefer, two different devices have been provided. Since they are both well known, being already in use on the Wild apparatus previously constructed, I shall confine myself here to a few notes on these devices. It might be noted also that the telescope is provided with stadimetric lines for the determination of the distance by means of the method known as "vertical sighting"; the multiplication factor being 100 and the constant to be added equals zero.

a) *Measurement of distance by means of the prismatic wedge.* — A prismatic wedge may be placed in front of middle of the objective. This prism deviates part of the rays which fall on the center of the objective while the others reach the objective without being deviated. We thus obtain a double image which serves directly for the measurement of the distance. The reading is made on a horizontal stave provided with a vernier. The accuracy is about 2 or 3 cm. for a distance of 100 meters.

b) *Measurement of the distance with the optical micrometer for accurate measurement.* — This auxiliary instrument, which furnishes a double image of the horizontal stave is fitted with an optical micrometer. Under favorable conditions the accuracy is 1/5000 of the distance measured.

The instrument gives the inclined distances which must be referred to the horizontal. When the distance is measured by means of the stadimetric lines, the known formulae must be employed for the reduction.

5) *Electric Illumination.* — The electric illumination is very simple. A small box containing the two electric elements and a small electric bulb is secured near the mirror serving for illumination in the opening designed for this purpose. The lamp is protected from bad weather. It illuminates simultaneously the two circles, the micrometric scale and the cross-wires of the telescope.

6) *Accessories.* — In the very humid mines and in tropical regions it sometimes happens that the optical lenses become obscured, owing to the condensation of water vapor from the air. To avoid this inconvenience use is made of small hygroscopic granules, known under the trade name of "silica-gel". These small granules, which the firm of Wild supplies on request, are enclosed in a small metallic capsule which is screwed on to the instrument. These small granules are regenerated easily when they have become saturated

with moisture by simply heating the capsule. Their color gives an indication as to when this regeneration is necessary.

In order to adapt the theodolite to all kinds of topographic work, it may be provided with various accessories; we shall note here only a few incidently :— the tubular compass case and the circular compass case, as well as the telescope for very high sights. Attention should also be invited to the very special construction of the targets for the precision polygonal pointings on three stations. Each target is supplied with its precise level to insure the verticality of its axis and is provided with a vertical optic corresponding to that of the theodolite. The targets may be used at night also, as they are provided with electric illumination.

The theodolite T 1 is protected in transport by its metal case (fig. 3). This case, hermetically closed, has already proved its usefulness in the previous models put out by the firm of Wild; it protects the instrument from damage as well as from the variations in temperature and humidity.

