No. 673,807. Patented May 7, 1901.

T. S. WATSON.

CONTROLLER FOR ROTARY TRANSFORMERS.

(Application filed June 4, 1900.)

(No Model.) 2 Sheets—Sheet 1.

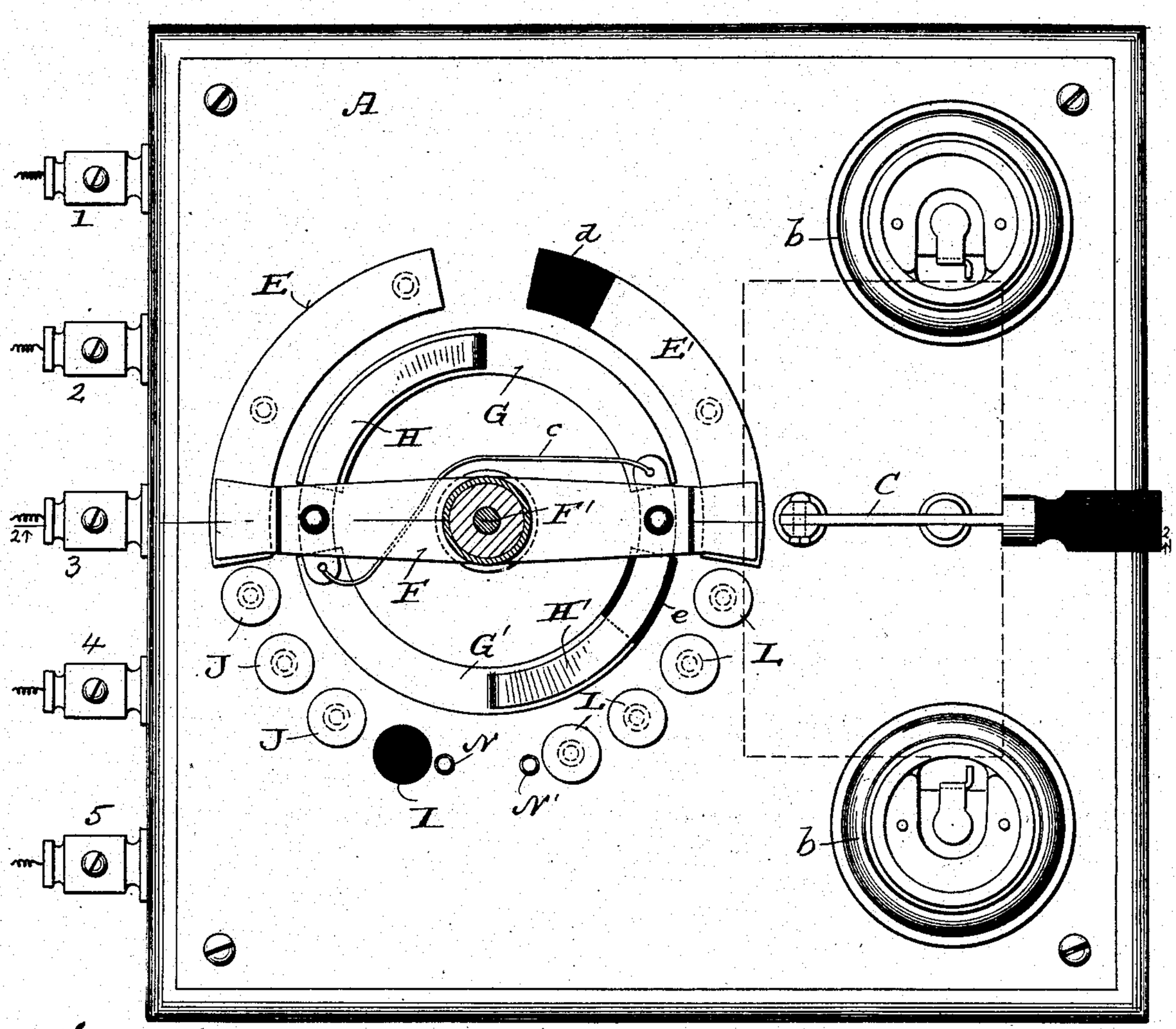

Fig. 1.

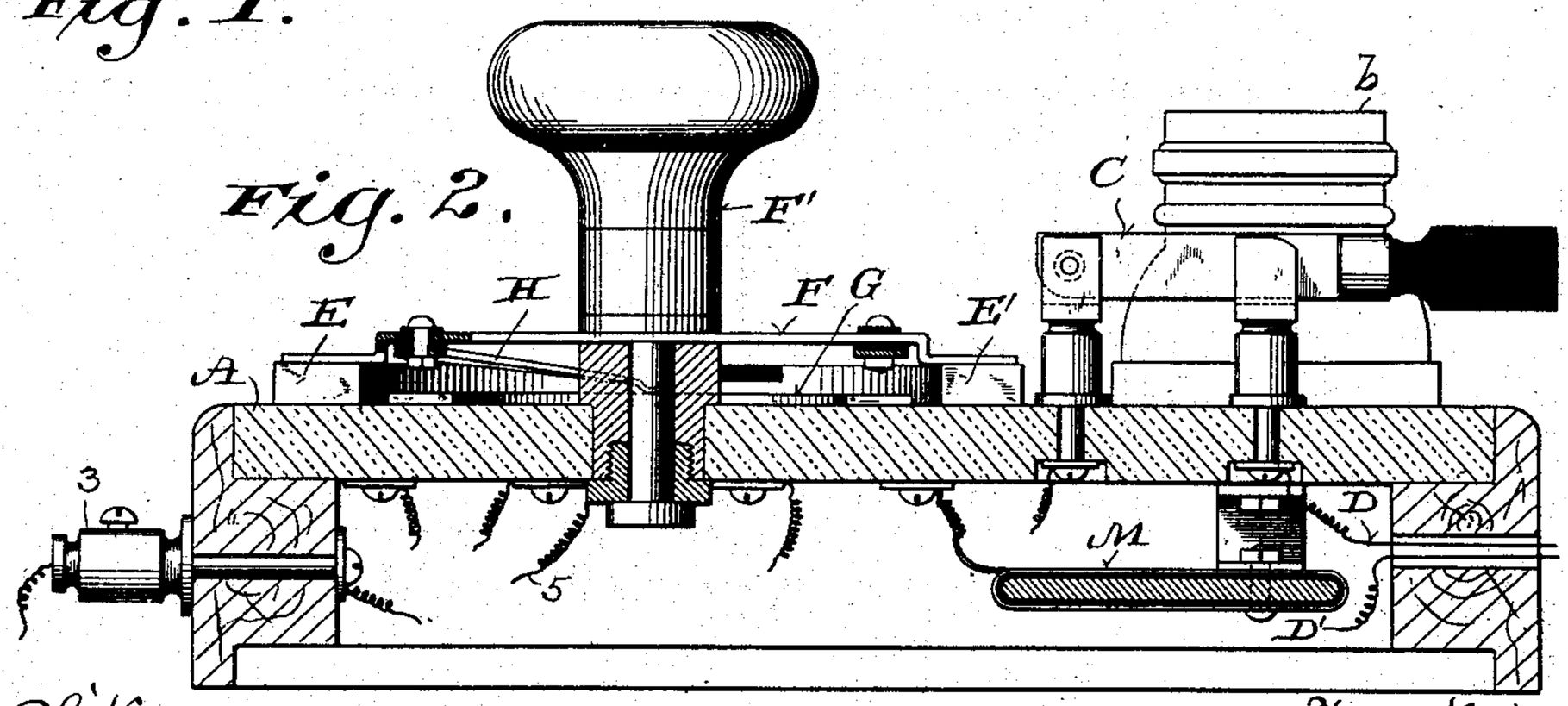

Fig. 2.

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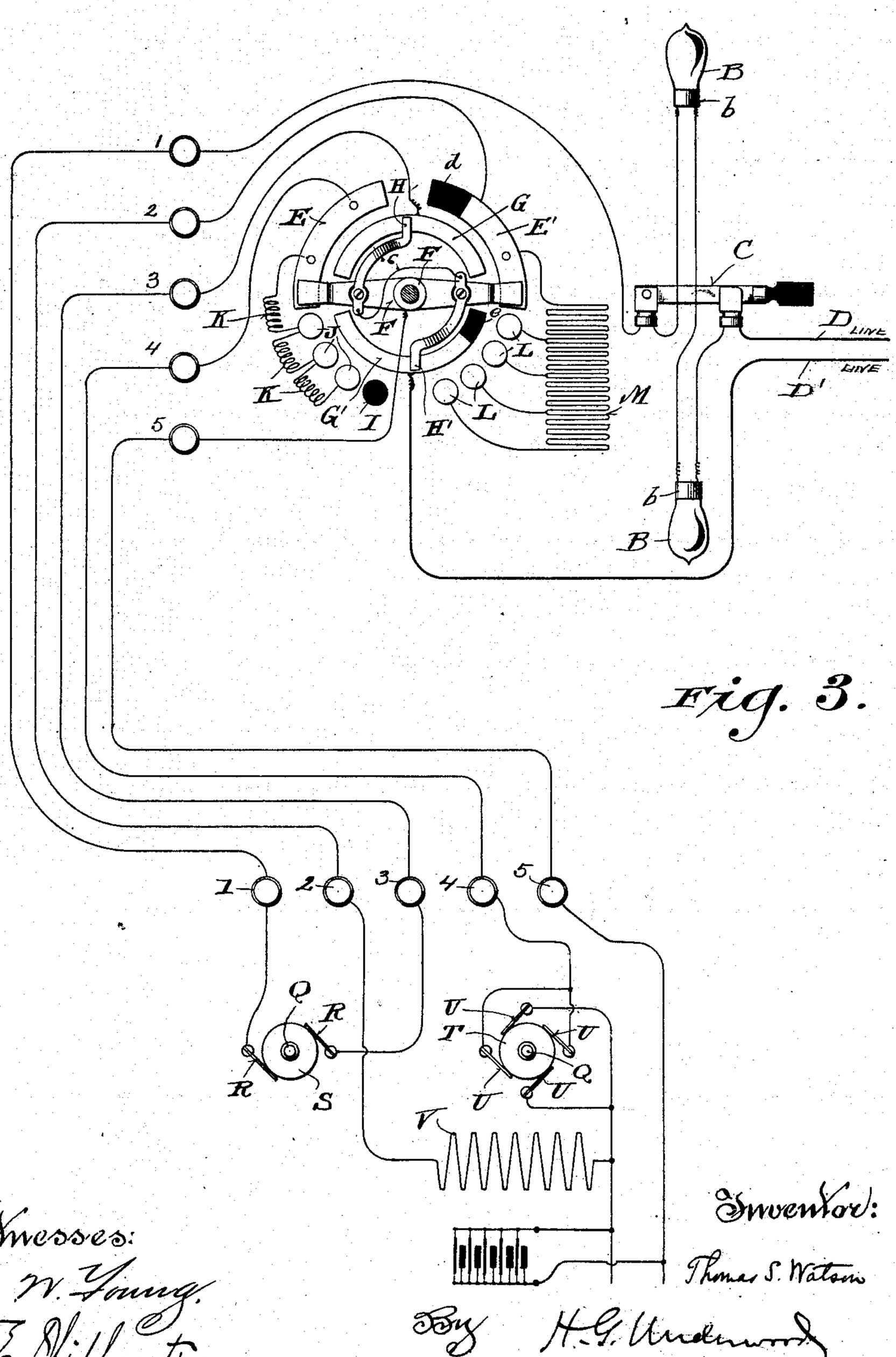

Fig. 3.

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UNITED STATES PATENT OFFICE.

THOMAS S. WATSON, OF MILWAUKEE, WISCONSIN.

CONTROLLER FOR ROTARY TRANSFORMERS.

SPECIFICATION forming part of Letters Patent No. 673,807, dated May 7, 1901.

Application filed June 4, 1900. Serial No. 18,955. (No model.)

To all whom it may concern:

Be it known that I, THOMAS S. WATSON, a citizen of the United States, and a resident of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Controllers for Rotary Transformers; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention has for its object to provide simple economical apparatus by which to start and regulate the running of a rotary transformer employed to change electric current of one description to that of another, such as transforming alternating to direct current, or the reverse, said invention consisting in certain peculiarities of construction and combination of parts hereinafter particularly set forth with reference to the accompanying drawings and subsequently claimed.

Figure 1 of the drawings represents a plan view of my apparatus that constitutes a controller for a rotary transformer, the handle of a center-pivot switch-bar shown in this view being in horizontal section; Fig. 2, a section on the plane indicated by line 2 2 in the preceding figure, and Fig. 3 a diagram illustrating an application of the controller to a rotary transformer in connection with a storage battery.

Referring to the drawings, the letter A indicates an insulating-base provided with sockets *b* for incandescent electric lamps B, that appear in the diagram Fig. 3. These lamps are shown in circuit with the terminals of a knife-switch C, mounted on the insulating-base and in electric connection with line-wires D D′ for an alternating current whose source of generation is more or less distant from the apparatus herein set forth. The lamps are utilized as indicators of current, and their omission would not in any way affect what I seek to cover as a controller for a rotary transformer. The insulating-base is shown as being provided with segmental contacts E E′ for the ends of a centrally-pivoted switch-bar F having a center handle F′, by which it is swung. Other segmental contacts G G′ are arranged on the insulating-base concentric with the contacts aforesaid and are respectively in opposition to brushes H H′, having insulated connection with the switch-bar F and electric connection with each other, as herein shown, a wire *c* being employed for said electric connection. Segmental contact E′ is shown provided at one end with insulation *d*, and insulation *e* is also shown on an end of segmental contact G′, this contact and the one G being illustrated within arcs of one hundred and eighty degrees of a circle opposite each other, while both the contacts E E′ are illustrated as being for the most part within the same arc of one hundred and eighty degrees of a circle. An insulating-stud I is clamped on base A in line with the insulation *d* on contact E′, and between this stud and contact E at intervals of a circle are a series of contact-studs J in electrical connection with a series of resistance-coils K, that are also in like connection with said contact E, as shown in the diagram Fig. 3. Another series of contact-studs L are clamped on base A at intervals of the circle upon which the contacts E E′ and studs I J are disposed, and said studs L are individually wired to a resistance-coil M, that is also electrically connected to the contact E′ aforesaid. Binding-posts 1 2 3 4 5 in connection with the insulating-base are respectively in electric connection with the knife-switch C, contacts E′ G E, and switch-bar F, as clearly shown in the diagram Fig. 3, and stops N N′ are arranged on said base to limit throw of said switch-bar in either direction.

The apparatus above specified constitutes the controller I seek to cover, and when this controller is cut out its pivotal switch-bar F will contact at the ends with insulation *d* and I, the brush H′ of said bar being then in contact with insulation *e*.

In practice the above-specified binding-posts of the controller are electrically connected to a corresponding series of similar posts belonging to a rotary transformer—such, for instance, as the one particularly set forth in my application for patent filed December 29, 1899, Serial No. 741,911, and indicated in the diagram Fig. 3, wherein a storage battery P is also indicated as being in circuit with said controller and transformer.

In practice the armature of the transformer is wound for alternating and direct currents, and the armature-shaft Q is provided at one end with collecting-rings of common knowl-

edge opposed by brushes R, reference-letter S being employed to mark that one of said rings appearing in the aforesaid diagram. The other end of the armature-shaft is provided with a commutator T, and brushes U oppose the commutator. The binding-posts of the transformer are numbered the same as those of the controller, and, as shown in the diagram Fig. 3, they are electrically connected to the brushes and field-magnet of said transformer.

Assuming that switch-bar F is turned to cut out the controller, the alternating-current circuit broken, and the storage battery materially weakened, the first step in the operation to recharge said battery will be to start the armature of the rotary transformer by moving said switch-bar so as to bring its ends out of contact with the insulations I *d*, its brush H′ being at the same time moved to clear insulation *e*, all of the resistance K being then in circuit with the direct-current winding of the armature and the resistance M entirely out of the field-circuit. The armature is now running under influence of direct current derived from the weakened storage battery, the electrical connections being such, as herein shown, that said current has both field and armature circuit. The resistance K is now gradually cut out by continued movement of the switch-bar and the speed of the armature is proportionately increased, the ends of said switch-bar being then on the segmental contacts E E′, as herein shown. The resistance K having been cut out, it becomes necessary to weaken the magnetic field V of the transformer to further increase the speed of the armature. This is done by cutting in some or all of the resistance M, there being continued movement of switch-bar F to have contact with studs L in successive order between contact E′ and stop N′ on the insulating-base. The armature being now run at sufficient speed, the alternating-current circuit is closed and resistance M, if any, cut out, whereby the full strength of the magnetic field is upon both windings of the armature. The armature is now running by alternating current, and direct current from the commutator is operating to charge the storage battery without further change of connections.

From the foregoing it will be understood that my controller in any form comprises an insulating-base provided with a pair of continuous contacts arranged to be included in circuit with a battery, a magnetic field, and a rotary armature wound for direct and alternating currents, another pair of continuous contacts on the insulating-base arranged to be included in circuit with the armature and a source of alternating-current generation, a switch-bar operative at all times in conjunction with at least one of the first pair of said contacts and provided with brushes insulated from itself, but electrically connected with each other, and positioned to work on the second pair of the aforesaid contacts, an armature-resistance electrically connected to one of the first pair of continuous contacts, a field-resistance likewise connected to the other of this pair of contacts, armature-resistance contacts on said base at intervals in the path of the switch-bar preceding one of the first pair of continuous contacts, and field-resistance contacts on the aforesaid base also at intervals in the path of said switch-bar succeeding the other of said first pair of continuous contacts, the extent of said armature-resistance contacts being less by one division than that of the continuous contact with which the field-resistance is electrically connected.

While I have shown a knife-switch as a means for making and breaking the alternating-current circuit independent of the switch-bar, its brushes, and the contacts for said bar and brushes, it is practical to omit said switch or its equivalent and depend on said bar, brushes, and contacts for the making and breaking of the said circuit.

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

1. A controller for a rotary transformer consisting of an insulating-base, a pair of continuous contacts arranged on the base to be included in circuit with a battery, a magnetic field and a rotary armature wound for direct and alternating currents; another pair of continuous contacts on said base arranged to be included in circuit with the armature and a source of alternating-current generation, a switch-bar operating at all times in conjunction with at least one of said first pair of contacts and provided with brushes insulated from itself but electrically connected with each other and arranged to work on said second pair of contacts, provision being had for touch of the switch-bar on both of the aforesaid first pair of contacts in one position of its adjustment, an armature-resistance electrically connected to one of the aforesaid first pair of contacts, a field-resistance likewise connected to the other of this first pair of contacts, armature-resistance contacts on the insulating-base at intervals in the path of the switch-bar preceding one of the first pair of continuous contacts, and field-resistance contacts on said base in the path of said switch-bar succeeding the other of said first pair of continuous contacts, the extent of said armature-resistance contacts being less, by one division than that of the continuous contact with which the field-resistance is electrically connected.

2. A controller for a rotary transformer consisting of an insulating-base, a pair of segmental contacts arranged on the base to be included in circuit with a battery, a magnetic field and a rotary armature wound for direct and alternating currents; another pair of segmental contacts on said base arranged to be included in circuit with the armature and a source of alternating-current generation, a

pivotal switch-bar operating at all times in conjunction with at least one of the said first pair of contacts and provided with brushes insulated from itself but electrically connected with each other and arranged to work on said second pair of contacts, provision being had for touch of the switch-bar on both of the aforesaid first pair of contacts in one position of its adjustment, an armature-resistance electrically connected to one of the aforesaid first pair of contacts, a field-resistance likewise connected to the other of this first pair of contacts, armature-resistance contacts on the insulating-base at intervals of an arc traversed by the switch-bar previous to its touch on one of the first pair of segmental contacts, and field-resistance contacts on said base at intervals of another arc traversed by said switch-bar after leaving the other of said first pair of segmental contacts, the arc of said armature-resistance contacts being less, by one division than the working face of the segmental contact with which the field-resistance is electrically connected.

3. A controller for a rotary transformer consisting of an insulating-base, a pair of continuous contacts arranged on the base to be included in circuit with a battery, a magnetic field and rotary armature wound for direct and alternating currents another pair of continuous contacts on said base arranged to be included in circuit with the armature and a source of alternating-current generation, a switch-bar operating at all times in conjunction with at least one of said first pair of contacts and provided with brushes insulated from itself but electrically connected with each other and arranged to work on said second pair of contacts, provision being had for touch of the switch-bar on both of the aforesaid first pair of contacts in one position of its adjustment, means independent of said switch-bar for interrupting the alternating-current circuit, an armature-resistance electrically connected to one of the first pair of contacts, a field-resistance likewise connected to the other of this first pair of contacts, armature-resistance contacts on the insulating-base at intervals in the path of the switch-bar preceding one of the first pair of continuous contacts, and field-resistance contacts on said base in the path of said switch-bar succeeding the other of said first pair of continuous contacts, the extent of said armature-resistance contacts being less, by one division, than the continuous contact with which the field-resistance is electrically connected.

4. An electrical device comprising a switch-bar provided with brushes insulated from itself but electrically connected with each other, continuous contacts arranged to be traversed by the bar, other continuous contacts arranged to be traversed by the brushes, variable electrical resistances in connection with the continuous switch-bar contacts, provision being had for touch of said bar on its continuous contacts in one position of adjustment simultaneous with a cutting out of all the aforesaid electrical resistances, and alternating-current conductors in circuit with the brush-contacts; together with a storage battery, a magnetic field, and a rotary armature wound for direct and alternating currents, said battery, field and armature being electrically connected in circuit with the aforesaid switch-bar, its continuous contacts, the brush-contacts, the variable electrical resistances and the alternating-current conductors.

5. An electrical device comprising a switch-bar provided with brushes insulated from itself but electrically connected with each other, continuous contacts arranged to be traversed by the bar, other continuous contacts arranged to be traversed by the brushes, variable electrical resistances in connection with the continuous switch-bar contacts, provision being had for touch of said bar on its continuous contacts in one position of adjustment simultaneous with a cutting out of all the aforesaid electrical resistances, alternating-current conductors in circuit with the brush-contacts, and an independent switch having its terminals electrically connected to the alternating-current conductors; together with a storage battery, a magnetic field, and a rotary armature wound for direct and alternating currents, said battery, field and armature being electrically connected in circuit with the aforesaid switch-bar, its continuous contacts, the brush-contacts, the variable electrical resistances and the alternating-current conductors.

In testimony that I claim the foregoing I have hereunto set my hand, at Milwaukee, in the county of Milwaukee and State of Wisconsin, in the presence of two witnesses.

THOS. S. WATSON.

Witnesses:
N. E. OLIPHANT,
B. C. ROLOFF.