Dec. 19, 1922.

I. L. BANCALARI.

TRANSIT.

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1,439,218.

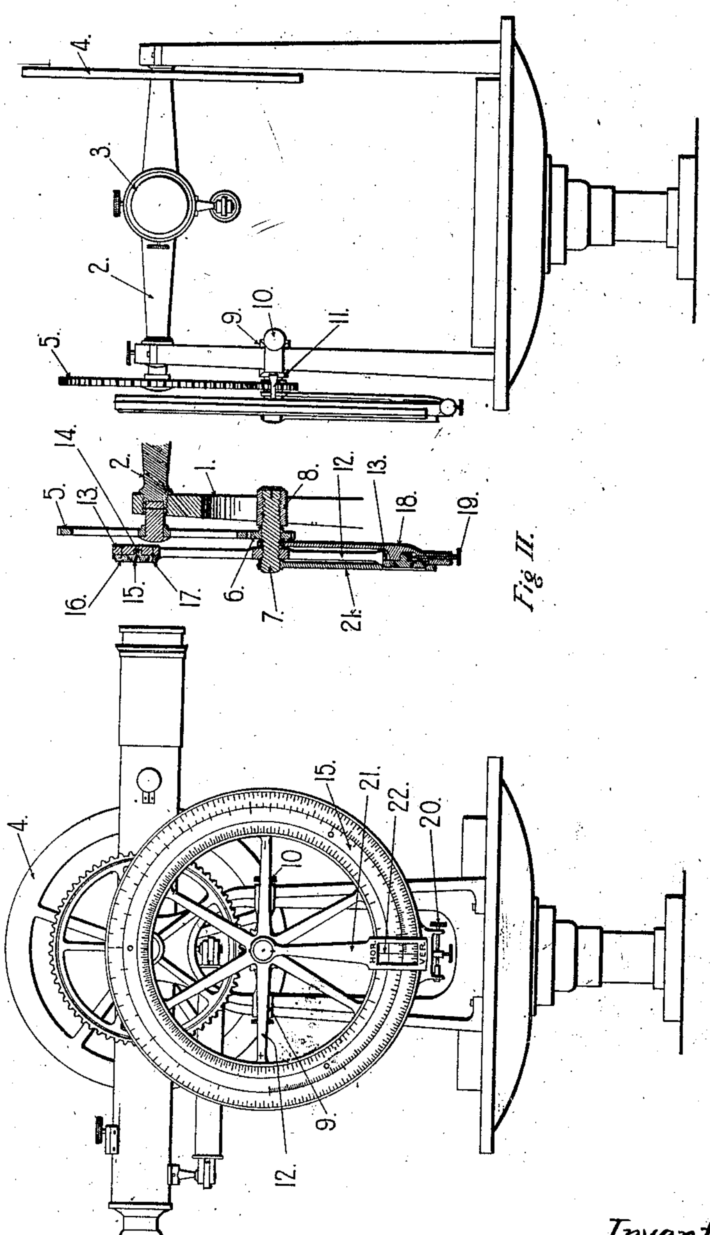

Fig. III.

Fig. II.

Fig. I.

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By [signature]

Attorney

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UNITED STATES PATENT OFFICE.

IGNACIO LÓPEZ BANCALARI, OF MEXICO, MEXICO.

TRANSIT.

Application filed March 30, 1921. Serial No. 456,835.

To all whom it may concern:

Be it known that I, IGNACIO LÓPEZ BANCALARI, citizen of the United Mexican States, residing at Mexico city, Federal District, Mexico, have invented certain new and useful Improvements in Transits, of which the following is a specification.

This invention refers to a circular trigonometric slide rule, mounted on the uprights of transits or any common tachymeter without interfering with the vertical circle, and the runner being positively connected by gearing to the telescope which then transmits movement to the runner making it slide on the scales, when the telescope is revolved.

The object is to complete the work done with the stadia, making it possible on the spot to determine both the horizontal distance which separates the optical axis of the lens from the object directed at, and also the difference in level between the same axis and the point of the field toward which the visual line is directed.

By applying the process of trigonometrical levelling with my attached circular slide rule, I am enabled to read and rectify on the field all the measurements otherwise only obtainable by calculation in office.

Fig. 1 is a side view of a transit equipped with the invention.

Fig. 2 is a fragmental transverse vertical section of Fig. 1.

Fig. 3 is a front view of Fig. 1.

In the drawing is shown a common transit comprising two inverted U-shaped uprights 1 between the arch portions of which the trunnions 2 of the telescope 3 are mounted, one trunnion also carrying the vertical circle 4.

To the end of the other trunnion 2 is fixed a spur wheel 5 engaging at the ratio of 4—1 with a spur pinion 6 of very fine pitch fixed to a runner shaft 7 revolving in a journal 8 disposed between the legs of the adjacent upright 1 and supported on bridge piece 9 clamped to said legs by set screws 10.

From the bridge 9 two brackets 11 project forward and are fastened to the horizontal arms 12 of the stationary spider 13. The spider is provided with a concentric groove 14 in which the annular rib on the back of circular slide 15 moves. The slide 15 is also held in place by outer and inner recessed scale rings 16 and 17 both attached to the spider 13.

Inside the hub of the spider 13 and loosely supported from shaft 7 is hung a thrust resisting arm 18 provided with a screw 19 used for the purpose of clamping the slide 15 to arm 18 when fine adjustment is performed by screw 20. From the shaft 7 is rigidly suspended the runner arm 21 provided with a hair line 22 and arranged to slide in cut outs on the rings 16 and 17.

The runner 21 is rigidly fixed to shaft 7 but has no contact with slide 15 which, for adjustment, is only moved by hand, as for instance by inserting the point of a pencil in one of the three holes. The screw 20 is secured in arm 18, and the spider 13 and arm 18 are hung on shaft 7 and are kept stationary, although the shaft 7 turns. There is no connection between arm 21 and slide 15; arm 18 being adjusted by screw 20 and fixed by screw 19 to arm 18 which is held by brackets 11.

The outer ring 16 is provided with outer graduations for reading the vertical distance between the optical axis of the telescope and the object, which latter, seen at the indicated inclination angle, is at a distance of 100 of the units of measure selected for determining the telemetric distance. It is to be understood that the stadia rod is held vertical at all times.

This gives the formula $H=\frac{1}{2}S \sin 2A$, in which H is the elevation distance, $S=100$ and A=the angle of inclination.

The hair line 22 therefore gives the value of H at 100 units distance, and by omitting two figures the distance in elevation of each unit is read. This distance, when used together with the inner logarithmic graduation and the movable logarithmic slide 15 gives the product of the two factors multiplied together, which is the result sought. In other words, the real vertical elevation between the telescope and object is thus read.

The inner ring 17 has graduations for recording horizontal distances between the telescope and the object, destined to give directly the value of a distance equal to 100 units as seen under the indicated inclination angle.

This gives the formula $L=S \cos 2A$, in which L is the horizontal distance; S=100 units and A is the inclination angle under which the telemetric reading was made.

Therefore the hair line 22 gives, when two figures are omitted, the value of correction by lineal unit.

Now, by moving the point 1 of the slide 15 to correspond, on the inner graduation of the ring 16 with the distance read on the stadia, the vertical elevation is read under the number of the slide corresponding with the number given by the runner on the outer graduation of the ring 16, and the horizontal distance is read in the same manner on the graduation of ring 17.

Of course, the runner may be mounted directly on the trunnion and the scale rings arranged concentrically therewith, although the amplified movement to the runner is then lost.

What I claim is:—

1. In a transit, the combination, with a telescope and a support, of stationary circular logarithmic scales mounted on said support; a movable circular logarithmic slide cooperative therewith; and a runner having an increasing gear connection with the telescope for amplified movement along said scales when the telescope is revolved.

2. In a transit, the combination, with a telescope and a support, of a stationary circular scale member having logarithmic scales; a stationary circular scale member having a logarithmic scale; a logarithmic scale slide cooperative with said scale members; a runner movable along said scale members and slide; and a positive gear connection between said runner and the telescope.

3. In a transit, the combination, with a telescope and a support, of a stationary circular scale member having logarithmic scales; a stationary circular scale member having a logarithmic scale; a logarithmic scale slide cooperative with said scale members; and a runner movable along said scale members and slide and connected with the telescope to be operated thereby.

In testimony whereof I have affixed my signature.

IGNACIO LÓPEZ BANCALARI.