

(No Model.)

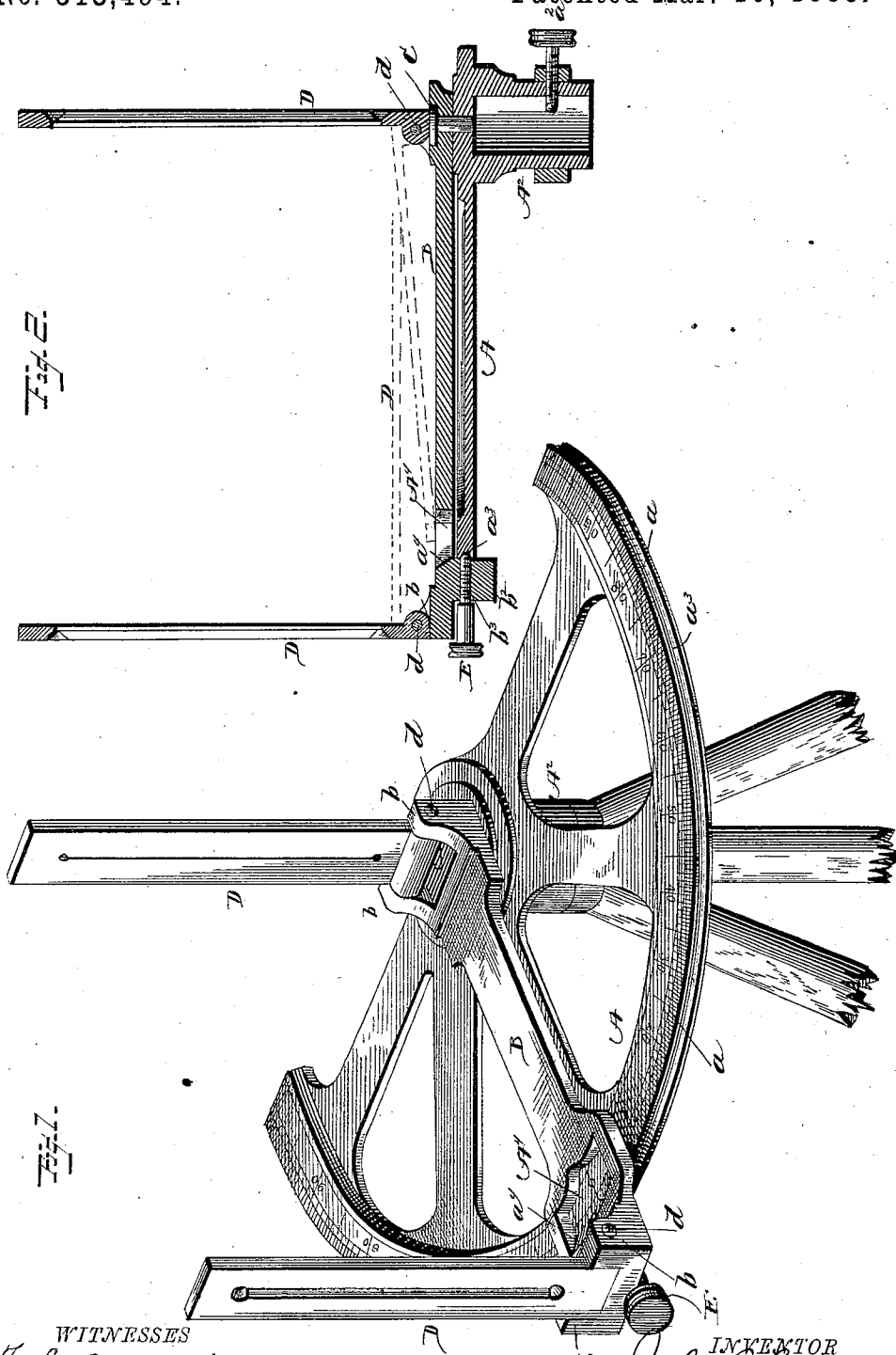
2 Sheets—Sheet 1.

J. HALE.

SURVEYING INSTRUMENT.

No. 313,494.

Patented Mar. 10, 1885.



WITNESSES
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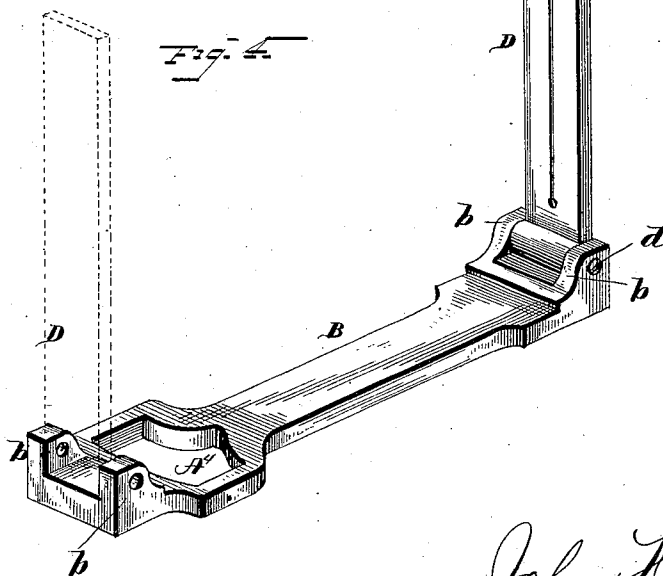
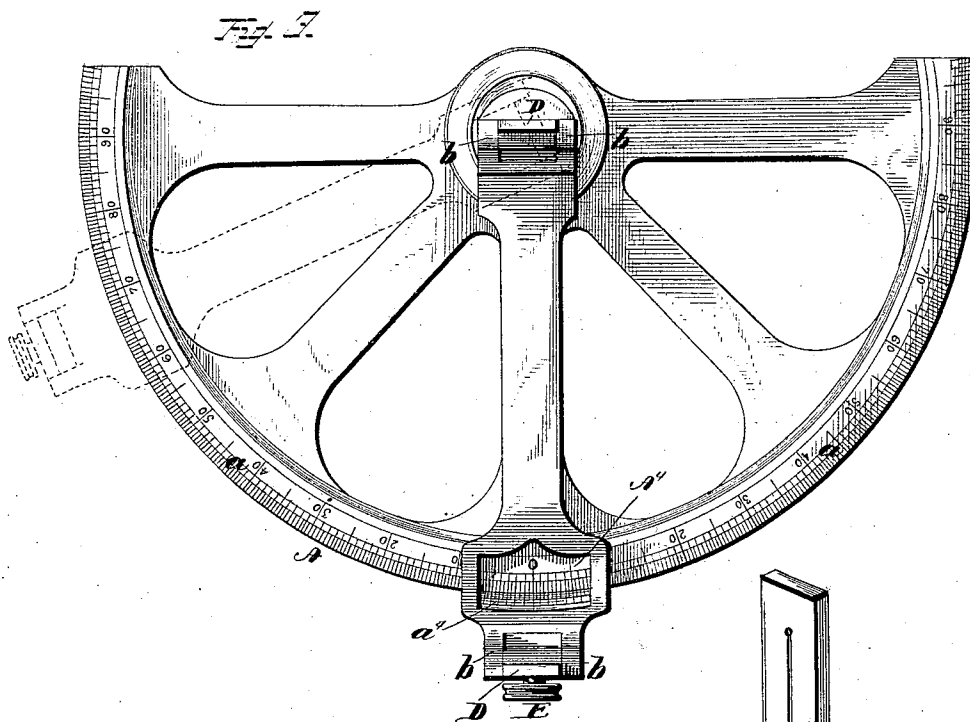
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UNITED STATES PATENT OFFICE.

JOHN HALE, OF SCRANTON, PENNSYLVANIA.

SURVEYING-INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 313,494, dated March 10, 1885.

Application filed October 22, 1884. (No model.)

To all whom it may concern:

Be it known that I, JOHN HALE, a citizen of the United States, residing at Scranton, in the county of Lackawanna and State of Pennsylvania, 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 invention, which will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to surveying-instruments, and is especially adapted for use in mines or the like in lieu of the miner's compass now commonly employed.

The object of my invention is to provide an improved instrument of this class which will possess advantages in point of simplicity, inexpensiveness, and general efficiency, and which can be readily and conveniently operated.

It is well known that the metallic or magnetic attractions which exist more or less in all coal or iron-ore mines cause a variation of the needle of ordinary miners' compasses to such an extent as to render the instrument unreliable and inaccurate.

My invention is designed to overcome all such difficulties, and to enable accurate surveys and the running of true parallel lines without the needle-compass, so that the metallic attraction is entirely avoided.

In the drawings, Figure 1 is a perspective view of my improved instrument. Fig. 2 is a vertical transverse sectional view thereof. Fig. 3 is a top or plan view illustrating the operation by dotted lines. Fig. 4 is a detail perspective view of the movable arm.

Corresponding parts in the figures are denoted by the same letters of reference.

Referring to the drawings, A designates the compass-plate, which is preferably semicircular, as illustrated, and provided with the graduations a and with the sleeve or socket A^2 , by which the plate is adapted to be supported upon a tripod or staff in such a manner as to be conveniently used in mines or at any other work in which a surveyor's compass or transit is employed, a set-screw, a^2 , being provided to secure the plate in position.

B is a movable arm, which is pivotally cen-

tered to the plate and adapted to move around the fixed center, the pivotal connection being formed, preferably, by a pivot pin or screw, C, passing through the arm and into the plate. At each end of the movable arm is provided a vertical sight, D, preferably pivoted between two lugs, $b b$, upon the arm by means of a pivot pin or screw, d , by which arrangement the sights may be readily folded down when the instrument is out of use. Upon the under side of the movable arm, at its outer end, projects a lug, b^2 , formed with a screw-threaded perforation, b^3 , through which works a set-screw, E, adapted to clamp the edge or periphery of the plate to secure the arm in the position to which it has been adjusted. The periphery of the plate is preferably provided with a concave groove, a^1 , to receive the end of this set-screw and obviate displacement or strain. Near its outer end the movable arm is preferably widened, as illustrated, and in this widened portion is provided a transverse slot, A^4 , in which is provided a vernier, a^4 .

The operation and advantages of my invention will be readily understood by those skilled in the art to which it appertains. In practice a base-line is first established in any of the known methods, such as dropping two plummet down the vertical shaft from the surface of the ground. Then at the bottom of said shaft a fine copper wire is stretched across and extends some distance into the mines—say fifty feet, more or less—the wire being so adjusted horizontally that it will touch the two plummet-wires above mentioned. After establishing the first base-line, my improved instrument is placed under the mark, the movable arm being clamped in position at 0 or zero on the scale or graduations of the plate. The base-line is well established through the sights while the arm is thus clamped in position, when the movable arm may be turned to the right or left at will as many degrees as desired, the second sight being then established, and the operation being continued to right or left until the survey is completed, without fear or any liability to inaccuracy through any magnetic or metallic influences.

My improved instrument is very simple and less expensive than the transit or the theodo-

lite, and it can be readily and conveniently operated, and is easily understood and governed.

I claim as my invention and desire to secure
5 by Letters Patent—

1. In a surveying-instrument of the class described, the combination, with the graduated compass-plate, of the movable arm having its inner end pivoted centrally in relation thereto, and vertical sights provided at the pivotal
10 and outer ends of said arms, substantially as and for the purpose set forth.

2. In a surveying-instrument of the class described, the combination of the graduated compass-plate, the movable arm moving around a fixed center in relation thereto, and provided with the vernier, and the folding sights provided at the pivotal and outer ends of the arm,
15 substantially as set forth.

20 3. The combination of the graduated com-

pass-plate, the movable arm pivoted at its inner end thereto and moving around a fixed center, and provided with the vernier and with the set-screw, and the folding sights provided upon the arm at its pivotal and vernier ends,
25 substantially as set forth.

4. The combination of the graduated compass-plate provided with the grooved edge, the movable arm centrally pivoted in relation thereto, and provided at its outer end with the
30 vernier and the downwardly-projecting lug, the set-screw working through the latter, and the folding sights provided at the ends of the arm, substantially as set forth.

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

JOHN HALE.

Witnesses:

WILLIAM GEORGE HOUSE,
JAMES M. THOMAS.