(No Model.) 2 Sheets—Sheet 1.

G. H. CONDICT.

REGULATOR FOR ELECTRICAL MACHINERY.

No. 399,599. Patented Mar. 12, 1889.

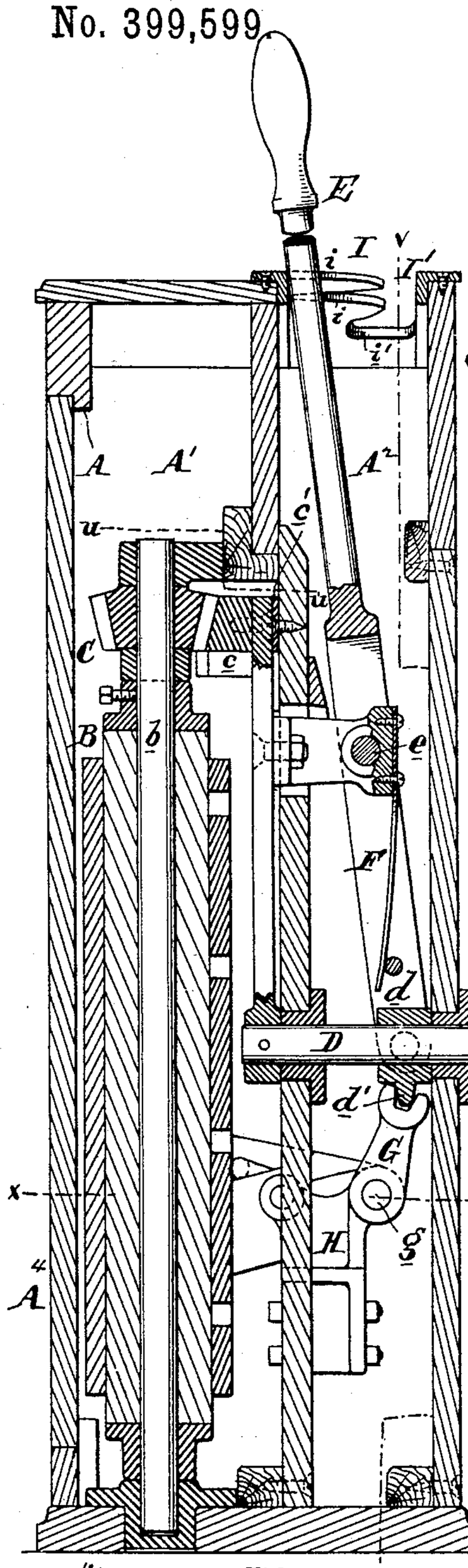


FIG. 1

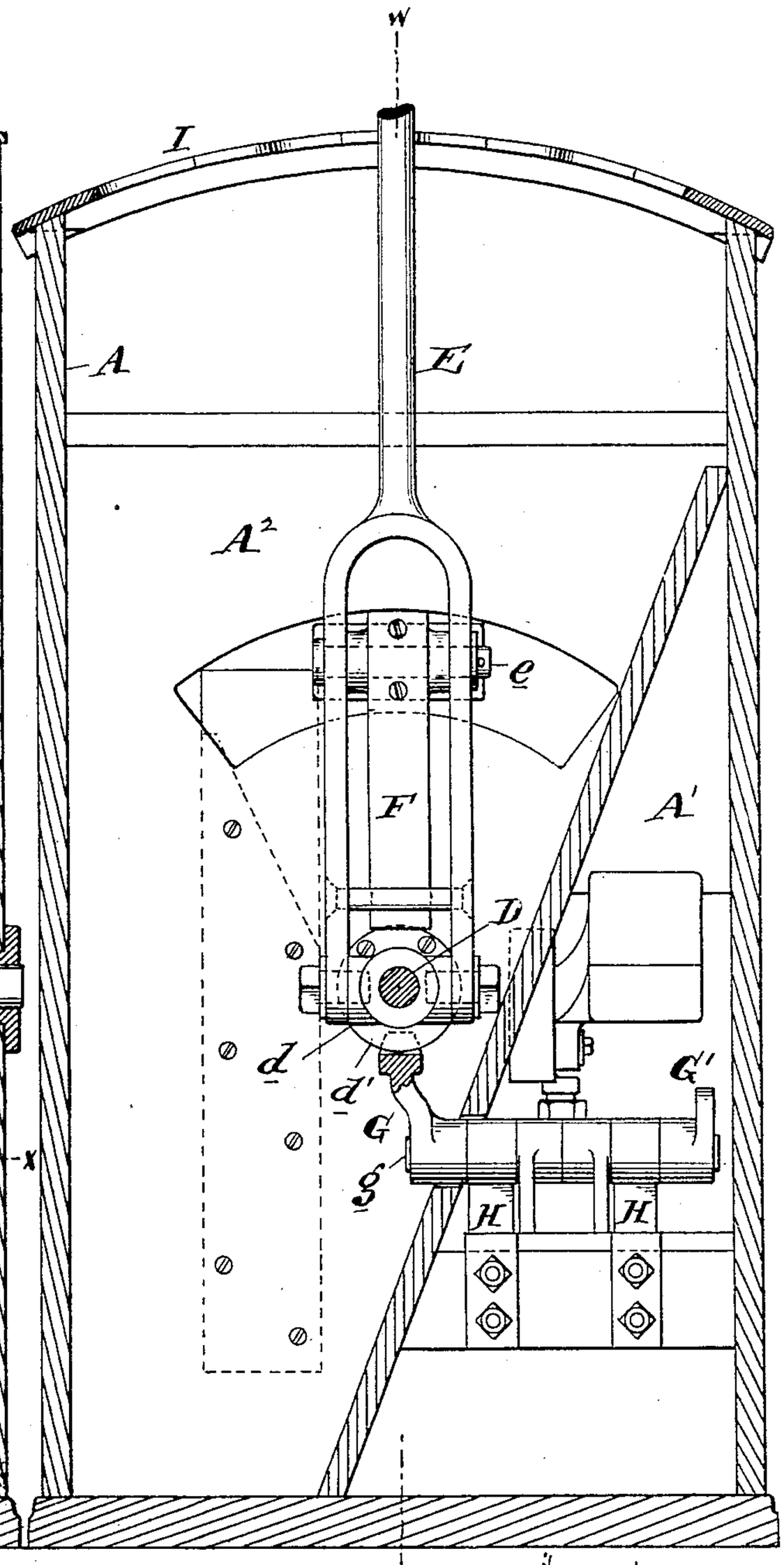


FIG. 2

Witnesses:
Henry Drury
C. H. Breckinridge

Inventor:
G. Herbert Condict
By his atty
Thos. Drury

(No Model.) 2 Sheets—Sheet 2.

G. H. CONDICT.

REGULATOR FOR ELECTRICAL MACHINERY.

No. 399,599. Patented Mar. 12, 1889.

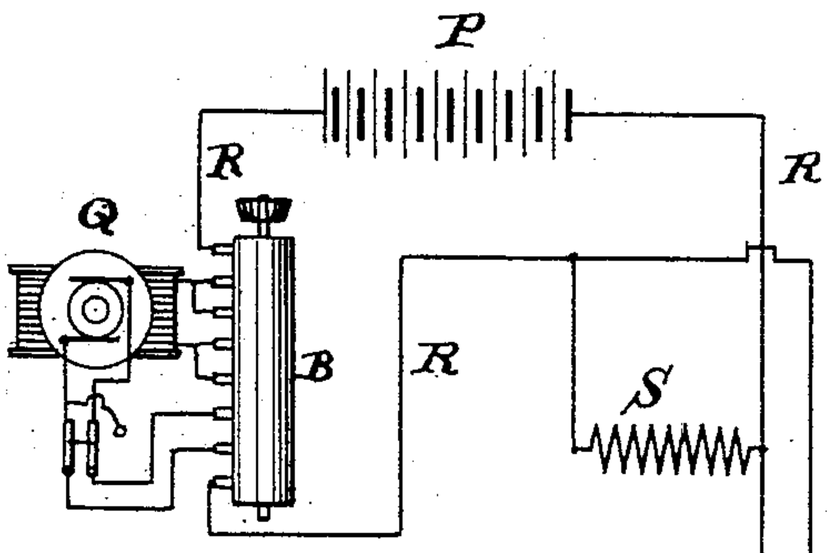
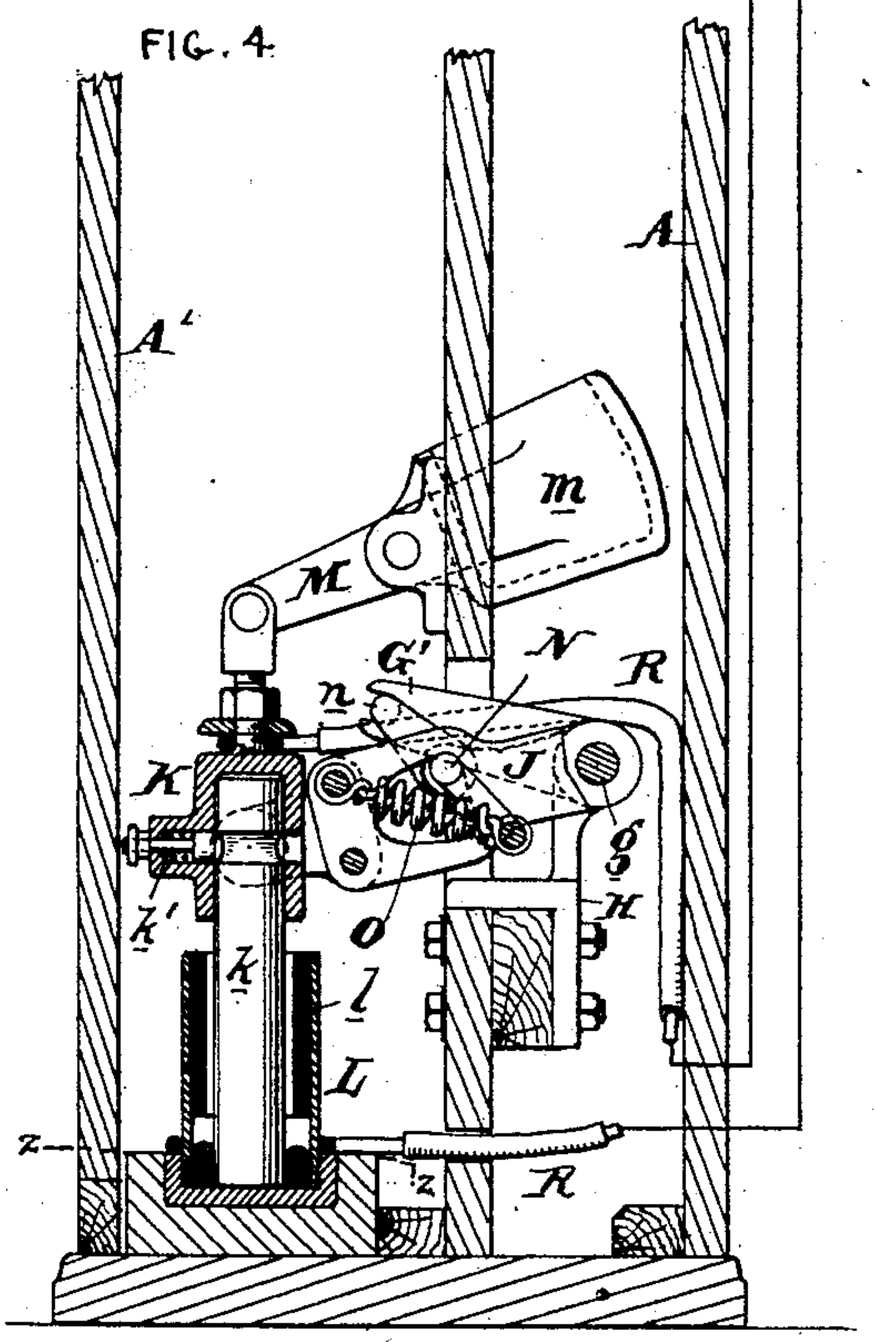


FIG. 4.



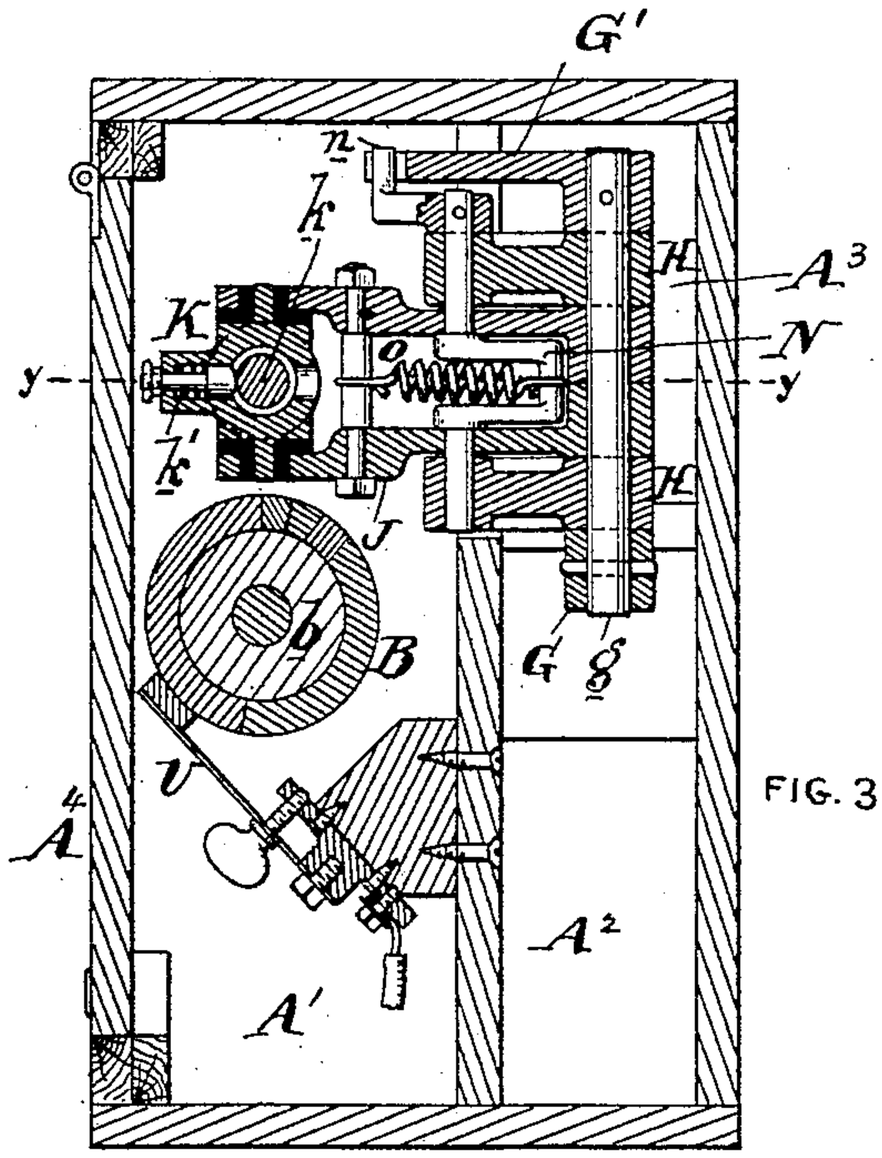


FIG. 3

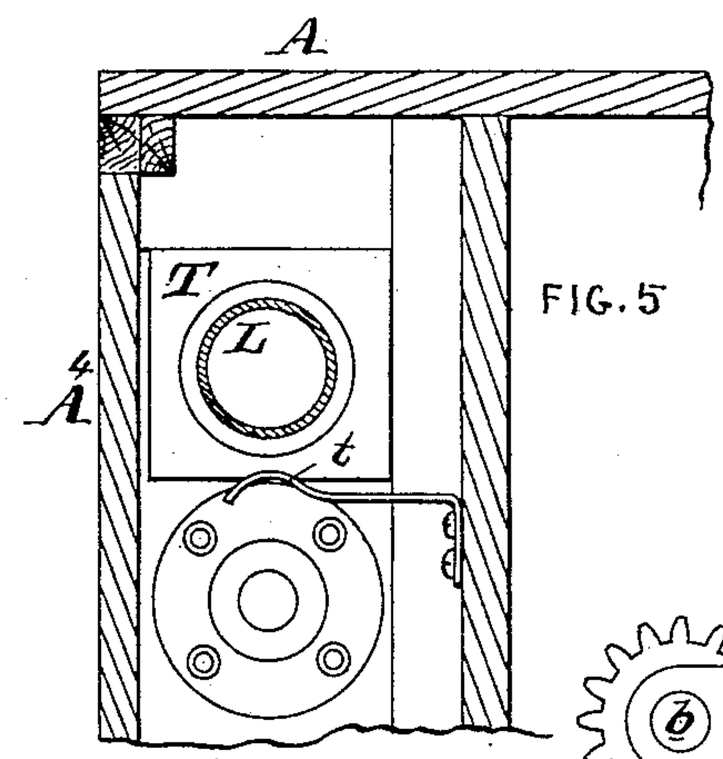


FIG. 5

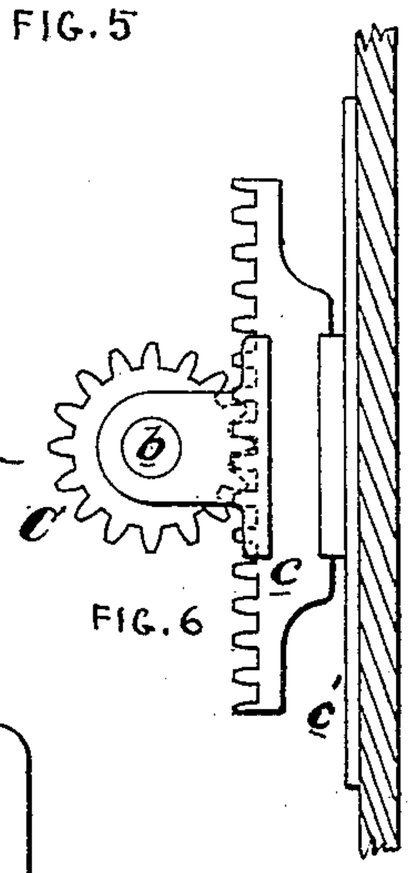


FIG. 6

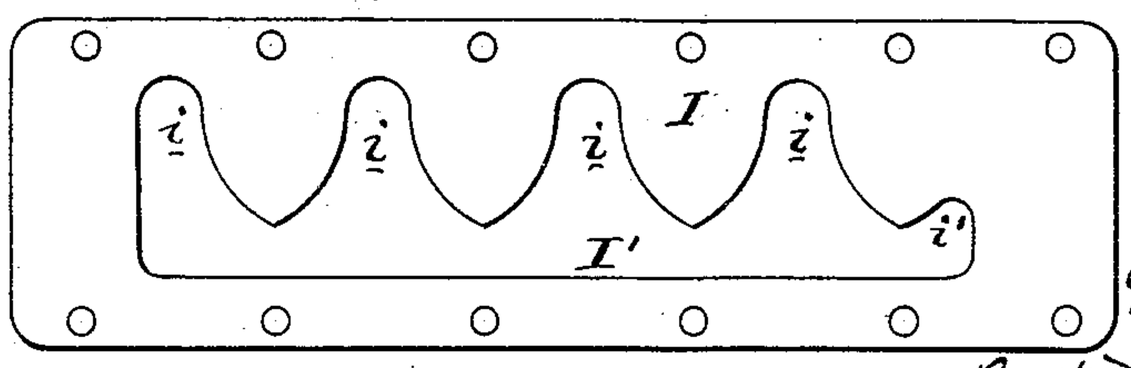


FIG. 7

Witnesses:
Henry Drury
E. M. Breckinridge

Inventor:
G. Herbert Condict
By his atty
S. Whittemore

UNITED STATES PATENT OFFICE.

GEORGE HERBERT CONDICT, OF PHILADELPHIA, PENNSYLVANIA.

REGULATOR FOR ELECTRICAL MACHINERY.

SPECIFICATION forming part of Letters Patent No. 399,599, dated March 12, 1889.

Application filed October 1, 1888. Serial No. 286,908. (No model.)

To all whom it may concern:

Be it known that I, GEORGE HERBERT CONDICT, of the city and county of Philadelphia, and State of Pennsylvania, have invented an Improvement in Regulators for Electrical Machinery, of which the following is a specification.

My invention has reference to regulators for electrical machinery; and it consists of certain improvements, all of which are fully set forth in the following specification and shown in the accompanying drawings, which form part thereof.

The object of my invention is to provide a suitable construction of regulator adapted either to electric motor or other purposes, and with an especial view to electric traction, whereby the electricity passing to the translating device may be varied or suitably regulated as to tension and volume, or both, and during any change in the current supply produced by the regulator the mechanism shall be such that the current shall be completely severed before the regulator is adjusted to a new position.

My invention also contemplates providing a high-resistance coil, which is normally in circuit across the terminals of the circuit-breaker of the regulator, so that when the circuit-breaker suddenly interrupts the current the coil acts as a shunt for the extra or reactionary current produced and prevents injury to the motor or other translating device.

In carrying out my invention I provide suitable mechanism for performing the objects desired, some of which mechanisms may be briefly referred to as follows: The operating-handle is so constructed that it is capable of two distinct movements at right angles, or thereabout, to each other, one of which performs a function of breaking a circuit, and the other of which moves the regulator-cylinder or other device for varying the current-supply to the translating device. In connection with this operating-lever I employ a notched plate, made with a longitudinal slot, more or less comb-shaped, for allowing a free movement of the operating-lever in one direction and locking it against movement when moved in the other direction. The circuit-breaker which I prefer to employ is of a peculiar construction, fully set forth later on, but one of the important features in it lies in the fact that it is moved directly through the action of a spring which is thrown into operative position by means of the operating-lever enabling the interruption of the circuit to be performed in the most rapid manner, thereby obviating fusing of the contact. To overcome the injurious effect of the reactionary or extra current produced by suddenly interrupting the current, I provide a high-resistance shunt around the circuit-breaker, as above stated.

Referring to the drawings for a more specific description of my improvements above referred to, and those of minor importance referred to hereinafter, Figure 1 is a sectional elevation of my improved regulator on line *w w* of Fig. 2. Fig. 2 is a sectional elevation of same on line *v v* of Fig. 1. Fig. 3 is a sectional plan view of same on line *x x* of Fig. 1. Fig. 4 is a sectional elevation of the lower part of the regulator, including the circuit-breaker, on line *y y* of Fig. 3, and shows the connections with the motor and source of power. Fig. 5 is a sectional plan view of part of the regulator on line *z z* of Fig. 4. Fig. 6 is a sectional plan view of part of the regulator on line *u u* of Fig. 1, and Fig. 7 is a plan view of the notched plate for holding and guiding the operating-lever.

A is a regulator-case, and is preferably provided with two compartments, A′, in which the regulator-cylinder proper and circuit-breaker are located, and A^2, in which the operating-lever is located.

B is the regulator-cylinder or contact-surface arranged vertically in the compartment A′ and journaled in suitable bearings by a shaft, *b*. Contact is made with this surface or cylinder by means of the spring-brushes U, Fig. 3, which connect with the various circuits. This cylinder or surface may be provided with suitable contacts for coupling up the various circuits in a suitable manner to vary the current to the translating device, such regulating cylinders or surfaces being well known.

C is a bevel-wheel secured upon the upper end of the shaft *b* and meshes with a segmental rack, *c*, secured upon a rock-shaft, D.

The rack *c* is held up to the pinion by a guide, *c'*. Pivoted to the rack on an axis, *e*, at right angles to the rock-shaft D and above it, is the operating-lever E, which connects at its lower part with a sliding collar, *d*, on the rock-shaft D, and which collar is provided with a tooth, *d'*. A spring, F, operates to keep the operating-lever E normally in the position shown in Fig. 1, in which the collar *d* is thrown to the right, and the upper end of the lever E is held in the notches *i* or *i'* of the plate I, arranged upon the upper portion of the regulator-case A. The lever E, it will thus be seen, is journaled upon *e*, and may be moved to reciprocate the collar *d* in the act of being drawn out of the notches *i* or *i'* into the longitudinal slot I', and may also move upon the rock-shaft D, as a center, when moving the rack, and in this case the operating-lever E moves at right angles to its movement upon *e* as a center. This latter movement has for its object the rotation or movement of the regulator cylinder or surface D, and its former movement has for its object the reciprocation of the collar *d* for the purpose of operating a circuit-breaker, to be described. It will be observed that both of these movements cannot be performed at the same time, but that the circuit-breaking movement must be positively performed before any appreciable movement can be given to the mechanism for varying the current passing to the translating device.

Referring now to Figs. 3 and 4, L is a cup, of brass, iron, or other suitable metal, containing mercury, and has its upper part lined with insulation, as at *l*. This cup is secured to a block, T, and is normally held in position by a snap-spring, *t*, Fig. 5.

k is a contact-block adapted to loosely fit within the cup L, and is removably connected to the cap K by a spring-catch, *k'*. This contact-block is preferably formed of iron. The cap K is hinged to a lever, M, having a counter-weight, *m*, the function of which is to counterbalance the movable parts of the circuit-breaker.

J are two arms journaled upon the horizontal shaft *g*, and pivoted to but insulated from the cap K of the circuit-breaker. The shaft *g* is journaled in the frame H, and has secured to one end a notched lever, G, Figs. 1 and 2, working in connection with the tooth of the sleeve *d*, and upon the other end an arm, G', which connects with a crank-arm, *n*, on the crank N, also journaled in the frame H and parallel to the shaft *g*. The crank N points away from the head K, and is connected to a cross-head on the arms J by a spring, O. The operation of this circuit-breaker will now be understood. The movement of the sleeve *d* rocks the shaft *g* and oscillates the crank N. This throws the end of the spring O above its connection with the arms J, and the elasticity of the spring instantly throws the arms J up and lifts the contact-block *k* out of contact with the mercury in cup L and breaks the electric circuit R. In the opposite movement of the sleeve *d* the reverse operation is performed. It will thus be seen that when the lever E is in the longitudinal slot I', the circuit-breaker has interrupted the circuit R, and whenever this lever is in the notches *i* the circuit-breaker has closed the electric circuit, and the making and breaking of the circuit is directly performed by the spring O in a rapid manner preventing continued spark, and is indirectly performed by the operating-lever. If desired, it could be directly performed by the operating-lever. The circuit R includes the source of electric power P, which may be a battery, dynamo-electric machine, or other source of power, and also includes the regulator cylinder or surface B, which directly controls the current flowing to the motor or other translating device Q. This regulator-cylinder may be of any suitable construction.

S is a shunt of high resistance, connecting the circuit R around the terminals of the circuit-breaker, and is normally in circuit with the battery when current is supplied to the translating device. When the circuit-breaker interrupts the circuit R, the reactionary or extra current so produced is shunted through said resistance, and its otherwise injurious results on the translating device and regulator generally are obviated.

The notch *i'* in the plate I is designed to hold the lever when the car is at rest, or when no current is passing to the motor or translating device, and in this position it holds the circuit-breaker open, and may also hold the cylinder B in such a position as to interrupt the circuit so that no current could pass even over the shunt, or the cylinder would simply be provided with insulated contacts for the brushes U in the well-known manner. The notches *i* are made V shape, so that if from any cause the operator should let go of the lever E the spring F thereof will instantly force it into one of the notches and insure a positive connection being made, and never allow the circuit-breaker to be half or partly open or closed, and thereby produce dangerous sparks or arcs.

A^4 is a door which may be opened to expose the interior of the compartments A'.

It is evident that the mere details of construction may be varied in numerous ways without in the least departing from the spirit of my invention, and therefore I do not limit myself to the precise constructions and mechanisms shown.

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

1. A regulator consisting of a movable switch contact-surface for varying the current supplied, in combination with a hand-lever movable in one direction to move said contact-surface and movable transversely thereto to make and break the electric circuit, and a circuit maker and breaker controlled thereby.

2. A regulator consisting of a movable switch contact-surface for varying the current supplied, in combination with a hand-lever movable in one direction to move said contact-surface and movable transversely thereto to make and break the electric circuit, a circuit maker and breaker controlled thereby, and a notched plate for said lever to hold it in position when moved to shift the contact-surface a given distance.

3. A regulator consisting of a movable switch contact-surface for varying the current supplied, in combination with a hand-lever movable in one direction to move said contact-surface and movable transversely thereto to make and break the electric circuit, a circuit maker and breaker controlled thereby, a notched plate for said lever to hold it in position when moved to shift the contact-surface a given distance, and a spring to press said lever normally into the notches.

4. In a regulator, the combination of a moving contact-surface for coupling up circuits in different orders and varying the current, a hand-lever movable on a horizontal axis to shift the contact-surface and movable on a second axis transverse thereto to make or break the circuit, a spring-actuated circuit maker and breaker in the regulator-circuit, and connecting devices, substantially as set out, for operating said circuit maker and breaker by the movement of the hand-lever on the transverse axis.

5. In a regulator, the combination of a source of electrical energy, electric-motor coils, a moving contact-surface for coupling up motor-coil circuits in different order and varying the current, a hand-lever movable on a horizontal axis to shift the contact-surface and movable on a second axis transverse thereto to make or break the circuit, a spring-actuated circuit maker and breaker in the regulator-circuit, and connecting devices, substantially as set out, for operating said circuit maker and breaker by the movement of the hand-lever on the transverse axis.

6. In a regulator, the combination of a rotary contact-surface for coupling up circuits in different orders and varying the current, a hand-lever movable on a horizontal axis to shift the contact-surface and movable on a second axis transverse thereto to make or break the circuit, gearing between said hand-lever and rotary contact-surface to rotate the latter by a reciprocation of the former, a spring-actuated circuit maker and breaker in the regulator-circuit, and connecting devices, substantially as set out, for operating said circuit maker and breaker by the movement of the hand-lever on the transverse axis.

7. In a regulator, an operating handle or lever movable in two lateral directions with reference to its length, and in which said movements are transverse with respect to each other, a current-regulator operated by said handle or lever when moved in one direction, and a circuit-interrupter operated by the handle or lever when moved in the other direction.

8. In a regulator, an operating handle or lever movable in two lateral directions with reference to its length, and in which said movements are transverse with respect to each other, and a guide having a continuous slot with lateral notches therefrom, in which said handle or lever moves, a current-regulator operated by said handle or lever when moved in one direction, and a circuit-interrupter operated by the handle or lever when moved in the other direction.

9. In a regulator, an operating handle or lever movable in two lateral directions with reference to its length, in which said movements are transverse with respect to each other, a guide having a continuous slot with lateral notches therefrom, in which said handle or lever moves, and a spring to force said handle or lever into the notches, a current-regulator operated by said handle or lever when moved in one direction, and a circuit-interrupter operated by the handle or lever when moved in the other direction.

10. In a regulator, the combination of the handle or lever movable laterally in two directions, with the guide I, having continuous slot I′, and notches *i i′*, opening laterally therefrom, a current-regulator operated by said handle or lever when moved in one direction, and a circuit-interrupter operated by the handle or lever when moved in the other direction.

11. In a regulator, a switch for varying the resistance offered to the line-current, a line-circuit, a circuit-breaker in said line-circuit, and a spring to assist the circuit-breaker in opening and make it move quickly.

12. In a regulator, a switch for varying the resistance offered to the line-current, a line-circuit, a pivoted circuit-breaker in said line-circuit, a spring to assist the circuit-breaker in opening or closing and make it move quickly, a lever for moving one end of the spring up or down above the pivot-point of the circuit-breaker, a hand-lever for moving the resistance-varying switch, and also the lever for moving the spring.

13. In a regulator, the combination of a switch for varying the current flowing through the line, a line-circuit, a circuit-breaker in the line-circuit, a switch-operating lever movable in two directions, a mechanical connection between the lever and current-varying switch, whereby said switch is operated by a movement of said lever in one direction, and a mechanical connection between the lever and circuit-breaker, whereby the circuit-breaker is operated by the other movement of the switch.

14. In a regulator, the combination of a switch for varying the current flowing through the line, a line-circuit, a circuit-breaker for the line-circuit, a single lever movable in two directions, a power-transmitting connection between the lever and current-varying switch,

whereby the latter is operated for one movement of the lever, a second power-transmitting connection between the lever and circuit-breaker, whereby the latter is operated for the other movement of the lever, and a guide to prevent two successive movements of the regulator-switch without first moving the lever to operate the circuit-breaker.

15. In a regulator, the combination of a switch for varying the current flowing through the line, a line-circuit, a spring-actuated circuit-breaker for the line-circuit, a single lever movable in two directions, a power-transmitting connection between the lever and current-varying switch, whereby the latter is operated for one movement of the lever, a second power-transmitting connection between the lever and spring of the circuit-breaker, whereby the latter is operated for the other movement of the lever, and a guide to prevent two successive movements of the regulator-switch without first moving the lever to operate the circuit-breaker.

16. In a regulator, a line-circuit, in combination with a switch for varying the current flowing through the line, and a circuit-breaker in the line consisting of a cup holding mercury, a vertically-reciprocating frame, and a removable contact-rod.

17. In a regulator, a line-circuit, in combination with a switch for varying the current flowing through the line, a circuit-breaker in the line consisting of a cup holding mercury, a vertically-reciprocating frame, a removable contact-rod, and a counter-weight to counterbalance the weight of the contact rod and frame.

18. The combination of a source of electric supply, a line-circuit, an electric motor in said line-circuit, a current-regulator, and a circuit-breaker in series in said line-circuit and exterior to said motor, and a resistance-shunt connecting the line-circuit on each side of the circuit-breaker.

19. The combination of a source of electric supply, a line-circuit, an electric motor in said line-circuit, a current-regulator, and a circuit-breaker in series in said line-circuit and exterior to said motor, a resistance-shunt connecting the line-circuit on each side of the circuit-breaker, and a lever to operate the current-regulator or circuit-breaker alternately, but not both at the same time.

20. In a regulator, the combination of a rotary barrel-switch for varying the flow of current in the line, a small pinion on said switch, a segmental rack of great radius meshing with said pinion, and a hand-lever for operating said rack pivoted on an axis at right angles to the barrel of the switch.

21. In a regulator, an operating handle or lever movable in two lateral directions with reference to its length, and in which said movements are transverse with respect to each other, and a series of guide-notches made V-shaped, in which the handle or lever moves and whereby it cannot catch in approaching them, and a spring to force said lever or handle into the notches, a current-regulator operated by said handle or lever when moved in one direction, and a circuit-interrupter operated by the handle or lever when moved in the other direction.

In testimony of which invention I hereunto set my hand.

GEORGE HERBERT CONDICT.

Witnesses:
R. M. HUNTER,
ERNEST HOWARD HUNTER.