

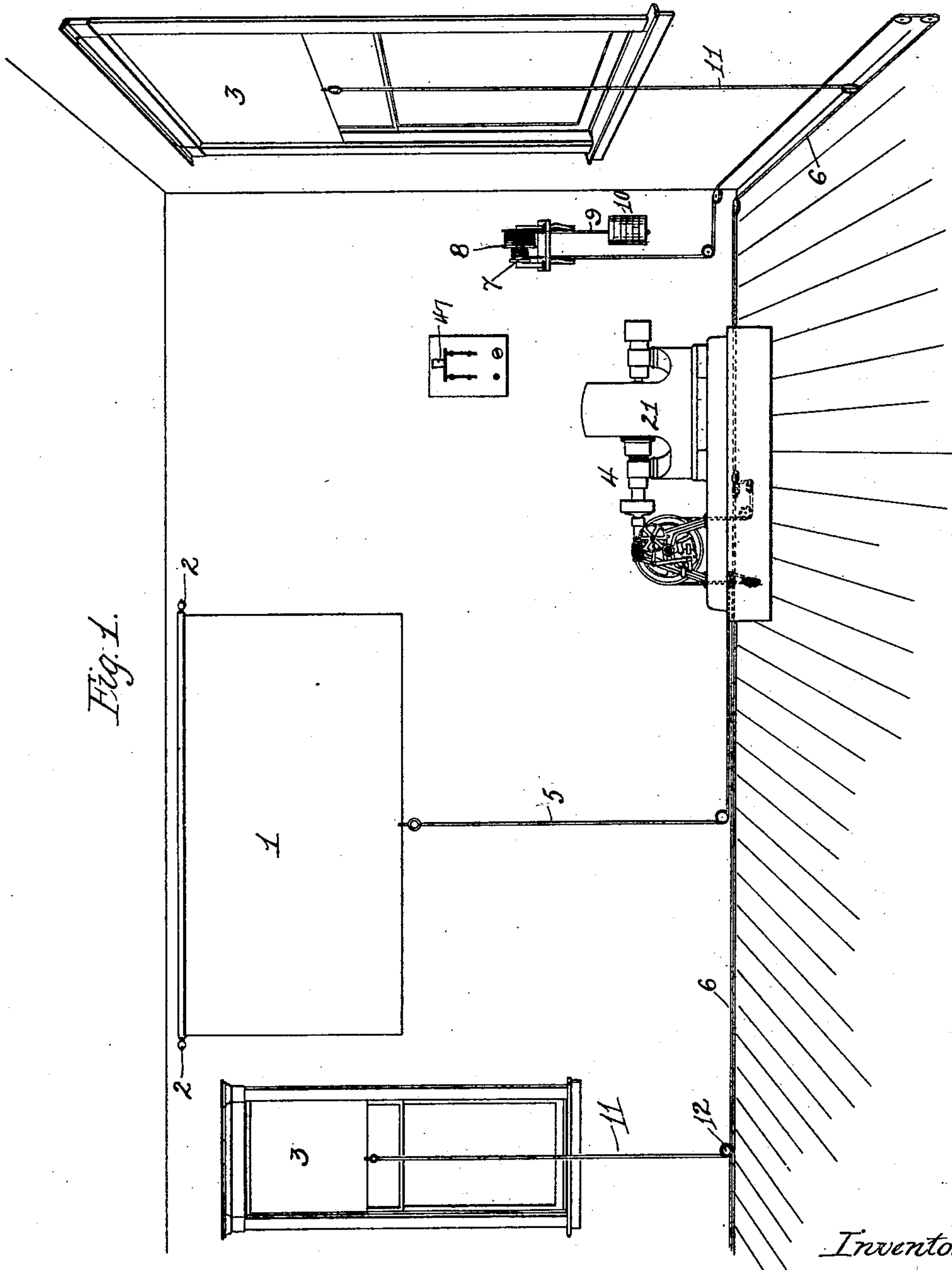
No. 706,019.

Patented Aug. 5, 1902.

C. W. CARMAN.
HOISTING MECHANISM.
(Application filed June 17, 1901.)

(No Model.)

3 Sheets—Sheet 1.



Witnesses:
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3 Sheets—Sheet 2.

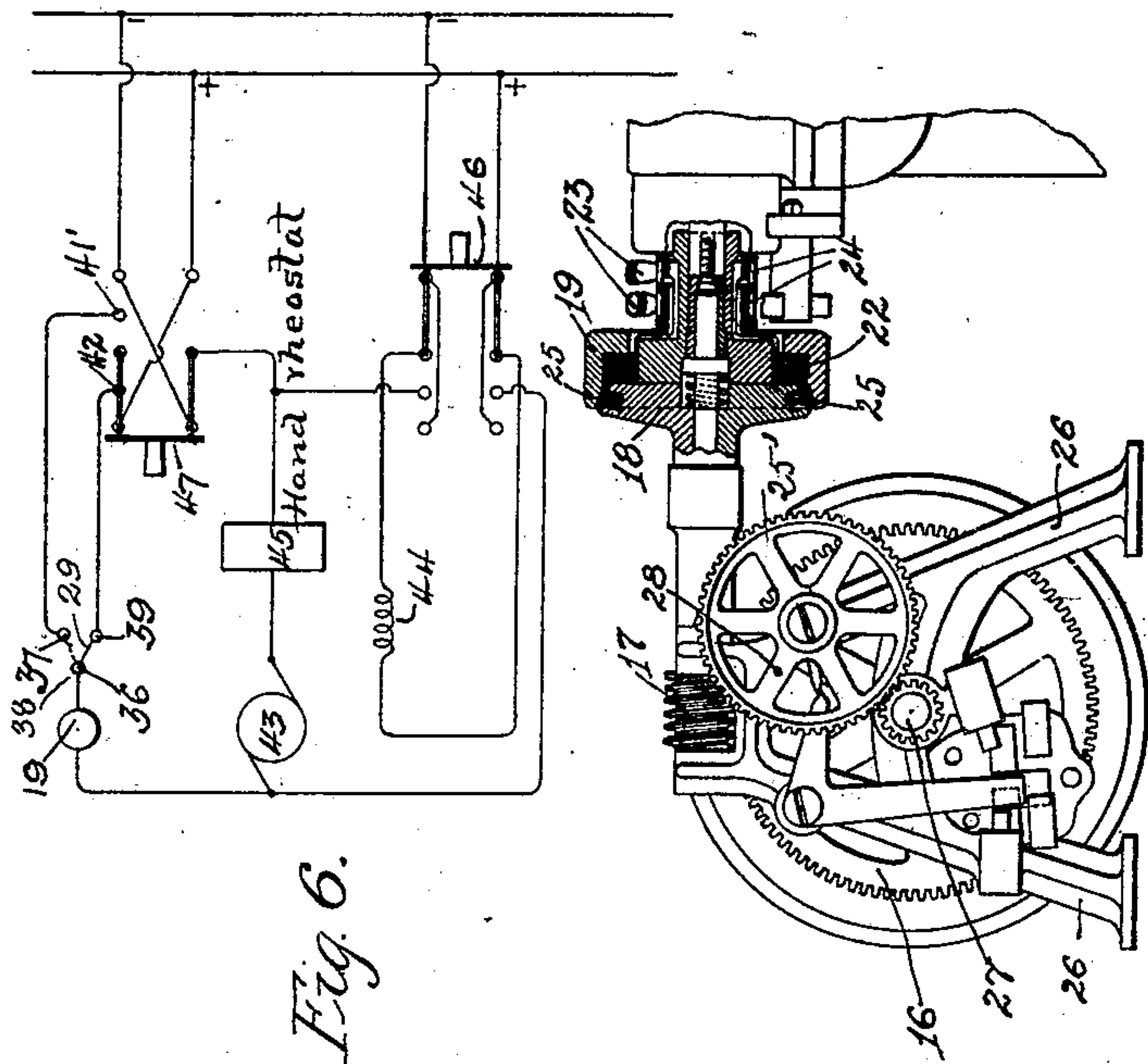
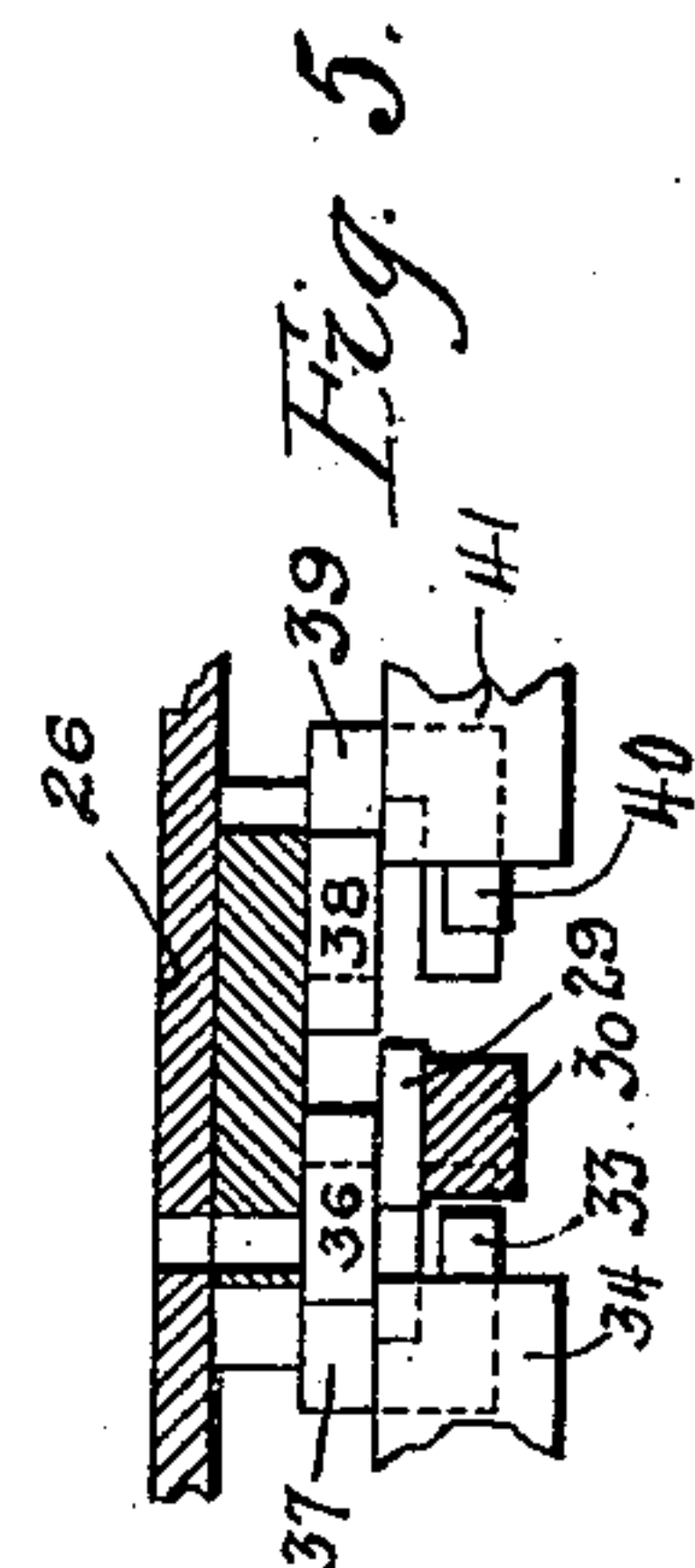
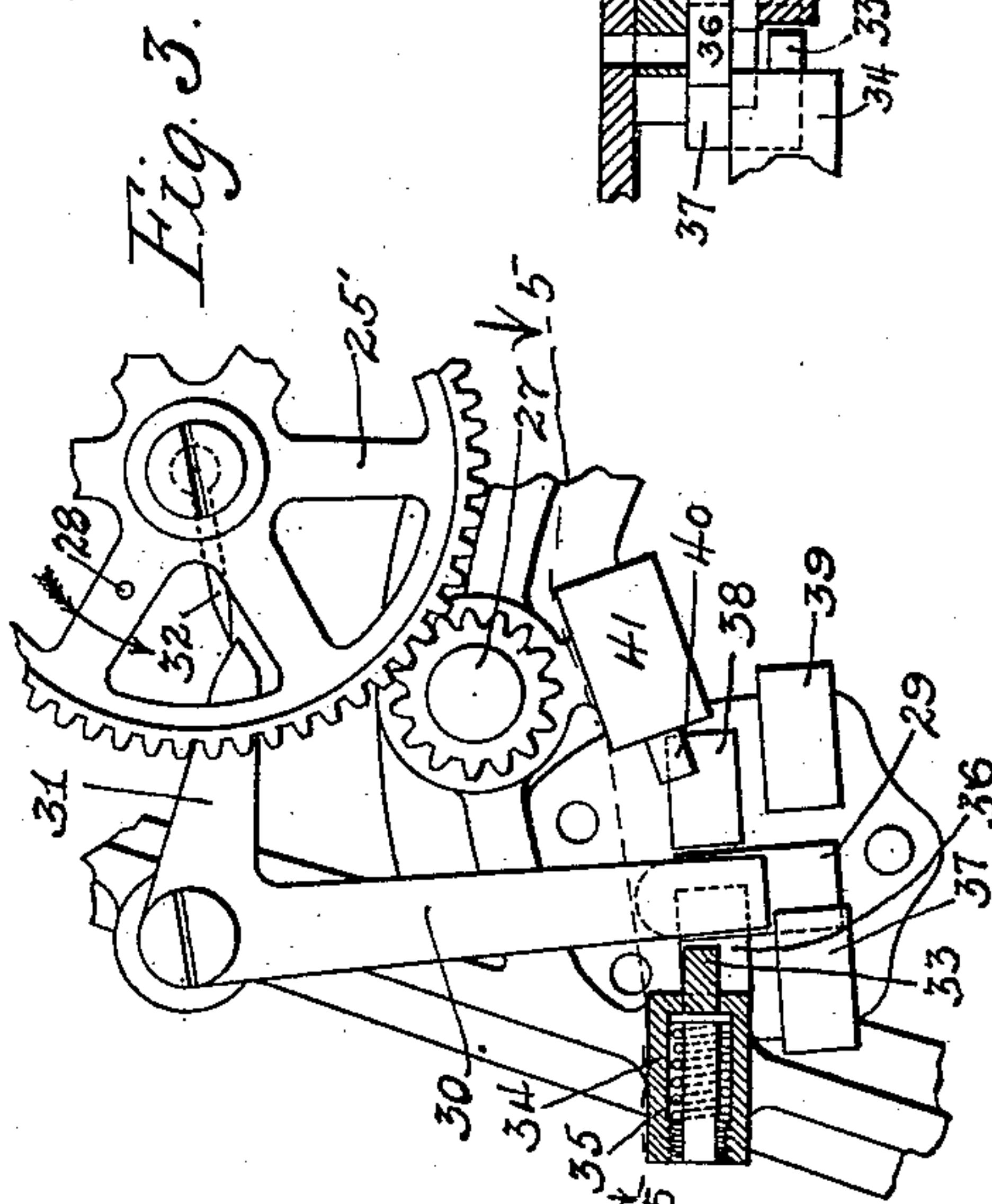
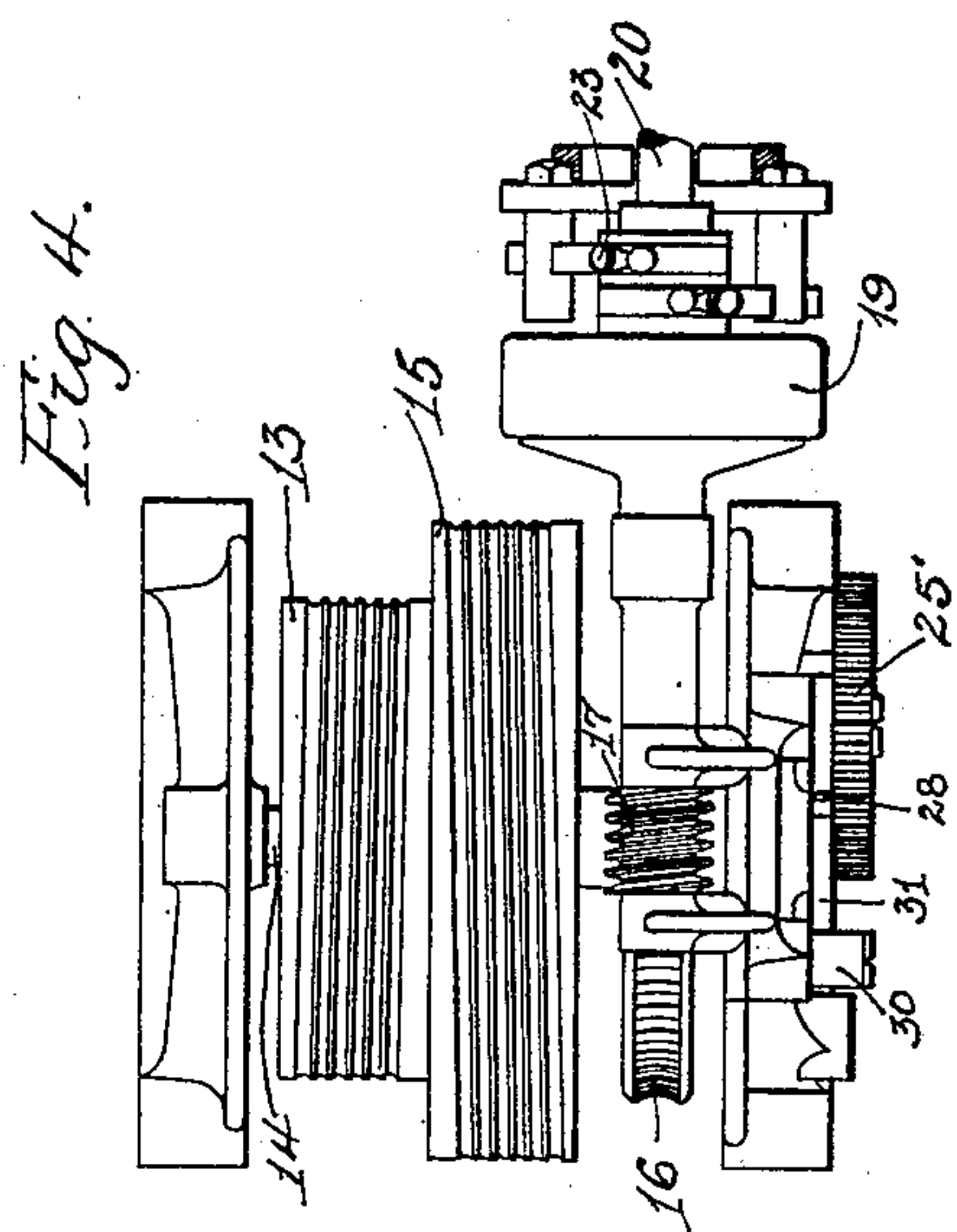


Fig. 2.



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3 Sheets—Sheet 3.

Fig. 7.

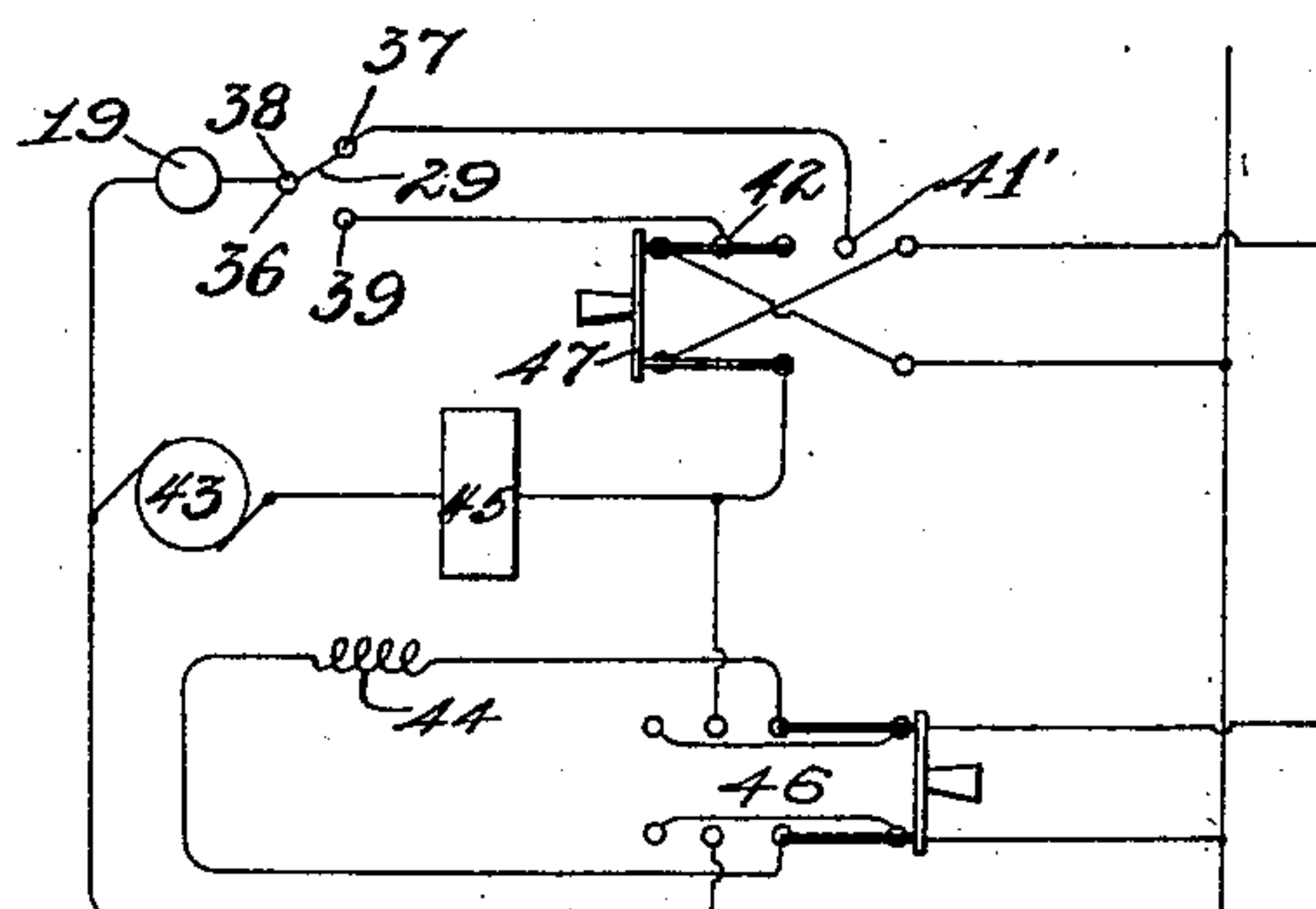


Fig. 8.

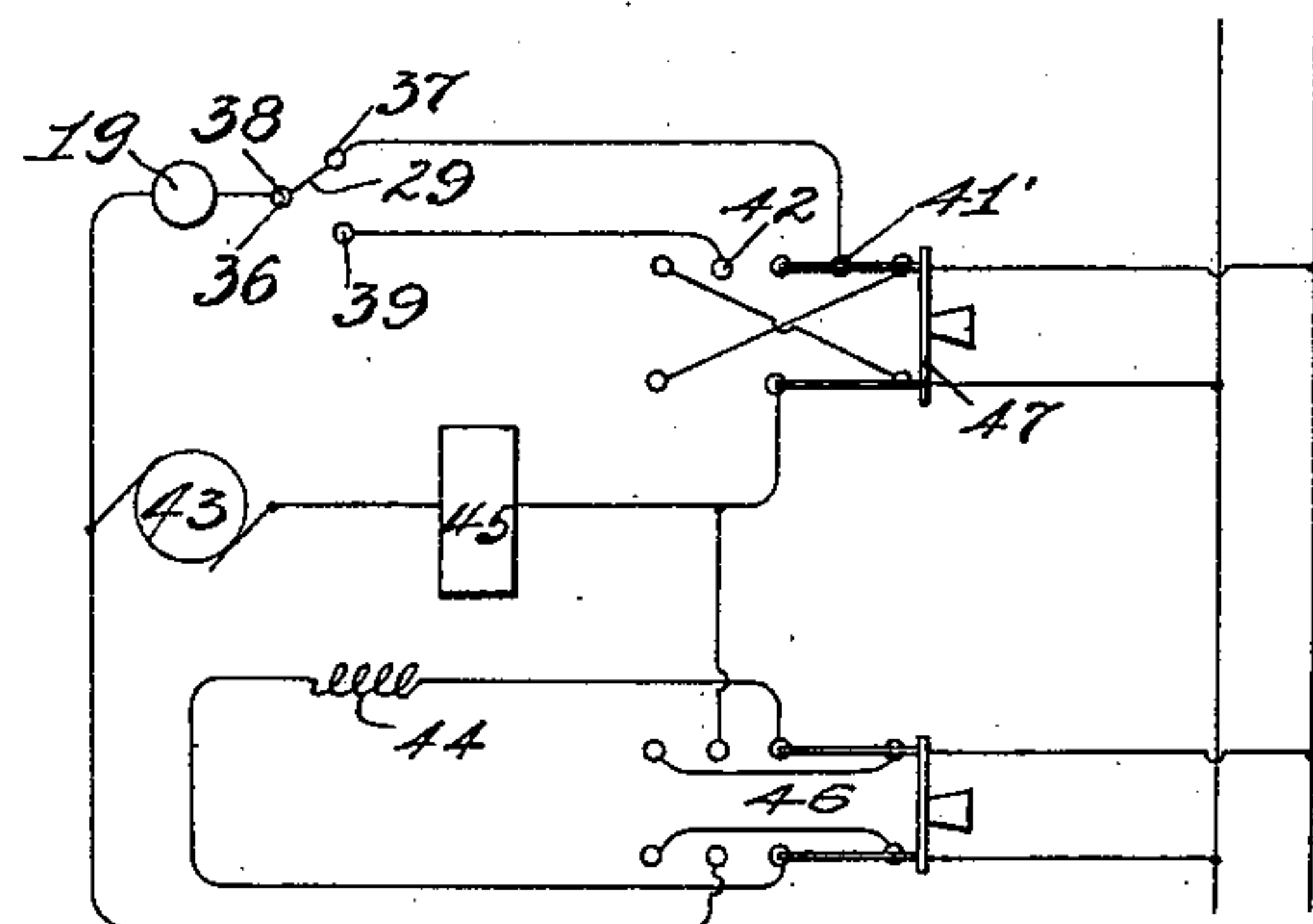
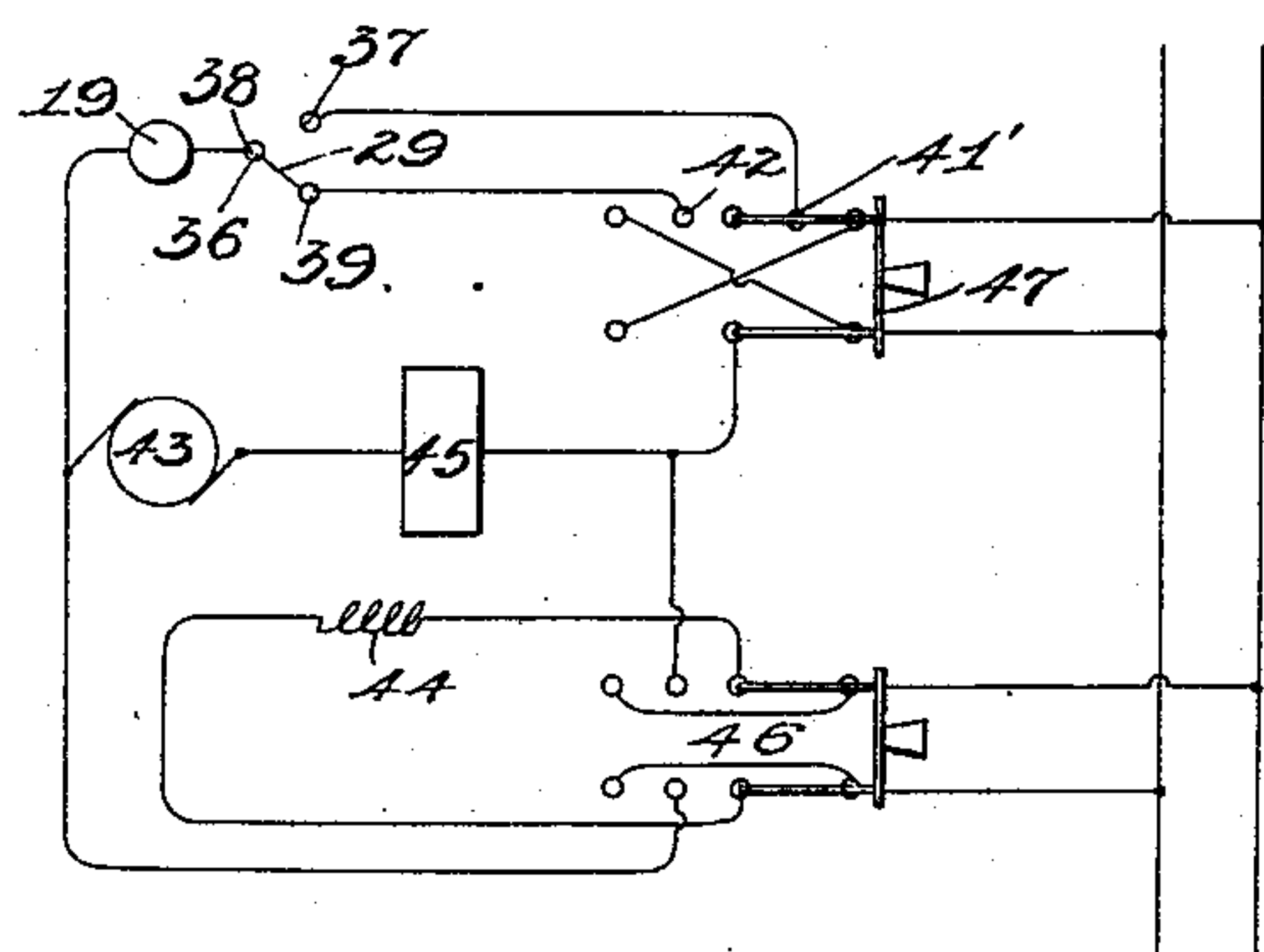


Fig. 9.



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UNITED STATES PATENT OFFICE.

CHARLES W. CARMAN, OF CHICAGO, ILLINOIS.

HOISTING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 706,019, dated August 5, 1902.

Application filed June 17, 1901. Serial No. 64,856. (No model.)

To all whom it may concern:

Be it known that I, CHARLES W. CARMAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Hoisting Mechanism, (Case No. 1,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to hoisting systems, and more particularly to those hoisting systems in which limit-stops are employed to permit the said hoisting mechanism to operate a given length of time or through a given space and to then be rendered inoperative through the agency of the said limit-stops.

My invention is especially useful in connection with curtain-hoisting systems, comprising in its preferred embodiment driving mechanism which effects the raising and lowering of a plurality of curtains which may be of different lengths, the distance through which they are raised or lowered being thus non-uniform. By means of my invention I am enabled, through the use of a simple switch or other controlling device, to start the driving mechanism to either raise or lower the curtains, limit-stops which are controlled by the driving mechanism serving when the driving mechanism has completed its requisite travel or rotation to cause the said driving mechanism to come to rest.

A further feature of my invention consists in the provision of means in connection with the limit-stops associated with the driving mechanism, whereby when the driving mechanism is brought to rest after having completed its travel in one direction the controlling means of the driving mechanism is reversed, so that the said driving mechanism is adapted to operate in a reverse direction when the switching means which are adapted to start the said driving mechanism are again actuated.

My invention has for its further object to provide improved clutch mechanism to be interposed between the motor means and the power-transmission mechanism of the driving mechanism, as well as improved means whereby the limit-stops associated with said driving mechanism may effect a change in

electric-circuit connections which may control the operation of the motor means when an electric motor is employed.

Further features of my invention will be apparent from the construction which I will now describe in connection with the accompanying drawings, illustrating one embodiment thereof, in which—

Figure 1 is a perspective view of a curtain-hoisting system constructed in accordance with my invention. Fig. 2 is a detail view of the driving mechanism of my improved apparatus. Fig. 3 is an enlarged view of a portion of the apparatus illustrated in Fig. 2. Fig. 4 is a top view of the apparatus illustrated in Fig. 2. Fig. 5 is a sectional view on line 5 5 of Fig. 3. Fig. 6 is a diagrammatic view of the circuit connections which I prefer to employ. Figs. 7, 8, and 9 are views to more clearly indicate the various circuit changes.

Like parts are indicated by like characters of reference throughout the different figures.

I have shown my improved system as applied in this instance for the purpose of raising and lowering a screen or display-curtain 1, upon which stereopticon views or the like may be projected. The curtain is mounted upon a roller held by suitable bearings 2 2, springs being provided in said roller in the usual manner, which springs tend to keep the curtain rolled about the roller, thereby tending to keep the curtain in its raised position. In the system illustrated window-shades 3 3 are also adapted to be raised or lowered simultaneously with the raising or lowering of the curtain 1. The curtain 1 is longer than the shades 3 3, and for this reason separate cords are employed to connect the said curtain and shades with the hoisting mechanism 4, the cord 5 being interposed between the curtain 1 and the hoisting mechanism 4, the rope 6 being employed to raise or lower the shades. The rope 6 as it leaves the hoisting mechanism divides into two parts and extends around the room past each window where a shade is to be raised or lowered. The end of the rope 6 is wound about and fixedly secured to a drum 7, which may be placed at any convenient point, said drum being fixedly secured to a drum 8 of larger diameter. About this drum and fixedly se-

cured thereto is wound a rope 9, the free end of the said rope being attached to a weight 10, the winding of the two ropes upon the two drums being in such a way that as one rope is being coiled about a drum the rope upon the other drum is being unwound. The weight 10 in this manner is thus adapted to keep the rope taut, so that there will be no danger of having the rope disengage the pulleys which guide its travel about the room, which might otherwise occur, for instance, if the springs which raise the curtain or the shades act sluggishly and do not withdraw the curtain as rapidly as the driving mechanism feeds out the rope.

Each window-shade 3 is provided with a cord 11, which is attached to the rope 6 after passing about a pulley or wheel. The cord 11 is preferably of such length that when the shade is in its raised position the said cord extends slightly beyond the pulley 12 along the rope 6. The rope 6 is adapted to be wound about a drum 13, which drum is fixedly mounted upon a shaft 14, a second drum 15 being also mounted upon the same shaft. The drum 15 is adapted to receive the rope 5, which is connected to the curtain 1, said drum being of larger diameter than the drum 13, inasmuch as the travel of the curtain 1 is greater than the travel of the shades 3.

The shaft 14 of my improved hoisting or driving mechanism 4 is provided with and driven by a worm-wheel 16, which worm-wheel has toothed engagement with a worm 17, mounted upon and rotatable with one member 18 of an electric-clutch mechanism, the other member 19 of which is fixedly secured to a motor-shaft 20 of a motor 21. Current is supplied to the motor preferably in such manner that the current through the fields and the armature may be independently controlled by separate switch mechanism, as will be more fully set forth hereinafter. The driving member 19 of the clutch mechanism is provided with an energizing-winding 22, which winding has current supplied to it through the agency of brushes 23, which bear against collector-rings 24, mounted to rotate with the motor-shaft 20. The driven member 18 of the clutch is provided with small distance-pieces 25, preferably of wood or other suitable non-magnetic material, to prevent the two members of the clutch from sticking when the winding 22 is deenergized. The motor 21 is adapted to run in a backward and forward direction, and is thus adapted to rotate the drums 13 and 15 in either direction to effect a raising or lowering of the curtain 1 and the shades 3. By means of my improved circuit-changing device I am enabled to cause the motor to stop rotating when the desired amount of raising or lowering of the curtain and shades has been effected, the plan of operation being that upon closing circuit through the switch the motor rotates to lower the curtain 1 and the shades 3, whereupon automatic means are actuated after the motor has op-

erated the required length of time to break circuit through the motor and the clutch mechanism associated therewith, thereby to prevent further rotation, and thus retain the curtain and shades in the right position. At the same time that the circuit is broken through the clutch mechanism, whereby movement of the curtains is stopped, (although the motor may still continue to rotate due to its own momentum,) the circuit connections of either armature or field of the motor are reversed, so that upon a reversal of the circuit-controlling switch the motor will operate in a reverse direction to effect a raising of the curtains, the limit-stops again coming into play to disengage the magnetic clutches when the curtains are raised sufficiently.

The controlling means comprise in their preferred embodiment a gear-wheel 25', secured to a counter-shaft mounted upon one of the uprights 26 26, which comprise the supporting-framework of my improved device, said gear-wheel being driven by a pinion 27, mounted upon and rotatable with the shaft 14. Upon the gear-wheel 25' is mounted a pin or limit-stop 28, which is adapted to cause an actuation of the circuit-controlling means, whereby circuit through the magnetic clutch is broken and the circuit-terminal leading to one element of the motor reversed. The pin is preferably mounted upon one of the radial arms of the said gear-wheel 25' and the angular position of the said arm adjusted upon its supporting counter-shaft, so that it may be caused to actuate the controlling mechanism at the right time. A switch-blade 29 is mounted upon a swinging arm 30, which arm has an angular extension 31. An actuating-bar 32 is rotatably mounted about the counter-shaft supporting the gear-wheel 25', which bar is adapted to rest against the angular extension 31 and adapted to move the same when the pin 28 engages the said bar 32. The arm 30 is in its normal position in close proximity to a plunger 33, which plunger projects within a cylinder 34 and is normally held in its extended position, as shown, by means of a spring 35. In the position of the switch-blade 29, as shown, the same effects contact between the contact portion 36 and a U-shaped conducting-bar 37. If now the motor is started to rotate in a given direction, gear-wheel 25' is rotated in a corresponding direction—as, for instance, in the direction of the arrow in Fig. 3—until the limit-stop 28 engages the bar 32. Upon a further rotation of the wheel 25' the bar 32 is carried along in its rotation and rotates bar 30 through the agency of the angular extension 31 in a clockwise direction until the same engages the plunger 33, which it pushes into the cylinder-chamber 34 in opposition to the spring 35. Upon a sufficient rotation of the arm 30 the rotatably-mounted bar 32 is disengaged from the angular extension 31, whereby the spring 35, actuating the plunger 33, recedes and throws the arm 30, together with the switch-blade

29, out of engagement with the contact parts 36 and 37 and into engagement with the corresponding contact portions 38 39, at the same time bringing the said arm into close proximity to a second plunger 40, similarly mounted in a cylinder 41. The contact portions 36 and 38 are preferably electrically united, while the conducting portions 37 and 39 are respectively connected to switch-contacts 41' and 42, as hereinafter more fully set forth. Upon a movement of the arm 30, as described, it will be seen that certain circuit conditions are changed, whereby the circuit through the magnetic clutch interposed between the driving mechanism and the motor is broken and the said magnetic clutch is deenergized, whereupon rotation of the drums 13 and 15 is stopped, as also the rotation of the wheel 25', although the motor may continue to revolve a short time, due to its own momentum. It will be seen that in this alternative position, with the arm 30 in close proximity to plunger 40, the operating-arm 32 is below the angular extension 31, and upon a reverse movement of the motor 21 and the wheel 25' the operating-arm 32 is moved a predetermined amount. Operating-bar 32 again engages angular extension 31 (this time from below) and serves to press the arm 30 into engagement with the plunger 40 in opposition to a spring. The gear-wheel 25' must move very nearly through a complete revolution before the pin 28 again actively actuates the bar 32—i. e., the pin must be brought from the upper side of said bar all the way around to the bottom side thereof, this requiring substantially the travel of wheel 25' through a complete revolution. The size of the gear 25' and its associated pinion are so chosen that the said wheel 25' may travel through about three hundred and sixty degrees during the time allotted to the motor to travel in one direction, so that when the motor is near the end of its revolution in either direction the pin 28 engages the bar 32 either at the top or the bottom, as the case may be, depending upon the direction in which the motor is running. With such proper proportioning of the wheel but one pin is necessary to actuate the bar 32 in both directions, as will be clear from the drawings, the proportions there illustrated being substantially correct. When the required movement of the gear-wheel 25' has taken place, the bar 32 is released from engagement with the extension 31, and the plunger 40, through the agency of its associated spring, throws the said arm 30 out of engagement with the contacts 38 and 39, thus breaking current through the magnetic clutch, as hereinafter set forth, and again establishing circuit between the contacts 36 and 37.

I will explain the preferred form of circuit connections more particularly by reference to Figs. 6, 7, 8, and 9. I have here shown the armature 43 of the motor 21 and the field-coils 44 thereof, said armature having included in circuit therewith a hand-rheostat 45. I em-

ploy a switch 46, which serves when in the position as shown to convey current to the field-coils 44 of the motor. In the reverse position of this switch the motor is adapted to be independently operated and is not used in connection with the system herein set forth. It will be seen that in the position of the said switch as shown it serves only to supply current to the field-coils 44 of the motor, the armature being without current unless supplied by a switch 47, thus placing the control of the motor under the last-aforesaid switch. If, however, the switch 46 is placed in its alternative position, it supplies current to the motor-armature 43, as well as the field-coils 44, thus operating it independently of the switch 47. I always employ the switch 47, however, when the motor is to actuate the hoisting mechanism. This switch 47 is adapted when in either position, depending upon the position of the switch-blade 29, to divert current through the motor-armature and the coil of the magnetic clutch 19. When the said switch 47 is in the position indicated in Fig. 6, current is passing through the armature of the motor and will continue to do so as long as switch-blade 29 remains in the position shown—that is, as long as it electrically connects the contacts 38 and 39. I have shown the electrically-connected contacts 36 and 38 as one contact in the diagrammatic illustrations for the sake of simplifying the drawings. Upon a sufficient rotation of the wheel 25', as set forth, switch-blade 29 is reversed and effects electrical connection with the contact portion 37, whereby circuit is broken both through the armature 43 and the magnetic clutch 19. This condition of the electrical circuit is shown in Fig. 7. The circuit through the magnetic clutch being broken, the hoisting-gear is stopped, and the motor likewise comes to rest, as the circuit through its armature is broken simultaneously. If now it is desired to rotate the motor in an opposite direction, the switch 47 is reversed, as shown in Fig. 8, whereby current is sent through the armature in a reverse direction, and the motor will continue to operate in a backward direction until circuit is again broken by means of the switch-contact 29. The condition when circuit is again broken by the contact 29 is shown in Fig. 9, in which position the apparatus is inactive. To restore the apparatus to the operating condition shown in Fig. 6, switch 47 must be again reversed, so that it occupies its initial position.

It will be apparent that the limit-stop 28 must be placed at such a position upon the wheel 25' as is commensurate with the length of the curtain or shades to be operated. The size of the drums 13 and 15 must also be in accordance with the size of the curtain and shades, so that all curtains and shades may be drawn to their extreme positions at the same time. It will of course be understood that the operation of the motor may be discontinued at any time before the limit-stops

have opened the circuit through the magnetic clutch simply by opening the switch 47.

The operation of my improved device will now be apparent. The curtain 1 is associated with the drum 15 through the agency of the rope 5, which is wound about the said drum when secured thereto. The shades 3 3 are each provided with a cord 11, which are secured to a rope 6, extending about the room beneath all the windows, as shown, the said rope 6 being wound about and secured to drum 13. The end of the rope 6 is provided with a weight 10, which tends to keep the said rope taut, irrespective of the action of the springs of the curtain-rollers. The portions 13 and 15 may be considered to constitute flights of a common drum, the flights being of different diameters to correspond to different ranges of travel of the curtains. Current may now be supplied to the motor through the agency of the switch 47, whereby the motor is operated in one direction or the other, depending upon whether the curtains are in their raised or lowered positions, the motor continuing to operate until the stop 28, through the agency of the arm 30 and one or the other of the plungers 33 and 40, has effected a change of circuit connections by means of the switch-blade 29, whereby circuit is broken through the motor-armature and the magnetic clutch 19, the limit-stop being so arranged that this breaking of the circuit occurs when the curtains are in their extreme positions. If now it is desired to restore the curtains to the positions they originally occupied, switch 47 is reversed and current is again supplied to the motor and the magnetic clutch, the said motor now continuing to operate in a reverse direction until circuit is again broken therethrough by the switch-contact 29.

I prefer to employ the worm-shaft 17 in engagement with the worm-wheel 16, as the said worm-shaft will act as a lock when the magnetic clutch is thrown out of action to disconnect the motor, so that the weight of the curtains or other load will not cause them to move.

It will be seen that I have provided a highly useful combination, comprising a motor, a winding-drum, a clutch, preferably magnetic, for uniting the motor with the winding-drum, a circuit-opening switch operated by the winding-drum to throw the motor out of circuit and simultaneously therewith the clutch out of action, so that the movement of the curtains may be instantly stopped while the armature is overcoming its momentum in being brought to rest, the pole-changing switch, which is preferably hand-operated and also preferably enters into the combination when reversed, serving to start the motor, the switch that was previously thrown to open the circuit being again included in circuit by the pole-changing switch in electrical connection therewith. By providing a drum with a plurality of flights the curtains may be caused

to have different ranges of travel for a given number of revolutions of the drum.

While I have herein shown and particularly described one embodiment of my invention, I do not wish to limit myself to the precise construction and arrangement as herein particularly set forth; but,

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

1. In a hoisting system, the combination with a drum having flights of different diameters, of curtains having different ranges of travel provided with cords in engagement with the different flights of the drum, a worm-wheel 16 in engagement with the drum, a worm-shaft 17 in engagement with the worm-wheel, a motor, an electromagnetic clutch coupling the motor-shaft with the worm-shaft, switching mechanism for including the helix of the clutch and the motor in circuit, means controlled by the drum for operating this switching mechanism to exclude the motor and the helix of the clutch from circuit, circuit closing and reversing switch mechanism for reversing the direction of rotation of the motor, and connections intervening between the switching mechanisms, whereby the helix of the electromagnetic clutch is included in circuit when the reversing switch mechanism occupies one or the other of its alternative positions, substantially as described.

2. In a hoisting system, the combination with a drum, of a worm-wheel 16 in engagement therewith, a worm-shaft 17 in engagement with the worm-wheel, a motor, an electromagnetic clutch coupling the motor-shaft with the worm-shaft, switching mechanism for including the helix of the clutch and the motor in circuit, means controlled by the drum for operating this switching mechanism to exclude the motor and the helix of the clutch from circuit, circuit closing and reversing switch mechanism for reversing the direction of rotation of the motor, and connections intervening between the switching mechanisms, whereby the helix of the electromagnetic clutch is included in circuit when the reversing switch mechanism occupies one or the other of its alternative positions, substantially as described.

3. In a hoisting system, the combination with a drum having flights of different diameters, of curtains having different ranges of travel provided with cords in engagement with the different flights of the drum, a worm-wheel 16 in engagement with the drum, a worm-shaft 17 in engagement with the worm-wheel, a motor, a clutch coupling the motor-shaft with the worm-shaft, switching mechanism for including the motor in circuit and excluding the same from circuit, means controlled by the drum for operating this switching mechanism and disengaging the clutch members to exclude the motor from circuit and disconnect the same from the drum, and

circuit closing and reversing switch mechanism for reversing the direction of rotation of the motor, substantially as described.

4. In a hoisting system, the combination
5 with a drum having flights of different diameters, of curtains having different ranges of travel provided with cords in engagement with the different flights of the drum, a motor having driving connection with the drum,
10 a clutch included in this driving connection, switching mechanism for including the motor in circuit and excluding the same from circuit, means controlled by the drum for operating this switching mechanism and disengaging the clutch members to exclude the
15 motor from circuit and disconnect the same from the drum, and circuit closing and reversing switch mechanism for reversing the direction of rotation of the motor, substantially as described.
20

5. In a hoisting system, the combination with a drum, of a worm-wheel 16 in engagement therewith, a worm-shaft 17 in engagement with the worm-wheel, a motor, a clutch
25 coupling the motor-shaft with the worm-shaft, switching mechanism for including the motor in circuit and excluding same from circuit,

means controlled by the drum for operating this switching mechanism and disengaging the clutch members to exclude the motor from
30 circuit and disconnect the same from the drum, and circuit closing and reversing switch mechanism for reversing the direction of rotation of the motor, substantially as described.
35

6. In a hoisting system, the combination with a drum, of a motor having driving connection with the drum, a clutch included in this driving connection, switching mechanism for including the motor in circuit and excluding the same from circuit, means controlled by the drum for operating this switching mechanism and disengaging the clutch members to exclude the motor from circuit and disconnect the same from the drum, and
40 circuit closing and reversing switch mechanism for reversing the direction of rotation of the motor, substantially as described.
45

In witness whereof I hereunto subscribe my name this 22d day of May, A. D. 1901.

CHARLES W. CARMAN.

Witnesses:

GEORGE L. CRAGG,

HERBERT F. OBERGFELL.