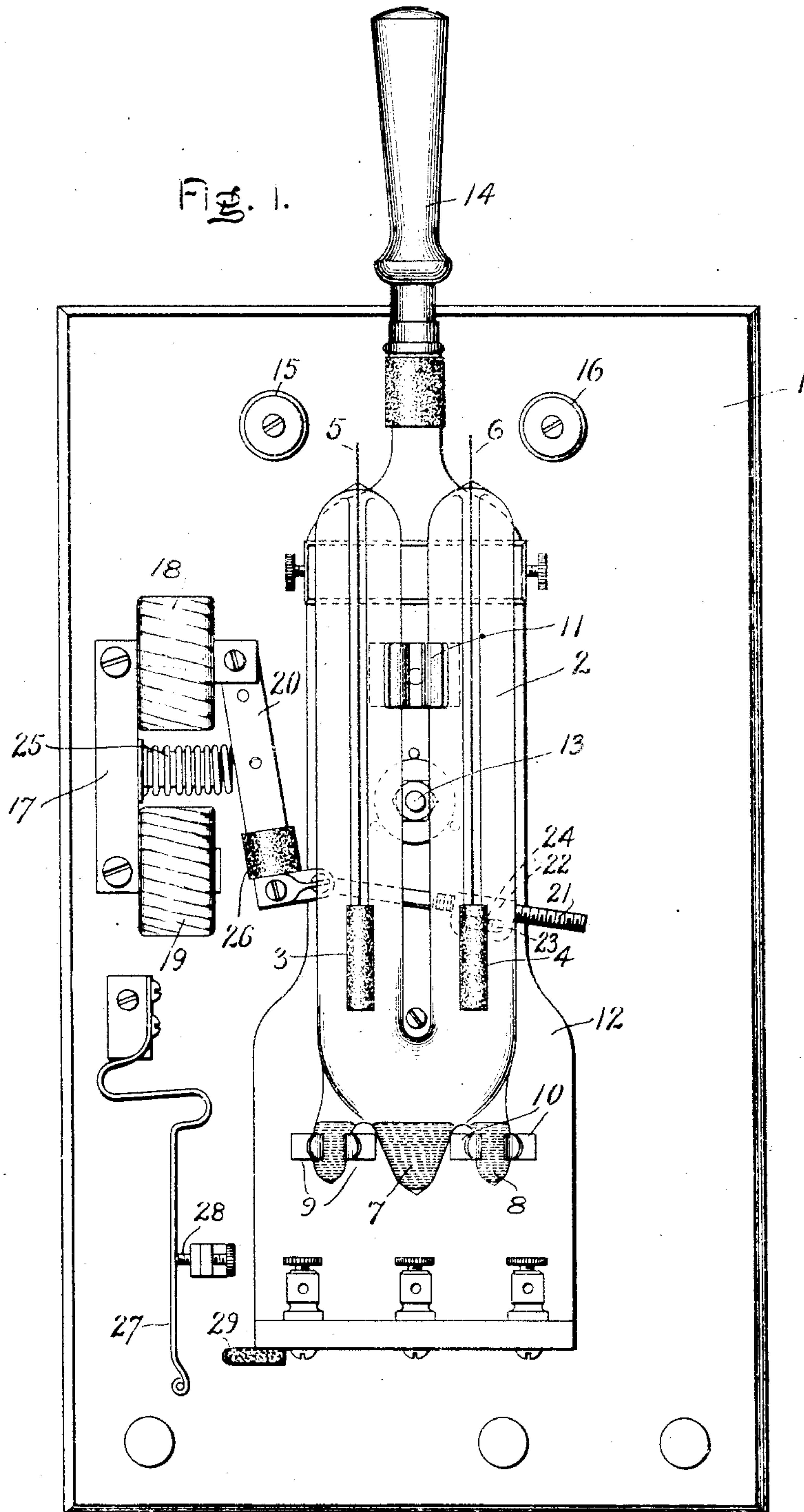


S. FERGUSON.
VAPOR ELECTRIC APPARATUS.
APPLICATION FILED JAN. 18, 1904.

2 SHEETS—SHEET 1.



WITNESSES:

George H. Shinton,
Allen W. Ford

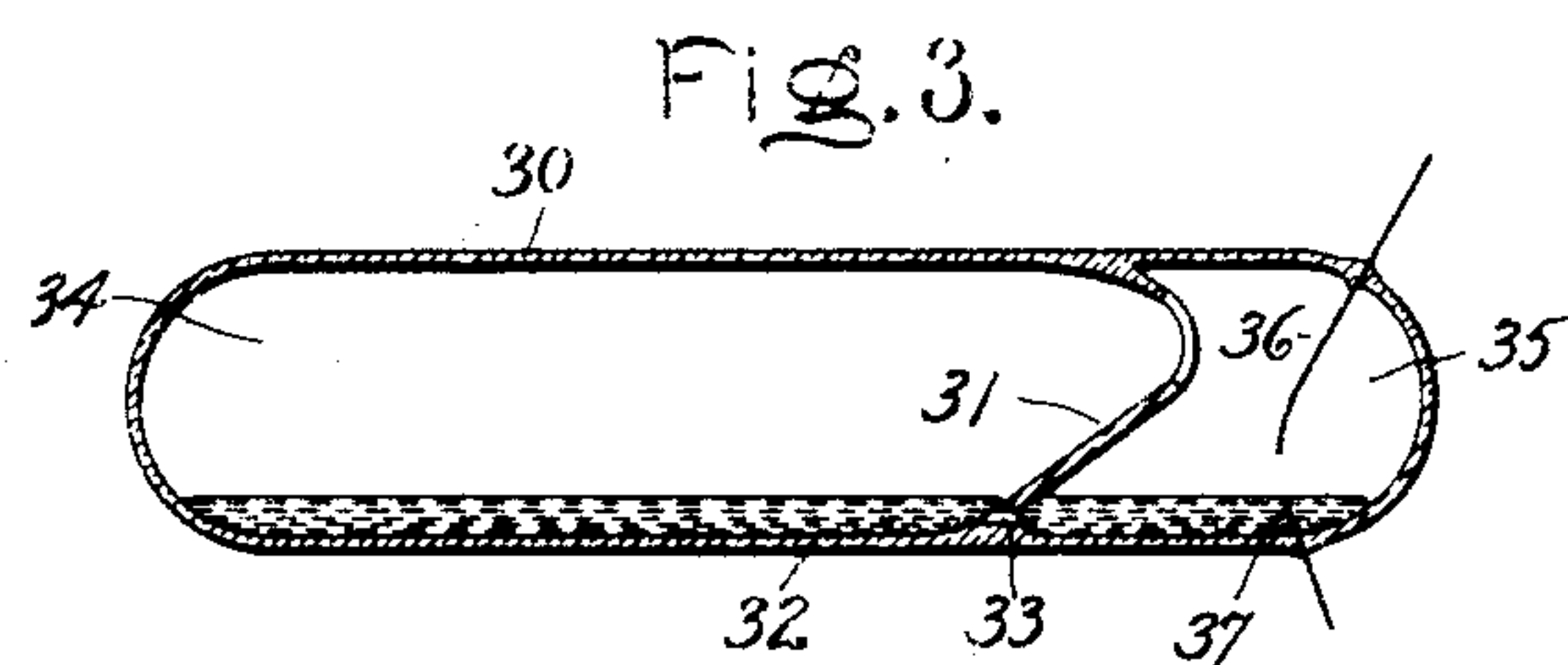
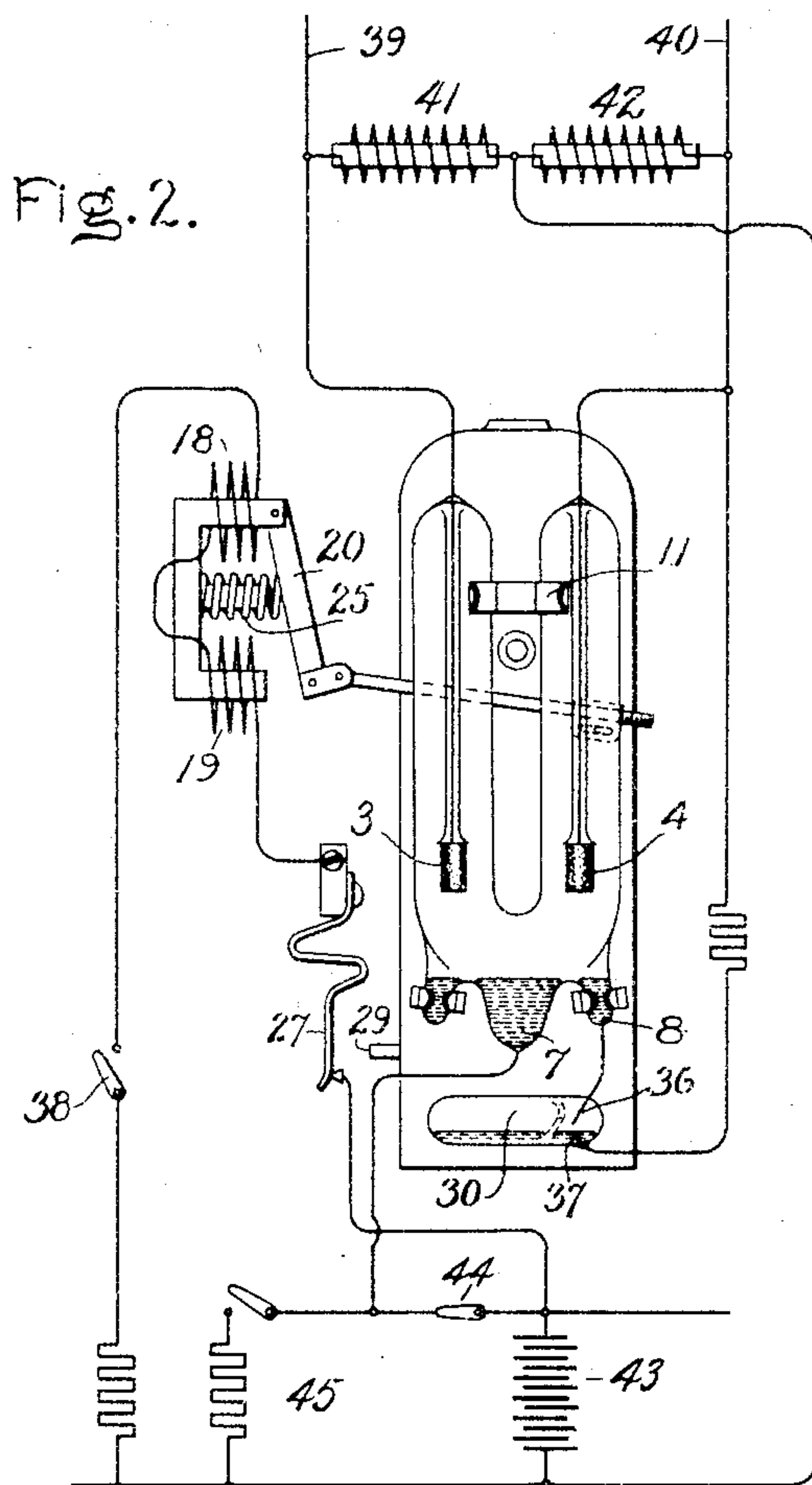
INVENTOR:

Samuel Ferguson.
by *Allen H. Davis*
ATTY.

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George A. Shonston,
Helen O'ford

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ATTY.

UNITED STATES PATENT OFFICE.

SAMUEL FERGUSON, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

VAPOR ELECTRIC APPARATUS.

SPECIFICATION forming part of Letters Patent No. 791,547, dated June 6, 1905.

Application filed January 18, 1904. Serial No. 189,465.

To all whom it may concern:

Be it known that I, SAMUEL FERGUSON, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Vapor Electric Apparatus, of which the following is a specification.

My invention comprises more especially certain improvements in controlling devices for vapor electric apparatus, such as rectifiers or the like.

The features of novelty characteristic of my invention are pointed out with particularity in the appended claims. The invention itself, however, will be better understood by reference to the following description, taken in connection with the accompanying drawings, in which—

Figure 1 represents a mercury vapor-rectifier provided with starting apparatus therefor embodying my invention. Fig. 2 represents a diagram of the circuits for Fig. 1, and Fig. 3 a detail.

In Fig. 1 the apparatus is mounted upon a base 1 of slate or other suitable material. The rectifier proper consists of a highly-exhausted U-shaped tube 2, provided in the usual manner with anodes 3 and 4 of artificial graphite or other appropriate material from which current-conveying conductors 5 and 6 lead to the alternating-current-supply mains. The negative electrode or cathode 7, of mercury, is at the bottom of the tube, as shown, and adjacent thereto is the usual auxiliary or starting anode 8. The rectifier is mounted by means of suitable clips, such as at 9, 10, and 11, on a support 12, pivoted above the center of gravity of the combination at 13. A handle, such as 14, may, if desired, be provided for manually swinging or tilting the apparatus on its pivot. Rubber-covered stops 15 16 limit the arc of oscillation.

The tilting or shaking of the rectifier by oscillation about its pivot serves to start the rectifier in a manner now well understood, and in order to perform this function automatically I have provided the improved form of shaking or oscillating device herein shown.

A magnet-core 17, which is to be laminated if used with alternating currents, is secured to the base 1 and provided with exciting-coils 18 19. Across the opposite ends of the U-shaped core an armature 20 is pivoted. The upper end of this armature is pivoted to the upper member of the core 17 and the lower end of the armature to a link 21. This link by means of the screw-threads shown is adjustably connected to a lost-motion device consisting of a block (indicated in dotted lines at 22) having a slot 23, encircling a pin 24, extending from the support 12.

When the magnet is energized by current from any suitable source, the rectifier is tilted about the pivot 13. The armature 20 in thus tilting the rectifier compresses the spring 25, and its cushioned end 26 comes up against the lower end of the core 17. The pivoted mechanism of the rectifier, by reason of a lost-motion connection afforded by the slot and pin 23 and 24, then brings up against a spring 27, forming one member of a circuit making and breaking device. The member 12, forming the pivoted support, is mounted far enough away from the base 1 so that it moves over the adjustable contact 28, and thus engages the spring 27 by means of a projection 29.

By referring to Fig. 2, in which the corresponding parts are correspondingly designated, the circuits of the apparatus will be readily understood. As the rectifier is swung in the manner just described the projection 29 causes the circuit of the exciting-coils 18 and 19 to be opened, whereupon the armature 20, under the influence of the spring 25 and assisted by gravity, swings the rectifier in the reverse direction. This serves to cause a temporary flow of mercury between the electrodes 7 and 8, which starts the rectifier in the usual manner.

After the rectifier has been started the circuit of the auxiliary or starting electrode 8 may be cut out. A convenient means for effecting this purpose consists of a device, shown in detail in Fig. 3 and in position in Fig. 2, on the tilting member of the rectifier. This device consists of a suitable receptacle, such

as 30, of glass or any other appropriate insulating material. This receptacle is provided with an inclined dividing wall or barrier 31, extending a moderate distance above the bottom 32 of the receptacle. This barrier or wall has a small perforation, such as 33, at a point close to the bottom of the receptacle. A moderate amount of mercury or other conducting fluid is placed in the receptacle and by reason of the perforation 33 is of the same level in the two chambers 34 35 on either side of the barrier. In the chamber 35 at the right of the barrier I locate two terminals 36 and 37, one engaging the mercury and the other extending down to within a short distance of the top thereof.

The device 30 is fastened by clips or in any other suitable manner to the tilting part of the rectifier. An overflow of mercury from the left-hand chamber over the barrier 31 into the right-hand chamber 35 will take place when the rectifier is oscillated briskly on its pivot. The level of the mercury in the chamber 35 is thus raised until the terminals 36 and 37 are connected, thus completing the circuit of the starting-electrode 8, (indicated more clearly in Fig. 2.) As soon as the rectifier starts the circuit of the shaking mechanism is interrupted, as by the switch 38, and the device 30 then resting quietly in a horizontal position mercury flows through the perforations 33 until the levels in the two chambers are equalized. As the level falls in the chamber 35 the circuit of the starting-electrode is thereby automatically interrupted.

The rectifier heretofore described is intended as typical of any vapor electric device which requires to be started by shaking or tilting. The particular device chosen for illustration is a now well-known form of rectifier of the single-phase type.

In the particular rectifier shown the supply-mains, heretofore referred to, are indicated at 39 and 40 and are connected through the anodes 3 and 4. The direct-current-consumption circuit is connected at one end to the cathode 7 and at the other to the junction between two inductance-coils 41 and 42 in series between the supply-mains. A storage battery 43 or any other suitable translating device or devices may be cut into or out of this circuit. In starting it is preferable that the translating devices be cut out of circuit, as by means of a switch 44, and the rectifier started on a starting-resistance 45 for which the translating devices are subsequently substituted.

Certain features of novelty of the shaking or oscillating apparatus above described are not of my invention, but are claimed in a concurrently - filed application of Alexander Churchward, Serial No. 189,464, and I therefore make herein no claims commensurate in scope with the features of novelty invented by the said Churchward.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a vapor electric apparatus, the combination of a pivoted member for supporting a rectifier, or similar vapor electric device, a magnet having an armature pivoted to said member, an exciting-circuit for said magnet, and means actuated by the rocking or tilting of said pivoted member for opening said exciting-circuit.

2. The combination of a vapor electric device of a type adapted to be started by tilting or shaking, a pivoted member for carrying said device, electromagnetic means for oscillating said member, and a circuit for said means positively interrupted by the oscillation of said member.

3. The combination of a vapor electric device of a type adapted to be started by shaking or tilting, a pivoted member therefor, electromagnetic means for oscillating said member, and means for interrupting the circuit of said electromagnetic means synchronously with the oscillation of said member.

4. The combination of a vapor electric device, a pivotal mounting for said device, electromagnetic means for urging said device in one direction, and means operative to deenergize said electromagnetic means when said device reaches the limit, or practically the limit, of its range of oscillation.

5. The combination of a pivotally-supported vapor electric or similar device, electromagnetic means for oscillating said device, and a lost-motion connection between said means and said device.

6. The combination of a pivotally-supported vapor electric or similar device, electromagnetic means for oscillating said device, and an adjustable lost-motion connection between said means and said device.

7. The combination of a vapor electric or similar device, an oscillating carrier therefor, a magnet, an armature connected to said carrier so as to have a limited amount of lost motion, a spring for resisting movement of the armature when attracted by the magnet, a circuit for the magnet, and an interrupter for said circuit actuated by said carrier.

8. The combination of an oscillatingly-mounted vapor electric or similar device, and a circuit-closing device carried with the vapor device and consisting of terminals and a chamber adapted to be filled temporarily with a conducting fluid to an extent sufficient to electrically connect the terminals.

9. In a circuit making and breaking device, the combination of a fluid-containing receptacle having an inclined wall or barrier therein provided with a relatively small opening at or near its bottom portion, terminals, and a conducting fluid in said receptacle and adapted when the receptacle is oscillated to flow over said barrier and make connection between said

terminals which connection is subsequently broken as the level of the fluid is restored by the passage of fluid through the opening in said wall or barrier.

- 5 10. The combination of a device mounted so as to permit oscillatory motion, electromagnetic means for urging said device in one direction, a spring for urging the device in the opposite direction, and means whereby

said electromagnetic means is energized and deenergized synchronously with the oscillation of said device.

In witness whereof I have hereunto set my hand this 15th day of January, 1904.

SAMUEL FERGUSON.

Witnesses:

BENJAMIN B. HULL,
HELEN ORFORD.