T. M. JACKSON.

Surveying Instrument.

No. 234,284. Patented Nov. 9, 1880.

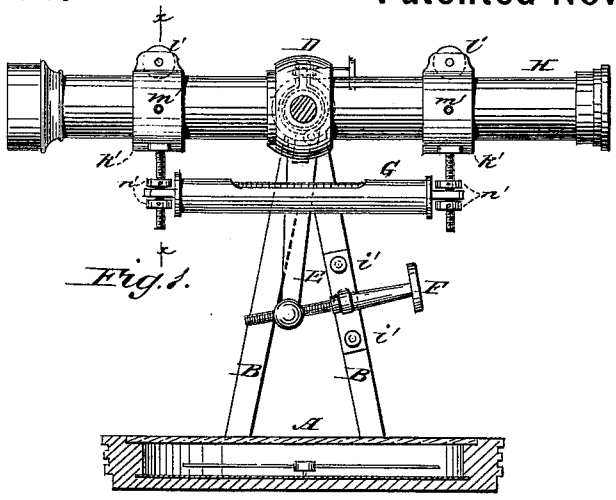


Fig. 1.

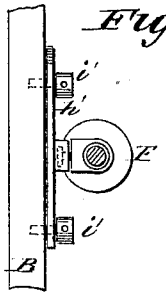


Fig. 6

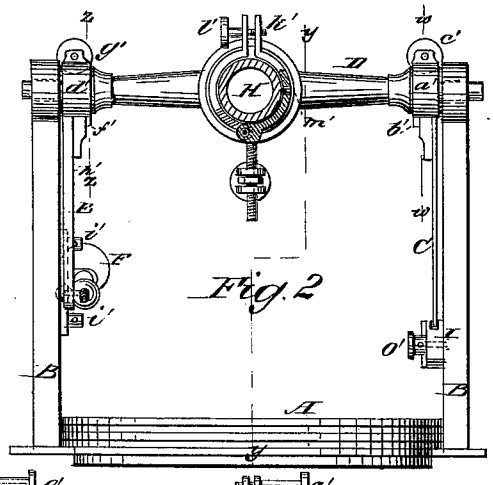


Fig. 2

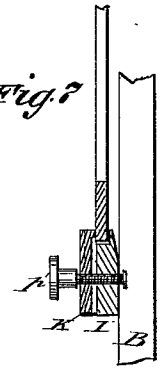


Fig. 7

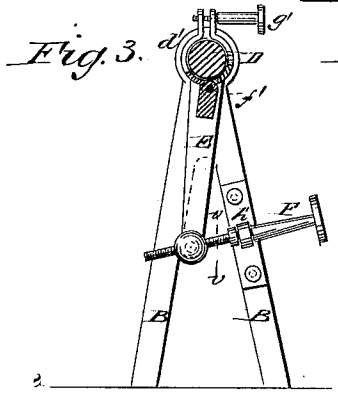


Fig. 3.

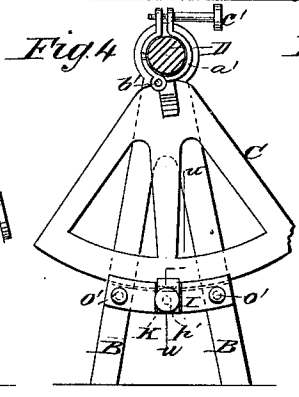


Fig. 4

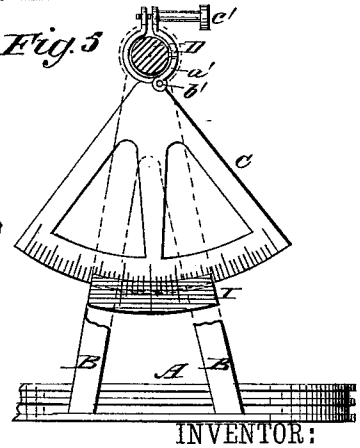


Fig. 5

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UNITED STATES PATENT OFFICE.

THOMAS M. JACKSON, OF CLARKSBURG, WEST VIRGINIA.

SURVEYING-INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 234,284, dated November 9, 1880.

Application filed September 1, 1879.

To all whom it may concern:

Be it known that I, THOMAS M. JACKSON, of Clarksburg, in the county of Harrison and State of West Virginia, have invented a new and Improved Surveyor's Instrument, of which the following is a specification.

Figure 1 is a sectional elevation of the device on line *y y*, Fig. 2. Fig. 2 is a sectional elevation on line *x x*, Fig. 1. Fig. 3 is a sectional elevation on line *z z*, Fig. 2. Fig. 4 is a sectional elevation on line *w w*, Fig. 2. Fig. 5 is an end elevation. Fig. 6 is a sectional elevation on line *v v*, Fig. 3. Fig. 7 is a sectional elevation on line *u u*, Fig. 4.

Similar letters of reference indicate corresponding parts.

The object of this invention is to construct engineers' and surveyors' instruments with certain detachable parts that can be fitted for use upon an instrument, old or new, and when not in use may be taken off and laid away in safety, thus lessening the weight of the instrument and the liability to injure the parts.

The invention consists in attaching a level detachably to the body of the telescope of a plain transit-instrument by means of two armed or hinged clamps whose upper or free ends are secured together by thumb and binding screws, the telescope being also provided with laterally-projecting pins that indicate the proper position of the clamps and prevent shifting of the same.

The invention further consists in the detachable attachment of the tangent arm to the body of the telescope by a construction and arrangement of parts hereinafter described.

The invention also consists in the combination of the arc detachably secured to the axis of the telescope by a screw-clamp, and the detachable vernier provided with a groove in which the arc moves, and provided with an adjustable clamp, and in the vernier-clamp operated by a screw, as will be hereinafter described.

In the drawings, A represents the compass; B B, the standards; and C the vertical arc that is bound to the axis D of the telescope by the clamp *a'*, which is hinged at *b'* and drawn together by the screw *c'*. On withdrawal of the screw *c'* the clamp *a'* may be opened and the arc C be removed from the instrument. The arc C is made in one piece, excepting the hinged clamp *a'*, and is graduated thirty degrees on each side of center, so that, if necessary, sixty degrees may be read, and a vertical angle of any number of degrees can be measured by measuring sixty degrees at a time.

E is the arm connecting the tangent-screw F to the axis by the clamp *d'* that is hinged at *f'*, and is drawn tightly around the axis D by the screw *g'*. By reason of its hinge this clamp *d'* is detachable from the axis D. The tangent-screw F is fastened to the standard B by the plate *h'*, the screws *i' i'* through which are operated by the ordinary adjusting-pin, making all the parts detachable.

G is the level attached to the telescope H, which, instead of being permanently fastened to the telescope H, as in all instruments heretofore made, is removably secured thereto by the hinged clamps *k' k'* that are drawn close upon the telescope H by the screws *l' l'*, and to enable the operator to place the clamps *k'* in the proper position, also to prevent the level G from slipping on the telescope H or shifting around it, the pins *m' m'*, which are permanently fixed in the telescope H itself, project into corresponding holes in the clamps *k' k'*, so that the level G is always kept in its proper place. The level G is adjusted by the adjusting-screws *n' n'*.

I is a detachable vernier that is fastened to the standards B B by the screws *o' o'*. This vernier I is slightly beveled on the outside, and has the vernier-scale marked on the beveled edge.

K is the vernier-clamp, operated by the screw *p'*. The object of this clamp is to hold the vertical arc C in position during the adjustment of the level G by the tangent-screw F, and also to hold the vertical arc C when not used or when the telescope H is being inverted or when the engineer should want to measure a vertical angle greater than sixty degrees. All these parts herein described are simple, and can be put in place on the instrument or removed with ease and rapidity.

Engineers prefer for railroad work the plain transit-instrument, yet there are times in run-

ning grades and leveling when the engineer is compelled to have the above attachments. All instruments heretofore made have had said attachments permanently fastened to them, thereby increasing the weight of the instrument and the liability to breakage and injury of the attachments when not in use. A plain transit-instrument with such attachment would give an engineer a complete instrument, and with stadia-hairs would give him his distance, grade, level, and position much more simplified than with a gradienter.

The object of the arc is to measure vertical angles, grades, distances, and heights. The object of the level G is to keep the telescope H horizontal, and to find differences of level between points. The object of the tangent-screw F is to give to vertical arc C and level G a slow motion for accuracy of reading the arc C and bringing level G to proper position. The object of the vernier I is to read graduation of the arc C to fractions. The object of the combined attachments is to make one instrument do the work of two or more, securing the advantages of each without its disadvantages.

I am aware that the levels of some transit-instruments are secured to the body of the telescope by screws; also, that tangent-screws have been commonly adapted to be screwed out of arms which form permanent attachments of the axis of the telescope.

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

1. In a surveyor's instrument, the combination of the arc C, detachably secured to the axis D by clamp a' and screw c', and the detachable vernier I, provided with a groove in which the arc moves, and with an adjustable clamp, K, substantially as and for the purpose set forth.

2. The vernier-clamp K, operated by screw p', substantially as shown.

3. In a surveying-instrument, the combination, with the level G and telescope H, provided with laterally-projecting pins m' m', of the two-armed detachable clamps k' k', having holes to receive said pins, and the thumb and binding screws l', all constructed as shown and described.

4. In a surveying-instrument, the combination, with the axis D, on which the telescope H is mounted, of the two-armed detachable clamp d and thumb and binding screw g', the arm E, hinged to said clamp, and the detachable tangent-screw F, connected with the arm, all as shown and described, for the purpose specified.

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