

(No Model.)

2 Sheets—Sheet 1.

K. FREEMAN.  
SURVEYING INSTRUMENT.

No. 267,178.

Patented Nov. 7, 1882.

Fig. 1.

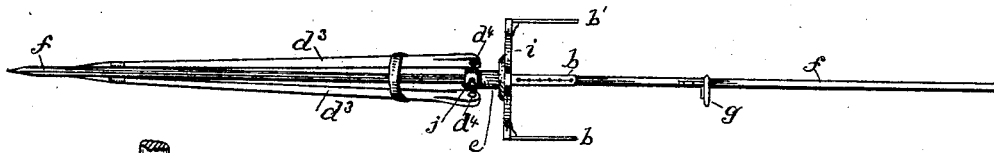


Fig. 3.

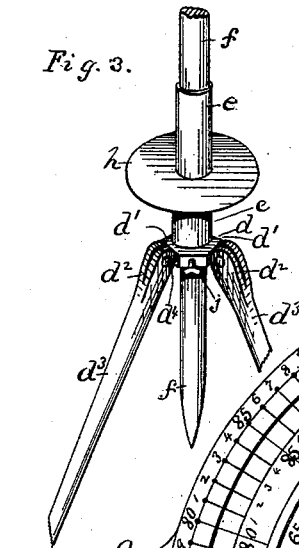


Fig. 2.

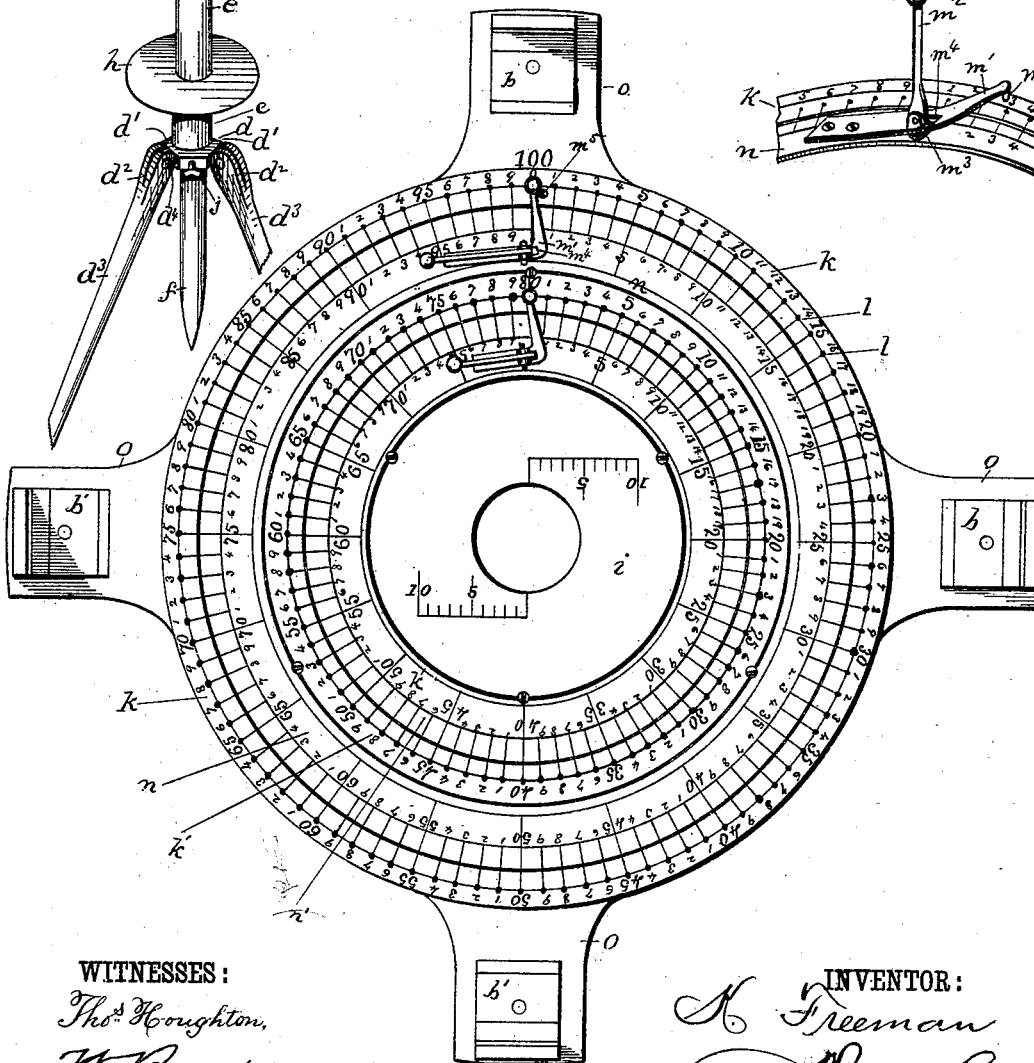
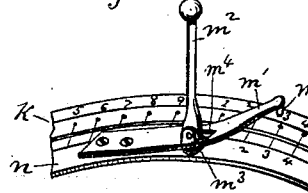


Fig. 4.



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W. Read,

INVENTOR:  
K. Freeman  
BY *[Signature]*  
ATTORNEYS.

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Fig. 5.

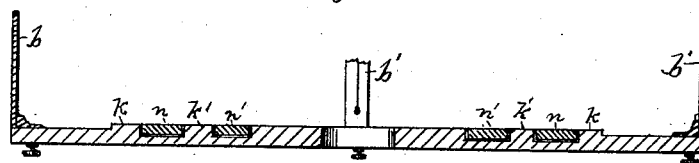


Fig. 6.

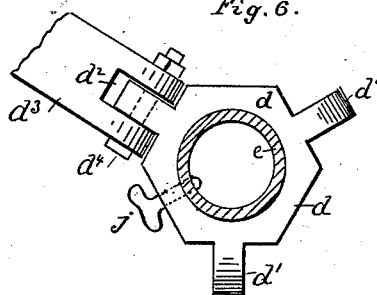


Fig. 7.

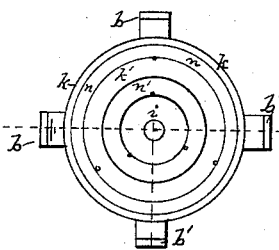
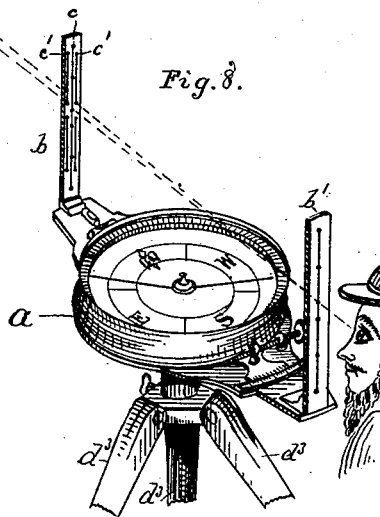


Fig. 8.



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# UNITED STATES PATENT OFFICE.

KASSON FREEMAN, OF GRAND RAPIDS, MICHIGAN, ASSIGNOR OF ONE-  
FOURTH TO HENRY DURBIN, OF OAK CREEK, WISCONSIN.

## SURVEYING-INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 267,178, dated November 7, 1882.

Application filed February 16, 1882. (No model.)

*To all whom it may concern:*

Be it known that I, KASSON FREEMAN, of Grand Rapids, in the county of Kent and State of Michigan, have invented certain new and useful Improvements in Surveying-Instruments; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is an elevation of my improved tripod, cross, and staff. Fig. 2 is a plan view of the cross and registering-table. Fig. 3 is a perspective view of the tripod and staff. Figs. 4, 5, and 6 are detail views. Figs. 7 and 8 are perspective views, showing the positions of the devices when in use.

In the employment of a chain in surveying land great inaccuracies have heretofore arisen in the measurements, particularly in rough and broken lands, the chain-men being inexperienced generally, so that it is difficult to find two men that would measure twenty chains twice alike. To remedy this defect and to obtain what is extremely important—an exact survey—and at the same time to dispense entirely with the employment of the chain and chain-men, are the objects of my invention; and to these ends my invention consists in the employment of a compass or transit-instrument provided with a micrometer-sight and a cross, and with a registering-table having micrometer-sights, and a staff detachably secured to a tripod, whereby the employment of a chain is entirely dispensed with.

My invention further consists in certain details of construction hereinafter more fully set forth.

In the accompanying drawings, *a* represents a compass, provided with the micrometer-sight *b* and plain sight *b'*, each composed of a vertical arm, the micrometer-sight having a vertical central slit, *c*, and a vertical slit, *c'*, lying on each side of the central slit and at equal distances therefrom. The micrometer and plain sights *b* *b'* lie diametrically opposite each other, and a central horizontal wire crossing the vertical wires.

*d* represents a polygonal collar, to the alter-

nate outer faces of which are secured the arms *d'*, which are each inserted in a vertical slot, *d''*, in a leg, *d''*, of a tripod, the arms *d'* being pivotally secured in the slots in the legs of the tripod by means of the bolts *d'*, each passing through the upper ends of the legs and the holes in the arms *d'*, whereby the legs *d''* are pivotally secured to the collar, constituting a tripod with a central hole in the collar.

*e* represents a sleeve projecting vertically upward from the central hole in the collar, 60 adapted to receive and hold a staff, *f*, provided with a spirit-level, *g*.

*h* represents a horizontal flange projecting from the sleeve *e*, adapted to support a cross and registering table, *i*, hereinafter more fully set forth.

*j* represents a set-screw passing through a hole in one of the sides of the collar *d*, and having its inner end bearing against the staff *f*.

*i* represents my improved cross and register of chain-and-link measures, and it consists of an outer stationary ring, *k*, graduated for links from 0 around to 100, and having a hole, *l*, opposite each graduation, each of which holes *l* is adapted to receive a vertical pin, *m*, on the outer end of a spring-lever, *m'*, the opposite end of which is secured to a rotating ring, *n*, concentric with the outer stationary ring, *k*. The ring *n* is graduated for links from 0 to 100 in the same manner as the outer stationary ring, *k*.

*m*<sup>2</sup> represents a lever with a cam, *m*<sup>3</sup>, on its lower end. The lever *m*<sup>2</sup> is pivoted in bearings in the spring-lever *m'*, over a slot, *m*<sup>4</sup>, in the upper face of the spring-lever *m'*. By this construction, by raising the outer end of the lever *m*<sup>2</sup> the pin *m* is raised out of its hole *l*, and the inner movable ring, *n'*, may be turned forward or backward, as desired, and by throwing down the lever *m*<sup>2</sup> the pin on the spring-lever will fall into one of the holes *l*.

*m*<sup>5</sup> represents a check-pin on the stationary ring *k*, to indicate by the levers striking against it in its revolution that one hundred links, or one chain, has been passed over, which should then be noted by moving the chain-circle one hole.

*k'* and *k''* represent respectively an inner

stationary and rotating ring, constructed and graduated for chains in the same manner as the stationary and movable rings *kn* described, the movable ring being provided with a spring-lever, *m'*, having a vertical pin, *m*, to engage with the holes in the stationary ring *k'*.

*o o* represent projections secured to the outer stationary ring, *k*, and lying diametrically opposite each other and at right angles to each other, and affording supports for the plain and micrometer sights *b b'*.

In practice, after the compass or transit-instrument is set and the direction noted, the flagman proceeds along the line to any desired distance. The cross carrying the register and staff is then planted along the line at any point. After this has been accomplished the staff is removed from its position in the cross by the flagman, who moves with it from the cross in a line at right angles to the survey-line until the staff is covered by the outside slot in the micrometer-sight or micrometer-wires or stadia-hairs in instrument on that side of the line which is indicated by the surveyor, and there plants the staff. The horizontal distance in feet and fractions of a foot from the center of staff to the center of the cross is then measured, one foot being equal to one chain, and one-tenth of a foot equal to ten links, the tape line or measure being divided into feet, and the latter decimally, or into tenths of a foot, and the distance entered in the registering-table. On arriving at the cross, and after noting the distance and recording the same, I take a look through the sights of the cross, which are on the right line, and if there are any trees, houses, or any other obstructions on the line, before taking up the cross by the flagman I set my compass or transit to either side, at right angles, far enough to clear said obstructions, and note the distance, and at the next setting place it back again on the line in the same manner. As soon as the cross is set and flag-pole taken out the axman can look through the sights and note the brush, &c., to be cleared on the line, and keep at work while the surveyor is advancing, and on approaching a river or lake

the distance across the same can be taken in much less time and more correctly than by the usual mode of triangulation or any other device; and in running up or down slopes, by noting the elevation or depression with a vertical arc or circle on the transit, a true measure can be readily ascertained with a traverse-table, thus avoiding the very uncertain measurement made with a chain, as one end of the chain must be raised to a point that will place the chain level.

What I claim as new, and desire to secure by Letters Patent, is—

1. The cross and register *i*, provided with the plain and micrometer sights *b b'*, substantially as described, and for the purpose set forth.

2. The combination, with a tripod provided with the collar *d*, having central orifice, sleeve *e*, and flange *h* and staff *f*, of the cross and register *i*, having the plain and micrometer sights *b b'*, substantially as described, and for the purpose set forth.

3. The cross and register *i*, provided with the plain and micrometer sights *b b'*, stationary graduated rings *k k'*, provided with holes *l*, rotating graduated rings *n n'*, spring-levers *m'*, secured to the rotating rings, and cam-levers *m*, substantially as described, and for the purpose set forth.

4. The combination of a compass provided with opposite plain and micrometer sights, a cross and register provided with opposite plain and micrometer sights, a tripod for supporting said cross and register, having a central orifice in its collar, and a detachable staff, substantially as described.

5. The combination, with a compass or transit-instrument, of the micrometer-sight *b*, provided with the vertical central slot, *c*, and parallel vertical side slots, *c' c'*, substantially as described, and for the purpose set forth.

KASSON FREEMAN.

Witnesses:

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JOHN T. LAWRENCE.