No. 620,196. Patented Feb. 28, 1899.

H. O. SWOBODA.

ELECTRIC TIME SWITCH.

(Application filed Nov. 2, 1897.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

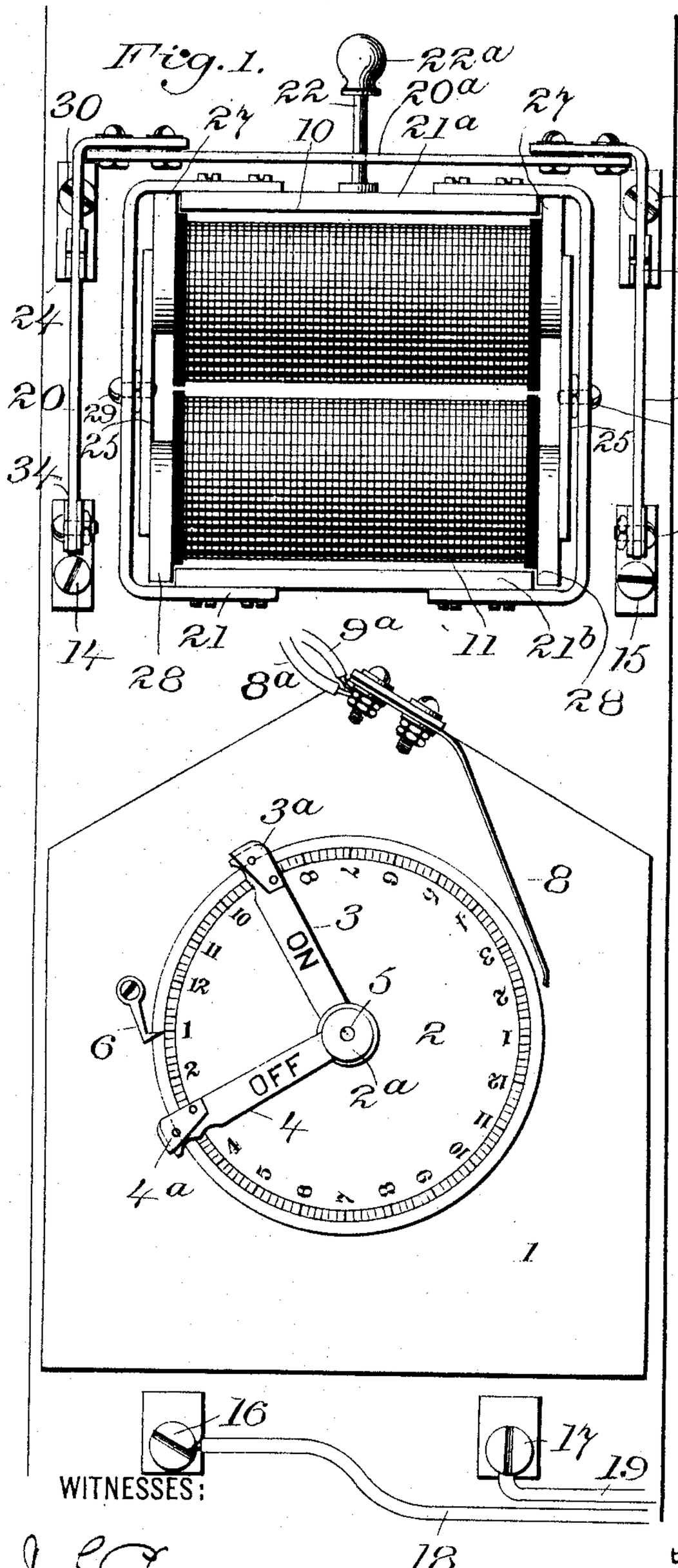

Fig. 2.

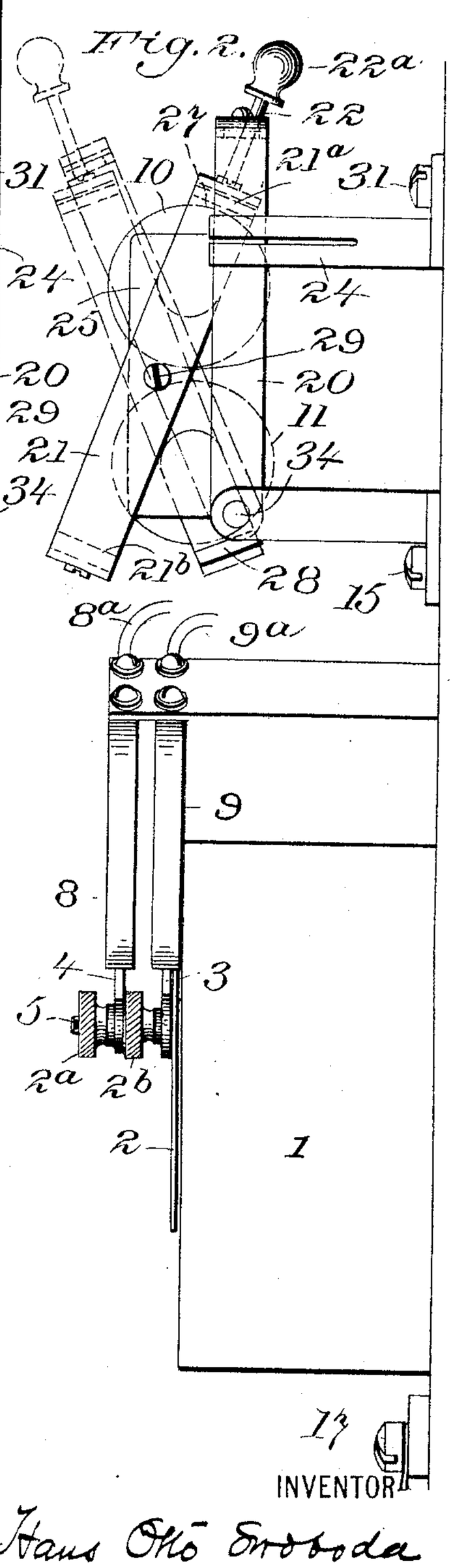

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Fig. 3.

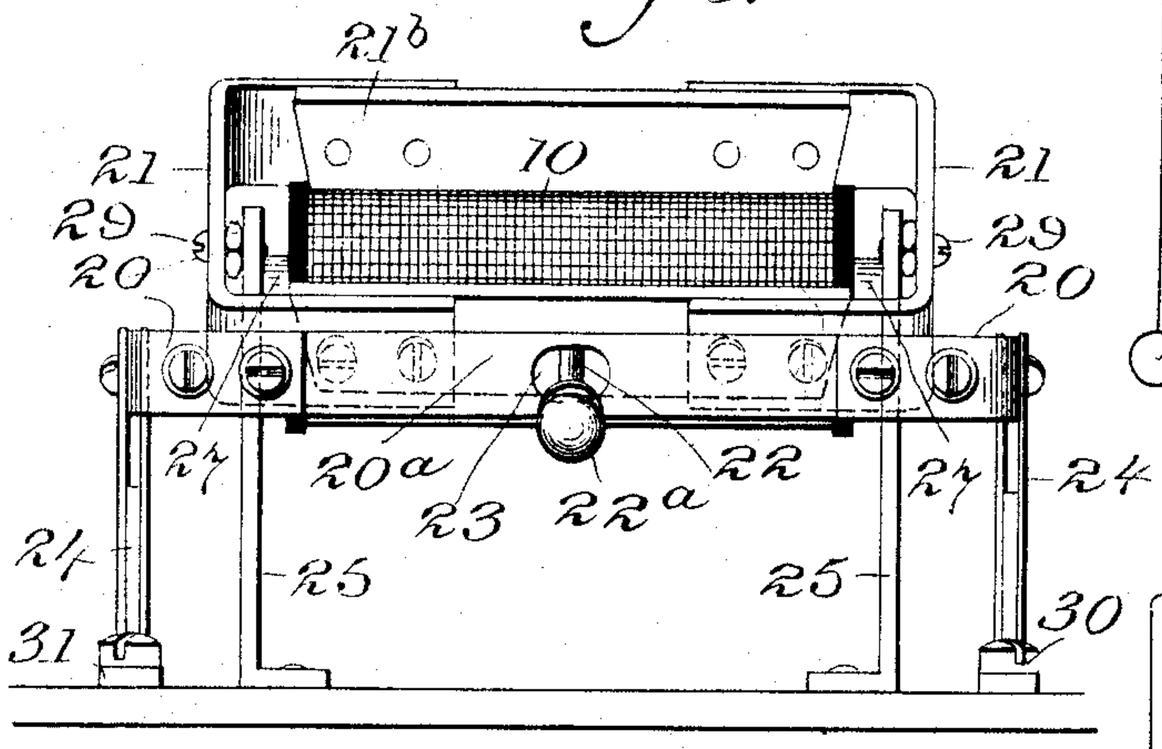


Fig. 4.

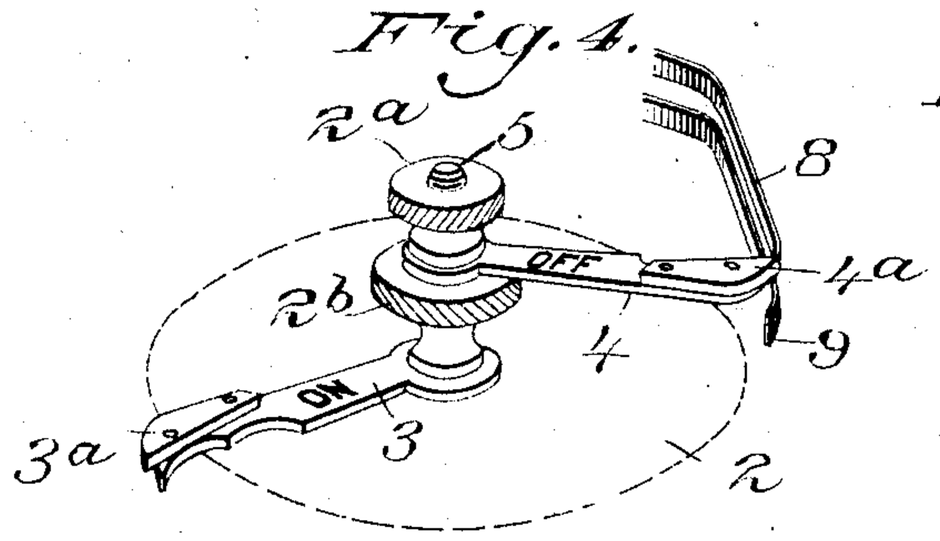


Fig. 5.

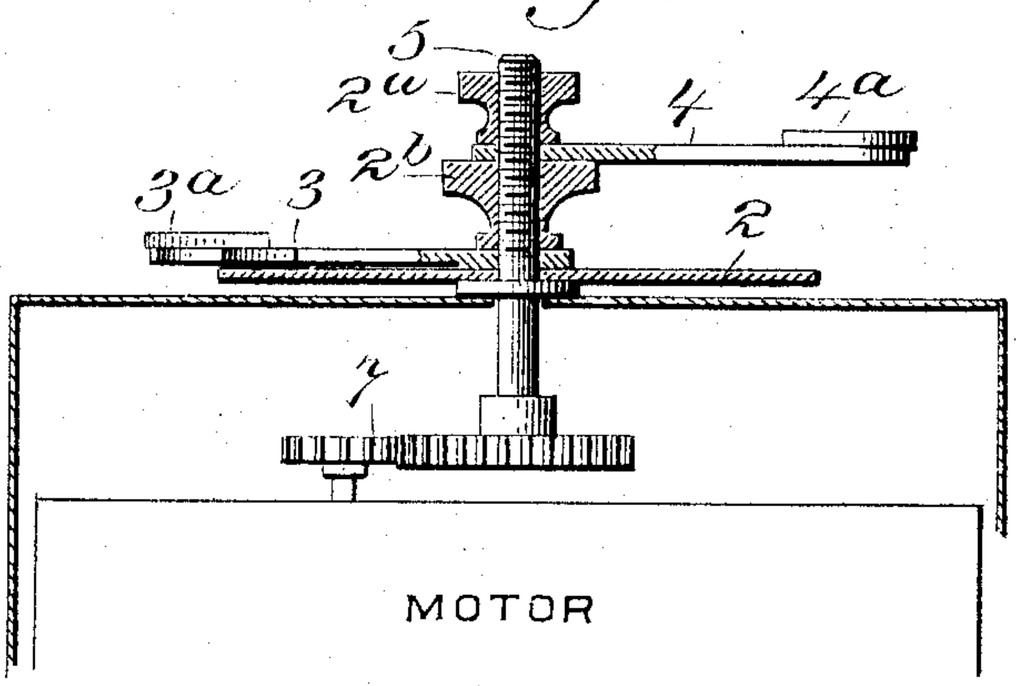
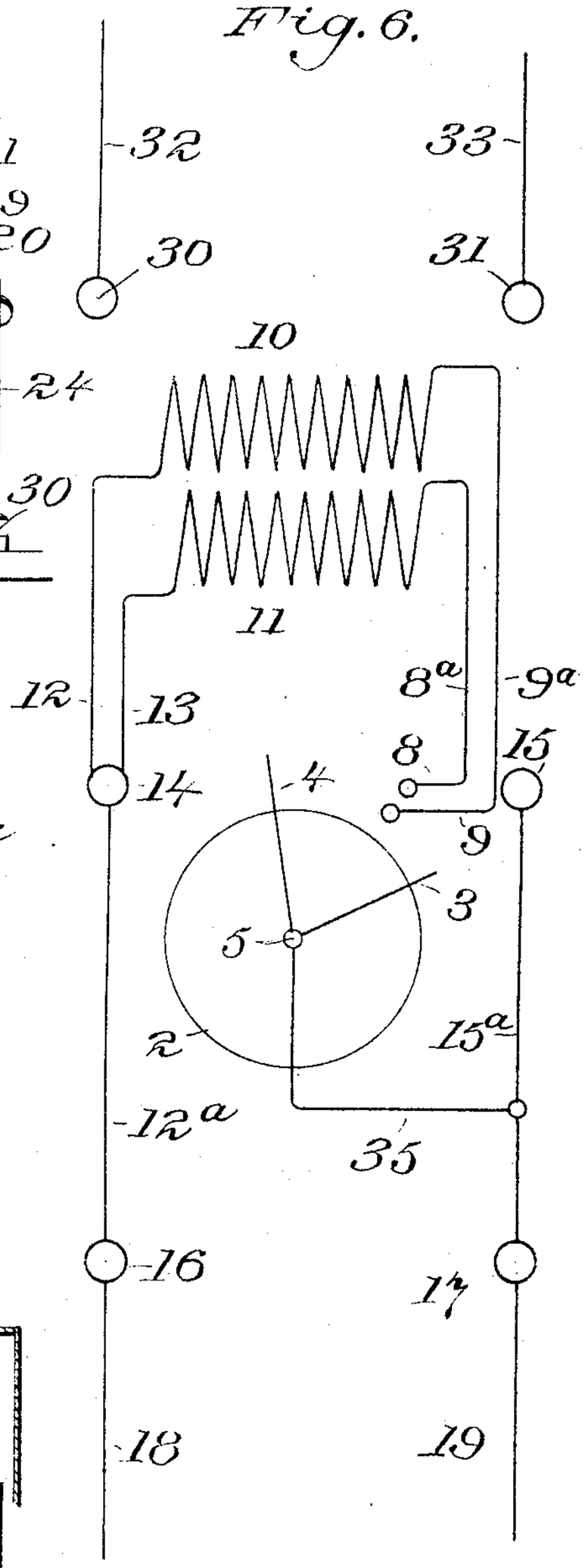


Fig. 6.



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UNITED STATES PATENT OFFICE.

HANS O. SWOBODA, OF NEW YORK, N. Y.

ELECTRIC TIME-SWITCH.

SPECIFICATION forming part of Letters Patent No. 620,196, dated February 28, 1899.

Application filed November 2, 1897. Serial No. 657,199. (No model.)

To all whom it may concern:

Be it known that I, HANS O. SWOBODA, a subject of the Emperor of Germany, residing at New York, State of New York, have invented new and useful Improvements in Time-Switches, of which the following is a specification.

My invention relates to time-operated electrical devices—that is to say, apparatus operated by a clock-movement or other motor driven at a uniform speed to make and break the current in an electrical circuit at predetermined periods of time. In systems of street-lighting by electricity—for instance, where the current is taken from the commercial mains supplying many other consumers—it is now necessary to have a man make the circuit of the system every evening to turn on the lights and every morning to shut them off, or in any place where electric apparatus are used it is now necessary to have some one to turn them on or off at the desired time. My apparatus is specifically designed to automatically turn on the current and automatically turn it off from the lamps or other translating devices at a period of time to be predetermined by the operator and adjustable at will, and by replacing the single-throw switch by a double-throw switch it also can be used to change over automatically from one circuit to another.

The preferred form of my apparatus is illustrated in the accompanying two sheets of drawings, in which—

Figure 1 is a front elevation of the apparatus as it appears when the case is hung to the wall or other vertical support and the lid removed. Fig. 2 is a side elevation of the same, the casing being removed. Fig. 3 is a plan view showing the switch and electromagnetic mechanism for operating the same. Fig. 4 is a perspective detail showing the adjustable contact-making arms. Fig. 5 is a detail section through the axis of the shaft on which said arms are mounted, and Fig. 6 is a diagram of the electrical connections.

Throughout the drawings like reference-figures refer to like parts.

1 is the casing of the clock-movement. (Not shown in the drawings.)

2 is a dial mounted on the shaft 5, driven from said clock-movement through the gearing 7 or any other suitable connection. This dial is figured to represent the twenty-four hours of the day, as shown in Fig. 1.

3 is an adjustable arm, mounted on the spindle 5, for closing the circuit which throws the switch into operative position. 4 is a similar adjustable arm which makes connections which throw the switch out of operative position.

6 is a pointer mounted on the casing of the clock-movement, which shows the time of day by pointing at the figures on the dial opposite.

Located in the path of the adjustable contact-arm 3 is the stationary contact-spring 9. A similar contact-spring 8 is located in the path of the contact-arm 4. These stationary contact-springs are preferably mounted on the casing of the clock-movement and insulated therefrom and from one another.

In order to prevent a long period of contact existing between the slow-moving contact-arms and the springs 8 and 9, I mount an insulating-piece 3^a on the end of the arm 3 and a similar piece 4^a on the end of the arm 4, leaving but a small portion of the ends of such metal arms exposed. The thumb-screws 2^a and 2^b render the position of the contact-arms 3 and 4 on the spindle 5 adjustable. The wires 8^a and 9^a complete the circuit from the contact-springs 8 and 9 to the electromagnets 10 and 11 through the coils of said magnets, respectively, and the wires 12 and 13 back to the binding-screw 14, which is connected with one of the poles of an external source of electric-current supply, which I will call the "supply-current." The spindle 5, which is in electrical connection with rotating adjustable arms 3 and 4, is connected by means of the wire 35 (shown in the diagram Fig. 6) with the other pole of the source of current-supply or supply-circuit.

16 and 17 are binding-posts to which the terminals 18 and 19 of the supply-circuit are connected, and 14 and 15 are binding-posts to which one end of the knife-blades of the switch, operated by the clock-movement, are connected. 12^a and 15^a connect the binding-posts 16 with 14 and 15 with 17, respectively. The magnets 10 and 11, which are thus alternately energized by the passage of current through them, by the rotation of the adjustable arms 3 and 4 operate a switch, which

may be of any convenient form, but which is preferably constructed as shown in Figs. 1, 2, and 3.

20 20 represent the knife-blades of an ordinary two-pole single-throw knife-switch, which knife-blades have their pivotal ends 34 connected with the binding-posts 14 and 15, as before mentioned, while the other ends of said knife-blades make contact with the ordinary spring-clips 24 24. These spring-clips are connected with the binding-posts 30 31, to which the terminals 32 33 of the work-circuit are attached. Although the drawings represent a double-pole single-throw knife-switch, it can easily be seen that any other kind of a knife-switch—as single-pole, triple-pole, or double-throw—can take its place without changing the action of the apparatus.

21 is an oscillating frame which is pivoted on the supports 25 25, which said supports also carry the magnets 10 11, the latter being rigidly fixed to such supports. The swinging frame 21 carries the armatures 21^a 21^b, which are respectively controlled by the pole-pieces 27 and 28 of the magnets. The swinging armature thus formed has an extension 22, preferably provided with a weight 22^a on its extremity, which extension passes through an enlargement or slotted opening 23 in the cross-piece 20^a, which connects the knife-blades 20 20 of the switch. The magnets 10 and 11 are held together and supported by the plate-supports 25 25. The screws 29 29 serve as pivots for the swinging frame 21 of the swinging armature. The magnets, their pole-pieces, and their armatures are shown for the use of direct current. They can, however, be laminated for use of alternating current.

The mode of operation of my invention is as follows: The dial 2 being properly set and the clock-movement, which may, for example, be an eight-day movement, being wound up the pointer 6 indicates the time of day. The extremities of the stationary spring contact-pieces 8 and 9 are diametrically opposite to the pointer 6. If it is desired to turn on the current at nine o'clock in the evening and it is now one o'clock in the afternoon, as indicated in Fig. 1, the adjustable contact-arm 3 will be placed in the position shown, covering the figure "9" in the upper half of the dial. If current is to be shut off at three o'clock in the morning, the contact-arm 4 will be placed in the position shown, covering the figure "3" in the lower half of the dial. The weighted extension 22^a of the swinging armature holds the said armature on whichever side of the center of oscillation in which it may be left, and in the present assumed case said armature will be in the position shown in dotted lines in Fig. 2 and the switch will be open. When the hour of nine is reached, the spring-contact 9 will snap down off of the insulating piece 3^a and make a momentary contact with the extremity of the rotating contact-arm 3. This will send a current from the binding-post 17 through the wire 35, the contact-arm 3, the stationary contact-spring 9, the wire 9^a, the coil of the magnet 10, the wire 12, binding-post 14, and wire 12^a back to the other binding-post 16. The energizing of the magnet 10 will cause its pole-pieces 27 27 to attract the armature 21^a strongly. The swinging armature and its frame will begin to move, and after a short period of idle motion its extension 22 will strike one extremity or side of the slotted or enlarged opening 23 and carry the knife-blades 20 of the switch over to the right-hand position and into contact with the spring-clips 24 24, thus closing the connection from the supply-circuit through to the work-circuit. The contact of the spring 9 with the adjustable contact-arm 3 being only momentary there is little tendency to burn out the contact-surfaces. When the hour of three in the morning is reached, the contact-spring 8 will snap down off of the insulating-piece 4^a and make a momentary contact with the rotating contact-arm 4. This will send the current from binding-post 17 through wire 35, adjustable arm 4, contact-spring 8, wire 8^a, coil of the magnet 11, wire 13, binding-post 14, and wire 12^a to the other binding-post 16. The energizing of magnet 11 by the passage of the current through its coils causes its pole-pieces 28 28 to strongly attract the armature 21^b on the other end of the swinging frame 21 and oscillates the said swinging frame from the position shown in full lines, Fig. 2, to that shown in dotted lines. The first portion of this movement of oscillation will be made freely by said swinging frame, and the momentum thus acquired by means of the weight 22^a will enable the extension 22 of said swinging frame to lift the knife-blades 20 of the switch from the grasp of the spring-clips 24, when said extension 22 shall strike the other side of the enlarged opening 23 in the cross-piece 20^a, which connects the knife-blades. This cross-piece 20^a is of course insulated from the knives of the switch. The continued motion of the swinging frame 21 will lift the knife-blades entirely out of engagement with the clips 24 24 and the switch will be opened and the current cut off from the work-circuit. By loosening the thumb-screw 2^a the contact-arm 4, which opens the circuit, can be adjusted to any hour, and a further loosening of the thumb-screw 2^b will permit a similar adjustment of the contact-arm 3, which closes the circuit.

The advantages of my construction lie in its simplicity and certainty of action and in its durability. The making of momentary contacts only means saving of electrical energy, and the feature of allowing the swinging frame to acquire a certain degree of momentum before it begins to operate the switch makes the said switch a quick making and a quick breaking device without increasing the size of the magnets beyond the practical point. The swinging frame having its center of grav-

ity above the pivotal point will be held permanently in whichever position it is left.

Of course various changes could be made in the details of my invention so long as the principle of operation herein described is preserved. Other forms of switch could be employed. A less or greater number of magnets could be employed which might be differently located in reference to the armature. The adjustable contacts might be stationary and the coöperating contact-pieces be permanently fixed upon the dial. The current for energizing the electromagnetic mechanism might be supplied from a separate source, &c.; but all these modifications would be within the scope of my invention.

Having therefore described my invention, what I claim as new, and desire to protect by Letters Patent, is—

1. In a time-switch, the combination with a motor device, of a pair of contact-arms and a movable dial adjustably mounted upon the spindle of said motor device and adapted to be driven at a constant speed, a pair of stationary contact-pieces located in the path of movement of said arms, an electrically-operated switch in the working circuit, comprising a switch-blade, an electromagnet, a swinging armature oscillated by the energizing of the magnet, and a loose connection between the armature and switch-blade, which permits a movement of the armature prior to that of the switch-blade in the direction of the common motion.

2. In a time-switch, the combination with a motor device adapted to make and break circuits at predetermined times, of an electrically-operated switch, comprising a switch-blade, an electromagnet, a swinging armature pivoted below its center of gravity and oscillated by the energizing of a magnet, and a loose connection between the armature and the switch-blade, which permits the armature to acquire momentum prior to the movement imparted by it to the switch-blade in the direction of the common motion.

3. In a time-switch, the combination with a motor device, of a pair of contact-arms, and a dial adjustable upon the spindle of said device and driven at a fixed speed, a pair of stationary contact-pieces located in the path of movement of said arms, a pointer, a switch in the work-circuit, a pair of fixed magnets respectively in circuit with said contacts, a swinging armature alternately oscillated in opposite directions when energized by the respective magnets, and a loose connection between the armature and the movable portion of the switch, which permits of a movement of said armature prior to the movement of the movable portion of the switch in the direction of the common motion.

4. In a time-switch, the combination of two electromagnets, a swinging armature pivoted below its center of gravity and oscillated by the alternate energizing of the magnets, and a contact-switch, the movable part of which is located in the path of movement of said armature and adapted to be actuated by said armature after said armature has traversed a part of its normal distance of movement.

5. In a time-switch, the combination of an electromagnet, a swinging armature pivoted below its center of gravity and provided with a weighted extension and adapted to be oscillated by the alternate energizing of the magnets, and a contact-switch, the movable part of which is located in the path of movement of said armature and adapted to be actuated by said armature after said armature has traversed a part of its normal distance of movement.

In testimony whereof I affix my signature in the presence of two witnesses.

HANS O. SWOBODA.

Witnesses:

A. PARKER SMITH,

J. E. PEARSON.