(No Model.)

2 Sheets—Sheet 1.

J. R. ROBINSON.

ELECTRIC MOTOR.

No. 464,231

Patented Dec. 1, 1891.

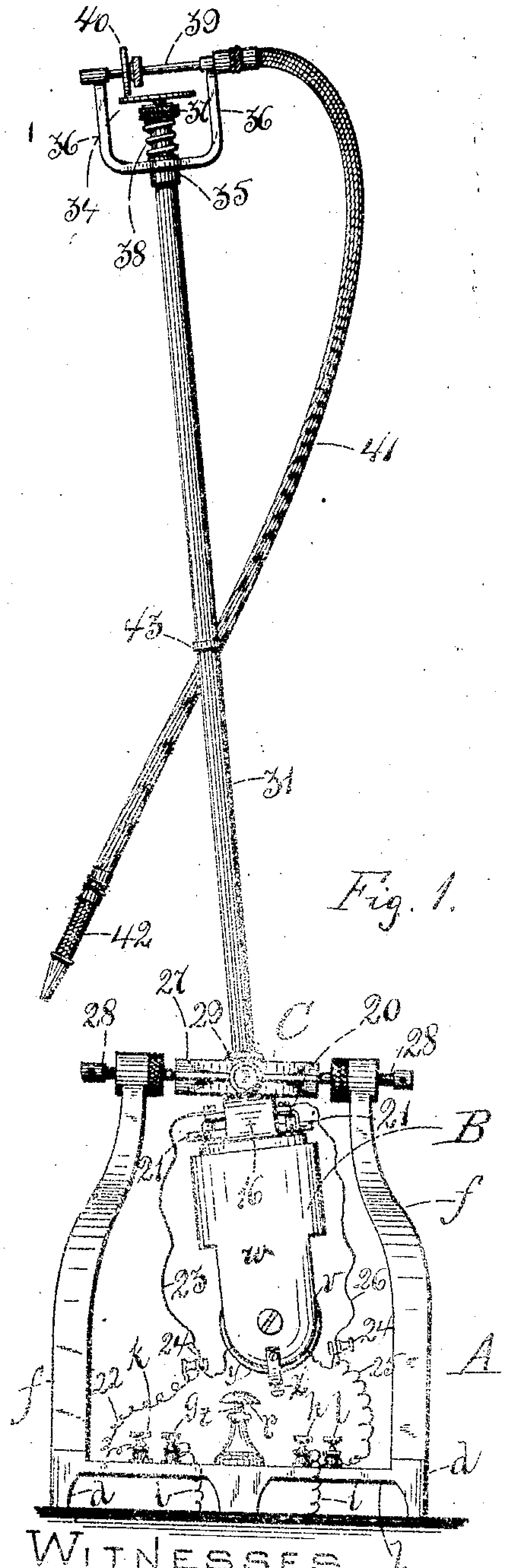

Fig. 1.

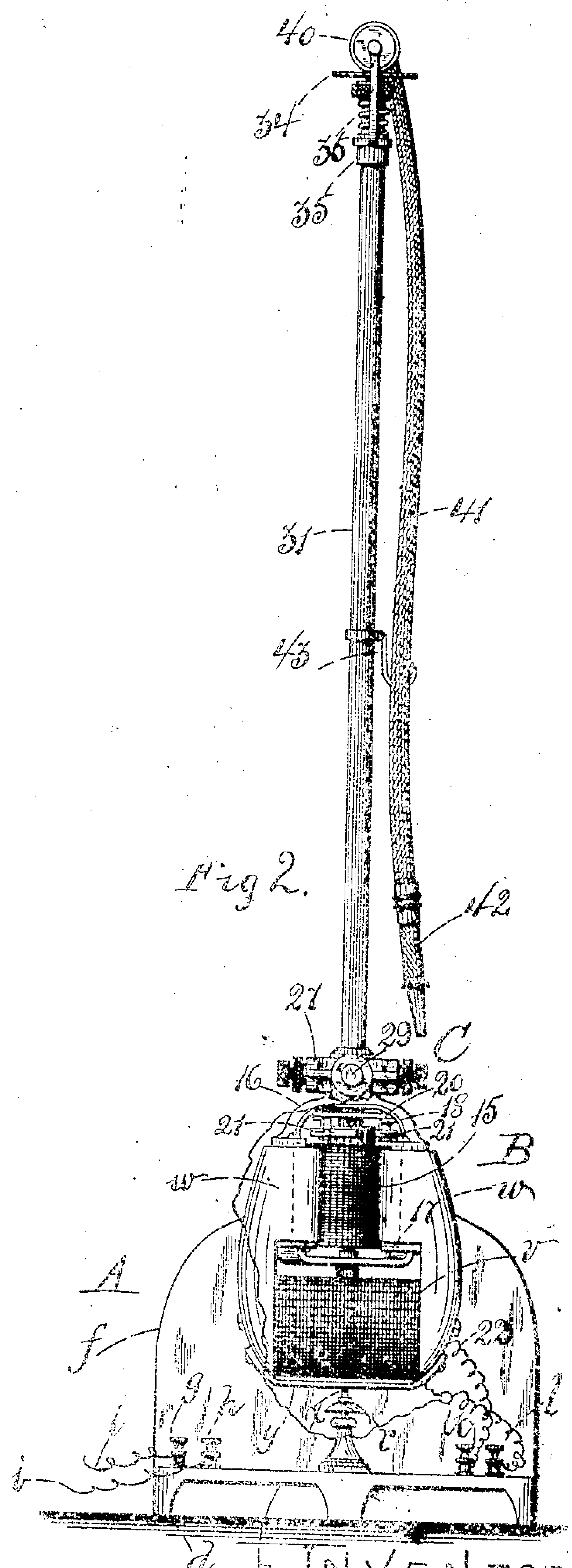

Fig 2.

WITNESSES

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(No Model.)

2 Sheets—Sheet 2.

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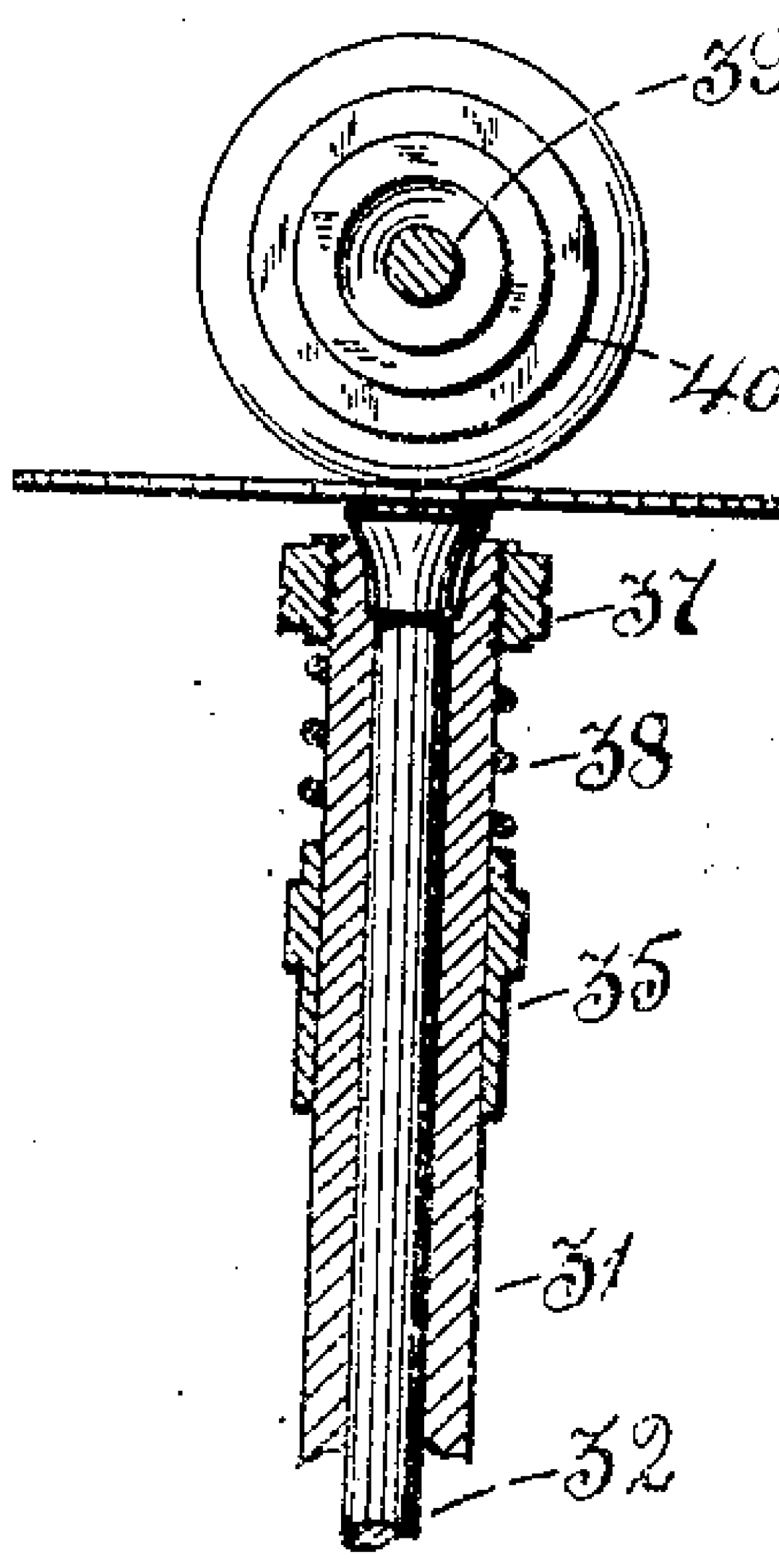

Fig. 5.

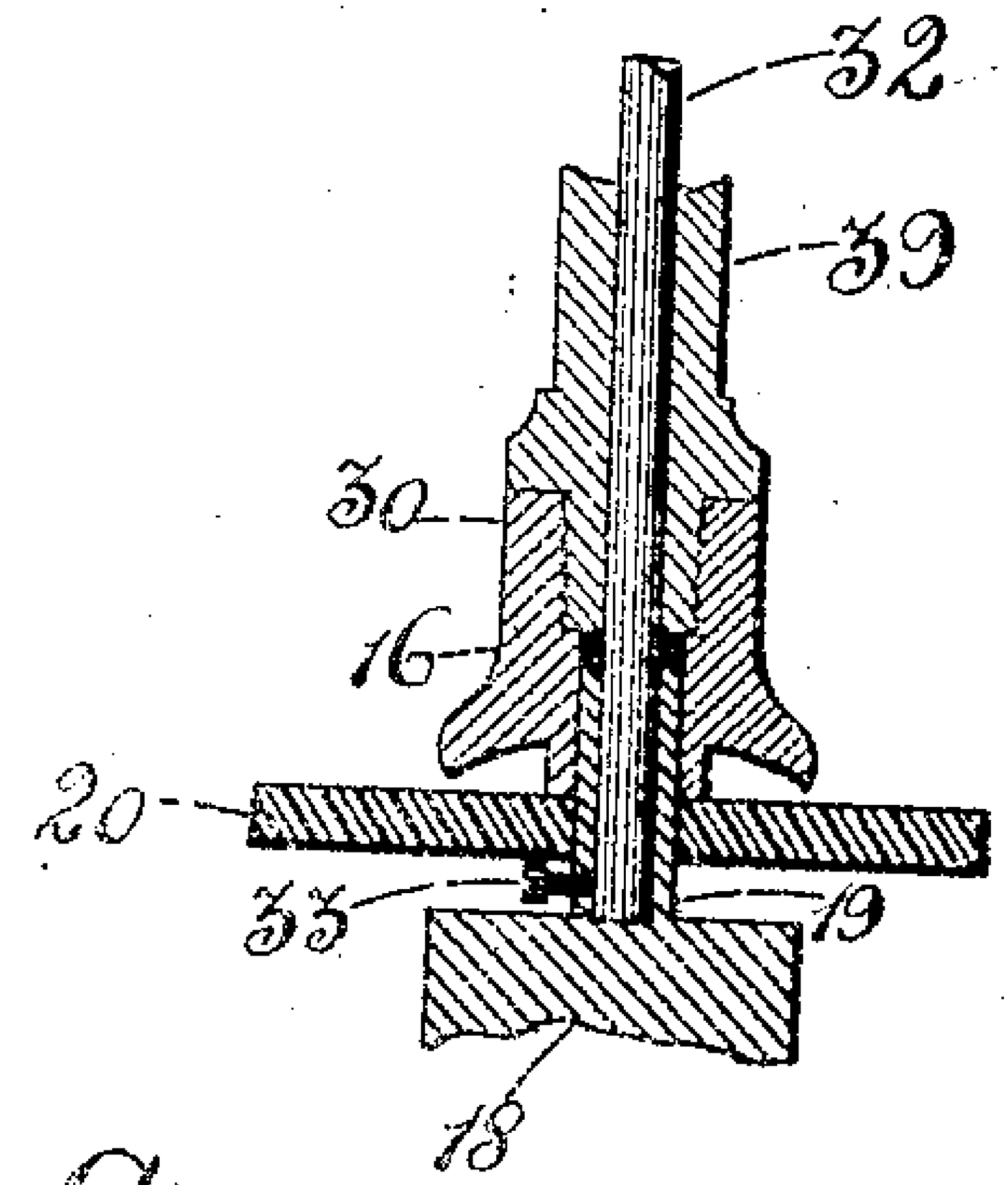

Fig. 6.

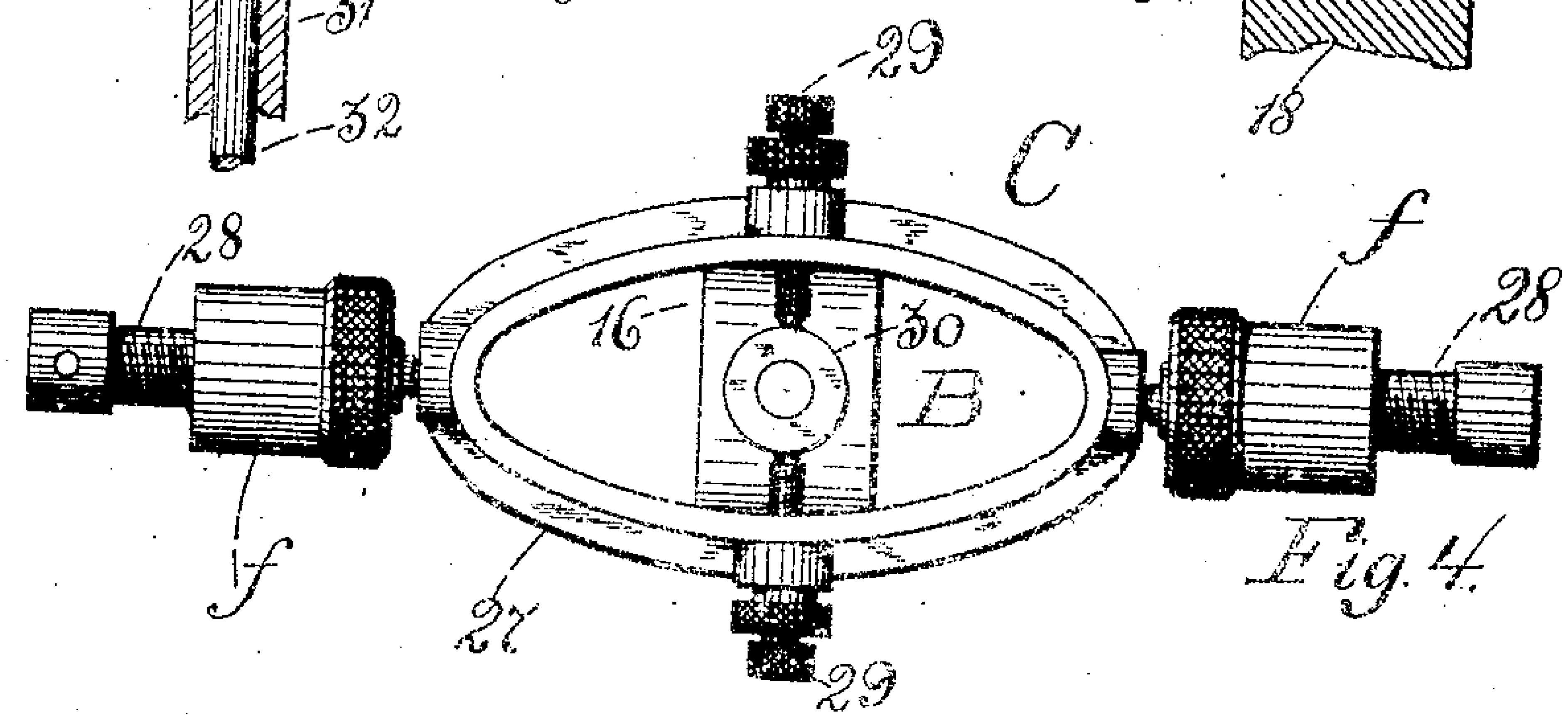

Fig. 4.

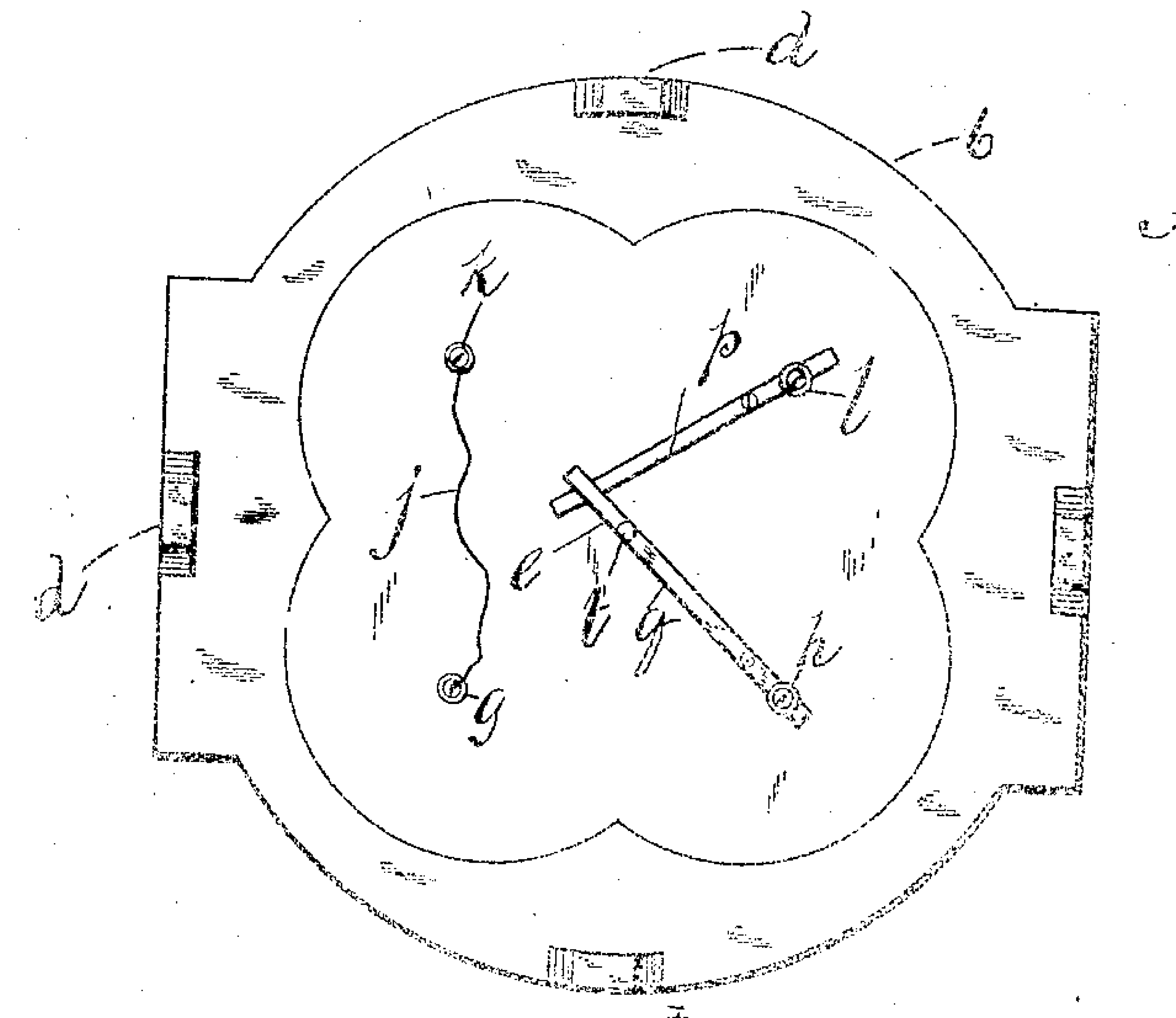

Fig. 3.

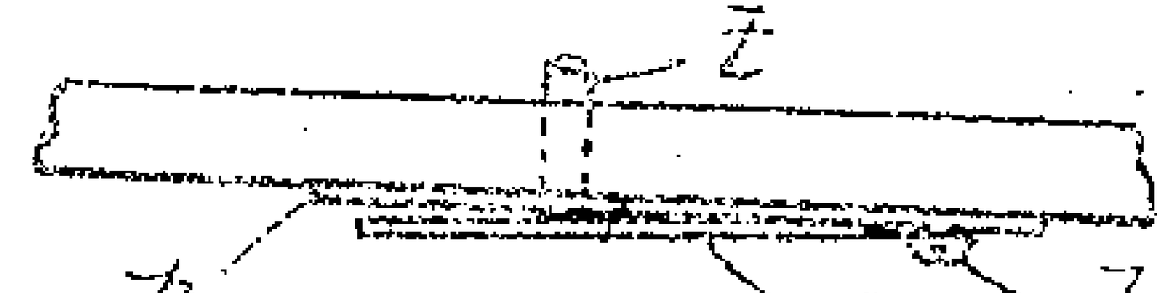

Fig. 7.

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UNITED STATES PATENT OFFICE.

JOHN R. ROBINSON, OF SALEM, ASSIGNOR OF ONE-HALF TO THEODORE F. LAWRENCE, OF PEABODY, MASSACHUSETTS.

ELECTRIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 464,231, dated December 1, 1891.

Application filed February 3, 1891. Serial No. 379,992. (No model.)

To all whom it may concern:

Be it known that I, JOHN R. ROBINSON, of Salem, in the county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Electric Motors, of which the following is a description sufficiently full, clear, and exact to enable any person skilled in the art or science to which said invention appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a front elevation of my improved motor; Fig. 2, a side elevation of the same, one of the base-standards being removed; Fig. 3, a bottom plan view of the base; Fig. 4, a plan view of the swivel-motor support; and Figs. 5, 6, and 7, sectional views illustrating certain details of construction.

Like letters and figures of reference indicate corresponding parts in the different figures of the drawings.

My invention relates to a swinging electric motor which is particularly adapted for use in driving flexible shafts; and it consists in certain novel features hereinafter fully set forth and claimed, the object being to produce a simpler, cheaper, and more effective device of this character than is now in ordinary use.

The nature and operation of the improvement will be readily understood by all conversant with such matters from the following explanation:

In the drawings, A represents the stand, and B the motor. The stand comprises a base *b*, supported on legs *d* and provided with vertical standards *f*. On the base *b* are two binding-posts *g h*, to which the generator-wires *i* are secured. These posts extend through the base. On the opposite side of the base two sliding posts *k l* are mounted. A wire *j* connects the posts *g* and *k*. Two spring contact-arms *p q* are respectively secured to the lower ends of the posts *h l* on the under side of the base *b*, the free end of the arm *q* overlapping the corresponding arm *p*. A spring-sustained plunger *t*, having an oval or curved head *r*, is fitted to slide vertically through the center of the base, its lower end being in engagement with the spring contact-arm *q*. Said plunger is adapted to force the arm *q* out of contact with the arm *p* when depressed. The motor B is supended vertically above the plunger by means of a gimbal-joint C, supported in the tops of the standards *f*. The motor comprises a horizontal coil *v*, to the ends of which vertically-arranged pole-pieces *w* are secured. A stud *x* on a brace-rod *y*, connecting the lower ends of the pole-pieces, is in position to engage the head of the plunger *r* and depress the same. The plunger-head is socketed to receive said stud and hold the motor against lateral movement, as shown in Fig. 2. A vertically-arranged armature 15 is fitted to rotate between the heads of the pole-pieces in bearings 16 and 17. The armature is provided with a commutator 18, from which the shaft 19 projects. A bar 20, of insulating material, is mounted loosely on said shaft and bears at each end brushes 21, contacting with the face of the commutator. A wire 22 leads from the post *h* to the coil, and a branch 23, secured thereto by a clamp 24, leads to one commutator-brush. A similar arrangement of wires 25 and 26 connects the opposite brush-coil and post 1.

The universal joint C comprises an oval ring 27, against the ends of which cone-pointed screws 28 bear, said screws passsing through the tops of the standards *f*. Similar screws 29 pass through the sides of the ring and take on opposite sides of the projection 30 on the bearing 16. The motor thus pendent can be freely swung or oscillated when disengaged from the spring-pushed plunger *t*.

To illustrate the use of the motor, it is shown in connection with mechanism for actuating dental, surgical, and similar instruments, as hereinafter described; but I do not confine myself to such construction, as any suitable form of flexible shafting may be secured to the motor-shaft for other purposes. A tube 31 has its lower end exteriorly screw-threaded (see Fig. 6) to enter the bearing projection 30, which is tapped and threaded to receive it. The motor-shaft 19 is chambered longitudinally to receive a shaft 32, which is fitted to rotate in said tube, said shaft 32 being secured in the motor-shaft by a set-screw 33. A friction-disk 34 is mounted on the upper end of the shaft 32. A loose sleeve 35 is fitted to slide on the tube 31 and is provided with two vertical arms 36. A nut 37 is turned onto the upper end of said tube, and between said nut and sleeve a coiled spring 38 is interposed,

acting expansively to force the sleeve downward. A shaft 39 is journaled in the upper ends of the arms 36. A rubber-tired friction-wheel 40, mounted on said shaft, bears against the disk 34, the spring 38 holding it firmly in contact therewith. To one end of said shaft a flexible shaft 41 is secured, said flexible shaft bearing a tool-chuck 42 and being of the ordinary construction employed for actuating dental drills and tools. A holder 43 for said shaft is secured to the tube 31.

In the use of my improvement, the tube 31 being moved laterally, the motor stud x is disengaged from the plunger-head r, which is forced upward by its spring, bringing the spring-contact q into engagement with the opposite contact p. The circuit is thus closed and the motor set in motion. The motor being swung from a universal joint, as described, can be rocked at will, enabling the tube 31 to be moved laterally, as required, by the manipulation of the flexible shaft without interfering with the rotation of the shaft 32. The stud x may frequently engage the beveled head of the plunger r without depressing it or breaking the circuit. When not in use, the plunger is forced downward against the pressure of its spring and the stud x inserted in the socket in the plunger-head, as in Fig. 2. This forces the contact q downward, breaking the circuit and stopping the motor. The disk 34 on the shaft 32 being held in engagement with the friction-wheel drives said wheel and the flexible shaft 41 as said shaft 32 rotates.

By providing the motor with a vertical rotary armature, as described, I increase the efficiency and effect results not attained when a horizontal armature is used. In such construction the line of shortest magnetic circuit is in the inner or lower portion of the poles and more lines of force pass therefrom to the armature. By my construction the strength of field is equal on both sides, overcoming any tendency to spark from a distorted field of magnetism.

Having thus explained my invention, what I claim is—

1. The combination of a stand or support with a swinging electric motor suspended by a gimbal-joint from said stand, substantially as described.

2. In a device of the character described, a support provided with binding-posts for the generator and motor wires, in combination with an electric motor mounted to swing in said support and a circuit-closer for automatically closing the electric circuit in said wires when the motor is swinging and breaking the same when said motor is stationary in perpendicular position, substantially as described.

3. In a device of the character described, a stand or support, in combination with an electric motor mounted to swing thereon, binding-posts for the generator and motor-wires, spring-contacts for closing the circuit between said wires, and a spring-pushed plunger in engagement with one of said contacts and disposed in position to be engaged by the swinging motor and depressed to break said circuit, substantially as described.

4. In a device of the character described, an electric circuit, a stand, as A, an electric motor mounted to swing in said stand, a circuit-breaker disposed in position to be engaged by said motor and depressed to break the circuit when the motor is stationary in perpendicular position and adapted to automatically close said circuit when the motor is swinging, a detachable shaft secured to the motor-shaft, and mechanism for attaching a flexible shaft thereto, substantially as described.

5. In a device of the character described, a stand or support, as A, provided with binding-posts $g h k l$ the connecting-wire j, and spring-contacts q p, the spring-pushed plunger r in engagement with one of said contacts, an electric circuit, and an electric motor in said circuit, said motor being mounted to swing in said support in position to engage and depress said plunger, all being combined and arranged to operate substantially as set forth.

6. In a device of the character described, the combination of a support with an electric motor disposed in a generator-circuit and mounted to swing in said support, and mechanism actuated mechanically by said motor for breaking said circuit, substantially as described.

7. In a device of the character described, the electric motor B and its support, in combination with the tube 31 and inclosed shaft 32, detachably secured to the motor-shaft, a disk on said inclosed shaft, a spring-pushed bracket on said sleeve, a shaft journaled in said bracket and having a friction-wheel bearing on said disk, and a flexible tool-shaft detachably secured to said wheel-shaft, substantially as described.

8. An electric circuit and the stand A, provided with spring-contacts p q, normally closing said circuit, in combination with the spring-sustained plunger r, engaging one of said contacts, an electric motor mounted to swing in said stand, and a stud on said motor adapted to engage and depress said plunger, whereby the circuit may be broken, substantially as described.

9. The motor B, mounted to swing in a support and comprising the horizontal coil, vertical pole-pieces w, secured thereto, the vertical rotary armature 15, disposed between the heads of said poles, the commutator and shaft, and the insulator-bar bearing contact-brushes, all being arranged to operate substantially as described.

JOHN R. ROBINSON.

Witnesses:
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CHARLES H. ODELL.