

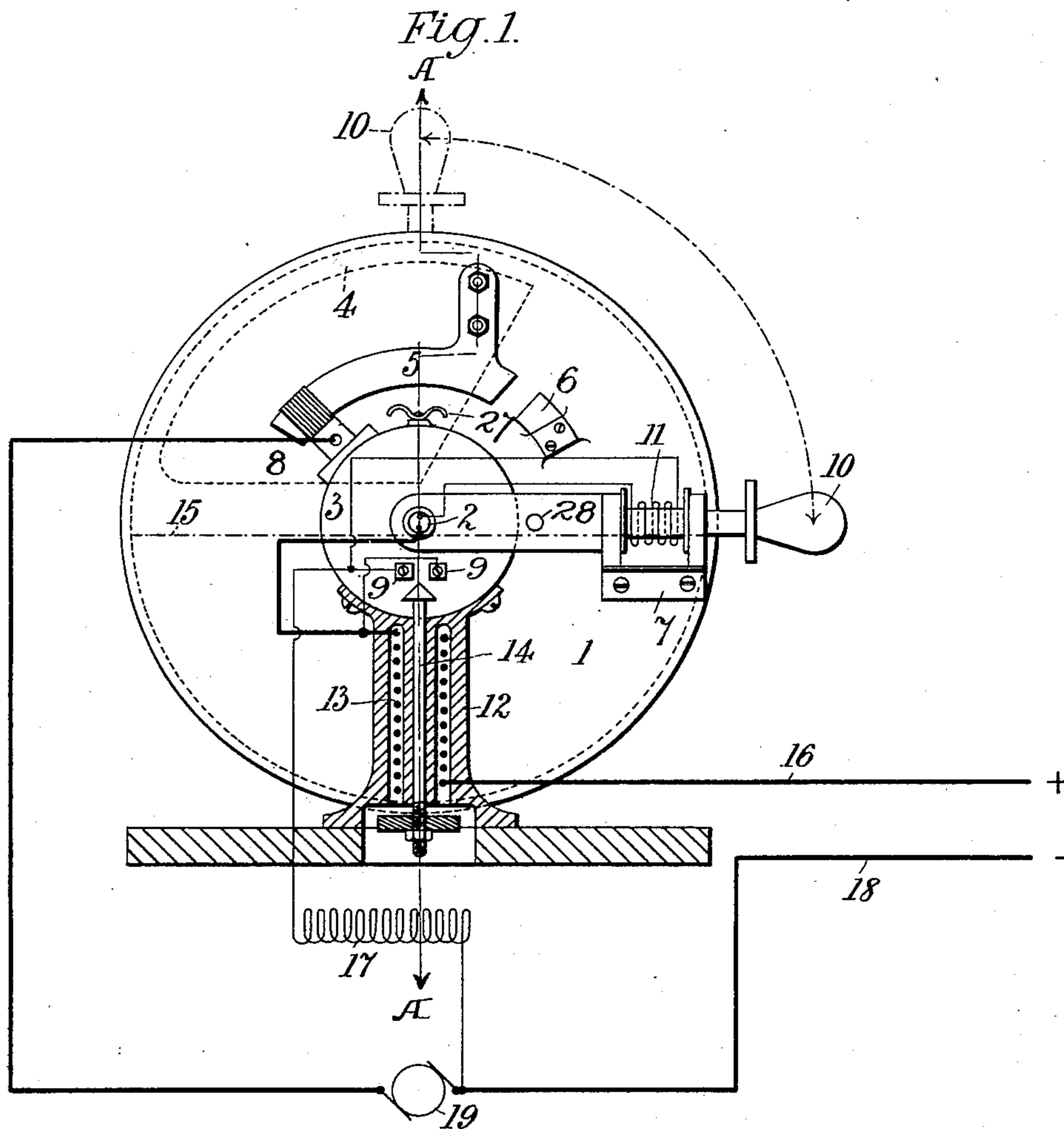
J. H. WOOLLISCROFT.

LIQUID RESISTANCE SWITCH FOR ELECTRICAL PURPOSES.

APPLICATION FILED OCT. 3, 1902.

NO MODEL.

3 SHEETS—SHEET 1.



WITNESSES.

Wm. Gillman, Jr.
J. G. Hinkel

INVENTOR.

John Harold Woolliscroft
By Foster Freeman
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J. H. WOOLLISCROFT.

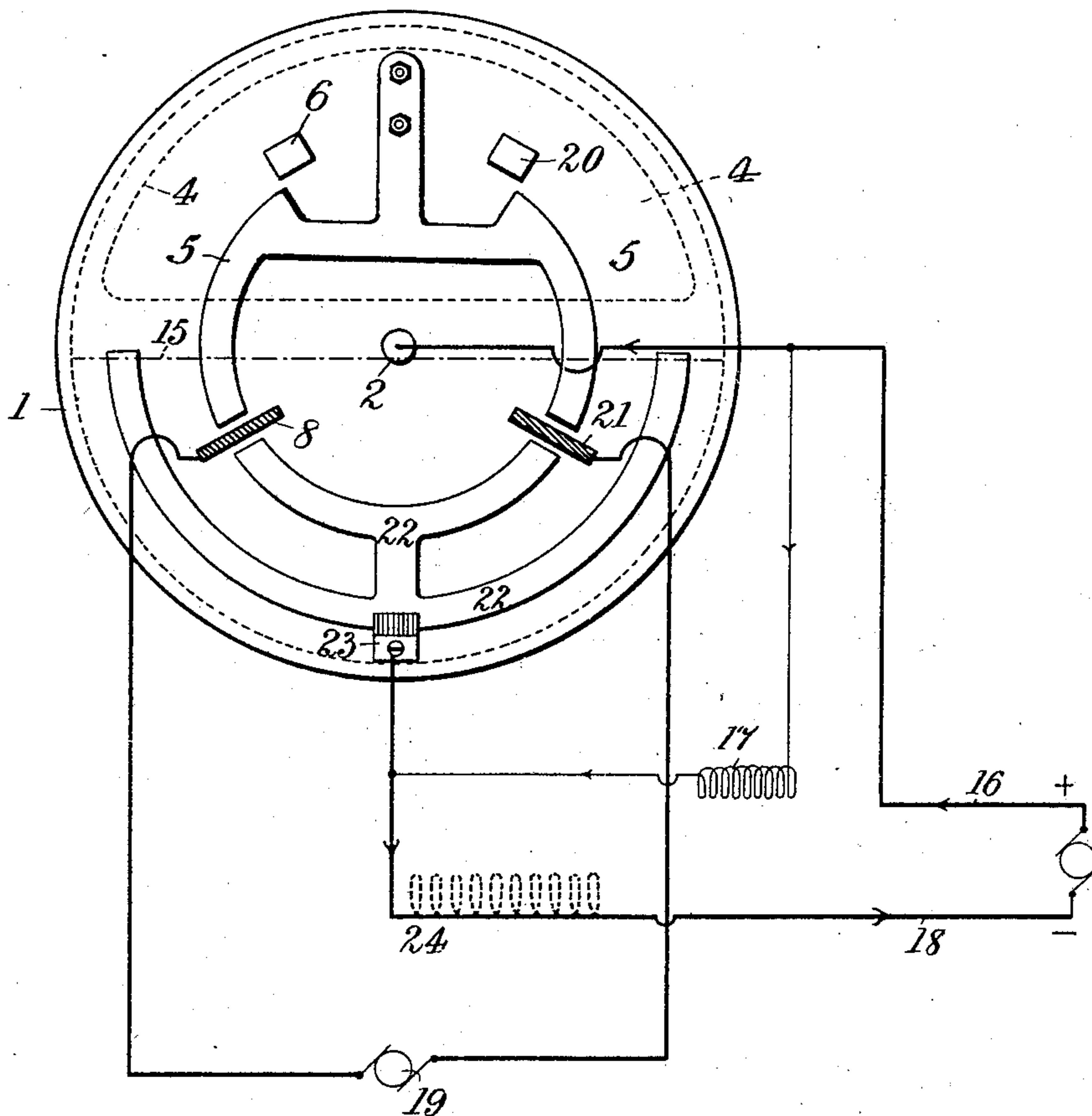
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3 SHEETS—SHEET 2.

Fig. 2.



WITNESSES.

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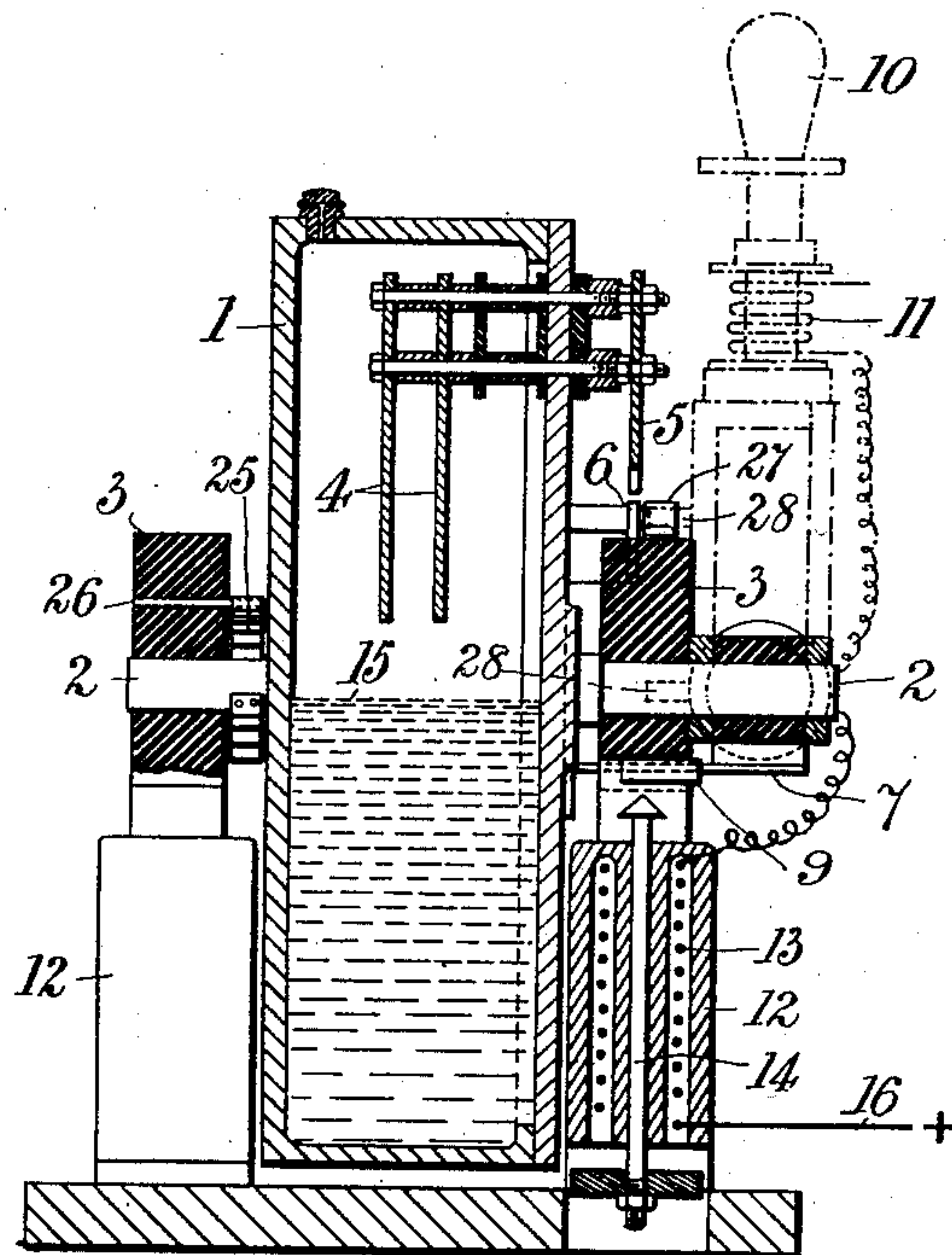
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NO MODEL.

3 SHEETS—SHEET 3.

Fig. 3.



WITNESSES.

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INVENTOR.

37 J. H. Wooliscroft
For the Treasurer
attys

UNITED STATES PATENT OFFICE.

JOHN HAROLD WOOLLISCROFT, OF SANDYCROFT, ENGLAND.

LIQUID-RESISTANCE SWITCH FOR ELECTRICAL PURPOSES.

SPECIFICATION forming part of Letters Patent No. 719,549, dated February 3, 1903.

Application filed October 3, 1902. Serial No. 125,798. (No model.)

To all whom it may concern:

Be it known that I, JOHN HAROLD WOOLLISCROFT, a subject of His Majesty the King of Great Britain, residing at Sandycroft, England, have invented a certain new and useful Improvement in Liquid-Resistance Switches for Electrical Purposes, of which the following is a specification.

This invention relates to liquid resistances or switches for electrical purposes, the object being to provide a liquid-resistance switch suitable for starting or starting and reversing motors and so inclosed that it may be operated without external sparking and with a minimum of evaporation of the liquid.

To clearly explain the invention, reference is made to the accompanying drawings, in which—

Figure 1 represents in diagrammatic elevation a shunt-motor starting resistance-switch with maximum and minimum releases. Fig. 2 is a like view, but showing some of the parts lengthened and others duplicated, so as to enable the switch to be used for reversing as well as starting, the maximum and minimum releases and operating-handle being omitted for the sake of clearness in showing the electrical connections. Fig. 3 is a cross-sectional elevation on the line A A, Fig. 1.

The construction illustrated by Figs. 1 and 3 will be first described.

The resistance may consist of any suitable liquid and is contained in a drum or vessel 1, made of conducting material, carried by trunnions 2, supported in insulated bearings 3. Said drum also carries internal blades 4, (indicated by dotted lines,) insulated from drum 1, but electrically connected to an external blade 5, also insulated from and carried by said drum, which in addition carries short-circuit plate 6, electrically connected to the drum and armature 7, insulated or not therefrom. The insulating-bearing 3 carries a fixed collector 8 and short-circuiting contacts 9 and a loosely-mounted handle 10, carrying an electromagnet 11. The bearing 3 is supported by a suitable base 12, within which is a coil 13 from the main surrounding a core 14, adapted when drawn up by an excess of current to complete the connection between short-circuiting contacts 9. The drum 1 is normally in the position shown in the draw-

ings, and this end may be attained by weighting the lower part or by spring action on the trunnions, as found most convenient.

In Fig. 3 is shown how spring action may be utilized. For this purpose one end of coiled spring 25 is secured to trunnion 2 and the other to a pin 26, carried by fixed bearing 3.

The liquid resistance in the drum may be of suitable depth—say up to the line 15.

With the parts in the position shown in Fig. 1 it will be seen that the current entering from the main 16 passes to trunnion 2 and thence to the drum 1 and its contained liquid, where the main circuit is broken, while a shunt-circuit passes from said trunnion 2 through magnet 11, and thence through field 17 to return 18. If the current passing through magnet 11 be normal, armature 7 will be held thereto with sufficient power to enable drum 1 to be partially rotated against the action of its counterweight or spring by raising the handle 10 to the position indicated by dotted lines, where it is held by a suitable catch—such, for example, as a friction spring-catch 27, carried on the bearing 3, and a pin or projection 28, carried by the handle 10, as shown in Figs. 1 and 3.

As stated, the drawings are diagrammatic, and in practice it will generally be found preferable that the handle 10 and armature 7 should be on the opposite side of the drum from that carrying the external blade 5. The effect of such motion will be to cause the blade 4 to become gradually immersed in the liquid resistance and the main current will pass through a gradually-decreasing resistance from the drum 1 to and through the liquid to blade 4, thence to external blade 5, to contact 8, motor 19, and return 18. As blade 4 becomes fully immersed, blade 5 leaves contact 8, with which short-circuit plate 6 makes connection, thus completely cutting out the resistance and permitting the current to pass from drum 1 through 6 and 8 direct to the motor. If the shunt-current becomes too weak, magnet 11 fails to attract armature 7 with sufficient force and drum 1 returns to its normal position, cutting out all connection to the motor, while if the current exceeds a predetermined value the armature carried by core 14 is drawn up and the circuit through short-

circuiting contacts 9 is completed, thus weakening the electromagnet 11 and releasing armature 7. In the construction indicated by Fig. 2 the internal blades 4 and external blade 5 are lengthened and the short-circuiting plates 6 and fixed collectors 8 are duplicated, and for clearness in description the duplicated parts are hereinafter referred to as 20 and 21, respectively, a further connecting-blade 22 and a further fixed collector 23 being added. With the parts in the position shown no current is passing to the motor 19; but if drum 1 be turned to the left the cycle of operations described with regard to Fig. 1 follows. The current flows to the drum, thence through the liquid resistance to blade 4, thence to 5, and by 8 to the motor, then to 21, now in contact with 22, and by 23 to return 18. As in the construction shown in Fig. 1, when short-circuit plate comes in contact with collector 8 all resistance is cut out. If for a series motor, it is only necessary to insert a field, say, at 24, and omit shunt-field 17. For reversing purposes, if the drum be now turned to the right short-circuit plate 6 leaves collector and the current flows with a gradually-increasing resistance through the liquid to blades 4 and 5 until the latter leaves 8. The main circuit is broken when the blades 4 leave the liquid. Continued movement to the right causes blade 5 to come in contact with collector 21, thus reversing the current in the motor 19, the return from which is then by 8, now in contact with 22, and by 23 to return 18.

In many cases the maximum and minimum releases, although making a more perfect apparatus, are not necessary, and the drum 1 may be turned and held in any convenient manner.

What is claimed is—

1. In liquid-resistance switches, an inclosed drum or case, a liquid resistance therein, internal and external blades in electrical connection carried by said drum but insulated therefrom, a short-circuiting plate in electrical connection with the drum and a collector adapted to make contact with the external blade and also with the short-circuiting plate, substantially as described.

2. In liquid-resistance switches, an inclosed drum or case, a liquid resistance therein, internal and external blades in electrical connection carried by said drum but insulated therefrom, short-circuiting plates in electrical connection with the drum, a second external connecting-blade, a collector adapted to remain in constant contact therewith, and two further collectors adapted to make contact with either of the external blades and with the short-circuiting plates, substantially as described.

3. In liquid-resistance switches, an inclosed drum or case, a liquid resistance therein, internal and external blades in electrical connection carried by said drum but insulated therefrom, a short-circuiting plate in elec-

trical connection with the drum, a collector adapted to make contact with the external blade and also with the short-circuiting plate, an armature insulated or not from but carried by said drum, and an electromagnet adapted when energized to attract said armature substantially as described.

4. In liquid-resistance switches, an inclosed drum or case, a liquid resistance therein, internal and external blades in electrical connection carried by said drum but insulated therefrom, a short-circuiting plate in electrical connection with the drum, a collector adapted to make contact with the external blade and also with the short-circuiting plate, an open shunt-circuit terminating in contact-points across the shunt-coil, an electromagnet in the main circuit, and a core therein adapted when its armature is drawn in to complete circuit through the contact-points, substantially as described.

5. In liquid-resistance switches, an inclosed drum or case, a liquid resistance therein, internal and external blades in electrical connection carried by said drum but insulated therefrom, a short-circuiting plate in electrical connection with the drum, a collector adapted to make contact with the external blade and also with the short-circuiting plate, an open shunt-circuit terminating in contact-points across the shunt-coil, an electromagnet in the main circuit, and a core therein adapted when its armature is drawn in to complete circuit through the contact-points, an armature insulated from but carried by the drum and an electromagnet adapted when energized to attract said armature, substantially as described.

6. In liquid-resistance switches, an inclosed drum or case, a liquid resistance therein, internal and external blades in electrical connection carried by said drum but insulated therefrom, short-circuiting plates in electrical connection with the drum, a second external connecting-blade, a collector adapted to remain in constant contact therewith, and two further collectors adapted to make contact with either of the external blades and with the short-circuiting plates, an armature insulated or not from but carried by said drum and an electromagnet adapted when energized to attract said armature substantially as described.

7. In liquid-resistance switches, an inclosed drum or case, a liquid resistance therein, internal and external blades in electrical connection carried by said drum but insulated therefrom, short-circuiting plates in electrical connection with the drum, a second external connecting-blade, a collector adapted to remain in constant contact therewith, and two further collectors adapted to make contact with either of the external blades and with the short-circuiting plates, an open circuit terminating in contact-points between the mains, an electromagnet in the main circuit, and a core therein adapted when its armature

is drawn in to complete circuit through the contact-points, substantially as described.

8. In liquid-resistance switches, an inclosed drum or case, a liquid resistance therein, internal and external blades in electrical connection carried by said drum but insulated therefrom, short-circuiting plates in electrical connection with the drum, a second external connecting-blade, a collector adapted to remain in constant contact therewith, and two further collectors adapted to make contact with either of the external blades and with the short-circuiting plates, an open circuit terminating in contact-points between the

mains, an electromagnet in the main circuit, 15 and a core therein adapted when its armature is drawn in to complete circuit through the contact-points, an armature insulated or not from but carried by the drum and an electromagnet adapted when energized to attract 20 said armature, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOHN HAROLD WOOLLISCROFT.

Witnesses:

M. J. SULIS,
WM. PIERCE.