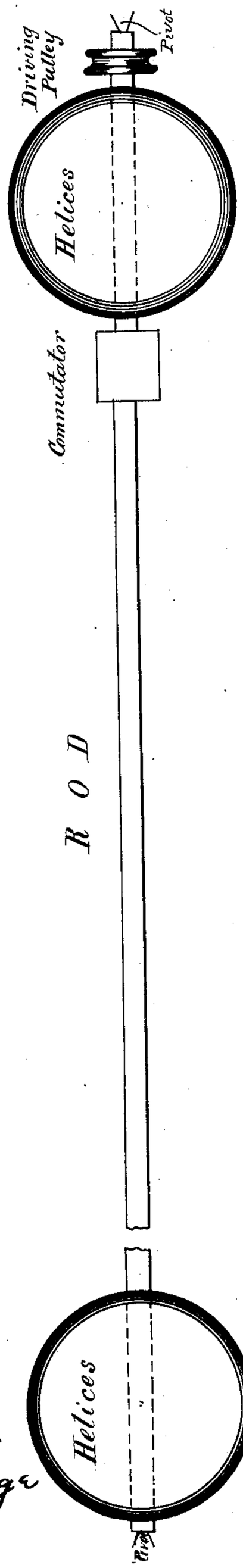
(No Model.) 4 Sheets—Sheet 1.

C. F. VARLEY.

ELECTRIC DIVINING ROD.

No. 277,087. Patented May 8, 1883.



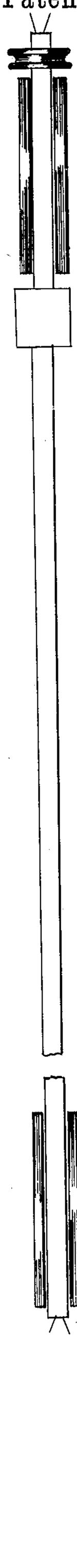


Fig. 1.

Witnesses.
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By his attorneys.
Baldwin, Hopkins & Peyton.

(No Model.) 4 Sheets—Sheet 2.

C. F. VARLEY.

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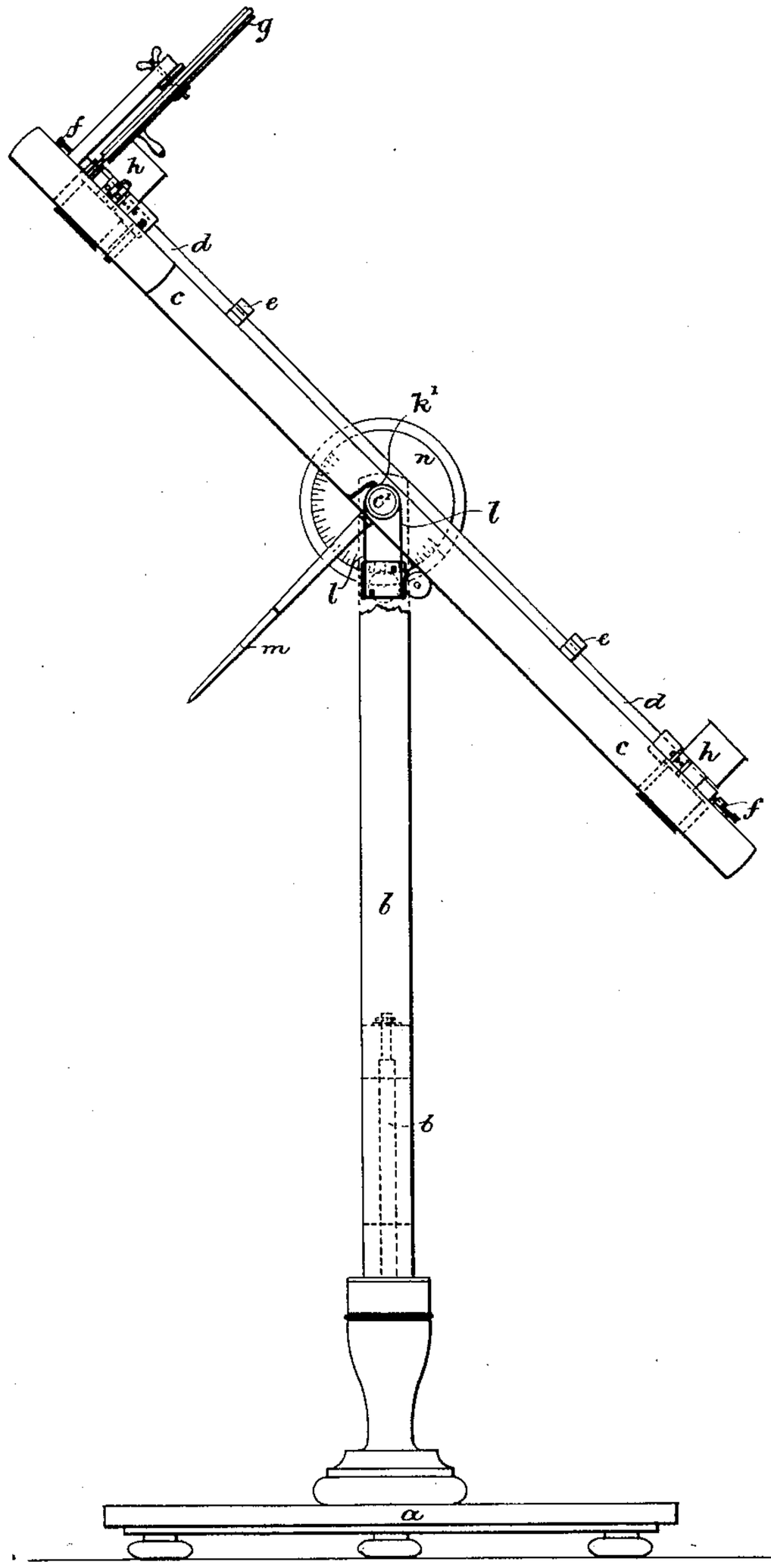
Fig: 2.



Witnesses

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(No Model.) 4 Sheets—Sheet 3.

C. F. VARLEY.

ELECTRIC DIVINING ROD.

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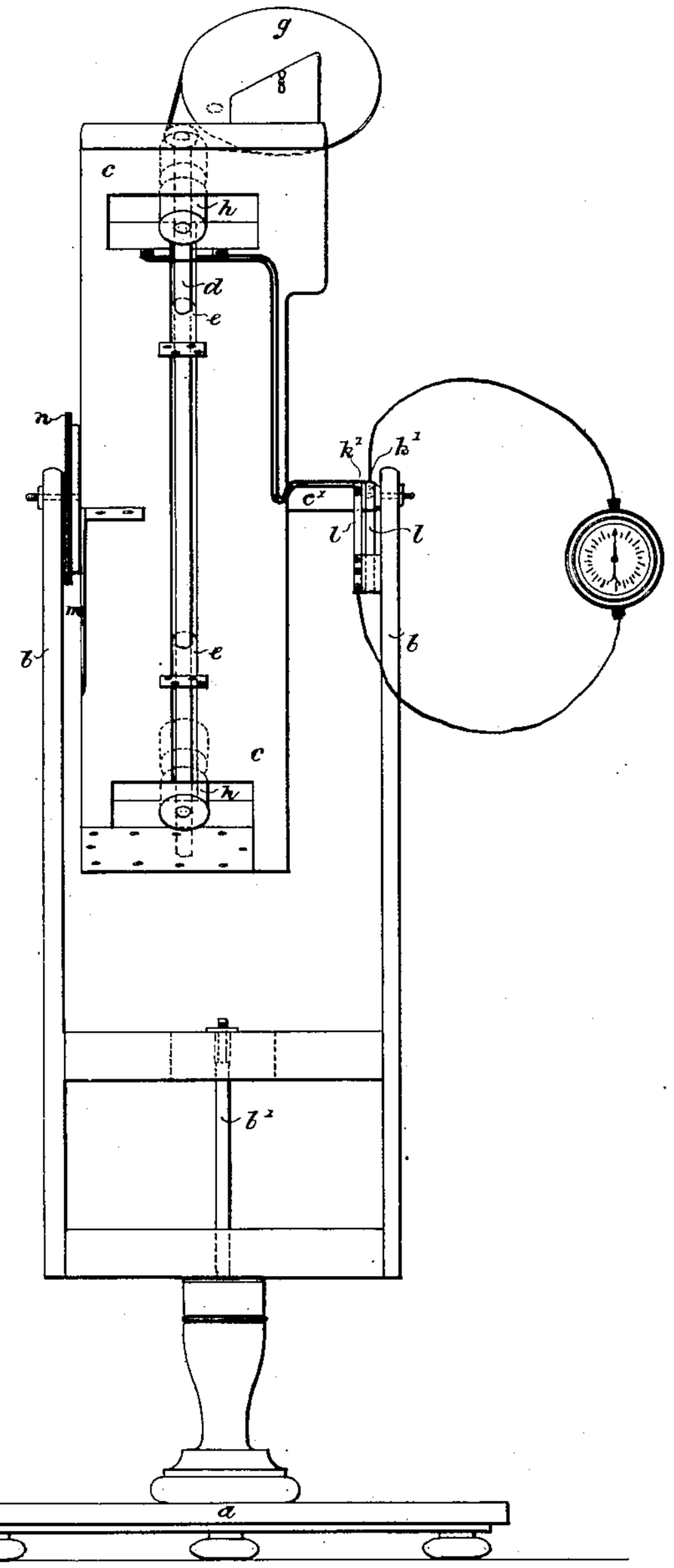
Fig: 3.



Witnesses

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(No Model.) 4 Sheets—Sheet 4.

C. F. VARLEY.

ELECTRIC DIVINING ROD.

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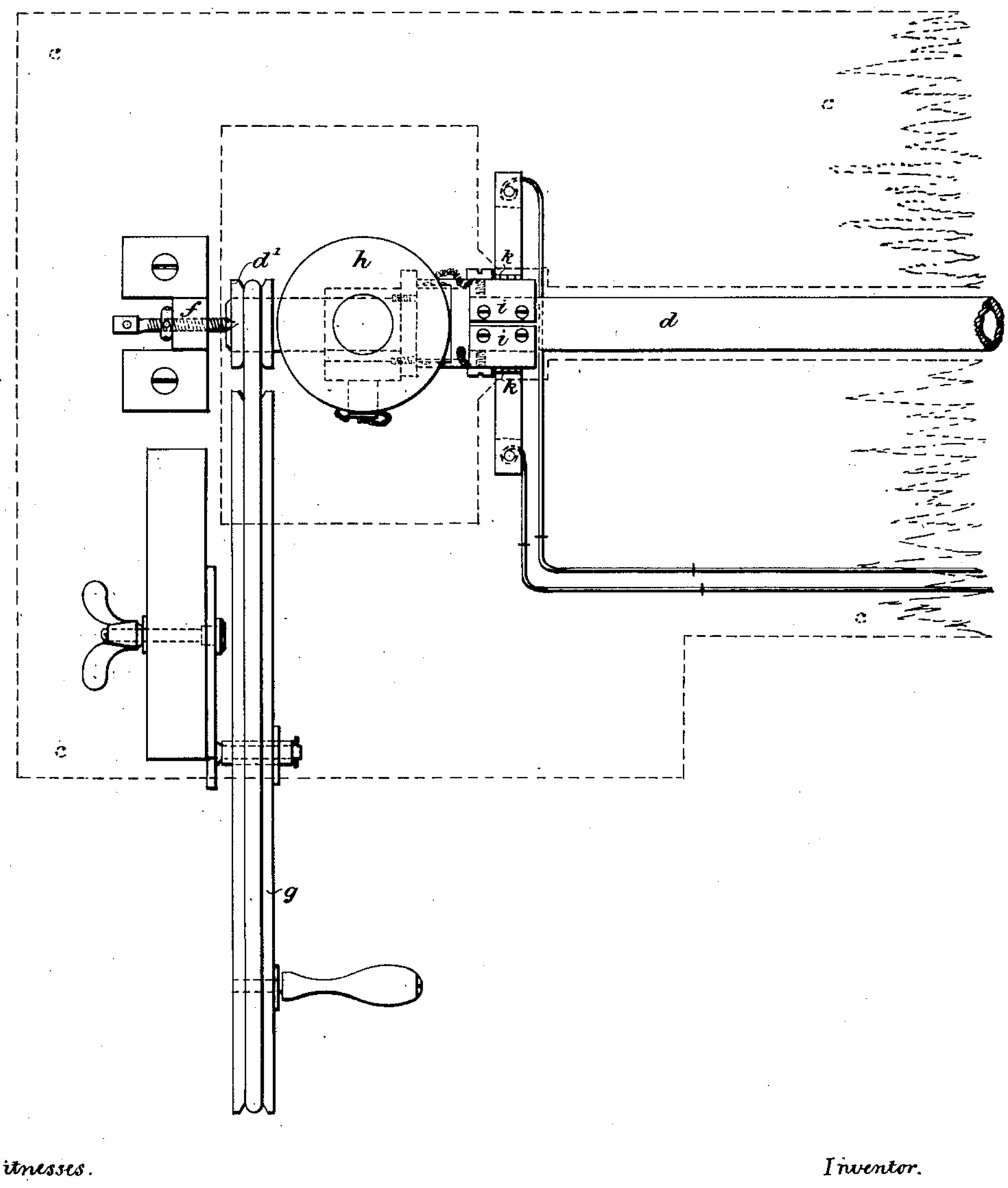
Fig: 4.



Witnesses.

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UNITED STATES PATENT OFFICE.

CROMWELL F. VARLEY, OF BEXLEY HEATH, COUNTY OF KENT, ENGLAND.

ELECTRIC DIVINING-ROD.

SPECIFICATION forming part of Letters Patent No. 277,087, dated May 8, 1883.

Application filed August 31, 1882. (No model.) Patented in England December 7, 1881, No. 5,353.

To all whom it may concern:

Be it known that I, CROMWELL FLEETWOOD VARLEY, a subject of the Queen of Great Britain, residing at Cromwell House, Bexley Heath, in the county of Kent, England, have invented certain new and useful improvements in divining-rods or apparatus by which the existence and position of metallic lodes may be discovered, and which is also applicable to other useful purposes, (for which I have received Letters Patent in Great Britain, No. 5,353, dated December 7, 1881,) of which the following is a specification.

The object of the invention is to discover the existence and position of metallic lodes by means of observations made upon the surface of the ground.

The apparatus in the form I find most convenient consists of a rod or axis of from one meter to two or three in length. The rod is pivoted into a frame. The rod carries on each end two helices of twenty to thirty centimeters in diameter, as indicated in Figure 1 of the drawings annexed. The planes of the rings are parallel with the axis, and the centers of the two helices are placed about one meter apart, more or less. These helices are connected together by two wires passing along the rod, so as to form one circuit, but broken at a convenient part of the axis, and attached to two insulated semi-cylindrical pieces of metal mounted upon the axis, and against which two springs press. This arrangement forms a commutator, and the contacts change during the rotation as the planes of the rings or helices become vertical. The axis is connected by means of a pulley and cord with a large wheel carried on the frame which supports the pivots, or is otherwise geared so as to permit of its being rapidly rotated. The two springs of the commutator are connected to a delicate astatic galvanometer at a convenient distance, or to a movable coil placed in a magnetic field. At right angles to the plane of the rod projects a pointer. This pointer is attached to the frame carrying the rod. The frame is mounted on pivots, so as to turn in any direction, the stand carrying the frame having two axes, one horizontal, the other vertical, as in the altazimuth mounting of a telescope. If there be an electric earth-current passing in a straight line of indefinite length underneath the axle, it will produce a magnetic field diminishing in power as the distance from it increases. This magnetic field, when cut by the helices, tends to generate currents in them. The commutator causes all the currents to flow through the galvanometer in one direction if the pointer is placed in a line perpendicular to the lode; but when the rod is suitably placed and the pointer is in the direction of the lode the currents are divided half in one direction and half in the other through the galvanometer, which returns to zero. Thus if the galvanometer is deflected with the rod in any position it shows the presence of a lode. By inclining the rod until no current is produced the pointer is brought to a position in which it indicates the direction of the lode, and by taking two observations, one on each side of the lode at which the pointer shows an angle of forty-five degrees, half the horizontal distance between these two stations is the distance of the lode beneath the surface of the earth, supposing the surface to be level or uniform. The hollow helices at each end of the rotating bar may be varied in form, and may be replaced by two bar electro-magnets.

An instrument with bar electro-magnets is represented by the Figs. 2, 3, and 4. Fig. 2 is a side elevation, and Fig. 3 a front elevation. Fig. 4 is a portion of a plan to a larger scale.

a is the foot or support. *b* is a frame carried by it, and capable of being turned around the vertical axis *b'*.

c is a board having horizontal axes or trunnions *c' c'*, by which it is carried in the frame *b*, and about which the board can be inclined as may be desired. The board *c* may thus be said to have an altazimuth mounting. *d* is an axis capable of turning in bearings *e e*, fixed on the board, and it has also pivots *f f* at the ends. The axis *d* can be put into rapid rotation by a band which encircles the small pulley *d'* on the axis, and also the wheel *g*, which, when required, is turned by hand.

h h are the electro-magnets at the two ends of the axis *d*. They are similar to each other, and each consists of a soft-iron core, which is perpendicular to the axis, and is surrounded with coils of silk-covered wires. The coils are

all connected in one circuit by wires which pass within the axis, which is hollow. The ends of the wires are brought out and attached to two semi-cylindrical pieces of metal, *i i*, which are carried upon the axis, but insulated from it and from each other.

k k are two metal springs fixed to the board *c*, and bearing against the metal pieces *i i*. These parts form a commutator. The springs *k k* are coupled with the galvanometer, which should be delicate and capable of appreciating small currents. The galvanometer is of ordinary construction. The connection is made by wires passing along the board from the springs *k k* to one of the trunnions *c'*, and to metal rings on this trunnion.

l l are springs resting on the rings *k k*, and wires pass direct from them to the galvanometer.

m is the pointer fixed to the board.

n is a graduated disk, also fixed to the board, and on which the inclination may be read by the aid of a plummet.

Having thus described the nature of my said invention and the manner of using the same, I would have it understood that I claim—

The described divining-rod or instrument by which metallic lodes may be discovered and their positions determined from the effects of the electric current which naturally traverses the lode, such instrument consisting of a pair of coils or helices at a distance apart, and either with or without cores, such coils or helices being connected in opposition to each other through a galvanometer or other instrument by which feeble electric currents may be appreciated, and being arranged for simultaneous rotation, substantially as described.

London August 1, 1882.

CROMWELL FLEETWOOD VARLEY.

Witnesses:
CHRIS BERKLEY HARRIS,
JOHN DEAN,
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