

J. B. TAYLOR.
MERCURY ARC RELAY.
APPLICATION FILED SEPT. 17, 1907.

953,361.

Patented Mar. 29, 1910.

3 SHEETS—SHEET 1.

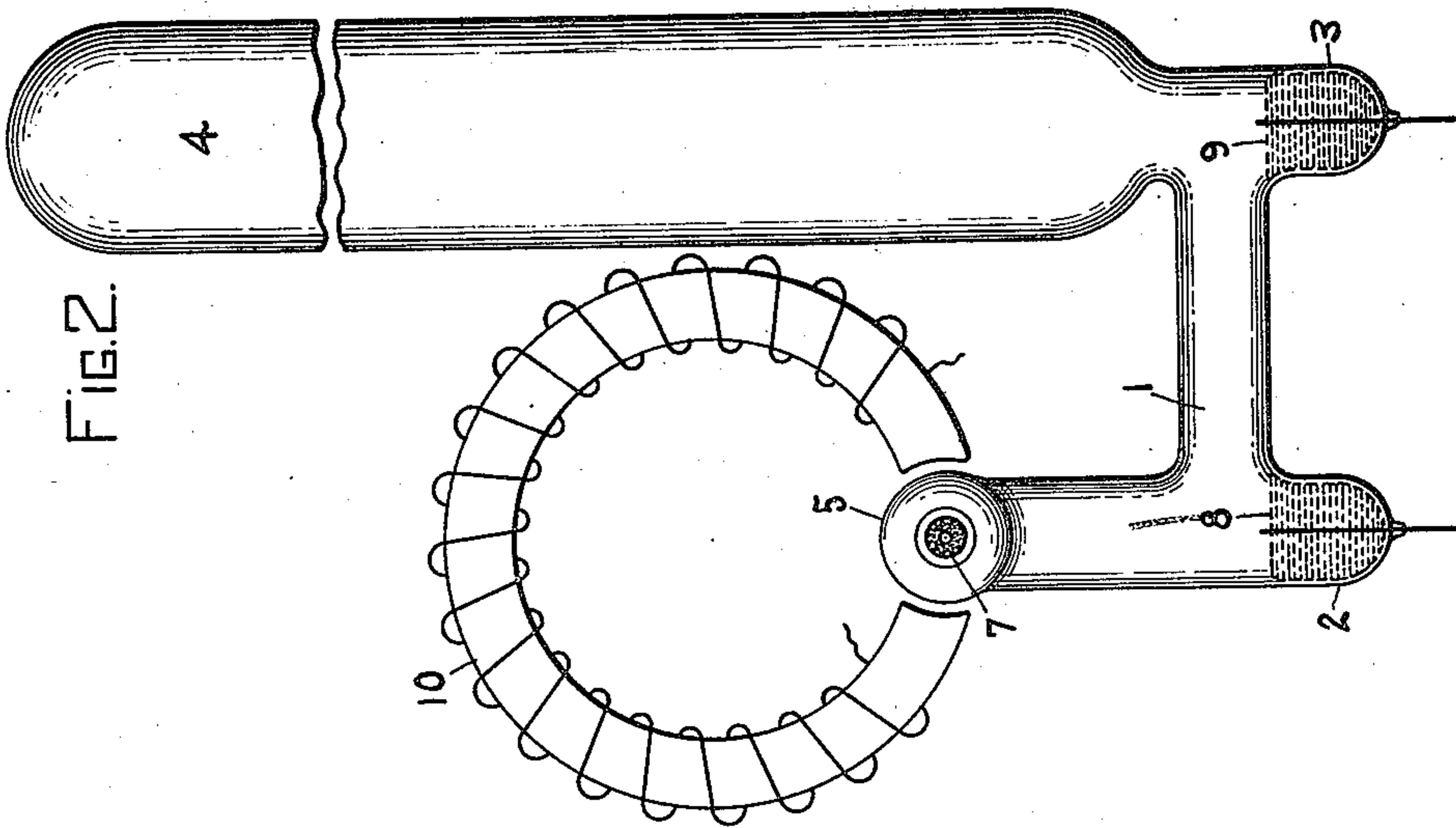


FIG. 2.

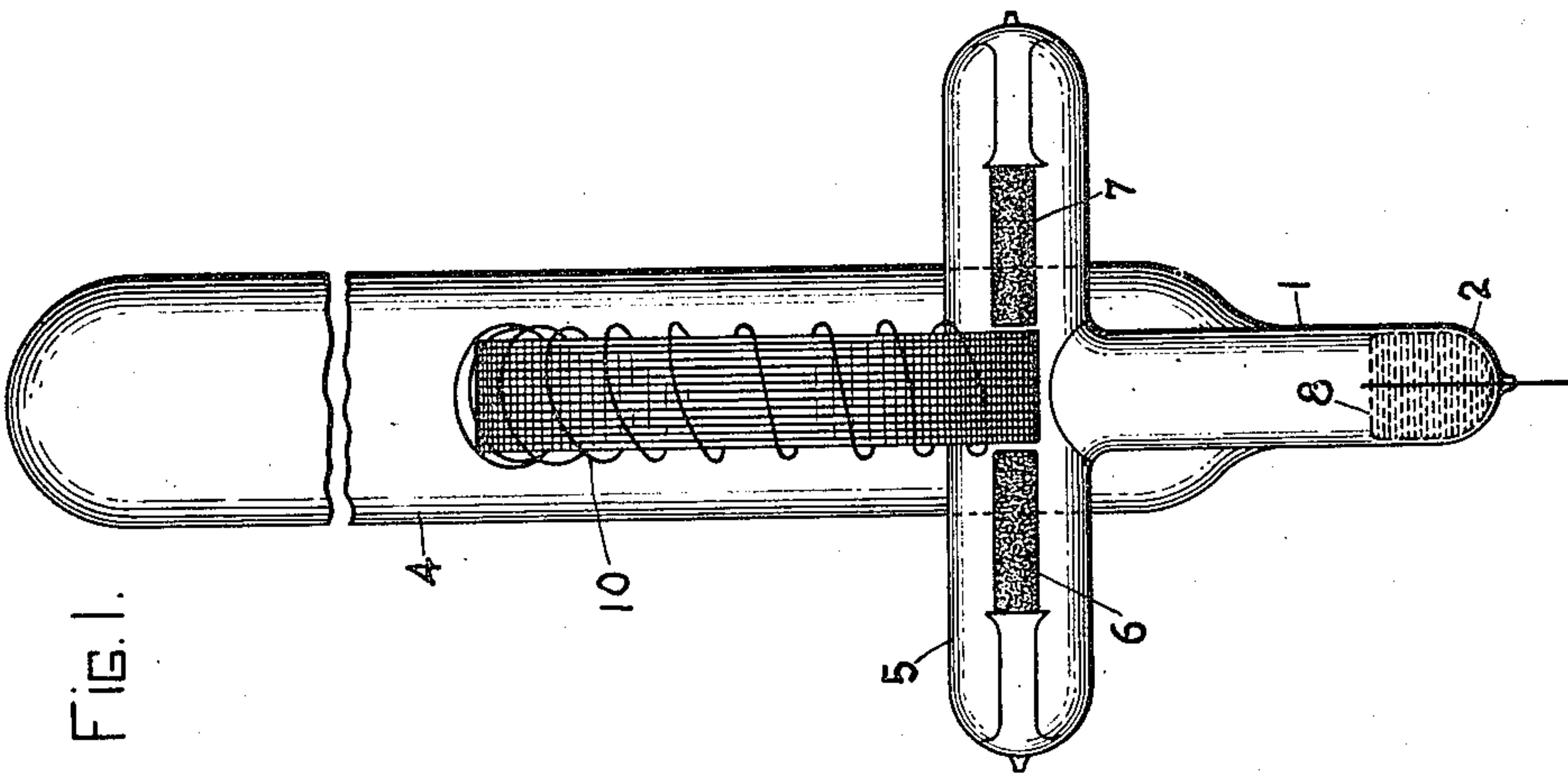


FIG. 1.

WITNESSES:

Irving E. Steers.
J. Ellis Allen

INVENTOR

JOHN B. TAYLOR.

BY *Alberty Davis*

ATTY.

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FIG. 4.

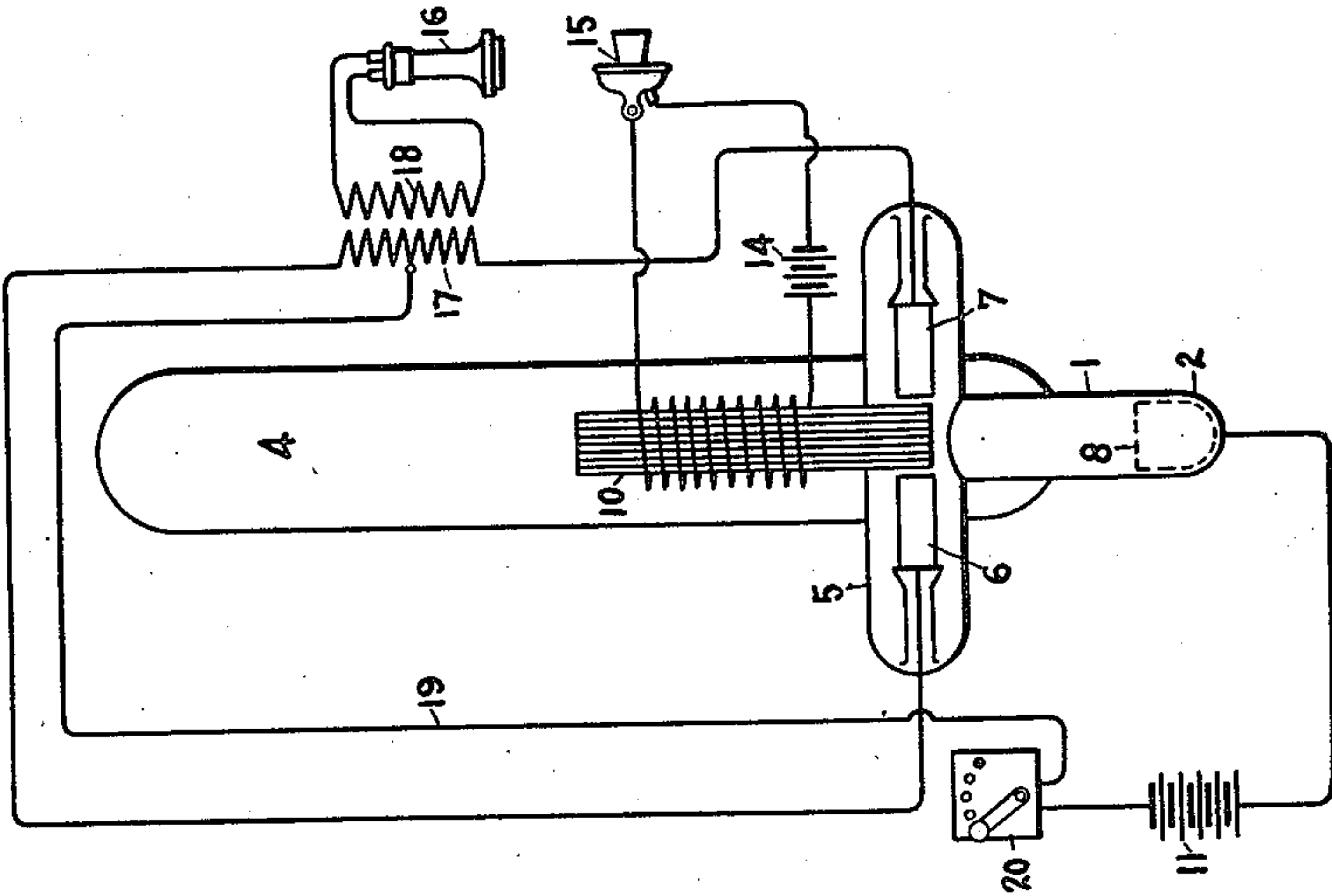
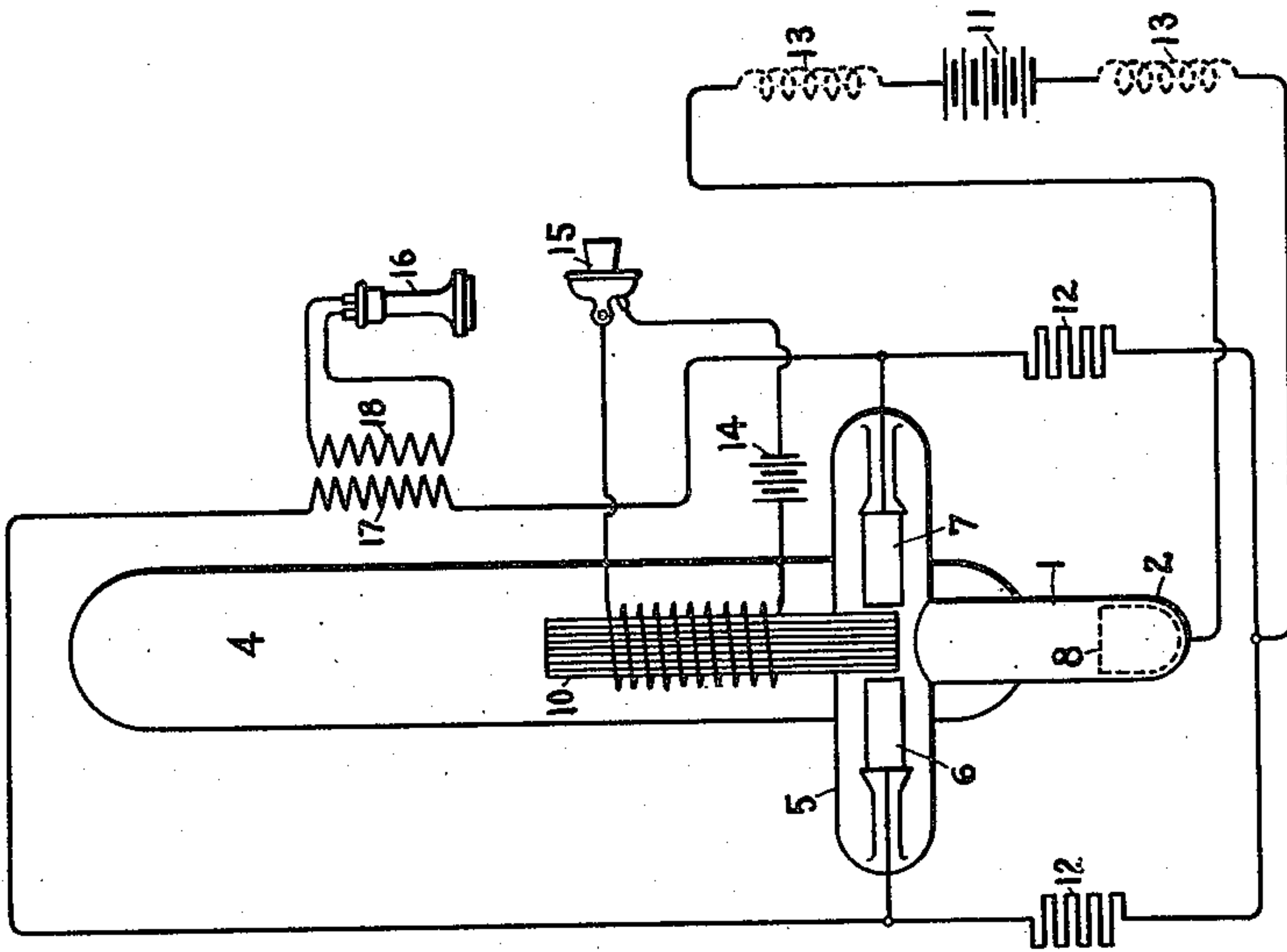


FIG. 3.



WITNESSES:

Irving E. Steers
J. Ellis Glen

INVENTOR

JOHN B. TAYLOR.

BY *Albert H. Davis*

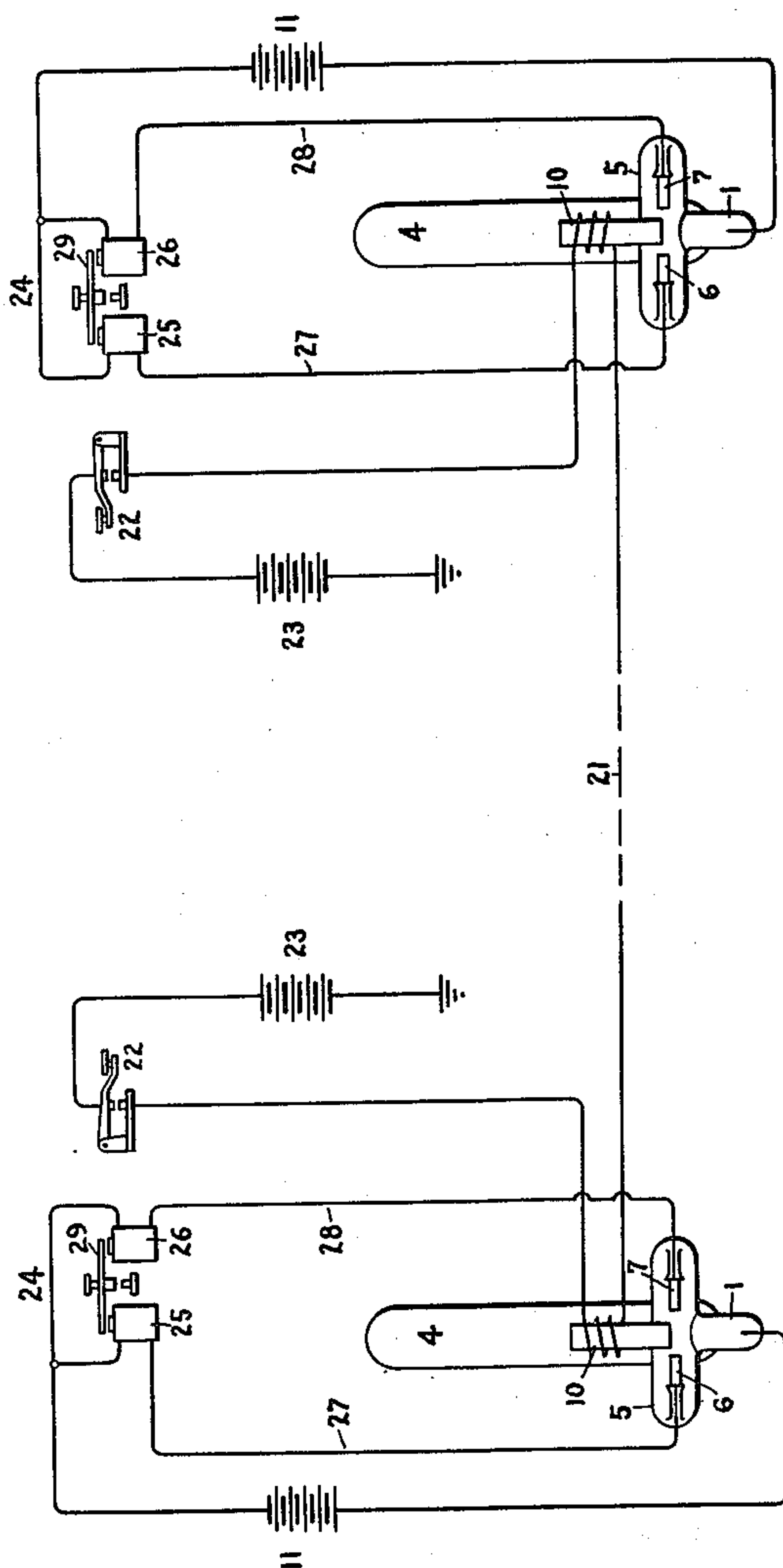
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FIG. 5.



WITNESSES:

Erving E. Steers.
J. Ellis Allen

INVENTOR
JOHN B. TAYLOR.
BY *Alvin H. Davis*
ATTY.

UNITED STATES PATENT OFFICE.

JOHN B. TAYLOR, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

MERCURY-ARC RELAY.

953,361.

Specification of Letters Patent.

Patented Mar. 29, 1910.

Application filed September 17, 1907. Serial No. 393,379.

To all whom it may concern:

Be it known that I, JOHN B. TAYLOR, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Mercury-Arc Relays, of which the following is a specification.

This invention relates to relays for use in connection with electric circuits wherever it is desired to reproduce or repeat in one circuit an electric impulse or oscillation impressed on another. Such devices are common in telegraph lines, telephone systems, signaling layouts, and the like.

My invention is applicable to any situation where a relay is necessary and consists in a device comprising two anodes and a cathode in an evacuated receptacle containing a body of mercury, a source of current, and means for causing the division of current between the two anodes to vary in accordance with the indications desired, whereby a translating device in circuit with said anodes will be caused to respond. The current deflecting means which I prefer to use is an electromagnet whose poles are arranged to produce a flux across the mercury arc set up between the anodes and the cathode. By varying the current energizing said electromagnet the flux will be varied, and the result is a corresponding variation in the circuit of the receiving instrument. If the electromagnet is in circuit with a telephone transmitter, and the receiving instrument is a telephone receiver, the relay will transmit spoken or other sounds.

In the accompanying drawings, Figure 1 is a front elevation of one embodiment of my improved relay; Fig. 2 is a side elevation thereof; Figs. 3 and 4 are diagrams showing the relay used in telephone circuits; and Fig. 5 shows its application to a telegraph line.

In the form in which the relay is here shown, the evacuated glass receptacle comprises an L-shaped tube 1, having pockets 2, 3, at the ends of its horizontal leg. An upright condensing chamber 4 rises above the pocket 3, while a horizontal T-head 5 surmounts the upright leg of the tube 1. In the arms of the head 5 are the two anodes 6, 7, one in each arm. In the pocket 2 is a mercury cathode 8, and in the pocket 3 is a starting anode 9 of mercury. The

anodes 6, 7, face each other a little distance apart and on each side of them, and preferably in a transverse plane midway between them, lie the poles of an electromagnet 10, arranged close to the outside of the head 5. This relay is shown in Fig. 3 connected up for service in a telephone system. At 11 is a source of current, one pole of which is connected by branch leads to the two anodes 6, 7. A resistance 12 may be included in each branch, if desired. The other terminal of the current generator is connected with the cathode 8. If the source of current is not absolutely steady, reactances 13 may be inserted in the circuit. The electromagnet 10 is in circuit with a battery 14 and a telephone transmitter 15, while a telephone receiver 16 is in circuit with the anodes, preferably through a transformer whose primary is in shunt to said anodes and its secondary 18 in series with the receiver 16.

The operation of this device is as follows: So long as no current flows through the winding of the electromagnet, or so long as the current is constant, the generator current will divide and will arc equally between the two anodes and their common cathode so that the potential at both anodes will be equal. But if the current in the magnet winding varies, as will be the case when a sound is made in the transmitter, the resulting variation in the magnetic flux between the poles of the electromagnet transverse to the mercury arc will produce more or less of a deflection of the mercury arc, causing more or less current to flow through one anode than the other and, therefore, unbalancing the potentials of the two anodes. This will cause a flow of current from them through the transformer which will produce a sound in the receiver. This effect will occur at every fluctuation of flux, the direction of flow in the transformer depending upon the direction of the magnetic flux.

Fig. 4 shows a modification in which the anodes are connected to the source of supply through a tap 19 brought from the neutral point of the transformer. A rheostat 20 is included in this circuit. Otherwise the connections are like those shown in Fig. 3 and the method of operation is practically the same.

Fig. 5 illustrates a mode of using the relay in telegraph systems. The coils of the elec-

tromagnets 10 are in series with the line 21 and with the keys 22 and batteries 23. The sounders 24 are in circuit with the anodes, each sounder having preferably two coils 25 and 26 located respectively in the two anode leads 27, 28, and differentially wound so that the balanced currents in said leads will not affect the armature 29. But any unbalancing of the potentials of the two anodes by the closing of either of the keys, will cause one or the other of said coils to attract the armature.

Obviously, many combinations of connections and various forms of tube or electromagnet may be devised to carry out the object of my invention, all falling within its general scope or spirit.

It will be observed that my invention will not only serve as an ordinary relay, but is, at the same time, a polarized relay. Moreover it is what may be termed a proportional relay, by which I mean a relay in which the effect in the relay circuit is greater or less in accordance with the current in the main circuit. This feature adapts it for use in many locations where a contact-making relay will not serve.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof; but I desire to have it understood that the apparatus shown is only illustrative, and that the invention can be carried out by other means.

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

1. An electric relay, comprising an evacuated receptacle, a vaporizable cathode and two anodes, and transmitting means for deflecting the arc stream away from one or the other of said anodes.

2. An electric relay, comprising an evacuated receptacle, a vaporizable cathode and two anodes, and an electromagnet energized by current to be relayed having its poles adjacent to said anodes.

3. An electric relay, comprising an evacuated receptacle, a vaporizable cathode, two

anodes near each other, and an electromagnet adapted to set up a magnetic flux transverse to the divided mercury arc.

4. An electric relay, comprising means for producing a divided mercury arc stream, and means for deflecting said stream in accordance with signals to be transmitted.

5. An electric relay, comprising means for producing a divided mercury arc, means for producing a magnetic flux adjacent to said arc and a transmitter controlling said flux.

6. Means for repeating electric oscillations, comprising a circuit including a divided mercury arc and a receiving instrument, and a circuit including a transmitting instrument and an electromagnet, the latter being in proximity to said arc.

7. Means for repeating electric oscillations, comprising a circuit having two parallel branches, each including one leg of a divided mercury arc, a receiving instrument responsive to variations in potential between said branch circuits, a transmitting instrument, and means whereby the latter can deflect said arc in order to vary the potential of said branch circuits in accordance with the indications to be transmitted.

8. The combination with an electric generator, of a circuit containing two parallel branches, an anode in each branch, a vaporizable cathode common to both anodes, a receiving instrument responsive to variations in potential between said anodes, an electromagnet arranged to deflect the arc stream between said anodes and cathode, and a transmitting instrument in circuit with said electromagnet.

9. Means for producing two mercury arcs in parallel, means responsive to a variation in voltage between said arcs, and means responsive to a transmitting instrument for causing such variation.

In witness whereof, I have hereunto set my hand this 16th day of September, 1907.

JOHN B. TAYLOR.

Witnesses:

BENJAMIN B. HULL,
MARGARET E. WOOLLEY.