

F. HEITZLER.
MOUNTAIN AND MINING TRANSIT.
APPLICATION FILED DEC. 18, 1908.

946,602.

Patented Jan. 18, 1910.

3 SHEETS—SHEET 1.

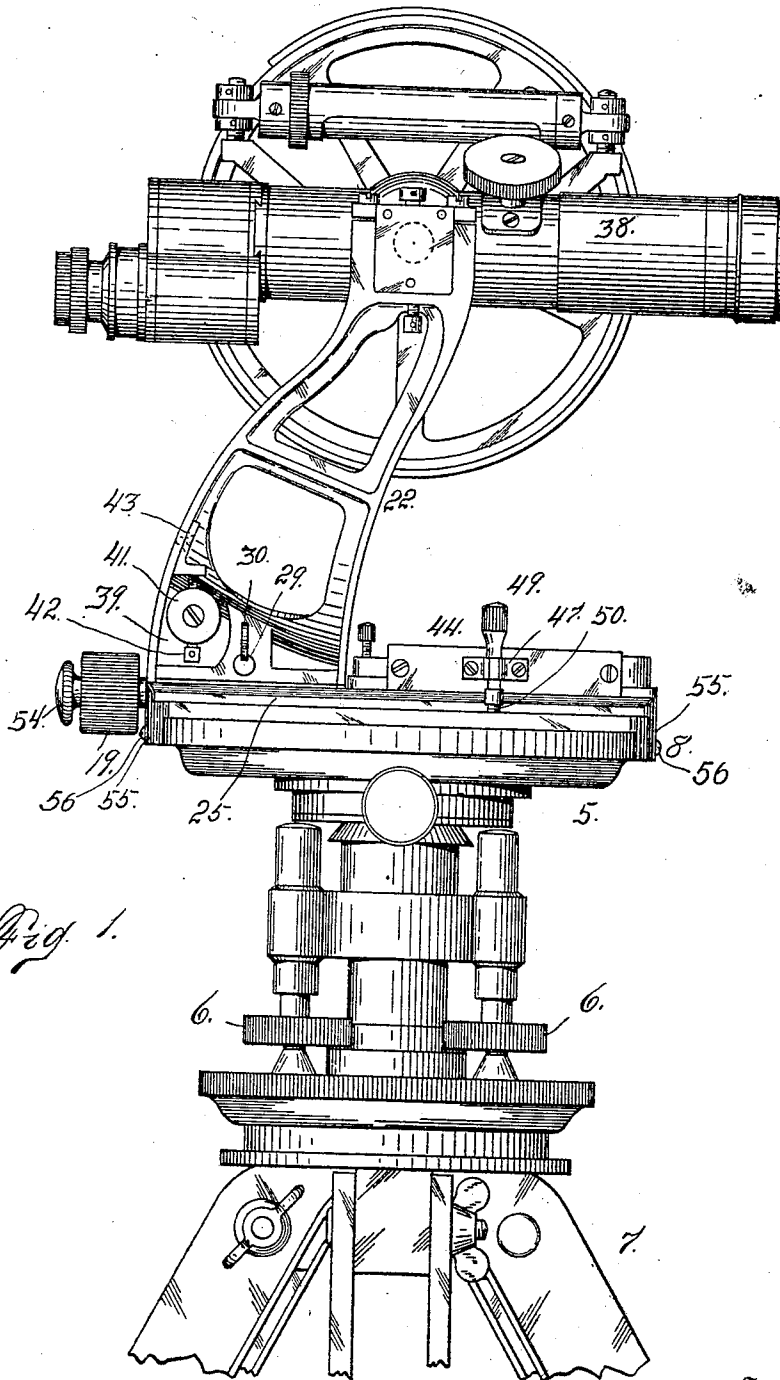


Fig. 1.

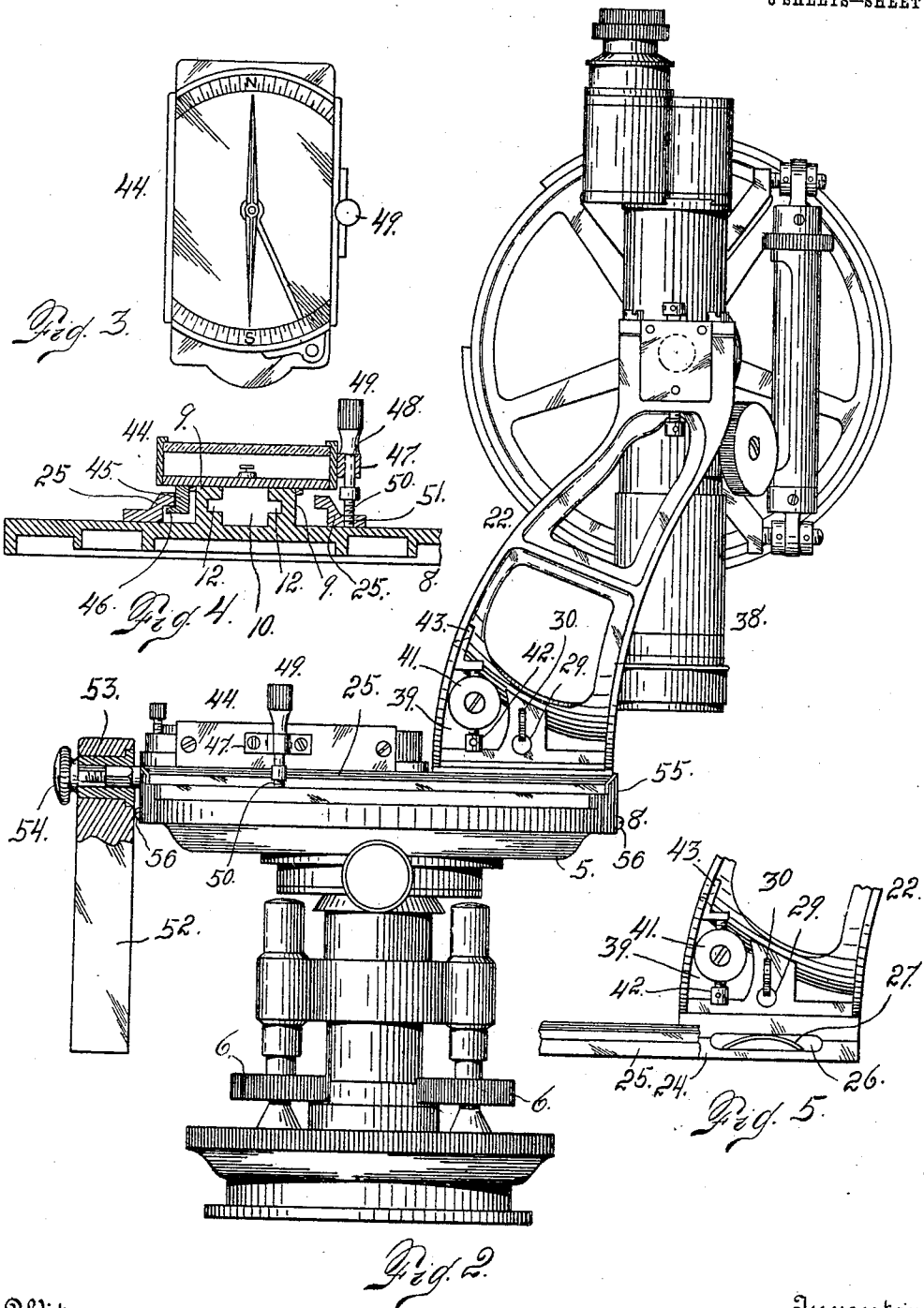
Witnesses
Otto E. Haddock.
J. D. Thornburgh.

Inventor
F. Heitzler.
By *[Signature]* Attorney

F. HEITZLER.
MOUNTAIN AND MINING TRANSIT.
APPLICATION FILED DEC. 18, 1908.

946,602.

Patented Jan. 18, 1910.
3 SHEETS—SHEET 2.



Witnesses
Otto E. Hoddick.
J. D. Thornburgh.

Inventor
F. Heitzler.
By *[Signature]* Attorney

F. HEITZLER.
MOUNTAIN AND MINING TRANSIT.
APPLICATION FILED DEC. 18, 1908.

946,602.

Patented Jan. 18, 1910.

3 SHEETS—SHEET 3.

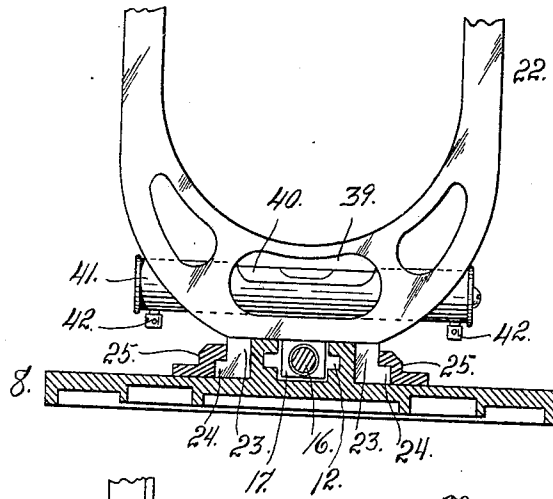


Fig. 6.

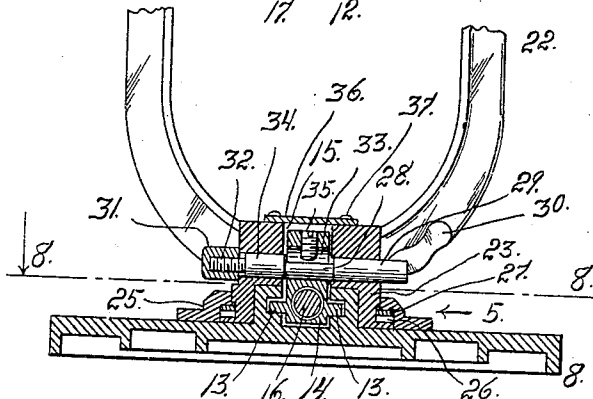


Fig. 7.

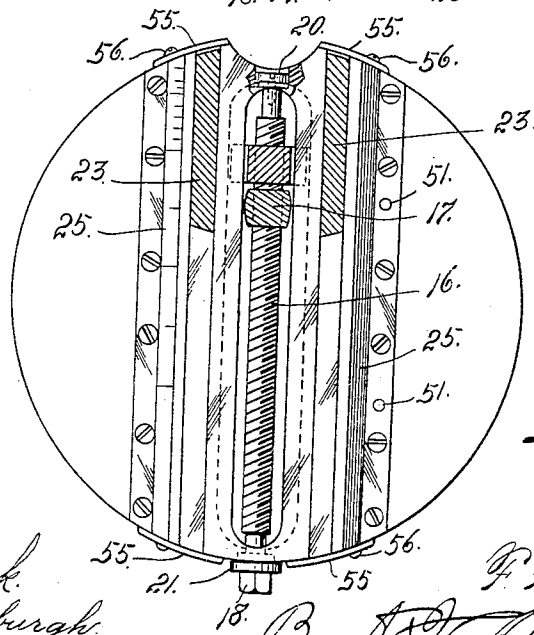


Fig. 8.

Witnesses
Otto E. Hoddick.
J. D. Thornburgh.

Inventor
F. Heitzler.
By *Attorney*

UNITED STATES PATENT OFFICE.

FRANK HEITZLER, OF DENVER, COLORADO.

MOUNTAIN AND MINING TRANSIT.

946,602.

Specification of Letters Patent. Patented Jan. 18, 1910.

Application filed December 18, 1908. Serial No. 468,243.

To all whom it may concern:

Be it known that I, FRANK HEITZLER, a citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Mountain and Mining Transits; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in surveyors' transits more especially adapted for use in mountain and mining work where it often becomes necessary to sight either upwardly or downwardly in a vertical line outside of or beyond the vernier plate.

In my improvement the U-standard carrying the telescope is slidably adjustable upon the vernier plate to a sufficient degree to throw the telescope, when in a vertical position, outside of the vernier plate, making it practicable to sight vertically either upwardly or downwardly.

Having briefly outlined my improved construction, as well as the principal function it is intended to perform, I will proceed to describe the same in detail, reference being made to the accompanying drawing in which is illustrated an embodiment thereof.

In this drawing, Figure 1 is a side elevation of a transit equipped with my improvements. The U-standard being shown in the ordinary or regular position with the telescope in a horizontal plane. Fig. 2 is a similar view with the U-standard adjusted for vertical sighting beyond the vernier plate and with the telescope in a vertical position. Fig. 3 is a top plan view of the compass in detail. Fig. 4 is a section taken through the vernier plate cutting the compass transversely. Fig. 5 is a fragmentary detail view looking at the base of the U-standard from one side, and illustrating a spring which serves to maintain the standard in its proper position upon the plate; in other words, serving to take up any lost motion due to the possible wear of the parts. This view is obtained by looking in the direction of arrow 5 Fig. 7, the angle guide plate being broken away. Fig. 6 is a section taken through the vernier plate in the rear of the standard, the latter being shown in

elevation and partly broken away. Fig. 7 is a vertical section taken transversely through the base of the U-standard cutting the vernier plate. Fig. 8 is a horizontal section taken on the line 8—8 Fig. 7 looking downwardly.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate the base of the instrument which is provided with the usual leveling screws 6, the base being adapted to be mounted upon a tripod 7, as is usual with instruments of this class. Suitably mounted upon the base 5 is the vernier plate 8, which is centrally provided with a raised reinforcement 9, in which is formed a groove 10 having lateral extensions 12, adapted to receive tongues 13 formed upon opposite sides of a block 14 inserted in an opening 15 formed in the base of the U-standard 22, the portion of this block which enters the groove of the vernier plate being provided with an unthreaded opening through which a feed screw 16 passes, the said screw being journaled in the opposite extremities of the central reinforcement 9. This screw passes through a nut 17 formed integral with the base of the U-standard. By turning the feed screw the standard is caused to travel either forwardly or rearwardly, as may be desired, by virtue of the engagement of the screw with the nut 17. One extremity of the feed screw is provided with a head 18, polygonal in cross section and adapted to receive a milled head 19, which is provided with a screw whose inner extremity is adapted to enter a threaded opening formed in the extremity 18 of the screw. The object of this milled head is to facilitate the operation of the feed screw during the adjustment of the U-standard. The extremity of the feed screw, opposite that to which the milled head is attached, is provided with a retaining screw 20 which engages a shouldered recess formed in the vernier plate to prevent longitudinal movement of the screw in one direction, its opposite extremity being provided with a collar 21 to prevent movement in the opposite direction.

The base of the standard is recessed to receive the central reinforcement 9 of the vernier plate, whereby depending projections 23 are formed which engage the reinforcement on opposite sides, and are also provided with lateral projections 24 extending out-

wardly from the parts 23 and engaging the upper surface of the body of the plate 8.

In order to maintain the U-standard securely in place, retaining strips 25 are applied to the upper surface of the plate on opposite sides of the parts 23. These strips are angular in cross section, their inner portions overlapping the outwardly projecting parts 24 of the base of the standard. These parts are recessed, as shown at 26, to receive bow-shaped leaf springs 27. The extremities of these springs rest in the bottom of the recess 26, while their upper curved portions are tangent to the lower surface of the overlapping parts of the retaining strips. These springs are under sufficient tension when the parts are assembled to take up any possible lost motion due to the wear of the parts resulting from the use of the instrument. It will be understood that during the adjustment of the U-standard, for the purpose heretofore explained, these springs travel with the standard, while their curved or bowed portions rub upon the adjacent surfaces of the retaining plates 25.

The clamp block 14, carried by the base of the U-standard aforesaid, is provided with a transverse opening 28, through which passes a locking spindle 29 having a manipulating crank 30 at one extremity, while its opposite extremity 32 is threaded to receive a nut 31. The central portion of this spindle 33 is cut away to make it eccentric to the body of the spindle on opposite sides, or the portions which form the journals of the spindle, and engaging openings 34, formed in the base of the standard on opposite sides of the opening 28 of the said block. The top of the block 14 is provided with a vertically disposed opening communicating with the transverse opening 28. A screw 35 is threaded in the said vertically disposed opening, and is adapted to engage the part 33, of the locking spindle when the latter is properly adjusted. As this screw is vertically adjustable in the block, it may be arranged to take up any lost motion due to the wear of the parts during use. The opening 15 formed in the base of the standard, as heretofore explained, is closed at the top by a plate 36, which is secured to the standard by suitable fastening devices as screws 37. This plate is readily removable for the purpose of adjusting the screw 35, which is provided with a slot in its upper extremity, for the purpose.

In the upper part of the U-standard the telescope 38 is mounted to rotate upon a horizontal axis in the usual manner. In the lower part of the base of the standard is formed a transverse opening 39, in which is located the bubble or glass spirit-tube 40 used for leveling purposes. This tube is inclosed in a metal casing 41 whose extremities beyond the bubble are provided with

openings for adjusting screws 42, which are passed through the said openings and threaded into small lugs or brackets 43 with which the body of the standard is provided. This feature is important with a slidable standard transit, since the sliding parts and the ways engaged thereby, are liable to become worn by movement whereby it may become necessary to readjust or relevel the instrument after the position of the standard has been changed from that shown in Fig. 1 to that shown in Fig. 2 or vice versa; and this becomes practicable by virtue of the fact that the standard carries the bubble with it, while in the ordinary form of construction, the bubble is mounted upon the vernier plate.

The compass 44 is provided on one side with an angle clip 45, having a bottom flange 46 adapted to engage the upper surface of the angle strip 25 on one side of the sliding base of the standard. On the opposite side the compass is provided with a perforated lug 47 through which passes the plain portion 48 of a screw 49 whose lower portion is threaded, as shown at 50, to enter a threaded opening 51, formed in one of the angle strips 23, which are secured to the top of the vernier plate in any suitable manner, as heretofore explained.

The location of the compass, when the standard is in the position shown in Fig. 1, or when the axis of the telescope is in a vertical plane passed through the center of the vernier plate, is in the front of the standard. When, however, it becomes necessary to adjust the standard to the position shown in Fig. 2, or for the purpose of using the telescope for vertical sighting beyond the base of the vernier plate, the compass is removed from the position shown in Fig. 1 by simply loosening the screw 49 and lifting it from the plate. This action leaves the path of the standard free for forward travel and it may be adjusted to the position shown in Fig. 2 by simply turning the feed screw 16 in the proper direction for the purpose, the base of the standard sliding freely within the guide straps during such adjustment. As soon as the standard is in the position shown in Fig. 2, the compass may be replaced upon the vernier plate, in the rear of the standard, as also shown in Fig. 2.

In order to use the instrument for vertical sighting, or when the telescope and its standard are in the position shown in Fig. 2, it is necessary that a counterpoise or counterbalance weight 52 be employed. This weight is of suitable mass and is connected with the extremity of the feed screw remote from the location of the standard when the latter is in the adjusted position, or that shown in Fig. 2. In order to apply the counterpoise, the milled head 19 is removed, and a bushing 53 applied to the ex-

tremity 18 of the feed screw, the bushing having an opening polygonal in cross section, to receive the polygonal extremity 18 of the screw. The counterpoise, which is provided with an opening to fit the bushing, is then slipped thereupon. The exterior surface of the bushing is cylindrical, and the opening in the counterpoise is of corresponding shape. A retaining screw 54 is threaded into the extremity 53 of the feed screw, to lock the bushing in place. The counterpoise may be turned upon the cylindrical bushing in order to throw it to one side, if this should be necessary or desirable while using the instrument.

The ways formed by the guide strips 23, in which the parts 24 of the base of the U-standard slide, are closed at their opposite extremities by stop plates 55 secured to the edges of the vernier plate by means of suitable fastening devices 56. When the standard is adjusted to its limit of forward movement, as shown in Fig. 2, it engages forward stop plates 55, hence these plates determine the proper adjustment of the standard when it is desired to use the telescope for vertical sighting in a line beyond the vernier plate. Furthermore, when the standard is adjusted to bring the telescope into the proper position for general use, as illustrated in Fig. 1, the base of the standard engages the rearward stop plates 55. By virtue of this arrangement no difficulty is experienced in the proper adjustment of the standard.

From the foregoing description the use and operation of my improved instrument will be readily understood. When the telescope is to be used in the usual way, the standard is in the position shown in Fig. 1, and sights may be taken either in a horizontal line or in lines varying considerably with the horizontal in either direction.

Having thus described my invention, what I claim is:

1. In a transit, the combination with the vernier plate, of a standard and a telescope mounted thereon, the standard being slidably mounted upon the vernier plate to permit the telescope when the standard is properly adjusted to occupy a position for vertical sighting, either upwardly or downwardly, beyond the periphery of the vernier plate, substantially as described.

2. The combination in a transit of a vernier plate and a movable telescope-supporting standard, said standard being slidably mounted upon said vernier plate.

3. The combination in a transit, of a vernier plate, a U-standard, a telescope mounted thereon, the standard being slidably mounted upon the vernier plate, and means for causing the standard to move forwardly and rearwardly thereon, for the purpose set forth.

4. The combination in a transit, of a vernier plate, a telescope-supporting standard slidably mounted on the vernier plate, the latter being equipped with a counterpoise detachably connected therewith for the purpose of balancing the structure when the standard is adjusted for vertical sighting, except for the counterpoise, substantially as described.

5. The combination in a transit, of a vernier plate, a telescope-supporting standard slidably mounted on the vernier plate, a feed screw journaled on the said plate, and a connection between the feed screw and the standard whereby, as the screw is turned, the standard may be moved on the plate in the one direction or the other, substantially as described.

6. The combination in a transit, of a vernier plate, telescope-supporting standard whose base is provided with a depending nut, the standard being mounted to slide upon the vernier plate, and a feed screw journaled in the said plate and engaging the nut of the standard for purposes of adjustment, substantially as described.

7. The combination in a transit, of a vernier plate, a telescope-supporting standard whose base is provided with a depending nut, the vernier plate having a groove into which the said nut projects, a feed screw journaled in the said plate and passing through the threaded opening of the nut, a block inserted in a recess formed in the base of the standard and slidable in the groove of the said plate, the said block having laterally disposed tongues engaging counter grooves formed on opposite sides of the main groove, a locking spindle passed transversely through the said block and the base of the standard on opposite sides of the block, the central portion of the spindle being cut away, whereby it is eccentric to the journal portions of the spindle on opposite sides, and a vertically disposed screw inserted in a threaded opening formed in the top of the block and adapted to engage the central portion of the spindle when the latter is properly adjusted, substantially as described.

8. The combination in a transit, of a vernier plate, a telescope-supporting standard, slidably mounted on said plate, a screw connected in operative relation with the standard for causing the latter to move back and forth upon the said plate, and a spindle eccentrically mounted for locking the standard upon the plate, substantially as described.

9. The combination in a transit, of a vernier plate, a telescope-supporting standard, slidably mounted on said plate, a block for connecting the standard in operative relation with the plate, and a locking spindle, co-operating with the said block, for taking up the lost motion between the standard and the plate, substantially as described.

10. The combination in a transit, of a vernier plate, a telescope-supporting standard, slidably mounted on said plate, a block engaging a groove formed in the plate, whereby the standard is connected in operative relation with the plate, and a locking spindle, passed through the said block and the base of support, for taking up lost motion between the standard and the plate, substantially as described.

11. The combination in a transit, of a vernier plate, a telescope-supporting standard, mounted to travel on the said plate, a nut depending from the base of the said standard, and engaging a groove formed in the said plate, a block inserted in the base of the standard, and projecting into the said groove, whereby the standard and the plate are connected in operative relation, and a feed screw, passed through an opening formed in the said block, and engaging the threaded opening of the nut, the screw being journaled in the said plate, substantially as described.

12. The combination in a transit, of a vernier plate, a telescope-supporting standard, slidably mounted on said plate, guide strips mounted on opposite sides of the standard, and bow shaped springs located in recesses

formed in the base of the standard and engaging the guide strips, substantially as described.

13. The combination in a transit, of a vernier plate, a telescope-supporting standard, slidably mounted on said plate, guide strips mounted on opposite sides of the standard, and projecting inwardly above a portion of the base of the standard on opposite sides, and springs carried by the base of the standard and engaging the over-lapping parts of the guide strips for the purpose set forth.

14. A transit, provided with a telescope-supporting standard slidably mounted on the vernier plate, a feed screw connected in operative relation with the standard for moving the latter back and forth upon the plate, and a counterpoise connected with one extremity of the feed screw for the purpose of balancing the instrument, the counterpoise being movably mounted on the feed screw, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

FRANK HEITZLER.

Witnesses:

ALICE I. LAKIN,

A. EBERT O'BRIEN.