

## NEW CHASSELON THEODOLITE WITH MICROSCOPES.

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General PERRIER explained, in the *Revue d'Optique Théorique et Instrumentale*, 3rd year, N° 4, April 1924, pages 187 to 190, the reasons which led the Geodetic Section of the French Army Geographic Service to demand certain conditions of the manufacturers for a new model of repeating theodolite with microscopes, which would be a truly universal geodetic and astronomical instrument.

These conditions are as follows :

Repeating instrument for the two circles ;

Central telescope, revolving on bearings carrying the trunnions, and capable of making a complete revolution around the trunnions in both directions, even when fitted with its elbowed eye piece ;

Focal length of the objective about  $30 \frac{\text{cm}}{\text{m}}$  ; Aperture of the objective  $5 \frac{\text{cm}}{\text{m}}$  approximately ;

Ocular with micrometric drum, magnifying power 20, 30 and 40 times, approximately ;

One turn of the micrometer drum to equal 10 centesimal minutes approximately ; each division of the drum to equal 10 centesimal seconds approximately ;

Foresights and peepsights to be fitted on each side of the telescope, above and below, permitting the object sighted to be easily brought into the field ;

Axis of the trunnions of the telescope and the principal axis to be made perpendicular to each other ;

Diameters of the divided limbs—horizontal limb :  $22 \frac{\text{cm}}{\text{m}}$ —vertical limb :  $18 \frac{\text{cm}}{\text{m}}$  ;

Limbs divided to 20 minutes centesimal ;

Two microscopes for each limb ; one turn of the drum of the microscopes to equal 8 centesimal minutes, each division of the drum to equal 8 centesimal seconds (uncorrected) ;

Divisions on bright silver, which interfere with and expose the readings to errors, especially at night with artificial light, are not to be used for the micrometer drums,

Electric illumination of the field of the telescope, the index-microscopes, and the four microscopes ;

To avoid, by day, the darkening of the horizontal limb from the shade of the altitude level.

These requirements have been fulfilled in the new theodolite constructed by M. CHASSELON.

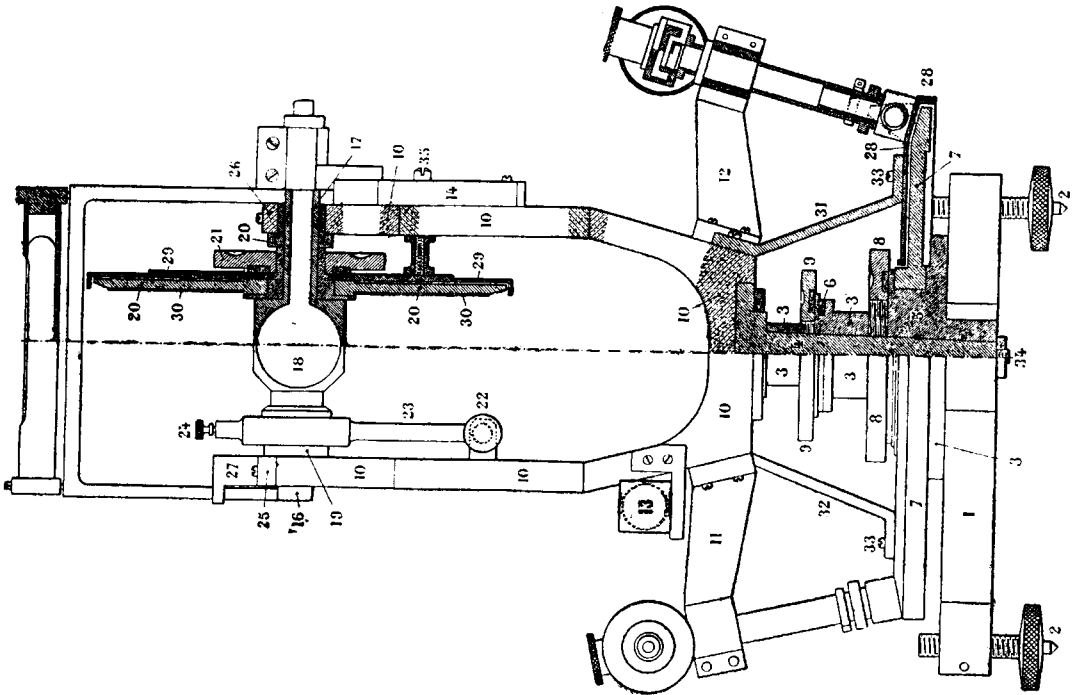


Fig. 1.

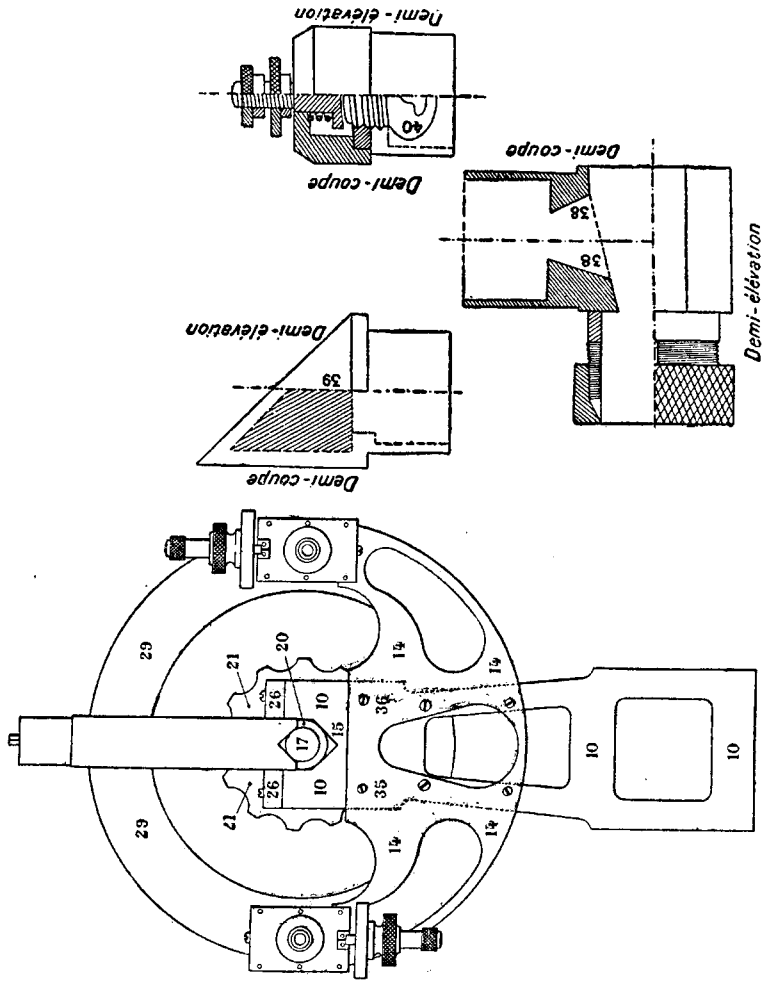


Fig. 2.

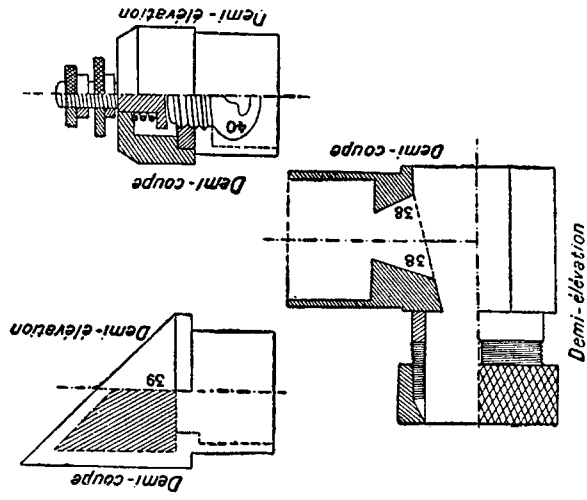


Fig. 3.

The 3 figures show the disposition of the various parts :

- 1 Triangular support in cast brass.
- 2 Levelling screws,  $125 \frac{m}{m}$  from the centre.
- 3 Truncated conical support of the vertical axis.
- 4 Vertical axis, the whole weight of which is carried by 3.
- 5 Support of 7.
- 6 Arm of mechanism for taking up backlash.
- 7 Horizontal divided circle.
- 8 Clamp of the horizontal circle.
- 9 Clamp of backlash arm.
- 10 Frame entirely in one piece.
- 11-12 Microscope supports.
- 13 Level for altitudes.
- 14 Crown supporting microscopes.
- 15 Segmental trunnion bearing surfaces.
- 16-17 Trunnions.
- 18 Telescope.
- 19-20 Trunnion collars.
- 21 Clamp fixing the vertical divided circle to the telescope.
- 22 Spring plunger.
- 23 Arm.
- 24 Adjustment screw of the arm to the telescope.
- 25-26 Trunnion caps.
- 27 Mounting of striding level.
- 28-29 Aluminium limb covers.
- 31-32-33-34-35-36 Fixings of movable limb covers.

The slow motion of both the horizontal and vertical circles is fitted with a new device to take up play. A bolt with a conical end presses against a female threaded sleeve, split and likewise conical, in which the adjusting screw engages. The operator can regulate the tightening of the bolt as required, and thus obtains a smooth motion of the adjusting screw, and without play.

The micrometer drums are made of brass enamelled dull black, and have their divisions inlaid with white varnish.

In order to illuminate the microscopes, by day, without the dangerous reflections given by silvered mirrors, these microscopes are fitted, in front of the object glass, with a dull white reflector, formed by two truncated conical surfaces at right angles, 38, turning around the axis of the microscope and reflecting the light perpendicularly onto the limb.

The illumination may be increased by means of a movable prism, 39, which enables some additional light to be directed on the reflector, even from the side.

In dull weather, and at night, the electric illumination of the fields of the microscopes, and also that of the telescope, is obtained by means of small bulbs, 40, of the torch type, and a dry battery of 3 cells placed in a box fixed to one of the uprights of the instruments.

For the microscopes, prisms are substituted for these bulbs as above described.

The index-microscope of the horizontal circle is illuminated by a lamp with a special bayonet joint; the index-microscope of the vertical circle, by the lamp of the microscope of that circle, placed above it.

The trunnions are hollow. The illumination of the field is obtained by a lamp attached to the inside of one of the trunnions, whilst in the other is attached a rod carrying a small mirror placed on the axis of the telescope.

All these lights are secured by bolts pressing against split clamps, in order to avoid, as much as possible, the use of the screw driver on the instrument. In order to economise the battery, the current is only switched on at the moment of reading or of observation, by means of a flexible plate, which is pressed on a contact by the finger of the observer.

All the wires are visible, to facilitate finding them in case of breakdown of the lighting.

The levels are not fitted with any lighting arrangement, but it would be easy to provide one and to fit a mirror to the striding level.

The instrument and its accessories weigh only 15 kgs. They are encased in a walnut box the dimensions of which are  $39 \frac{0}{m} \times 39 \frac{0}{m} \times 50 \frac{0}{m}$ . The whole, box included, weighs 34.5 kgs.

In default of a solid pillar of masonry, a very satisfactory stability may be obtained by using the special stand constructed by Mr. CHASSELON on the principle of the tripod, according to the designs of H. ROUSSILHE. This stand, contained in a special box, weighs 24 kgs.

