

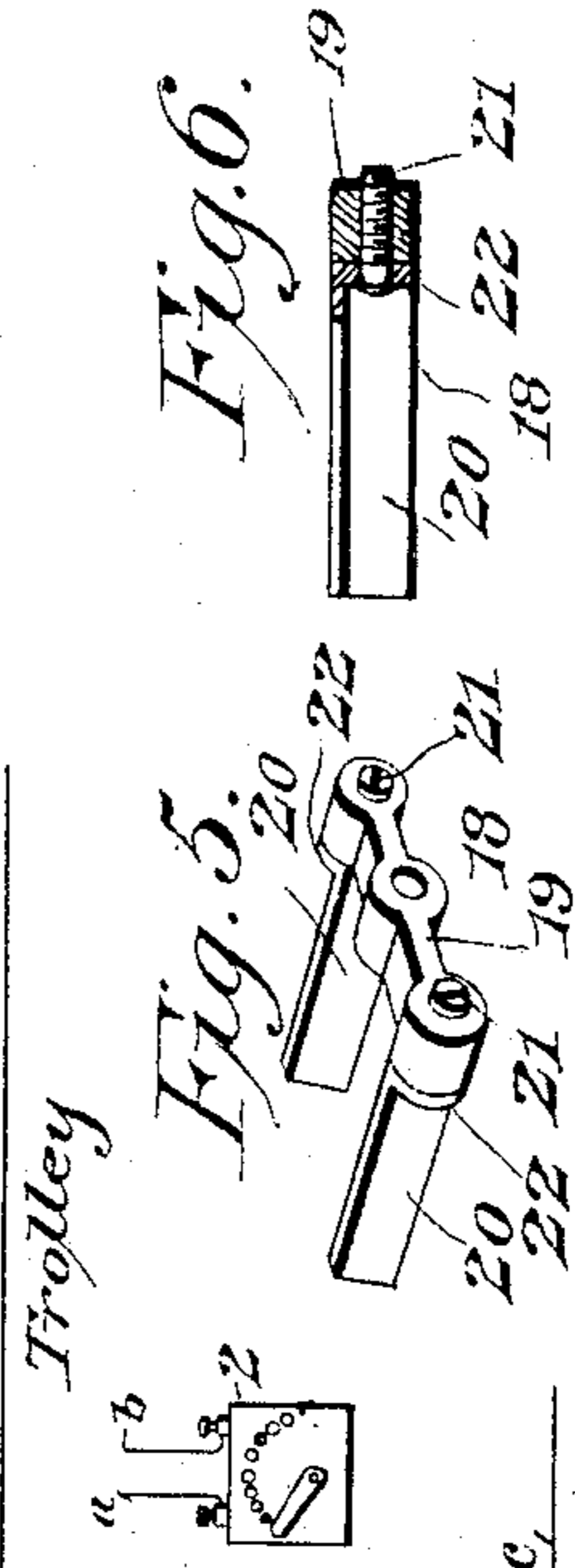
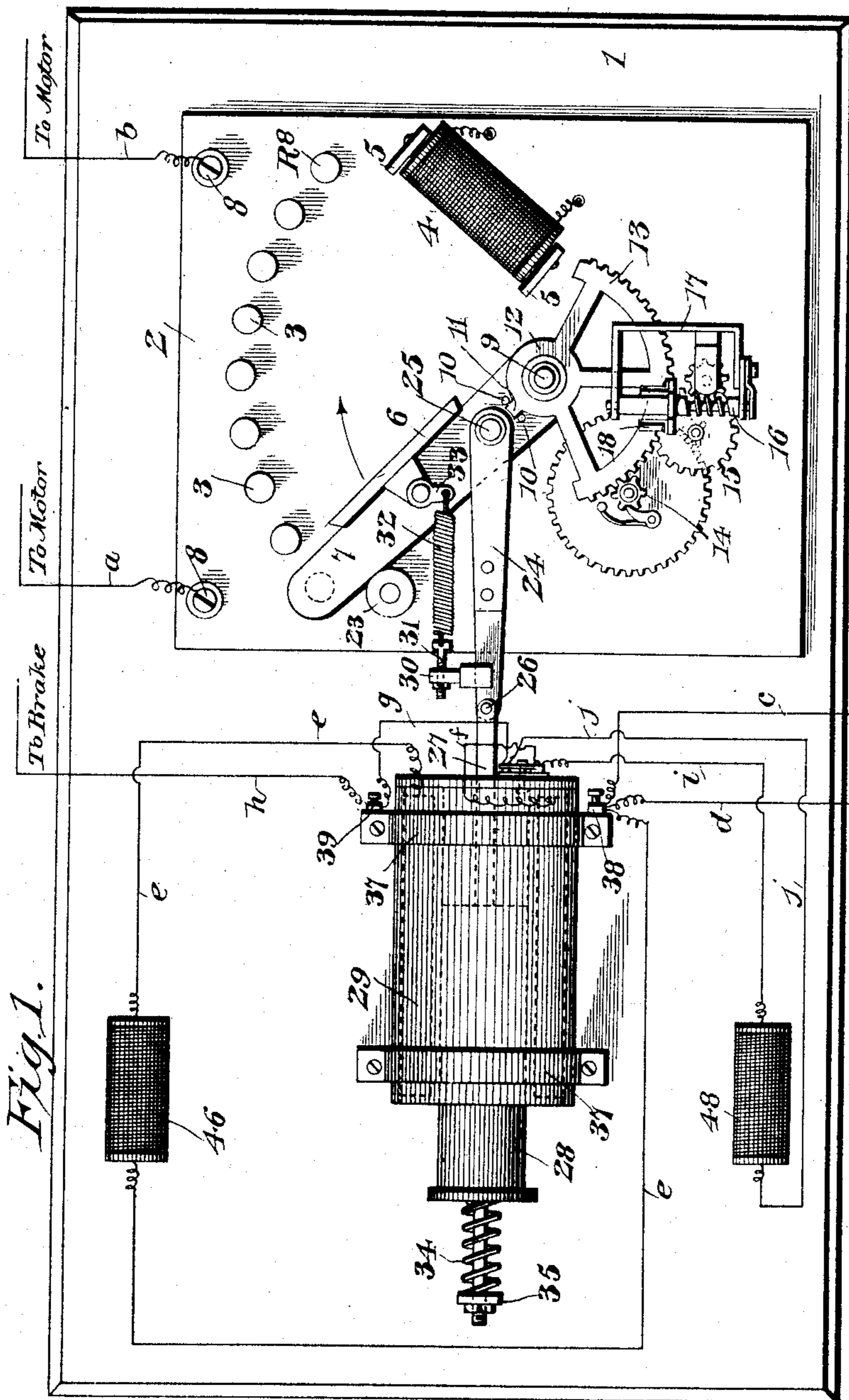
No. 630,466.

J. H. MCGURTY.
AUTOMATIC RHEOSTAT.
(Application filed Oct. 11, 1898.)

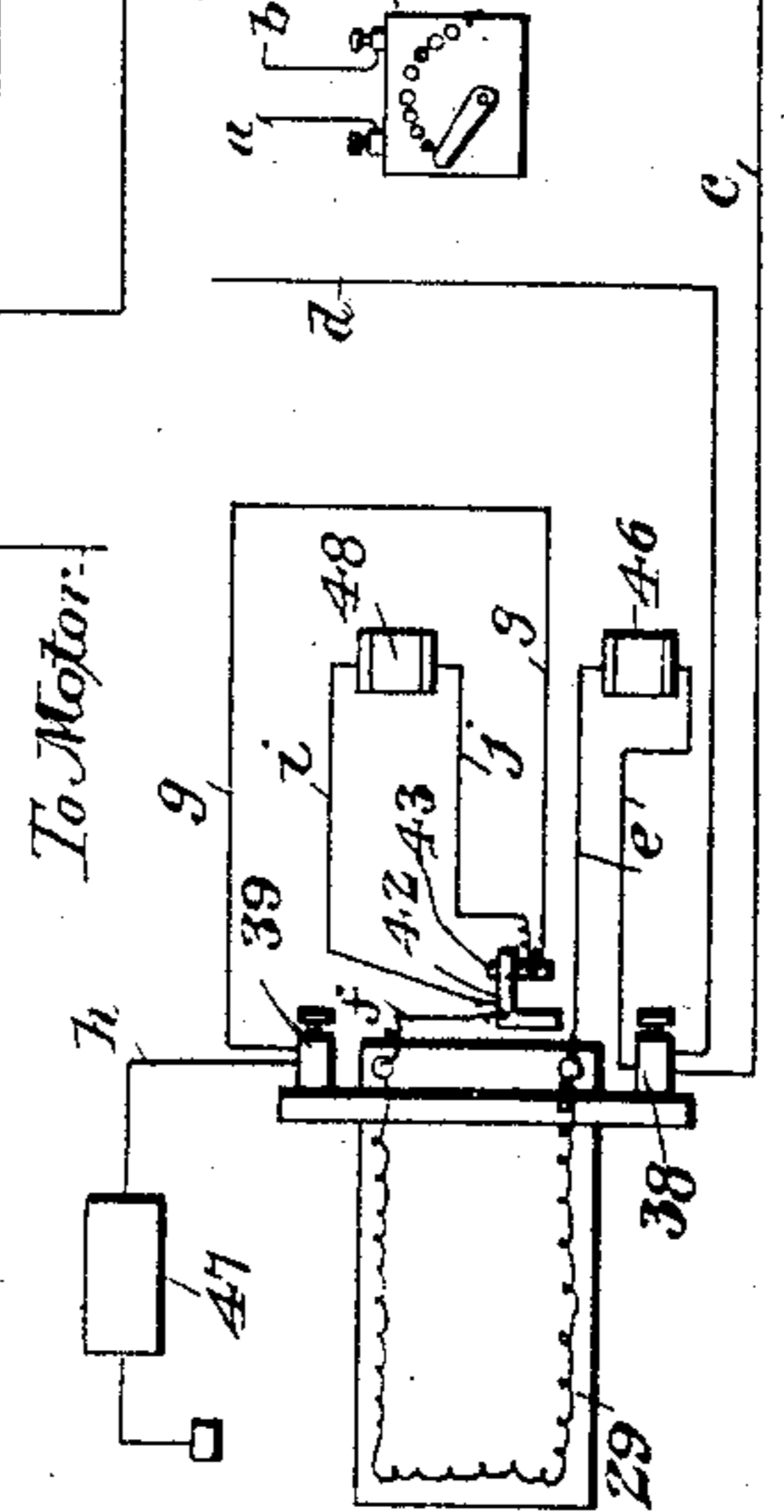
Patented Aug. 8, 1899.

No Model.)

2 Sheets--Sheet 1



Trolley



Witnesses
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2 Sheets—Sheet 2.

Fig. 2.

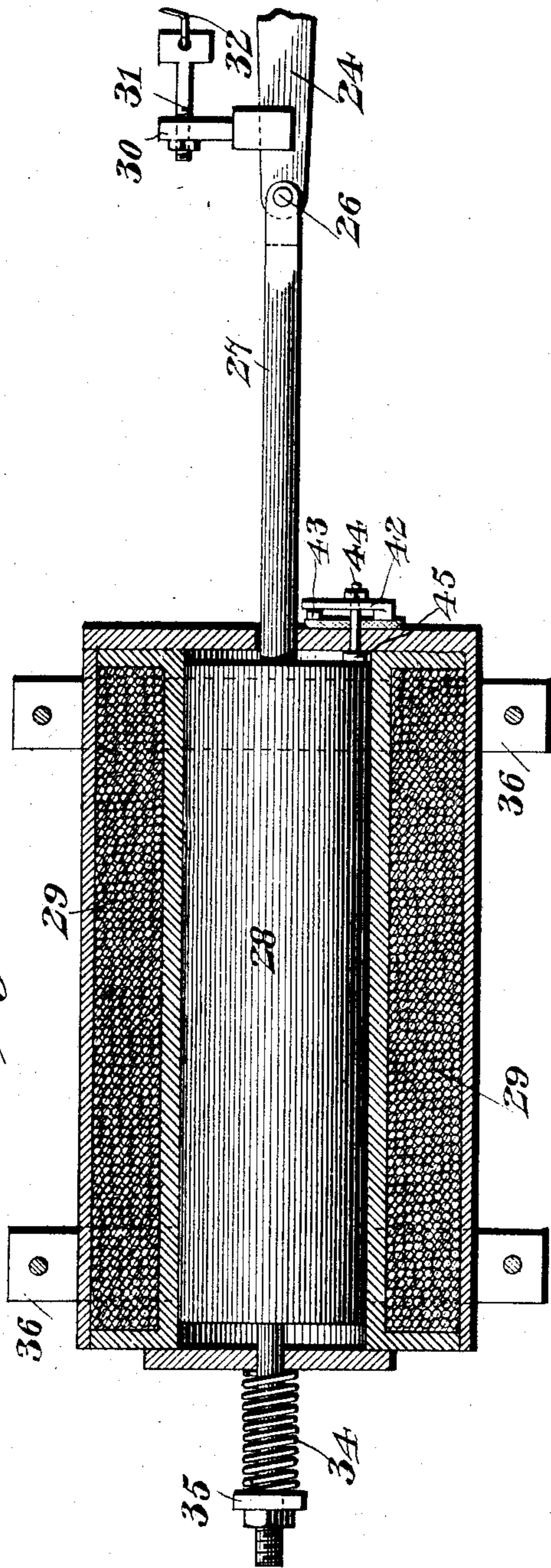
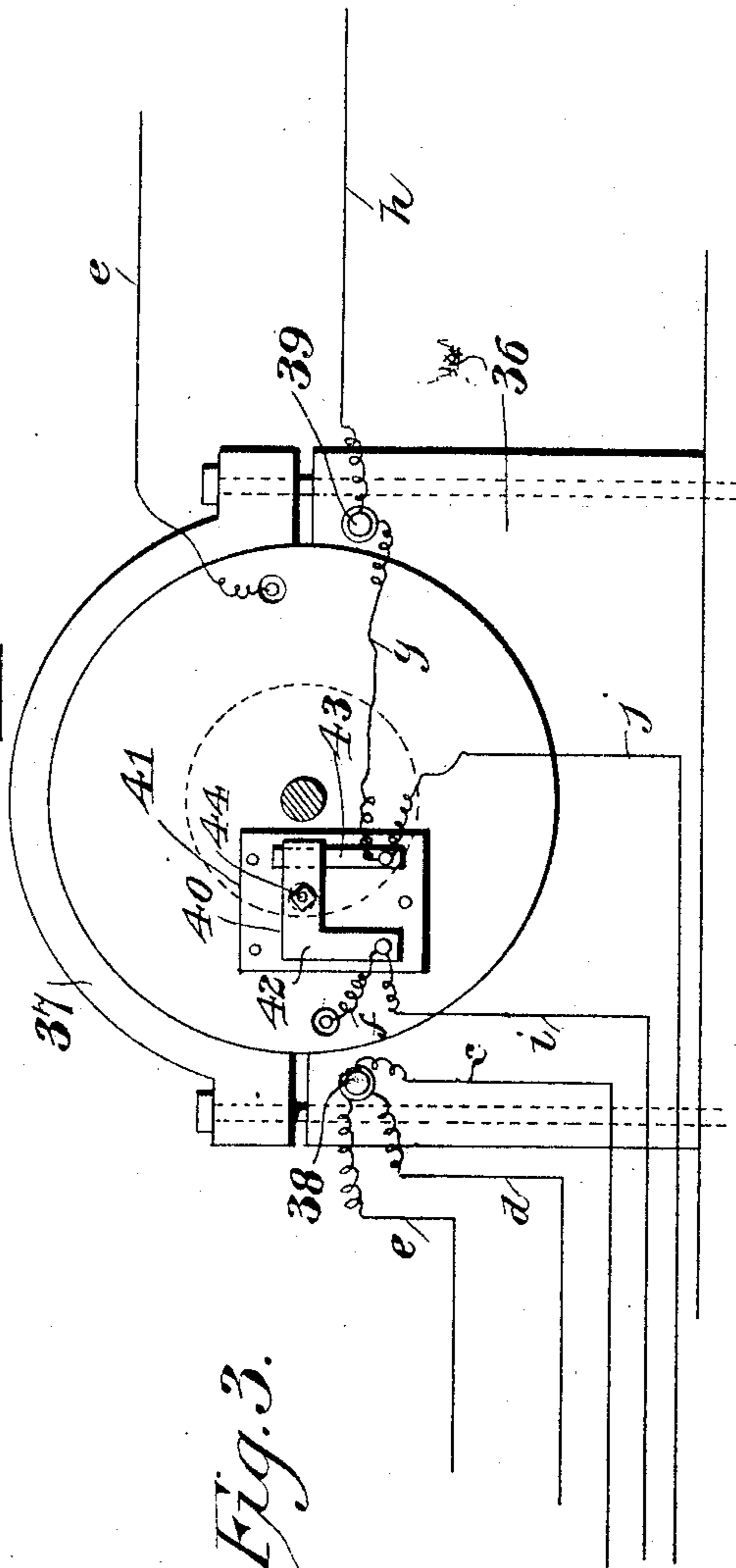


Fig. 3.



Witnesses

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By his Attorneys,

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UNITED STATES PATENT OFFICE.

JAMES H. MCGURTY, OF JERSEY CITY, NEW JERSEY.

AUTOMATIC RHEOSTAT.

SPECIFICATION forming part of Letters Patent No. 630,466, dated August 8, 1899.

Application filed October 11, 1898. Serial No. 693,254. (No model.)

To all whom it may concern:

Be it known that I, JAMES H. MCGURTY, a citizen of the United States, residing at Jersey City, in the county of Hudson and State of New Jersey, have invented a new and useful Automatic Rheostat, of which the following is a specification.

This invention relates to an automatic electrical rheostat designed for automatically regulating the supply of current to an electric motor or other electrical device; and it has for its main and primary objects the provision of improved mechanism coöperating with a resistance-box to form what might be properly termed a "starting-box" for automatically starting and stopping an electric motor or other electrical device and which shall provide positive and efficient means for delivering the current to the motor or other device gradually instead of suddenly turning on the full force of the line-current, although the controller or switch may have been turned on full, as is frequently done by unskilled or ignorant motormen or operators. In carrying out these objects the present invention positively prevents the burning out of the lamps, motors, or other machines that may be in circuit with the rheostat by too suddenly turning on the full current strength from the line or supply wire.

A further object of the invention is to combine with the rheostat and its coöperating mechanism a supplemental working circuit having resistances that are automatically cut in and out of the circuit by the operation of the core or plunger of the solenoid or plunger-magnet which operates the rheostat.

With these and other objects in view, which will readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination, and arrangement of parts hereinafter more fully described, illustrated, and claimed.

While the invention is necessarily susceptible to modification, still the preferred embodiment thereof is shown in the accompanying drawings, in which—

Figure 1 is a plan view of an automatic electrical rheostat constructed in accordance with the present invention. Fig. 2 is a longitudinal sectional view of the solenoid or plunger-

magnet forming a part of the rheostat mechanism. Fig. 3 is an end view of the solenoid or plunger-magnet showing the shunt-circuit closer operated by the movement of the plunger-core of the solenoid or magnet. Fig. 4 is a diagrammatic view showing the circuit-wire connections for the apparatus. Fig. 5 is a detail in perspective of the governor-fan. Fig. 6 is a detail sectional view showing the adjustable connection between one end of the fan-blades and the terminals of the cross-head.

Referring to the accompanying drawings, the numeral 1 designates the base supporting the entire apparatus, which may be arranged in any convenient position with relation to the motor or other electrical device in connection with which it is employed for automatically regulating the current delivered thereto. The base 1 supports thereon, preferably near one end, a resistance-box 2, which resistance-box is of an ordinary construction and provided within the interior thereof with the usual resistance-coils, which are connected up with the series of contact steps or studs 3, exposed at the upper or outer side of the box; but as the precise arrangement of the resistance-coils within the box 2 and the common manner of connecting the same up with the contact steps or studs 3 form no part of the present invention the same are not illustrated in the drawings; but it will of course be understood that the series of steps or studs 3 are arranged on the arc of a circle, as usual, and the last step or stud (designated by R^8) has the last resistance-coil 4 connected therewith and arranged in the usual manner on the upper side of the box to form a holding-magnet. This holding-magnet 4, which is the last resistance-coil of the resistance-box, is provided at its opposite ends with the pole-pieces 5, which coöperate in the usual manner with the armature-plate 6, fitted to one side of the swinging resistance-bar 7 of the rheostat, to provide for holding the current closed by preventing displacement of the bar 7 from contact with the last step or stud R^8 , as will be well understood by those skilled in the art.

The resistance-box 2 is provided with the usual binding-posts 8, which have wire con-

nections *a b* with the motor of the electric car or with any other electrical device in connection with which the apparatus is employed.

To adapt the improvements contemplated by the present invention to the resistance-box, the swinging resistance-bar 7 is arranged to have one end swing over and in contact with the contact steps or studs 3, while the other end turns on a pivot-post 9, fitted in the top slab of the resistance-box, and adjacent to its pivot-post connection the bar 7 is provided with a pair of upwardly-disposed pins 10, which receive therebetween a short locking-arm 11, projected from one side of the hub 12 of a horizontally-arranged segment-gear 13, it being observed that the pin-and-arm connection 10 and 11 between said gear and the bar 7 provides for the movement of these parts in unison and also facilitates the assembling of the parts. The segment-gear 13 meshes with a ratchet-pinion 14, which communicates motion in one direction to a train of gears 15, carried by suitable shafts fitted in the top of the resistance-box, and said train of gears 15 provides for transmitting motion from the segment-gear 13 to the worm governor-shaft 16. The worm governor-shaft 16 is mounted horizontally in a bearing-bracket 17, supported on the resistance-box, and carries a horizontally-arranged governor-fan 18. The governor-fan 18 essentially comprises a cross-head 19 and a pair of flat blade-strips 20, arranged parallel with the shaft 16 and respectively at opposite sides thereof. The cross-head 19 is rigidly connected between its ends to the shaft 16 and receives in its opposite extremities the fastening-screws 21, which engage with flanges 22, formed at one end of the blades 20 and abutting against one side of the cross-head 19. The said screws 21 when tightened hold the blade-strips 20 rigid, but when loosened form axes on which said blade-strips may be turned to any desired angle or deflection, thereby providing simple and efficient means for positively regulating the speed of travel of the resistance-bar 7 across the series of contact steps or studs 3.

In its initial position, away from the holding-magnet 4, the resistance-bar 7 is held against a stop or buffer 23, secured fast to the resistance-box at one side of the bar 7. Motion is automatically communicated or transmitted to the swinging bar 7 through the medium of a pitman 24, pivotally connected at one end, as at 25, to the bar 7, at a point intermediate the ends of the latter, and having its other end pivotally connected at 26 to one end of the stem 27, projecting beyond opposite ends of the movable plunger-core 28 of the solenoid or plunger-magnet 29. The said pitman 24, which connects the plunger-core 28 with the resistance-bar 7, has fitted thereto near its connection with the stem 27 an attaching-arm 30, having adjustably connected thereto an adjusting-bolt 31, to which adjusting-bolt is connected one end of a retractile spring 32, the other end of which

is connected at 33 with the swinging resistance-bar 7, at one side of the pitman connection therewith, and said spring 32 not only assists in retarding the advance movement of the resistance-bar 7, but also assists in retracting the same against the stop 23 when the current is cut off.

The action of the retractile spring 32 is assisted by a supplemental retarding-spring 34, arranged on the stem 27 of the plunger-core and interposed between one end of the magnet 29 and a fixed projection or plate 35 near one end of the plunger-core stem 27, and the action of the spring 34 in connection with that of the spring 32 will be hereinafter more fully referred to.

The solenoid or plunger-magnet 29 is supported on the base 1 in the oppositely-arranged ring brackets 36, secured to the base and provided with removable top members 37, which permit of the ready removal and replacing of the solenoid or magnet should the adjustment or repair of the apparatus render this necessary, and one of said ring brackets 36 has preferably fitted thereto a pair of oppositely-located binding-posts 38 and 39, respectively.

Coöperating with the mechanism described is a supplemental working circuit which provides for operating a brake or any other electrical devices, such as lamps and the like, which are usually used in connection with electric-motor cars or with any electrical device with which the rheostat may be employed. This supplemental working circuit utilizes the current that is passed through the solenoid or plunger-magnet and has the resistance thereof automatically governed by the action of the rheostat mechanism. For the purpose of illustrating the use or adaptation of this supplemental working circuit I have shown the same applied to an ordinary electric brake of an electric-motor car, as the rheostat is especially designed for use in connection with the motors of an electric car. The opening and closing of said supplemental working circuit is accomplished through the medium of a circuit-closer 40, fitted to a base 41, rigidly fastened to one end of the solenoid or plunger-magnet 29. The said circuit-closer 40 essentially comprises a pair of contact-plates 42 and 43, respectively, secured fast at one end to the base 41 and having their free ends normally in contact. The contact-plate 42 is preferably of an L shape and has bolted or otherwise suitably connected to the movable portion thereof one end of an adjusting-pin 44, the other end of which pin is provided with a head 45, disposed within the bore of the solenoid or magnet 29. The pin 44 slides through a guide-opening in one end of the solenoid or magnet, and when the core 28 reaches the limit of its inward movement the same engages against the head 45 of the pin and presses the same outwardly, thereby separating the plates 42 and 43 and throwing into the supplemental working circuit an extra resistance arranged in a shunt, as will now be

further explained in connection with the circuit-wire.

The binding-post 38, carried by the support of the solenoid of the plunger-magnet, has connected thereto the supply-wire *c*, having arranged in the circuit thereof the usual operator's switch for turning on or cutting off the current, and said binding-post 38 has also connected thereto a motor-wire *d*, which when the apparatus is used with an electric motor connects with such motor in the usual manner, together with the wire connections *a* and *b* of the resistance-box; but as these motor connections are common the same are not illustrated in detail.

The current supplied through the wire *c* is a constant current and divides at the binding-post 38, part going to the motor through the wire *d* and part passing through the wire *e* of the supplemental working circuit. The wire *e* is connected up in series with a suitable coil or equivalent resistance 46 and is also connected to one terminal of the solenoid or magnet coil 29, the other terminal of which has a wire connection *f* with one of the plates 42 of the circuit-closer. The other of said plates 43 has a circuit-wire connection *g* with the binding-post 39, and this binding-post has a circuit-wire connection *h* with a brake or other electrical device 47 to be operated by the supplemental working circuit. The supplemental working circuit formed by the wires *e*, solenoid 29, and wires *f* *g* and *h* has arranged in connection therewith an extra or supplemental resistance 48, having shunt-wire connections *i* and *j*, respectively, with the plates 42 and 43 of the circuit-closer.

In the operation of the apparatus when the current is first turned on and passes through the wires *c* and *e* into the solenoid or plunger-magnet 29 the latter is energized and the core 28 drawn inward, thereby imparting motion to the pitman 24 and the resistance-bar 7, causing the said bar to automatically travel over the contact steps or studs 3, thereby gradually increasing the current delivered to the motor or other electrical device until the last contact step or stud *R*^s is reached, when the full current is permitted to pass through the motor or other electrical device. It will be observed that in the initial movement of the resistance-bar 7 the retractile spring 32 will prevent the same from suddenly jumping over the first few steps or studs, and as the said bar 7 travels farther along and reaches the intermediate steps or studs the spring 34 comes into play and prevents an acceleration of the resistance-bar over the last steps or studs, while the fan-governor, herein described, makes the speed uniform and regular. When the current is entirely cut off over the supply-wire connection, both springs 32 and 34 automatically draw the bar 7 back against the stop 23 to its initial position. The ratchet-pinion 14 permits the free backward movement of the resistance-bar without turning the train of gears 15.

When the current is passing through the resistance-box, there is no material danger of the brake-magnet 47 or other device operating on the supplemental circuit burning out, so only the resistance 46 is included in said supplemental working circuit, as the plates 42 and 43 are in contact, and thereby shunt out of the circuit the extra resistance 48. However, when all of the resistance-coils of the resistance-box are cut out and the full current strength is passing over the wires the plates 42 and 43 will be separated in the manner explained, thereby throwing into the supplemental working circuit the extra resistance 48. In this way the resistance is increased in the supplemental working circuit and the amperage reduced. When the plates 42 and 43 are separated, the circuit is as follows: wire *c*, wire *e*, resistance 46, solenoid or magnet 29, wire *f*, plate 42, wire *i*, extra resistance 48, wire *j*, plate 43, wire *g*, wire *h*, electrical device 47, and ground.

From the foregoing it is thought that the construction, operation, and many advantages of the present invention will be readily apparent to those skilled in the art, and it will be further understood that various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is—

1. In an automatic rheostat, the combination with the resistance-box, and the swinging resistance-bar thereof, of electrically-controlled means for swinging said bar, a governor-shaft carrying a cross-head, a pair of flat blade-strips arranged parallel with the shaft respectively at opposite sides thereof, and provided at one end with attaching-flanges abutting flat against one side of the cross-head, screws connecting the flanges of the blade-strips with the terminals of the cross-head, said screws forming axes for the strips to turn upon, and also providing fastening means for holding said strips rigid, and a gear connection between the pivotal end of the resistance-bar and said governor-shaft, substantially as set forth.

2. In an automatic rheostat, the combination with the resistance-box, and the swinging resistance-bar thereof, of a solenoid having a plunger-core, a pitman having pivotal connection at one end with the plunger-core, and at its other end with the resistance-bar, and a spring connected at one end with the resistance-bar and at the other end to said pitman, substantially as set forth.

3. In an automatic rheostat, the combination with the resistance-box, and the swinging resistance-bar thereof, of a solenoid, a pitman connection between the plunger of the solenoid and the resistance-bar, and a plurality of springs cooperating with the resistance-bar and the solenoid-plunger to successively

prevent acceleration of the bar in its initial and advanced movements, substantially as set forth.

4. In an automatic rheostat, the combination with the resistance-box, and the swinging resistance-bar thereof, of a solenoid, a pitman connection between the plunger of the solenoid and the resistance-bar, and a pair of springs coöperating with the resistance-bar and the solenoid-plunger to successively prevent acceleration of the bar in its initial and advanced movements, said springs also acting in unison to provide for returning the bar to its starting-point, substantially as set forth.

5. In an automatic rheostat, the combination with the resistance-box mechanism, and the solenoid or plunger-magnet coöperating therewith, of a supplemental working circuit including the solenoid or plunger-magnet, a suitable resistance, and a circuit-closer, an extra resistance in shunt with the circuit-closer, and means for automatically operating said circuit-closer, substantially as set forth.

6. In an automatic rheostat the combination of the resistance-box provided with the contact-steps, a swinging resistance-bar, a solenoid, a pitman connection between the plunger-core of the solenoid and the resistance-bar, a spring connected at one end to the pitman, and at its other end with the resistance-bar, and a separate spring connected with one end of the plunger-core and coöperating with the other spring to prevent acceleration of the resistance-bar, and to return the same to its initial position when the current is cut off, substantially as set forth.

7. In an automatic rheostat, the resistance-box, provided with the contact-steps, a swinging resistance-bar, a solenoid having a plunger-core provided with an extended stem, a pitman pivotally connected at its ends respectively to said stem and resistance-bar, and a spring connected at one end with the resistance-bar, and at its other end to the pitman near the connection of the latter with the plunger-core stem, substantially as set forth.

8. In an automatic rheostat, the combination with the resistance-box mechanism and a solenoid or plunger-magnet coöperating therewith, of a supplemental working circuit including the solenoid or plunger-magnet, a suitable resistance, and a circuit-closer, an extra resistance in shunt with the circuit-

closer, and means for operating said circuit-closer by the movement of the core of the solenoid, substantially as set forth.

9. In an automatic rheostat, the combination with the resistance-box mechanism, and a solenoid or plunger-magnet coöperating therewith, of a supplemental working circuit including therein the solenoid or plunger-magnet, a suitable resistance, and a circuit-closer rigidly supported at one end of the solenoid or magnet, a sliding pin connected at one end with one of the circuit-closer plates and having its other end arranged in the path of the core of the solenoid or magnet, and an extra resistance in shunt with the circuit-closer, substantially as set forth.

10. In an automatic rheostat, the combination of the resistance-box and the swinging resistance-bar thereof, of electrically-controlled means for swinging said bar, an adjustable governor-fan, a train of gearing connecting the pivot end of the resistance-bar with the governor-fan, and means for setting the adjustable fan to govern the movement of the resistance-bar at any required speed, substantially as set forth.

11. In an automatic rheostat, the combination with the resistance-box and the swinging resistance-bar thereof, of electrically-controlled means for swinging said bar, a governor-fan having blades arranged in parallel relation and adjustable to variable angles, means for holding said blades rigid in their adjusted positions, and a train of gearing connecting the pivot end of the resistance-bar with said governor-fan, substantially as set forth.

12. In an automatic rheostat, the combination with the resistance-box, the swinging resistance-bar, and means for swinging said bar, of a segment-gear having its hub arranged on the pivot-post for the resistance-bar and provided with an offstanding arm having a detachable interlocking engagement with the bar, a speed-governor, and a train of gears connecting the shaft of the governor with said segment-gear, substantially as set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

JAMES H. MCGURTY.

Witnesses:

THOS. MCEWAN, Jr.,
FRED ELLABY.