No. 620,783. Patented Mar. 7, 1899.

W. H. K. KING.

ELECTRICAL REGULATOR.

(Application filed Sept. 20, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1

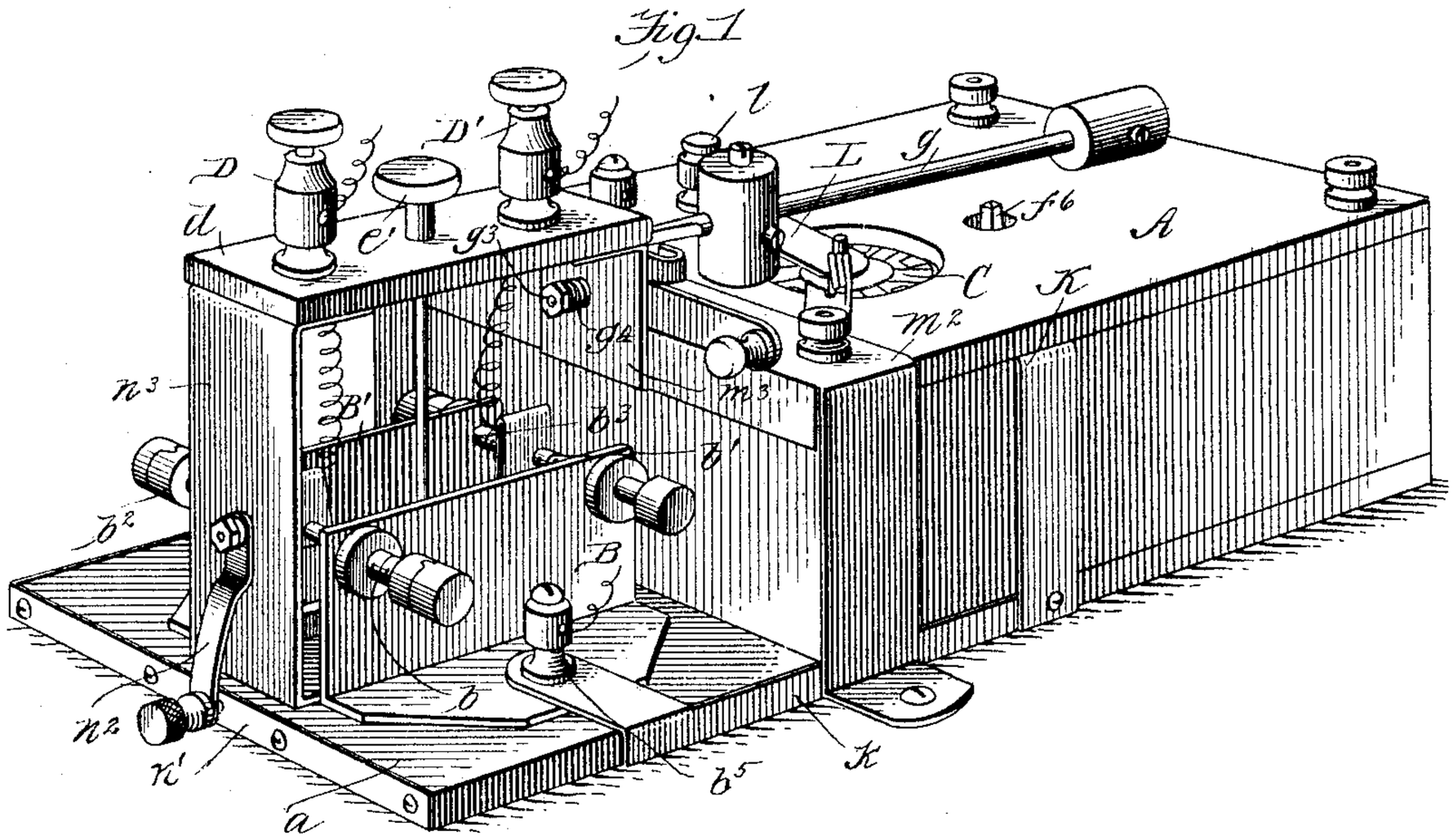


Fig. 2.

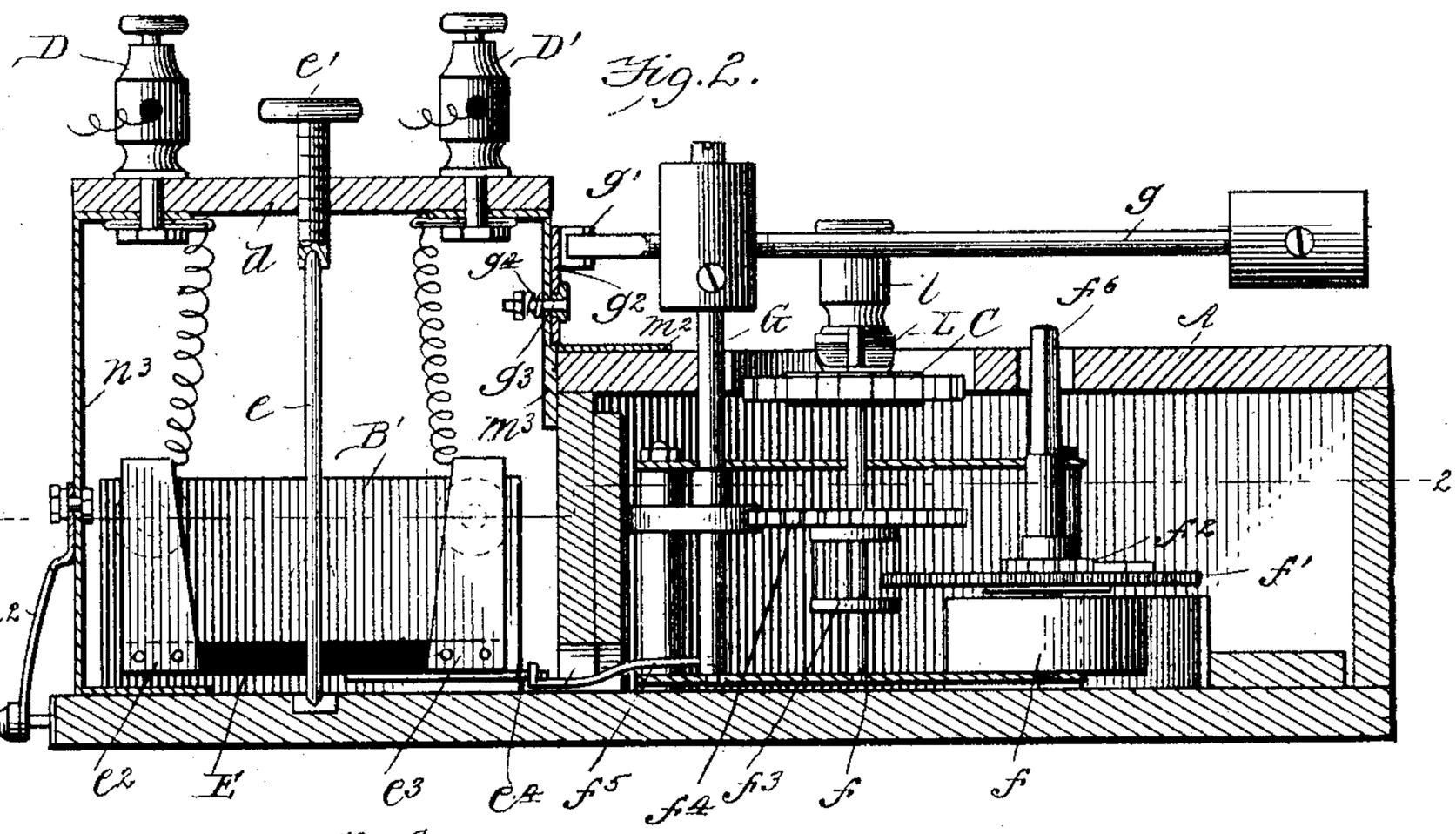
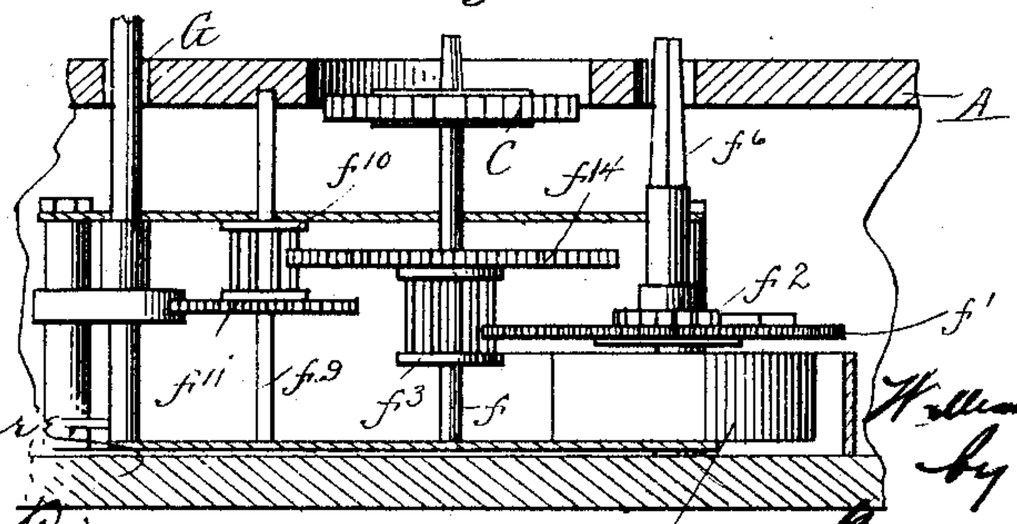


Fig. 7.



WITNESSES

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(No Model.) 2 Sheets—Sheet 2.

Fig. 3.

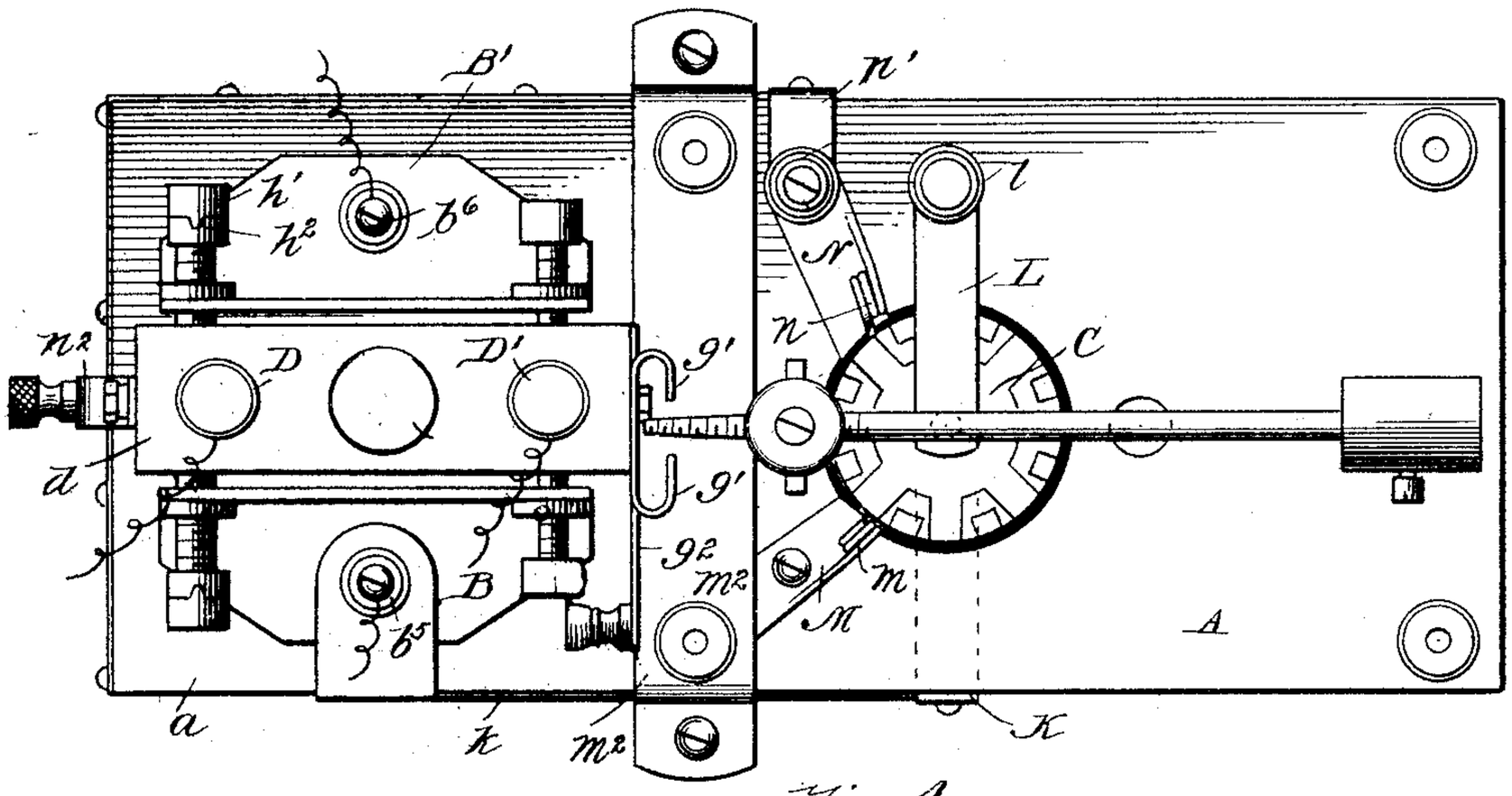


Fig. 4.

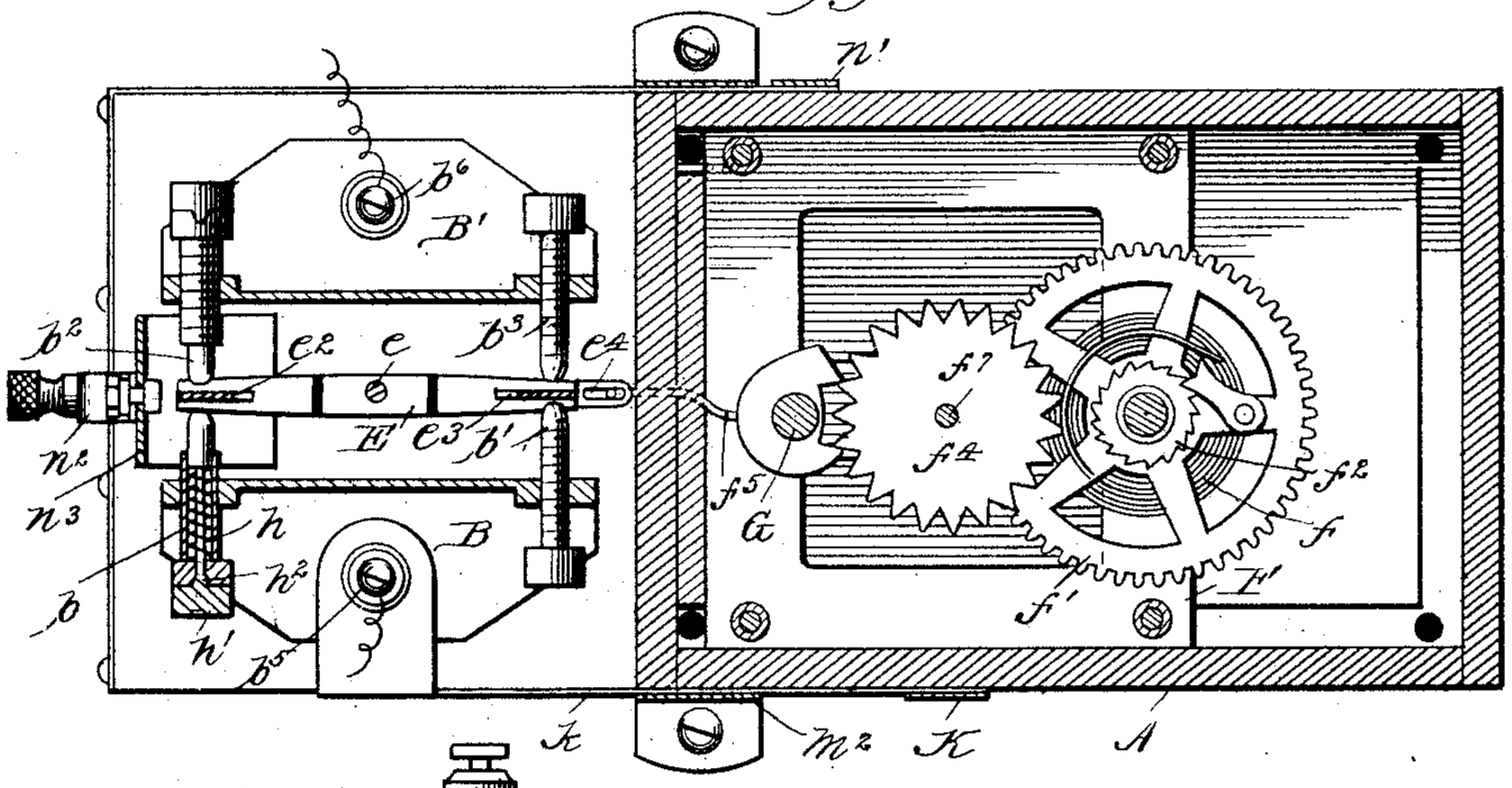


Fig. 6.

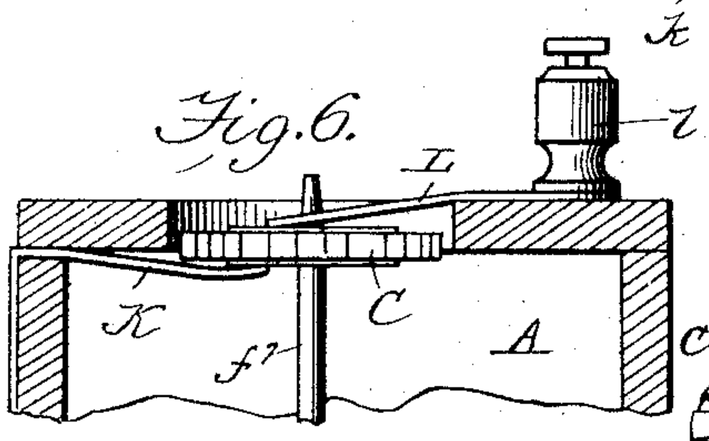
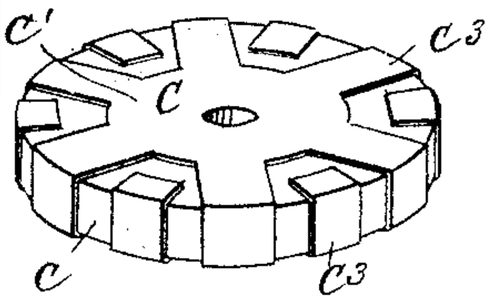


Fig. 5.



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ELECTRICAL REGULATOR.

SPECIFICATION forming part of Letters Patent No. 620,783, dated March 7, 1899.

Application filed September 20, 1898. Serial No. 691,473. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM HENRY KANE KING, a citizen of the United States, residing at Carthage, in the county of Jasper and State of Missouri, have invented certain new and useful Improvements in Electrical Regulators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in regulators for electrical currents, and is designed to be used for regulating electrical currents of all kinds.

It consists in suitable contacts adapted to be connected with a source of electricity, circuit makers and breakers adapted to be moved into and out of engagement with the said contacts, and means for operating the said circuit-breakers, so as to produce either an interrupted current or an alternating current, as may be desired.

It also consists in suitable contacts adapted to be connected with an electric circuit, circuit-breakers adapted to engage the same, and an actuating mechanism adapted to control the vibrations of the circuit-breakers, and suitable switches whereby an uninterrupted or an interrupted current may be produced or an alternating current may be formed.

It also consists in contacts automatically connected with a circuit, circuit-breakers adapted to engage said contacts, and a commutator adapted to be connected with the current to make an alternating or an interrupted current which shall have equal periods of flow and rest.

It also consists in certain other novel constructions, combinations, and arrangements of parts, as will be hereinafter fully described and claimed.

In the accompanying drawings, Figure 1 represents a perspective view of my improved current-regulator. Fig. 2 represents a vertical longitudinal section through the same. Fig. 3 represents a top plan view; Fig. 4, a horizontal section through the said regulator. Fig. 5 represents a perspective view of the commutator. Fig. 6 represents a detail transverse sectional view through the commutator and a portion of the casing, showing the spring-contacts bearing upon its upper and lower surfaces; and Fig. 7 shows a detail sectional view of the actuating mechanism, illustrating a slightly different train of gearing.

A in the drawings represents a casing for holding a part of the mechanism, B B′ receiving-plates, and C a commutator.

I find that it is very desirable in using electricity for all purposes to have a mechanism connected up with the current by which the kind of current used may be changed to suit the purpose for which it is being used. In pursuing this idea I have conceived an invention which comprises suitable mechanism for producing a continuous current, or an automatically-interrupted current, or an automatic alternating current, as may be desired. For the purpose of my invention I employ a casing, as A, made of insulating material, which is provided with an extended floor or base, as *a*, upon which are mounted receiving-plates B B′. These receivers are preferably formed of angular plates of suitable conducting material and carry contacting-screws, as *b b′* and b^2 b^3. Each of the receiving-plates B B′ is provided with a suitable binding-post, as b^5 b^6. In using the device either one of these posts may be connected with the positive pole of a battery or other current, while the other end is connected with the negative pole. For the sake of description and illustration we will say that the binding-post b^5 is connected with the positive pole of the current, while the binding-post b^6 is connected with the negative. Delivery-posts, as D D′, are mounted upon a suitable insulating block or plate, as *d*, supported at a suitable distance above the receiving-plates B B′, as clearly illustrated in the drawings, the said plate *d* being preferably supported by standards secured to the casing A and the base *a*. Mounted between the receiving-plates B B′ is a vibrating arm, as E, carried by a vertical post or shaft *e*. The lower end of said shaft finds a suitable bearing upon the base *a*, while the upper end is engaged and held in place by means of an adjusting-screw, as *e′*. The said screw *e′* engages suitable threads formed in the insulating-plate *d*, the said screw being provided with a socket or bearing in its lower end for holding the upper end of the shaft *e* pivotally in place. Carried upon the outer ends of the arm E are

contact-springs, as e^2 e^3, which extend upwardly, so as to have their free ends between opposite ends of the contact-screws b b^2 and b' b^3. Each of the contact-springs e^2 e^3 is connected by a suitable connecting-wire with one of the binding-posts D D', the said springs being insulated one from the other, preferably by forming the arm E of insulating material. From these binding-posts the current can be conducted to any suitable place for use. When the arm E is held stationary, having its spring-contacts in engagement with diagonally opposite contact-screws—as, for instance, b' b^2—the current would be continuous through the receiving-plates and the delivery-posts; but when it is desired to make an interrupted current or an alternating current it is necessary to vibrate the arm E, whereby the spring-contacts will make and break the circuits, as required. I employ a very simple mechanism for automatically vibrating the arm E and certain means for controlling the said vibration to accommodate the mechanism to different uses of the current. Interiorly of the box or casing A, I mount an actuating mechanism, which is preferably a simple clockwork, as illustrated in Figs. 2 and 4 of the drawings. This mechanism comprises a suitable frame, as F, in which is mounted a main shaft carrying a mainspring, as f. A master-gear, as f', is also mounted upon this shaft and connected with the same by means of a pawl-and-ratchet mechanism, as shown in Fig. 4 in the drawings at f^2. The cog-wheel f' engages a pinion, as f^3, which is secured to an escapement-wheel, as f^4. This escapement-wheel is adapted to be controlled by pallets in the usual manner, carried by the lever f^5. The lever f^5, carrying the pallets, extends out to a suitable opening in the casing A and engages a slot, as e^4, formed in a projection secured to one end of the lever or arm E. The main shaft of the clockwork is provided with a winding-stem, as at f^6, so that it may be wound up at any time. The shaft G of the pallet-lever extends up through the top of the casing A and carries at its upper end a horizontal pendulum, as g, which is suitably weighted at its outer end. The other or shorter end of the said pendulum extends to a point near one of the standards supporting the insulating-plate d' and projects between the engaging or contact arms, as g', formed upon a switch, as g^2. The switch g^2 is mounted upon a suitable pin, as g^3, the said pin engaging a slot in the switch, so that the said switch may be moved back and forth upon the said pin. In order to hold the switch by a frictional contact against the standard, a coil-spring, as g^4, is preferably interposed between the said standard and a nut upon one end of the said pin g^3. This spring serves to hold the switch g^2 with sufficient frictional contact against the standard to prevent its being accidentally moved from one position to another. As seen in Figs. 2 and 3 of the drawings, the contacts g' g' are formed upon the switch g^2. It will thus be seen that the swinging of the pendulum may be regulated by setting the switch g^2, as said switch controls the extent of movement of the pendulum. It will be apparent also that when the switch is moved to one extremity it will carry the pendulum with it and move the pallet-lever so as to vibrate the arm E between the receiving-plates and bring the spring contact-plates against the diagonally opposite contact-screws—namely, either b' and b^2 or b and b^3. If the positive and negative poles of a circuit are connected, respectively, with the binding-bosts b^5 b^6, as heretofore mentioned, and the switch g^2 is pushed to one extremity of its movement, so that one of the spring-contacts will engage the contact-screw b' and the other contact-screw b^3, a continuous current will be established through the receiving-plates B and B' and the delivery-posts D D', and the binding-post D' is positive, while the post D is negative. If the switch g^2 is pushed to the opposite extremity, the arm E will be so disposed as to connect the contact-screws b and b^3. A continuous current will thus be established through the receiving-plates and the delivery-posts, the post D receiving a positive current and the post D' a negative current. If, however, the switch g^2 is moved to an intermediate point, as seen in Fig. 3 of the drawings, the pendulum will be free to vibrate in reference to the clock mechanism, and the arm E will be kept in motion, bringing its spring-contacts into engagement with first one set of contact-screws and then the other, so that an alternating current is thus formed through the delivery-posts, its polarity being continually changed.

The mechanism can also be used as an automatic rheotome, for, as seen in Fig. 4 of the drawings, the contact-screws b and b^2 are made hollow and have mounted within them contact-points which are normally held in their distended or outermost position by means of springs, as h. These contact-points are provided with heads, as h', which have projecting fins formed upon their inner faces. When the contact-points are in the position shown in Fig. 4 of the drawings, the fins h^2 occupy the recesses formed in the heads of the screws b and b^2; but when it is desired to withdraw one or the other of the contacts the head may be pulled outwardly and turned until the fins no longer rest in the said recess, thus holding the contact-point in its innermost position and so that it will not be engaged by the vibrations of the spring-contact of the lever E. By utilizing this construction the device may be used as a rheotome, for one of the contacts may be withdrawn—as, for instance, the contact in the screw b. This would prevent the formation of a current between the screw b and the contact at the outer end of the screw b', so that the current would only be completed when the spring-contacts engage the screws b' and b^2, the opposite vibration of

the said arm producing only a continuation of the interval between the times of making of the current. It will be readily seen that instead of pulling out the contact in the screw b the contact in the screw b^2 may be operated in a similar manner for producing an interrupted current, but in the opposite direction. It will be readily seen that by this means the current is completed through the same circuit, and it is only interrupted as distinguished from the alternating current previously described, in which the poles of the delivery-posts were changed at every vibration of the lever E.

As thus far described, the device has been capable of producing an interrupted or alternating current in which the periods of rest are longer than the periods of flow. Very often it is desirable to use an alternating current in which the periods of rest shall be equal to periods of flow. I accomplish this result in a very simple manner in my improved regulator. Upon the shaft f^7 of the clock mechanism I mount a commutator, as C, the said commutator preferably occupying a circular space formed in the cover of the casing A. The commutator C is preferably constructed of a body portion formed of insulating material, as c, and contact-plates, as c' c^2, secured to opposite faces of said commutator. Each of the contact-plates is formed with radially-extending contact-arms, as c^3, which are bent so as to extend across the edge of the commutator, the free ends of each of said arms being preferably bent over the opposite faces of the commutator, as clearly seen in Fig. 5 of the drawings. In order to connect one set of contacts of the commutator with one pole of the circuit, I secure a spring-contact, as K, in the casing A, the said contact extending at its free end beneath the commutator and engaging the contact-plate c^2 upon the underside thereof. The said contact engages the said plate at a point near the shaft of the commutator, so that it will have a continuous bearing upon the said plate when the commutator revolves. The spring-contact K is connected by a metallic plate or piece k with the binding-post b^5 upon the receiving-plate B, so that when the positive pole of the battery or other circuit is connected with the said post the current will also pass through the spring-contact K. A second contact-spring, as L, is mounted upon the top of the box A, preferably exteriorly thereof, and bears with its free end upon the upper plate c' of the commutator. A binding-post, as l, is secured to one end of the contact-spring L, and the other pole of the battery may be thus connected directly to the said plate. Contact-plates, as M N, are also mounted upon the casing A and provided with spring contact-points, as m n, which extend downwardly and engage the edge of the commutator C. The contact M is electrically connected with the delivery-post D′ by means of a plate m^2 and the inner standard m^3, supporting the insulating-plate d. The contact-plate N is connected with a metallic strip, as n', which extends downwardly upon the side of the casing A and around the edge of the base a along the end thereof. A switch, as n^2, is pivotally mounted upon the standard n^3 of the insulating-plate d. When it is desired to complete the circuit through the contact N, the switch n^2 is lowered, so as to engage the metallic strip n'. It will thus be seen that the current of electricity can be completed from the positive pole of the battery through the binding-post b^5 and the metallic connecting-strip k', the lower spring K, the lower plate of the commutator, the spring contact-point m and the contact-plate M, the plate m^2, standard m^3, binding-post d', thence through any device or mechanism which is being used or operated in connection with the electric current back to the binding-post D, thence through the standard n^3, the switch n^2, the metallic strip n', the contact-plate N and contact-point n to the upper plate c' of the commutator, contact-spring L, binding-post l, and thence to the negative pole of the battery or other source of electricity. The arms of the contact-plates upon the commutator c^2 are made of the same width throughout, and the spaces between the said arms are made equal to the width of the spring-points n n, so that the current flow will be exactly equal to the period of rest. In using the commutator it will be apparent that when the clock mechanism is set in motion the alternating current will be set up between the receiving-plates and the delivery-posts.

I have illustrated my actuating mechanism as communicating its movement to the pole-changing mechanism through the escapement and pole devices. It will be obvious, however, that a similar result could be accomplished by employing a cam upon the shaft G and using a loop for engaging the same, the said loop being secured to the lever f^5.

While I have shown the train of gearing in the actuating mechanism as using only three shafts and gearing carried thereby, yet it will be apparent that any number of shafts and gears could be used for regulating the movement transmitted from the spring to the mechanism operated. Thus, as seen in Fig. 7 of the drawings, a shaft, as f^9, may be mounted in the casing A and carry an escapement-wheel, as f^{11}, a pinion, as f^{10}, being secured to the said escapement and engaging a gear-wheel f^{14}, secured to the shaft f. This gearing would communicate a different speed to the operating parts through the gearing shown in Fig. 2. It will be apparent that this and other arrangements of gearing may be used without departing in the least from the spirit of my invention.

It will be apparent from the above description that my improved regulator may be termed a "universal regulating device for electrical currents," as it is adapted to produce without changing or detaching the con-

nections with the poles of the source of electricity either a continuous uninterrupted current or an interrupted current through the same poles or the polarity of the current may be changed so as to produce an alternating current, all being controlled by two switches. The mechanism is also readily adapted to give either an alternating current having the periods of current flow shorter than the periods of rest or with the periods of current flow of equal duration with the periods of rest.

The device is very simple with small chance of the parts getting out of order, and it can be used for medical or mechanical purposes.

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

1. In an electrical regulator, the combination with receiving-posts connected with a suitable source of electricity, of contact-points on the said posts, a vibrating arm having spring-contacts extending between the said contact-points, a delivery-post connected with each of the said contact-springs, and a clock mechanism connected with and vibrating the said arm and springs, whereby they may receive an automatic movement for alternating the current through the delivery-posts, substantially as described.

2. In an electrical regulator, the combination with receiving-plates and delivery-posts, of vibrating spring-contacts for changing the polarity of the current passing through the said posts, a clock mechanism mounted in the said casing, an escapement connecting the said mechanism with the said vibrating springs, a pendulum connected with the said escapement, and means for controlling the extent of movement of the pendulum, substantially as described.

3. In an electrical regulator, the combination with receiving-plates and delivery-posts, of vibrating contacts adapted to change the polarity of the current passing through the delivery-posts, a clock mechanism for automatically vibrating the said contacts, the pallet-lever of the said clock mechanism engaging the lever carrying the said contacts, a pendulum mounted upon the pallet-lever shaft and a switch adapted to engage one end of the pendulum whereby the pendulum may be moved to one side for producing a continuous current or may be permitted to oscillate in response to the clock mechanism for producing an alternating or interrupted current, substantially as described.

4. In an electrical regulator, the combination with receiving-plates and delivery-posts, of contact-screws mounted in the said receiving-plates, vibrating contact-springs mounted between the said screws, means for vibrating the said contact-springs the said contact-screws comprising hollow screw-casings and interior contact-points, springs for holding the contact-points normally outward, and means upon the heads of said contacts for holding them out of engagement with the spring-contacts whereby an interrupted current may be produced, substantially as described.

5. In an electrical regulator, the combination with a suitable actuating mechanism of a commutator adapted to be revolved thereby, the said commutator having contact-plates upon its opposite faces, the said plates having arms extending to the periphery of the said commutator and arranged so that the spaces between the said arms shall be equal to the width of the said arms, contact-plates mounted upon the casing and having spring contact-points adapted to engage the periphery of the commutator, the said contact-plates being electrically connected with delivery-posts, a switch for controlling the connection with one of said delivery-posts, spring-contacts engaging the body portion of the plates upon the commutator upon the upper and lower sides thereof, one of said spring-plates being connected with the positive pole of a source of electricity, while the other one is connected with the negative pole of said source of electricity, the construction being such that an alternating current having equal periods of flow and rest may be produced, substantially as described.

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

WILLIAM HENRY KANE KING.

Witnesses:
J. D. KELLY,
C. T. REYNOLDS.