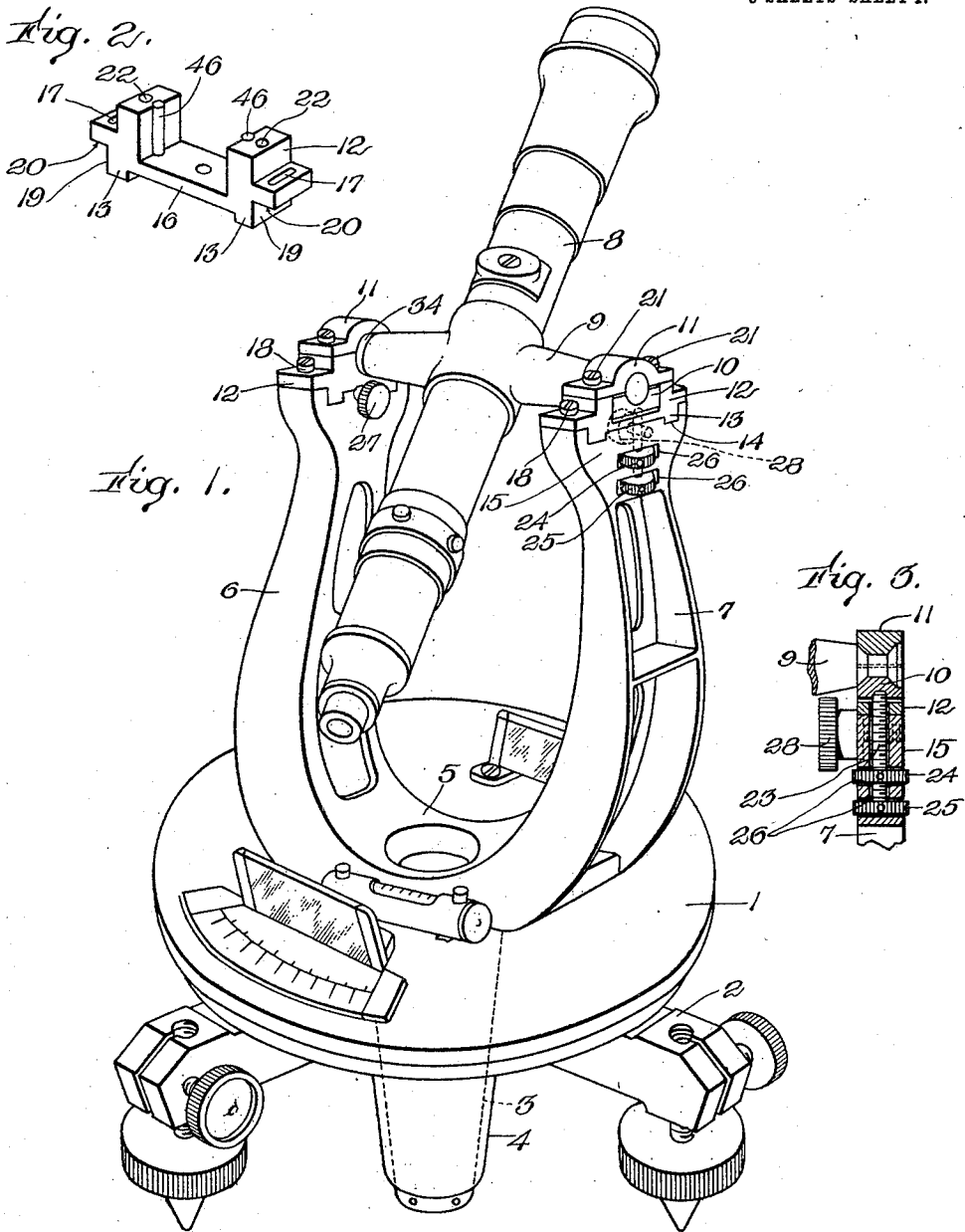


C. L. BERGER.
SURVEYING INSTRUMENT.
APPLICATION FILED MAR. 7, 1910.

1,003,419.

Patented Sept. 19, 1911.

3 SHEETS-SHEET 1.



Witnesses:
Edward Maxwell
M. J. Spalding

Inventor:
Christian L. Bergen
by Geo. H. Maxwell,
Attorney.

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3 SHEETS—SHEET 2.

Fig. 4.

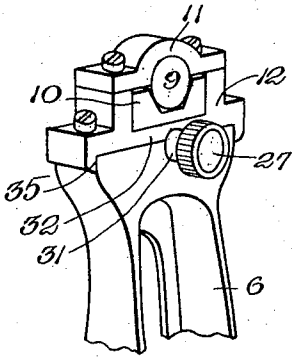


Fig. 5.

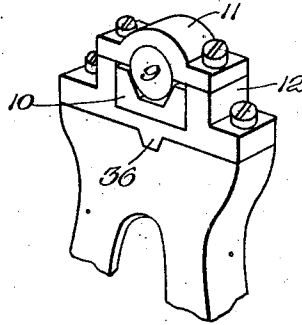


Fig. 6.

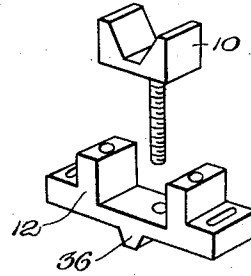


Fig. 7.

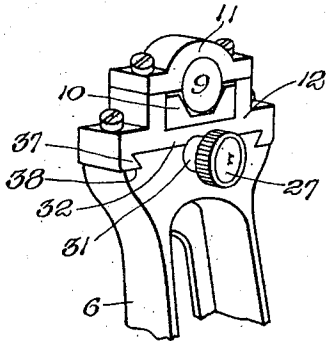


Fig. 8.

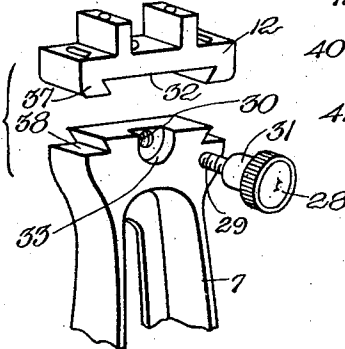


Fig. 9.

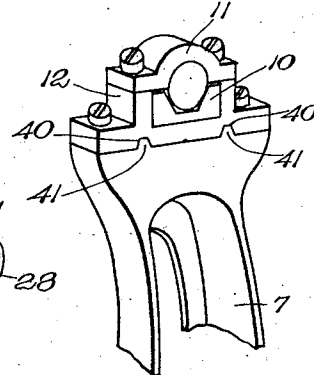


Fig. 10.

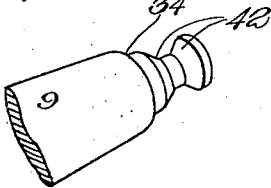


Fig. 11.

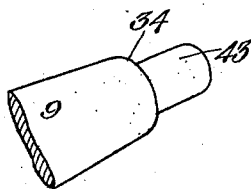
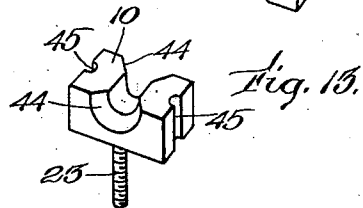
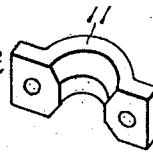


Fig. 12.



Witnesses:
Edward Maxwell.
W. J. Spalding

Inventor:
Christian L. Berger,
by Geo. S. Maxwell
Attorney.

1,003,419.

3 SHEETS--SHEET 3.

Inventor:
Christian I. Berger,
by Geo. S. Maxwell,
Attorney.

UNITED STATES PATENT OFFICE.

CHRISTIAN L. BERGER, OF BOSTON, MASSACHUSETTS.

SURVEYING INSTRUMENT.

1,003,419.

Specification of Letters Patent.

Patented Sept. 19, 1911.

Application filed March 7, 1910. Serial No. 547,651.

To all whom it may concern:

Be it known that I, CHRISTIAN L. BERGER, a citizen of the United States, and resident of Boston, in the county of Suffolk and State of Massachusetts, have invented an improvement in Surveying Instruments, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention relates to those instruments in which a telescope is mounted on a horizontal axis in bearings at the upper ends of opposite standards, as in a transit, theodolite, etc.

The object of my invention is to provide convenient means for quickly and accurately bringing the telescope into the vertical plane of the vertical axis of the instrument, *i. e.* the base plate pivot.

My invention has various other advantages which will be recognized by those skilled in the art, as, for instance, it provides convenient and accurate means for bringing the telescope bearings toward each other to take up with the utmost nicety and accuracy all wear at the axis collars, means for shifting the bearings as may be required to compensate for molecular or other changes of shape or position in the opposite standards, etc.

In the accompanying drawings, in which I have illustrated my invention in various details, Figure 1 is a perspective view of an instrument provided with my invention; Fig. 2 is a perspective detail of one of the shiftable journal bearing blocks; Fig. 3 is a central vertical section of the journal support at the right hand end of the instrument; Figs. 4 and 5 are fragmentary perspective views of the upper ends of standards provided with different forms of my invention; Fig. 6 is a perspective view showing two of the separable portions in their proper relation; Fig. 7 is a view similar to Fig. 4, showing a further modification; Fig. 8 is a perspective view showing certain of the parts of Fig. 7 dismembered; Fig. 9 is a perspective view of a still further modification; Figs. 10 and 11 show in perspective view end portions of different kinds of telescope horizontal axes; Figs. 12 and 13 are perspective views of two of the movable portions of a journal bearing for the kind of axle shown in Fig. 10; and Figs. 14 and 15 show a modified construction, in which the journal

bearing supporting members are almost co-extensive with the vertical distance of the telescope above the base plate, Fig. 15 being a perspective view and Fig. 14 an enlarged vertical sectional detail.

As herein shown, for convenience, the base plate 1 of the instrument is mounted on a trivet support 2, having its vertical pivot 3 mounted to turn in usual manner in a bearing 4, said construction being used for the purpose of illustration, as representing a typical instrument of the general kind to which my invention applies. Secured to the upper side of the base plate 1 is a stand 5 whose opposite uprights or standards 6, 7 support a usual main telescope 8 whose barrel is immovably secured at the middle of its horizontal axis 9 so that the telescope may swing in a truly vertical plane coincident with the vertical axis 3 when the base plate is adjusted to a true level. At its opposite ends, as shown in Fig. 1, the axis 9 is mounted to turn on a block 10, being retained by a journal cap or yoke 11, said parts being carried in a bed piece or supporting member 12 having depending transverse guide lugs 13 fitting into corresponding grooves or ways 14 formed transversely in the adjacent end 15 of the adjacent standard, said lugs and ways being truly parallel with the axis 9.

Further constructional details of the bed plate 12 may be seen in Fig. 2, where it will be seen that between the guide lugs 13, said plate extends in a slightly raised portion 16 horizontally to receive the block 10, and at either end elongated slots 17 are provided for receiving the securing screws 18 so as to permit the entire bearing to have lateral movement with relation to the standard, being guided by the cooperating surfaces 13, 14 and the adjacent angular flat surfaces 19, 20. The cap 11 is secured by screws 21 entering holes 22 in the block-like ends of the bed plate which embraces the journal block 10. One end of the axis requires means for its vertical adjustment, and accordingly one of the journal blocks 10, as shown in detail in Figs. 3 and 13, carries a depending threaded post 23 to be engaged by rotary adjusting nuts 24, 25 mounted in transverse recesses 26 in the upper end of the standard 7.

Preferably positive means is provided in the instrument for laterally and accurately moving the journal supports in their guided

alinement, said means being herein shown as consisting of opposite headed thumb screws 27, 28 shown as having a screw end 29 threaded into the adjacent standard at 30 and having a shoulder 31 to engage the adjacent lower edge 32 of the bed plate 12 whereby extreme delicacy of lateral adjustment and positioning of the latter is rendered possible. To permit the desirable range of movement, the standard is cut out at 33, as best shown in Figs. 3 and 8, to receive the shouldered portion 31 of the adjusting device. Thus by screwing out on the device 27 and simultaneously screwing in on the device 28, the telescope and its bearings will be shifted to the right, Fig. 1, with extreme accuracy and delicacy so that it may be brought into correct position with its line of collimation lying wholly within a vertical plane of the vertical axis of the instrument. If in use the standards should get sprung so as, for instance, to separate them slightly, the journal bearings may be adjusted at once to overcome this defect, or if, for instance the bearing shoulders 34 of the telescope axis should get worn, the bearings may be brought together slightly. In any case, when the telescope has been thus shifted into its absolutely correct plane of vertical movement, the bearings are clamped accordingly by means of their screws 18. The interlocking alining projections and ways 13, 14, 16, 19, and 20, maintain true position while permitting the transverse movement of the journal bearings either with or without the telescope and its horizontal axis, so that said bearings may be moved toward or from each other or together as may be required.

I believe it is new to provide means for shifting the telescope and its axis transversely of its vertical plane of rotation without movement on the base plate, and while I prefer to restrict this moving means to the extreme top ends of usual standards, I do not limit myself thereto, nor to any particular form of shiftable bearing, although I prefer the bed piece or supporting-post construction of Figs. 19. When thus used, the interlocking guiding arrangement thereof may vary widely.

In Fig. 4 I have shown the bed piece or supporting member 12 as provided at its ends with depending parallel guides 35, and in Figs. 5 and 6 as provided with a central V-shaped guide 36.

In Figs. 7 and 8, I have provided cooperating guiding dovetail members 37, 38, and in Fig. 9 a pair of V-shaped grooves 40 in the member 12 and complementary projections 41 in the standard.

In Fig. 10, I have shown a conical journal 42, Fig. 11 showing a cylindrical journal 43, the block 10, as shown in Fig. 12, having beveled portions 44 shaped to re-

ceive the journal of Fig. 10, and the cap 11 in Fig. 12 shaped to cooperate with said block 10 of Fig. 13. Vertical guiding grooves 45 are preferably provided to cooperate with guide posts 46, Fig. 2.

In Figs. 14 and 15, instead of the U-shaped stand transit without compass, of Fig. 1, I have shown a compass transit, the base plate 1 being provided with a usual compass box 47, and the standards are cut off short, nearly at the base plate, thereby providing short stub-like standards 6^a, 7^a, to receive the bed pieces or supporting members 12^a, the cooperating ends being provided respectively with guiding portions 13^a, 14^a, and clamped together by screws 18^a and shifted or adjusted by thumb-screws 28^a. In this case the members 12^a, which correspond to the members 12 of the preferred construction, are much higher than the members 12 and in fact more nearly correspond to the supporting legs or side members of the stand.

The securing screws 18^a have threaded engagement with the lower ends of the supporting members 12^a, as best shown in Fig. 14, and have lateral movement in elongated slots 48 in the uprights or standards 6^a, 7^a, provided on the base plate.

I have omitted the usual adjusting mechanism, graduated circles, etc., which go to make up a complete transit, and have merely shown the members 12^a conventionally, as I do not intend to limit my invention in any way to any particular design.

It will be apparent that in the construction shown in Figs. 14 and 15 the same range of adjustment to take up any wear of journal bearings or variations of correct normal position of journal bearings due to molecular change, accident, or other cause, may be made as in the preferred construction previously described and that the adjustments are effected by substantially the same means, the opposite members 12^a being capable of being adjusted in either direction with relation to the base plate, together or separately as may be required in order properly to aline or adjust the telescope and its horizontal axis.

Having described my invention, what I claim as new and desire to secure by Letters Patent is,

1. A surveying instrument, comprising a base plate, a telescope and its horizontal axis carried by said base plate, supporting means constructed to embrace each end of said horizontal axis at opposite sides thereof, and adjusting means for horizontally adjusting said two supporting means with relation to each other.

2. A surveying instrument, comprising a base plate, a telescope and its horizontal axis carried by said base plate, supporting means constructed to embrace each end of

said horizontal axis at opposite sides thereof, and adjusting means for horizontally and vertically adjusting said two supporting means with relation to each other and relatively to the base plate.

3. A surveying instrument, comprising a base plate mounted to turn horizontally on a vertical axis, standards carried by said base plate, a horizontal axis embraced by said standards, a telescope mounted on journals on said horizontal axis, and adjusting means to adjust the telescope with its journals lengthwise of its axis relatively to said standards to swing in a vertical plane which includes said vertical axis.

4. A surveying instrument, comprising a base plate mounted to turn horizontally on a vertical axis, standards carried by said base plate, a horizontal axis carried by said standards, a telescope mounted on said horizontal axis, journal bearings and supporting members for the ends of said horizontal axis, and adjusting means to adjust said supporting members and the parts carried thereby relatively to said standards lengthwise of said horizontal axis to bring the plane of swinging movement of the telescope into alinement with said vertical axis.

5. A surveying instrument, comprising a telescope and its horizontal axis, a supporting stand for the ends of said axis, journal bearings embracing said axis ends, and means for laterally shifting said telescope and bearings relatively to the said supporting stand in a direction lengthwise of said axis.

6. A surveying instrument, comprising a telescope and its horizontal axis, opposite vertical supporting standards, one for each journal end of said horizontal axis, a journal box constructed to embrace a journal end of said horizontal axis, and means for laterally shifting said journal box, and thereby the telescope, relatively to said standards in a direction lengthwise of said axis.

7. A surveying instrument, comprising a telescope and its horizontal axis, the latter being provided with bearing shoulders, and bearings and upright standards for supporting the ends of said axis beyond said shoulders, including provision for varying the distance apart of said bearings to compensate for the wear at said shoulders.

8. A surveying instrument, comprising upright standards, a telescope and its horizontal axis, end bearings for said axis secured to and movable with said axis independently of said standards, and means for adjusting an end bearing in two directions at an angle to each other whereby the telescope and its axis and bearings can be changed in position with relation to the standards without changing the adjustments of the bearings with reference to said axis.

9. A surveying instrument, comprising a telescope and its horizontal axis, and end bearings secured to said axis, said bearings, axis, and telescope having provision to be held for movement together, and relatively stationary supporting means for all the aforesaid parts, said means being formed to permit adjustment of said bearings therein.

10. A surveying instrument, comprising a telescope and its horizontal axis, end bearings embracing said axis for movement therewith, a support for said bearings, and means for adjusting an end bearing endwise of said axis and also vertically.

11. A surveying instrument, comprising a telescope and its horizontal axis, journal bearings for the journal ends of said axis, vertical standards for supporting said journal bearings at their upper ends, and means for adjusting one of said bearings toward the other.

12. A surveying instrument, comprising a telescope and its horizontal axis, journal bearings embracing the journal ends of said axis, vertical standards for supporting said journal bearings at their upper ends, means for adjusting said bearings relatively to said standards in a direction lengthwise of said horizontal axis, and means for adjusting a bearing vertically.

13. A surveying instrument, comprising a telescope and its horizontal axis, journal bearings for the journal ends of said axis, vertical standards for supporting said journal bearings at their upper ends, said bearings being adjustable relatively to said standards in a direction lengthwise of said horizontal axis, and adjusting means for effecting said adjustment.

14. A surveying instrument, comprising a telescope and its horizontal axis, opposite standards for supporting the journal ends of said axis, bed plates movably mounted on the upper ends of said standards, said standards and bed plates being provided with cooperating guiding surfaces for restricting the movement of the bed plates to a direction lengthwise of said axis, and journal bearings for the journal ends of the axis carried by said bed plates respectively.

15. A surveying instrument, comprising a telescope and its horizontal axis, opposite standards for supporting the journal ends of said axis, bed plates movably mounted on the upper ends of said standards, said standards and bed plates being provided with cooperating guiding surfaces for restricting the movement of the bed plates to a direction lengthwise of said axis, journal bearings for the journal ends of the axis carried by said bed plates respectively, and means for shifting said bed plates in their said adjustment relatively to said standards.

16. A surveying instrument, comprising a telescope and its horizontal axis, opposite

standards for supporting the journal ends
of said axis, bed plates movably mounted on
the upper ends of said standards, said
standards and bed plates being provided
5 with cooperating guiding surfaces for re-
stricting the movement of the bed plates to
a direction lengthwise of said axis, journal
bearings for the journal ends of the axis
carried by said bed plates respectively, and
10 a separately operable adjusting device for

each bed plate to shift said bed plate in
its said adjustment with relation to its
standard.

In testimony whereof, I have signed my
name to this specification, in the presence of 15
two subscribing witnesses.

CHRISTIAN L. BERGER.

Witnesses:

WILLIAM A. BERGER,

DAVID W. WEIS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
Washington, D. C."
