H. W. CHENEY.

POWER OPERATED SWITCH OR CIRCUIT BREAKER.

APPLICATION FILED OCT. 20, 1905.

960,504.

Patented June 7, 1910.

5 SHEETS—SHEET 1.

Fig. 1.

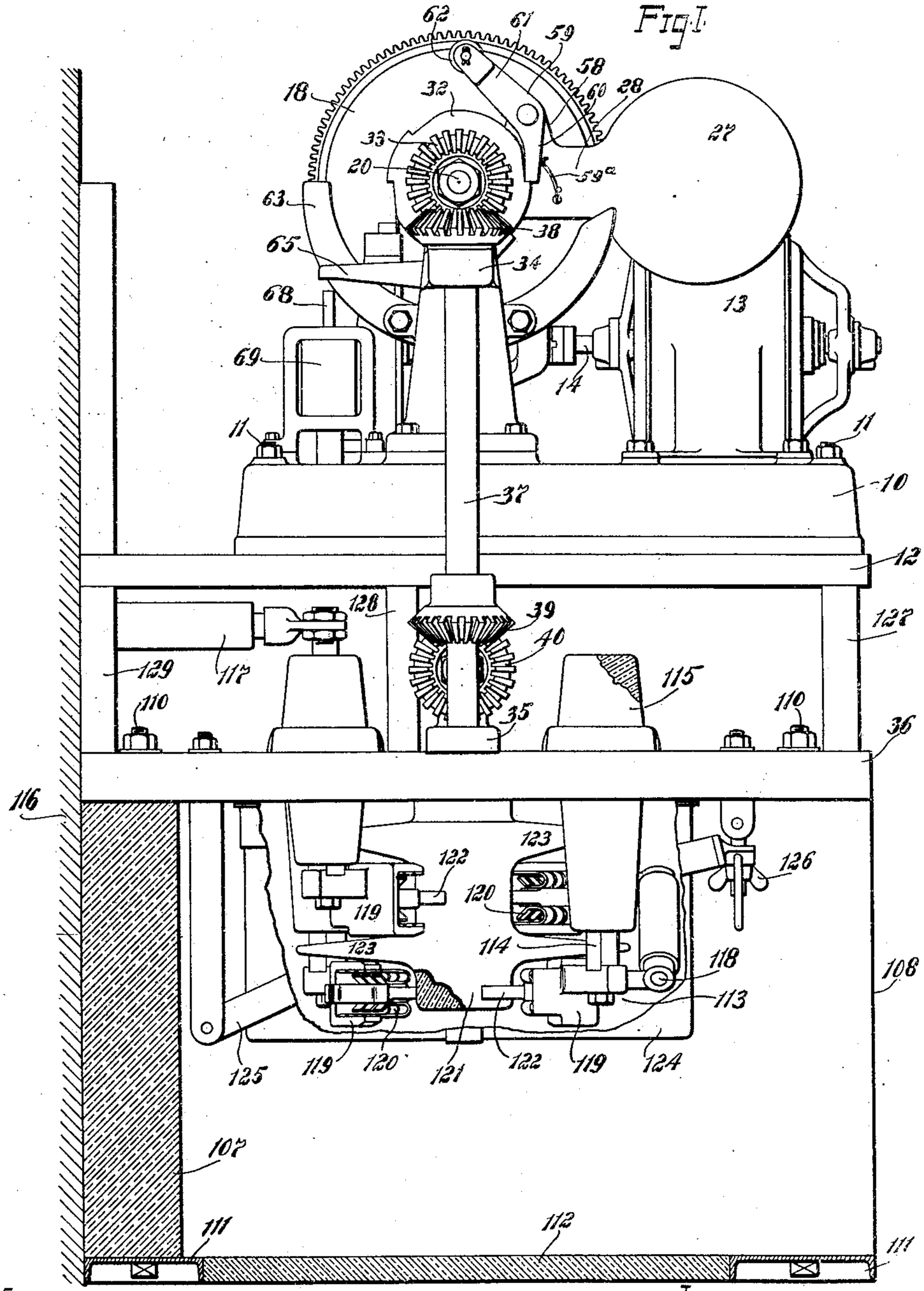

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Fig. 2.

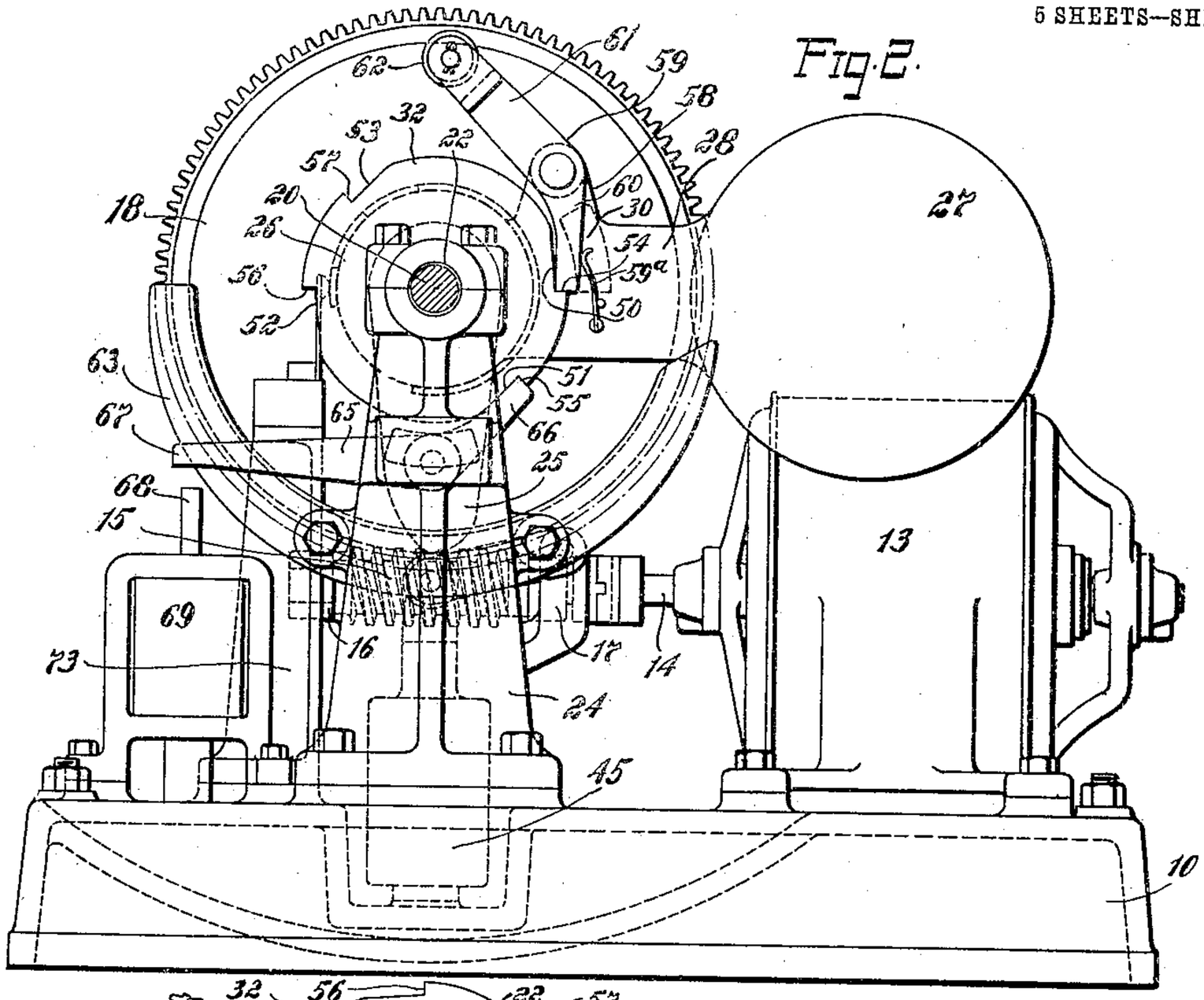
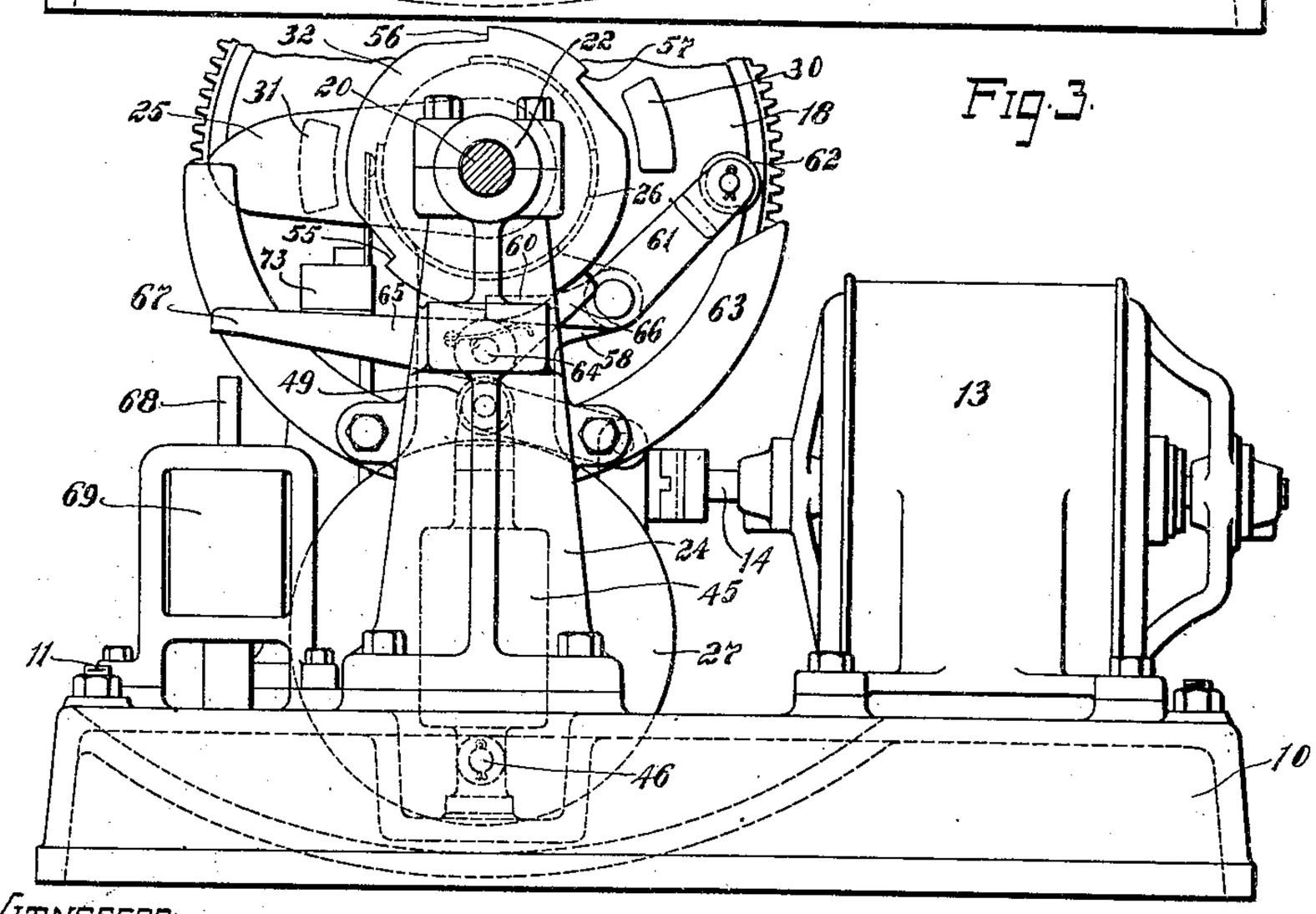


Fig. 3.



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5 SHEETS—SHEET 3.

Fig. 4.

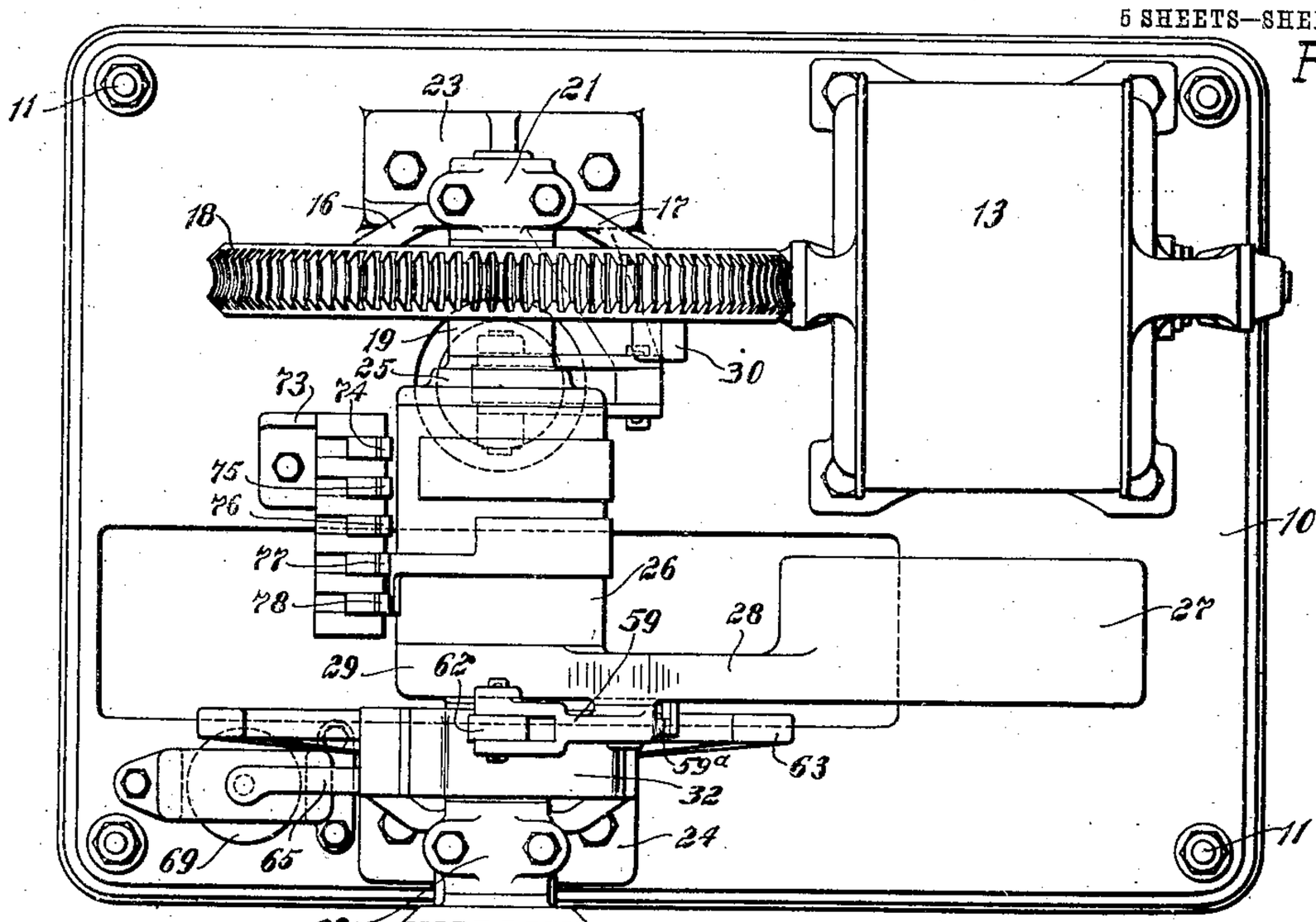
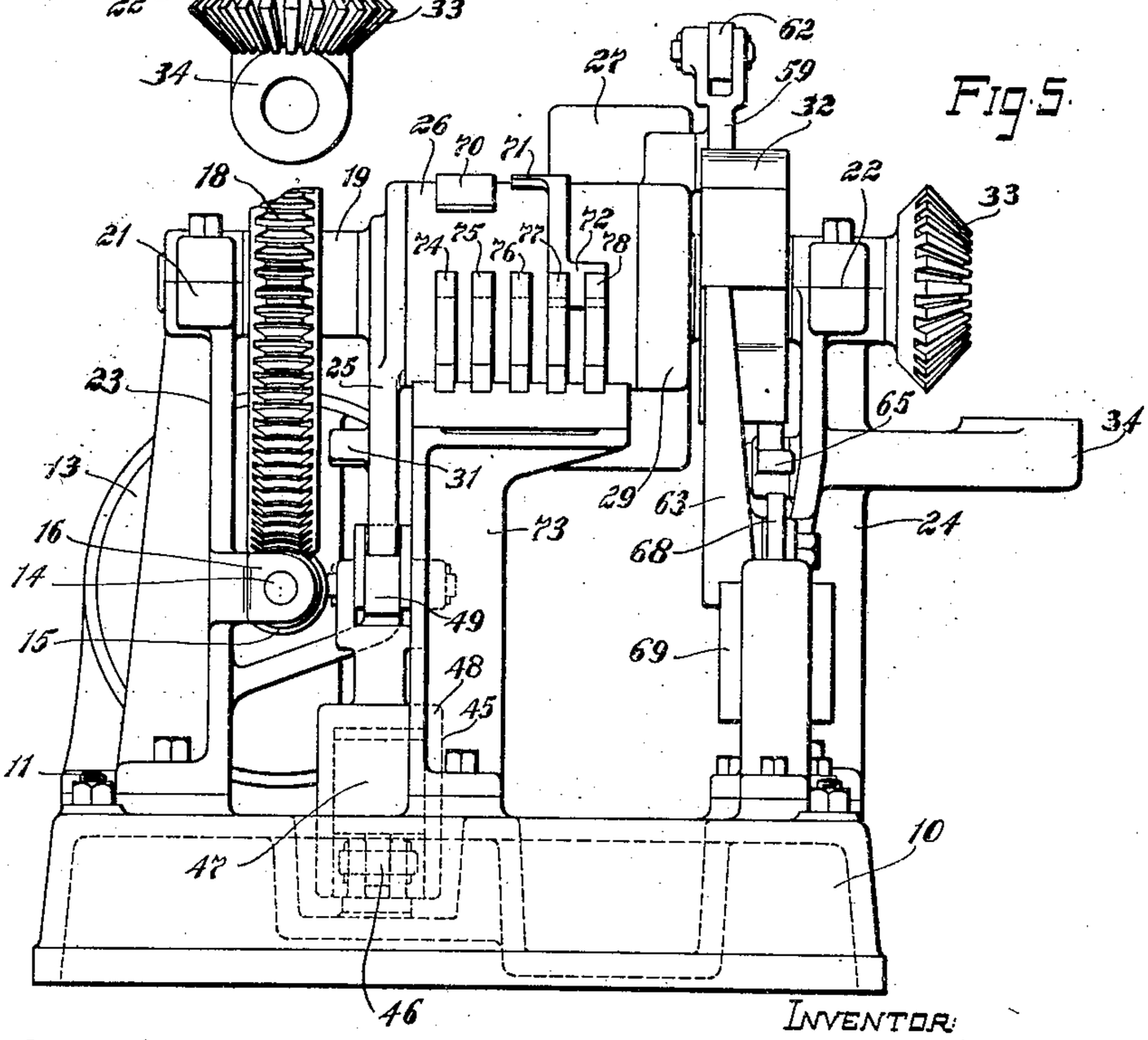


Fig. 5.



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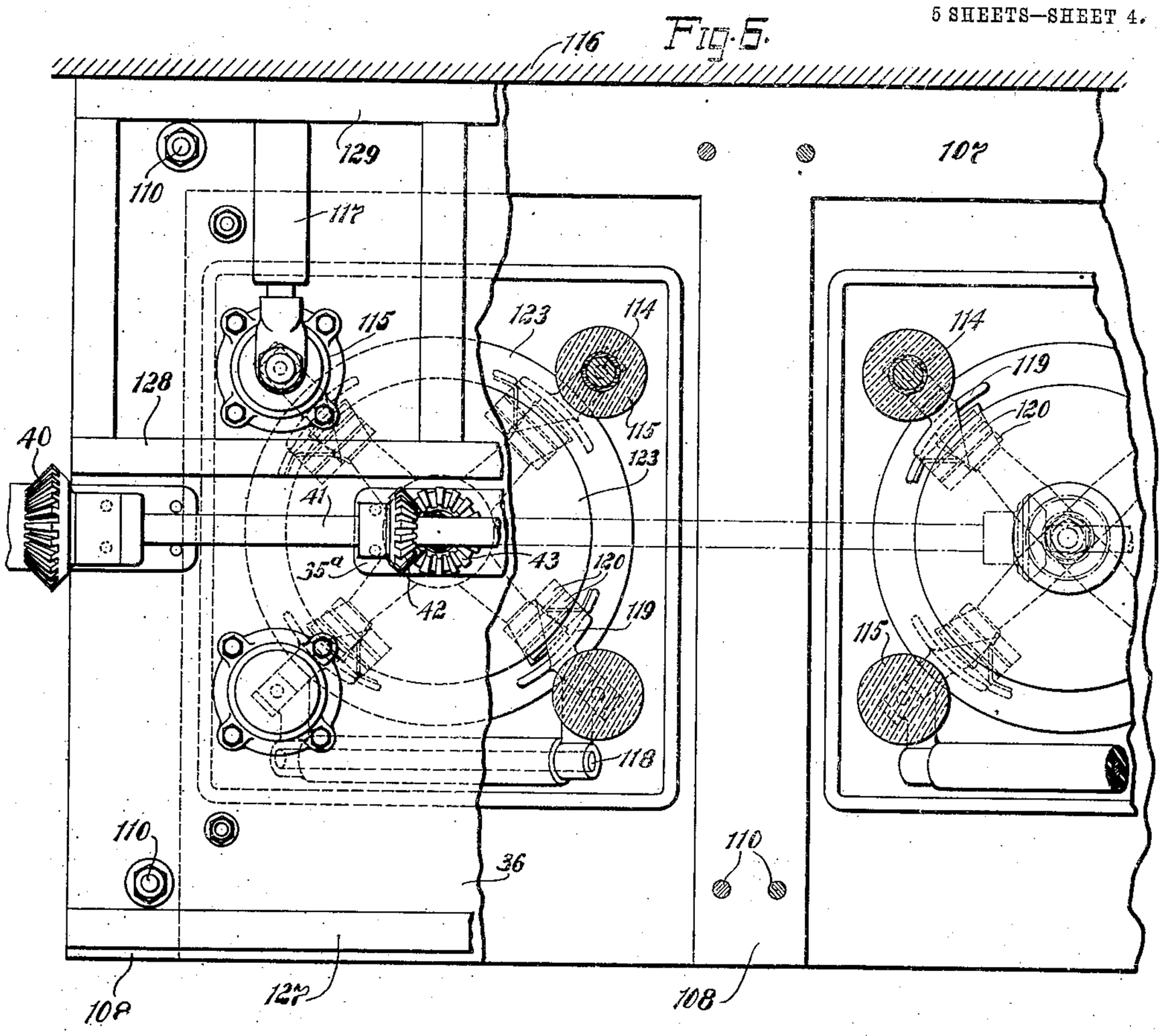
5 SHEETS—SHEET 4.

Fig. 5.



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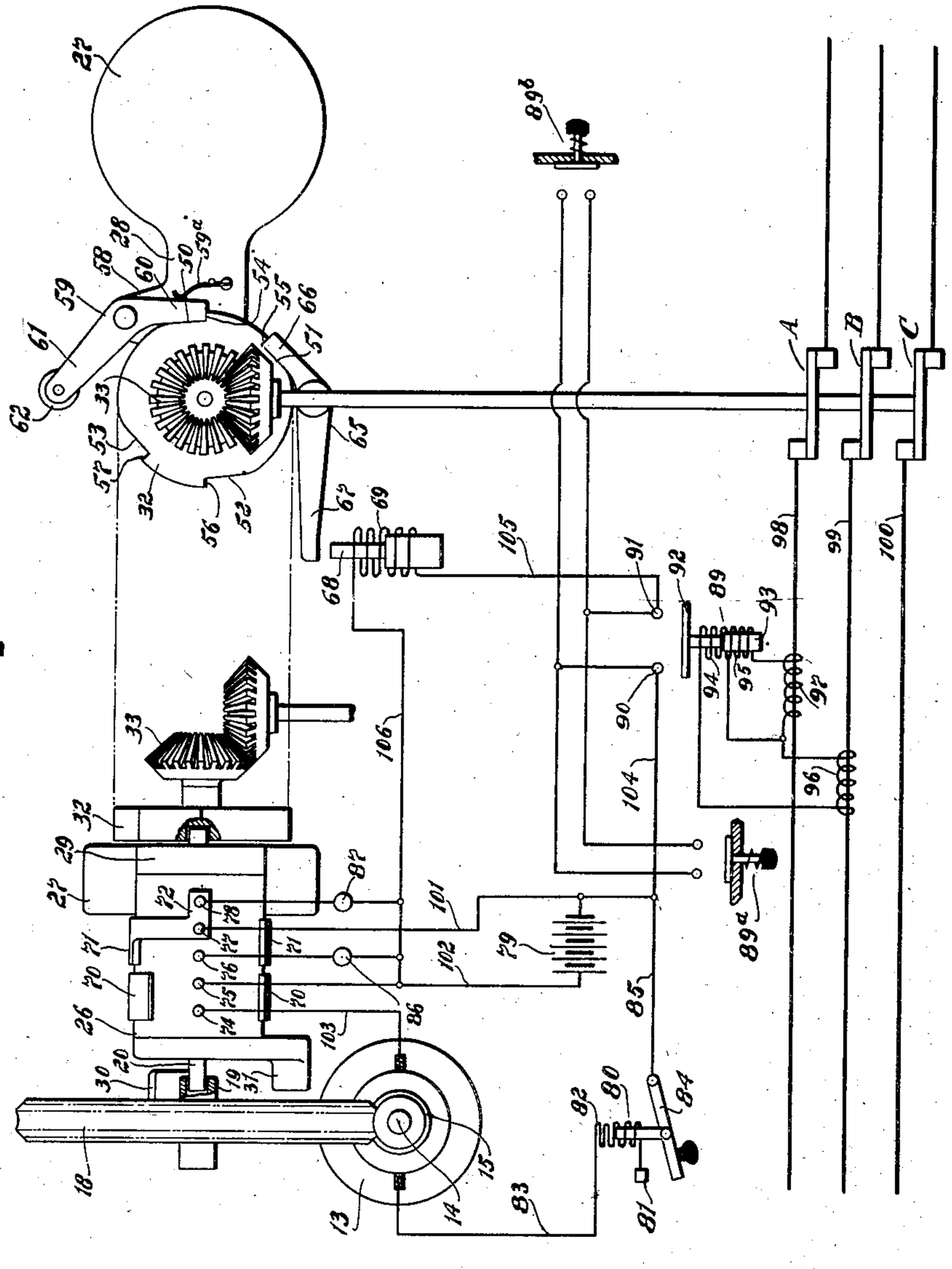
5 SHEETS—SHEET 5.

Fig. 7.



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UNITED STATES PATENT OFFICE.

HERBERT W. CHENEY, OF NORWOOD, OHIO, ASSIGNOR TO THE BULLOCK ELECTRIC MANUFACTURING COMPANY, A CORPORATION OF OHIO.

POWER-OPERATED SWITCH OR CIRCUIT-BREAKER.

960,504. Specification of Letters Patent. Patented June 7, 1910.

Application filed October 20, 1905. Serial No. 283,689.

To all whom it may concern:

Be it known that I, HERBERT W. CHENEY, citizen of the United States, residing at Norwood, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Power-Operated Switches or Circuit-Breakers, of which the following is a full, clear, and exact specification.

My invention relates to switches and circuit-breakers and especially to those adapted for currents of very high potential and large amperage.

One of the objects of my invention is to provide an effective switch for opening circuits carrying currents of high potential and large amperage.

A further object of my invention is to provide an improved operating mechanism for the switch which may be controlled from a remote point if desired either automatically or manually and which will be reliable in its action and will assure safety to the operator.

In carrying out one of the objects of my invention, I provide a switch or circuit breaker with means for successively moving the contacts into and out of engagement to close and open the switch, and an electric motor for storing potential energy in said means.

Considering my invention from a more specific standpoint, it consists in a switch having a rotary contact member operatively connected to a shaft which carries a weight and a contact drum, a motor for lifting the weight to an operative position without moving the shaft and movable switch member, a clutch between the weight and shaft, whereby the weight in falling moves the contact members successively into and out of engagement, means for stopping the weight after a predetermined movement and holding the latter with the contact members in engagement, means for releasing the weight to move the contact members out of engagement, lamps for indicating the open and closed positions of the switch and contacts carried by the drum for controlling the motor and indicating lamps, whereby the switch can be safely operated.

My invention still further consists in certain novel details of construction and combinations of elements described in the specification and set forth in the appended claims.

For a better understanding of my invention reference is had to the accompanying drawings in which—

Figure 1 is a sectional elevation with parts broken away for the sake of clearness, the switch operating mechanism being shown in elevation and the supporting walls and switch housings being shown in section; Fig. 2 is a side elevation of the switch operating mechanism the view being similar to that shown in Fig. 1 but being on a slightly enlarged scale and the connection between the parts being more clearly shown. The switch operating mechanism is shown in position for opening the switch. Fig. 3 is a similar view, parts being broken away, with the mechanism in the position when the switch is open; Fig. 4 is a plan view of the operating mechanism in the position shown in Fig. 2; Fig. 5 is an end view of the same; Fig. 6 is a sectional plan view, parts being broken away, of two four-break single-pole oil switches, and the supports and housings therefor, which switches are adapted to be operated by my improved switch operating mechanism; Fig. 7 is a view somewhat diagrammatic showing a part of the operating mechanism and the circuits for controlling the motor, indicating lamps and tripping coil. As shown the switch is closed and the operating mechanism is set, or in position to open the switch. This view is intended to show more clearly the connections between the parts and the method of operation.

The main parts of the switch operating mechanism are mounted on the rectangular cast-metal base 10, secured by bolts 11 to the top of a horizontal insulating slab 12, which forms part of the protecting housing for the switch terminals. The details of the switches, the supports and housings therefor will be explained later. Secured on this base is a small electric motor 13 which stores potential energy in the weight 27 by raising the latter to a position from which it can fall a certain distance to close one or more switches and later a farther distance to open the latter as will be explained. The shaft 14 of the motor, carries at one end a worm 15. The outer end of the shaft is supported in bearings 16 and 17. The worm en-

gages the large worm wheel 18 provided with a sleeve 19, which is loosely mounted on a horizontal shaft 20 supported in bearings 21 and 22 at the top of two upright supports 23 and 24 bolted to each side of the base 10. Also loosely mounted on the shaft and adjacent the worm wheel 18 and connected together so as to rotate in unison, are the cam 25, circuit controlling cylinder or drum 26, and switch operating weight 27. Weight 27 has an enlarged outer end connected by a neck 28 to a sleeve 29 which surrounds the shaft 20 and is secured to the drum 26. The worm wheel 18 has on the side adjacent the cam 25, a lug 30, and the cam has on the side adjacent the worm wheel 18, a lug 31. The lugs are of such lengths that when the worm wheel 18 is rotated by the motor, lug 30 will engage the lug 31 on the cam and rotate the cylinder and the weight; thus a separable driving connection is provided between the motor and the weight.

Secured to the shaft and located adjacent the sleeve 29 of the weight 27, and adjacent the bearing 22, is the notched cylinder 32. Fixed at the end of the shaft 20, and beyond the bearing 22, is the bevel gear 33. Mounted in a bearing 34 on the upright 24 and a bearing 35 supported on the insulating slab 36, is a vertical shaft 37, which carries at its upper end a bevel gear 38, which meshes with the bevel gear 33, and near its lower end a bevel gear 39, which meshes with the bevel gear 40 mounted on a long horizontal shaft 41, which extends over the switches to be operated, and carries a plurality of bevel gears 42 the number of which depends upon the number of switches. Each one of these last named gears engages a bevel gear 43 shown in Fig. 6 mounted directly on the vertical spindle which carries the movable contacts of one of the switches.

Directly below the cam 25, is a dash-pot 45 pivotally mounted on the base at 46. The dash-pot consists of a normally stationary arm or plug 47 and a movable surrounding shell or cylinder 48 which carries at its upper end a roller 49 adapted to be engaged by the cam 25, so as to check slightly the fall of the weight 27 from the upper vertical position to the position shown in Figs. 1, 2, 4, 5 and 7 as the switch blades are moved from the open to the closed position as will be explained more fully.

The cylinder 32 is provided with four notches 50, 51, 52 and 53 as shown clearly in Figs. 2, 3 and 7 which notches are arranged in pairs oppositely disposed, forming two pairs of shoulders 54, 55 and 56, 57, the pairs being diametrically opposite on the cylinder. Two of the shoulders 55 and 57, 180° apart, are adapted to be engaged successively by a holding latch when the switch or switches are closed and the other shoulders 54 and 56 located 180° apart are adapted to be engaged successively by a latch on the weight, whereby a driving connection is provided between the weight and shaft 20. These last named shoulders 54 and 56 are adapted to be engaged by the latch on the weight 27 at the proper intervals to move the shaft to close the switch or switches, and later to move the shaft to open the switch or switches as will be explained more fully.

The neck 28 integral with the weight is provided with a lug 58 on which is mounted a bell-crank holding latch 59, the shorter arm 60 of which, is adapted to engage at different intervals each of the shoulders 54 and 56 to form the driving connections between the weight and the shaft 20, for opening and closing the switch. A spring 59ª holds the shorter arm 60 in engagement with the shoulders 54 and 56. The longer arm 61 of the latch 59 is bifurcated as shown and has at its outer end between the bifurcations a roller 62. Supported on the upright 24 below the notched cylinder 32, and in the path of the roller 62, is a semi-circular cam 63. This cam is adapted to be engaged by the roller 62 at the proper interval to rock the driving latch 59 so as to move the shorter arm 60 out of engagement with one of the shoulders on the notched cylinder, so that the weight can be rotated by the motor for a part of a revolution without driving the shaft 20. As is shown in Fig. 3 the cam will be engaged by the roller during nearly a half revolution of the weight. Mounted on the upright 24, at 64, is another bell-crank shaped latch 65, having a shorter arm 66 which is adapted to engage at different times the two shoulders 55 and 57 of the notched cylinder 32, to hold the weight in the position shown in Fig. 2, when the switch is closed.

Latch 65 is provided with a long arm 67 which is adapted to be engaged by the vertically movable plunger 68 of the tripping magnet 69. In Fig. 2 the weight is shown as supported in its half way down position with the arm 60 of the driving latch 59 in engagement with the shoulder 54 and the arm 66 of the holding latch in engagement with the shoulder 55. It will be seen that when the solenoid core 68 is raised, the latch 65 will be rocked on its pivot 64 and the shorter arm 66 will be moved out of engagement with the shoulder 55 and the weight 27 will fall from the position shown in Fig. 2 to the lowermost position shown in Fig. 3, driving the notched cylinder 32 and shaft 20. During this movement of the weight from the position shown in Fig. 2, to the position shown in Fig. 3, the switch operated thereby is opened. It will be seen in Fig. 3 that the shorter arm 60 of the driving latch 59, is still in engagement with the shoulder 54 on the notched cylinder 32 and that the roller 62 at the outer end of the

longer arm 61, has approached closely the face of the cam 63. It will also be seen that when the weight falls from the position shown in Fig. 2 to that in Fig. 3, notched cylinder 32 is rotated substantially 90° and is stopped with the notch 56 vertically above the center of the shaft 20. It will also be seen that if the weight is moved to the left of the position shown in Fig. 3 the notched cylinder will be rotated a short distance farther, and the shoulder 56 will pass beyond the vertical line through the center of shaft 20, before the roller 62 will engage the face of the cam 63. When this occurs, the driving latch 59 will be rocked on its pivot and the shorter arm 60 will move out of engagement with the shoulder 54. Further rotation of the weight from this point results in no movement of the notched cylinder 32 and the shaft 20, as long as the roller 62 engages the cam. The cam is of such a length that the weight can be rotated to a position 180° from that shown in Fig. 3 with the roller in engagement with the cam and the short arm 60 of the latch out of engagement with the notched cylinder. On still further rotation of the weight, the roller will pass beyond the cam 63, and the short arm 60 of the latch will be permitted to pitch forward into engagement with the notched cylinder. When the weight moves to a position a short distance beyond its uppermost position, that is, a little more than 180° from the position shown in Fig. 3, the shorter arm 60 of the driving latch 59 will engage the shoulder 56 and the weight will then fall to the position shown in Fig. 2, driving the notched cylinder and the shaft 20. The latter part of the fall of the weight is checked by the cam 25 engaging the movable shell of the dash-pot, and the weight is stopped and held in the position shown in Fig. 2 by the short arm 66 of the holding latch which engages the shoulder 57. By the fall of the weight from its uppermost position to the position shown in Fig. 2 the main switch or switches are closed, and will remain closed until opened by the further drop or fall of the weight.

The circuits and diagram shown in Fig. 7 will now be explained. The contact cylinder 26, which is loosely mounted relative to the shaft as has been explained, is provided with contacts for controlling the operation of the motor, and for controlling the circuits through a lamp for indicating the closed position of the switch, and through another lamp for indicating the open position of the switch. The contacts are shown at 70, 71 and 72. The contact 70 extends over half the distance around the cylinder and controls the circuit of the driving motor as will be explained. The contact 71 which is connected to the contact 72 is somewhat shorter than the contact 70 and controls the circuit of the lamp which indicates the open position of the switch. Contact 72 as is shown in Fig. 7, is comparatively small and controls the circuit of the lamp which indicates the closed position of the switch. Mounted on the standard 73 are five contact fingers 74, 75, 76, 77 and 78. Contact fingers 74 and 75 are adapted to engage the contact 70, contact fingers 76 and 77 are adapted to engage the contact 71, and contact fingers 77, 78 are adapted to engage the contact 72, as is shown in Fig. 7. I have in this case shown a battery 79 for supplying current to the motor, indicating lamps and the tripping magnet, but it is evident that current can be supplied from the main circuit for this purpose, the battery as a source of supply, being merely shown for convenience of illustration and description. At 80 is shown a master switch for completing the circuit through the motor. This switch consists of a stationary contact 81 connected to a solenoid coil 82 and to conductor 83, and a movable blade 84 connected to the conductor 85. The lamp which indicates the open position of the switch is shown at 86, and the lamp which indicates the closed position of the switch is shown at 87. The coil of the tripping magnet 69 previously referred to, is shown at the right hand side of the figure. The overload solenoid switch shown at 89, is provided with two stationary contacts 90 and 91 adapted to be engaged by a bridging contact 92 which is connected to core 93 of the solenoid. The overload switch is provided with a compound solenoid coil consisting of two coils 94 and 95 connected respectively to transformers 96 and 97 on two of the mains of the three-phase distributing circuit 98, 99, 100. I have also provided means for manually closing the circuit through the tripping coil. Two push button switches are shown at 89^a and 89^b for this purpose. The conductors connected to the stationary contacts of each of these switches are connected to the conductors 104 and 105 to which the contacts 90 and 91 of the overload switch are connected. Either more or less than two manually operated switches may be employed for closing the circuit through the tripping coil to open the main switches, and these switches may be located in any desired positions.

It will be seen that when the main switches in the main conductors 98, 99, 100 (indicated at A, B and C in Fig. 7) are closed as is the case when the weight is in the position shown in Fig. 7, that the circuit will be completed through the indicating lamp 87 as follows: from battery 79, conductor 101, contact finger 77, contact 72, contact finger 78, lamp 87, conductor 102, to battery 79. It will be seen that the circuit through the indicating lamp 86 and through the motor is broken on the contact cylinder.

When the weight falls in opening the switch, the cylinder 26 will be rotated sufficiently to bring that part of the contact 70 shown at the lower part of the cylinder to the contact fingers 74 and 75 and that part of contact 71 shown at the bottom of the cylinder to the contact fingers 76 and 77. The circuit will then be completed through the indicating lamp as follows: from battery 79, conductor 101, contact finger 77, contact 71, contact finger 76, indicating lamp 86, conductor 102, to battery.

If it is desired to close the main switch or switches, all that is necessary is to close the switch 80, when the motor will raise the weight from the position shown in Fig. 3 to the position from which it can fall to close the switch. Circuit through the motor can be completed by means of the master switch as follows: from battery 79, conductor 85, master switch 80, conductor 83, armature of motor, conductor 103, contact finger 74, contact 70, contact finger 75, conductor 102 to battery. The circuit through the tripping magnet coil 69 can be completed through the overload switch or any one of the push-button switches as follows: from battery 79, conductor 104, overload switch 89, or either push-button switch, conductor 105, solenoid coil 69, conductor 106, conductor 102, to the battery.

The switches and switch operating mechanism are intended to be arranged at any convenient point in the station. The switches are supported, in this case, on concrete walls 107, 108, the wall 108 being arranged at right angles to wall 107, thereby forming compartments. In this case a single-pole four-break rotary switch is arranged in each compartment. Each switch has a slab of insulating material 36 previously referred to which rests upon the walls 107 and 108 and is held in place by tie rods or bolts 110, the lower ends of which pass through channel-irons 111. The space between the channel-irons 111 is filled in with concrete or cement 112 as shown in Fig. 1. The slab 36 of each switch 113 supports four vertical contact rods 114 mounted in insulating bushings 115. The two contact rods adjacent the wall 116 against which the switches are mounted are adapted to be connected to the main leads. One of the main lead connections is shown at 117 in Fig. 6. The other two contact rods of each switch are electrically connected together by the insulated connecting rod 118, also shown in Fig. 6. Each vertical contact rod 114 carries at its lower end a contact finger-holder 119 of peculiar shape. These holders which are preferably made of brass, as shown in Fig. 6 have faces which are concentrically shaped with respect to the center of the movable member and each having a jaw or a U-shaped projection as shown in Fig. 1. Each holder carries two groups of oppositely disposed spring contact fingers 120 which contact fingers are adapted to be engaged by the bridging contacts of the movable member. The movable member of the switch consists of an insulating drum 121 which drum is mounted on a vertical shaft having its bearing 35ª supported on the insulating slab 36. The shaft carrying the drum has at its upper end, above the slab 36, a bevel gear 43 which is engaged by a bevel gear 42 on the shaft 41 as previously explained. The insulating drum below the slab 36 carries two cross arms 122 arranged in different horizontal planes and at right angles to each other. These cross arms are adapted to engage the spring contact fingers, as is well understood. The insulating drum also has two integral circular flanges or wings 123, the lower one of which is between the bridging cross arms 122 and the upper one of which is above the upper set of contacts. These flanges or wings act as barriers to lessen the liability of injury by destructive arcing between the points of different potentials.

The contacts are surrounded by oil in a tank 124, which oil tank is normally held against the under side of the insulating slab 36 by any suitable holding mechanism, a part of which is shown at 125. A locking nut 126 locks the tank in place.

Mounted on the horizontal insulating slab 36 are three vertical slabs 127, 128 and 129. These slabs support the insulating supporting slab 12 upon which rests the base 10 as previously described. It is seen that horizontal slabs 36 and 12 and the vertical slabs 127, 128 and 129 form insulating compartments for the terminal members.

While I have shown and described in detail a specific form of switch and a special arrangement of supports and housings for the switches and operating mechanisms and while I have shown a number of these switches arranged in groups for a three-phase alternating current circuit, it is to be understood that the mechanism described can operate any number of switches and the main features of my invention are applicable to any type of switch including rotary, plunger, oscillatory etc., intended either for single-phase or polyphase alternating currents or for direct current. While I have shown the operating mechanism mounted above the switch, and supported on slabs which are a part of the switch construction, and a miter-gear connection between the mechanism and the switch, I desire it to be understood that the operating mechanism may be mounted in any convenient position, more or less remote from the switch, and operatively connected to the switch by any other means, such as sprocket and chain or by direct connection to shaft 41.

I shall now describe more completely the function and operation of the different parts of my switch operating mechanism. The parts are so adjusted that when the weight is in the position shown in Figs. 1, 2 and 7, the switch is closed. When the switch is closed the contact cylinder 26 is in the position shown in Fig. 7. The contact fingers 77 and 78 are bridged by the contact 72 and the circuit through the indicating lamp 87 is closed. Now if the current should rise above a predetermined amount in any one of the phases of the distributing circuit, the overload switch 89 will be closed completing the circuit through the tripping coil 69. Or if desired, the circuit through the tripping magnet may be completed manually by any one of the push-button switches. The core of the tripping solenoid will strike the longer arm 67 of the holding latch 65 and move the shorter arm 66 out of engagement with the shoulder 55 on the notched cylinder 32 and the weight 27 will quickly drop from the position shown in Figs. 1, 2 and 7 to its lowermost position as is shown in Fig. 3. As the weight falls, as described, the shorter arm 60 of the driving latch 59 is in engagement with the shoulder 54 of the notched cylinder 32. Since the notched cylinder is fixed to the shaft 20 which is geared to the switch, the shaft 20 will be rotated approximately through one quarter of a revolution and the switch will be thus quickly opened. When the weight falls in opening the switch, the cylinder or drum 26 will be rotated approximately a quarter of a revolution and the contact 72 will be carried away from the contact fingers 77 and 78, and the contact fingers 74 and 75 controlling the motor circuit, and the contact fingers 76, 77 controlling the circuit through the lamp 86 which indicates the open position of the switch will now be bridged respectively by the contacts 70 and 71. The lamp 87 is now extinguished and the lamp 86 which indicates the open posiions of the switch is lighted and remains lighted until the switch is closed. Now if the operator desires to close the main switch, the motor must be started to lift the weight from the position shown in Fig. 3 to the position diametrically opposite. When it is desired to start the motor, the master switch 80 must be closed. When the switch 80 is closed the circuit is completed through the motor and said switch will be held in its closed position by the solenoid until the contact 70 breaks the motor circuit at the contact fingers 74 and 75. After a portion of a revolution of the worm wheel 18 driven by the motor, the lug 30 engages the lug 31 forming the driving connection between the motor and the weight. The weight is thus slowly raised from the position shown in Fig. 3 to its uppermost position (not shown). In the position of the weight shown in Fig. 3 the short arm 60 of the driving latch 59 is still in engagement with the shoulder 54. The weight will continue to drive the notched disk of the shaft 20 through a few degrees of rotation from the position shown in Fig. 3. As soon however as the shoulder 56 has passed a short distance beyond that shown in Fig. 3, *i. e.* beyond a vertical line drawn through the center of the shaft, the roller 62 will engage the cam 63 and the arm 60 of the driving latch 59 will be rocked out of engagement with the shoulder 54 and the driving connection between the weight and the shaft will be broken. During the remainder of the upward travel of the weight, the notched cylinder 32, shaft 20 and switch contacts are stationary. The motor will continue to move the weight until the center of gravity of the latter is beyond the vertical line through the center of the shaft 20. At this position of the weight, the short arm 60 of the driving latch 59 engages the shoulder 56. The weight now falls with a quick movement to its mid position, driving the shaft and switch contacts through approximately a quarter of a revolution. During this movement of the weight and shaft 20 the switch is closed. Just before the weight reaches the position shown in Figs. 1 and 2 the cam 25 engages the roller 49 on the dashpot and the fall of the weight is broken. At this instant the short arm 66 of the holding latch 65 engages the shoulder 57 on the notched cylinder 32 and the movement of the weight is stopped. When the weight falls from its upward position the circuit through the motor is broken by the contact 70 leaving the contact fingers 74 and 75. The circuit through the indicating lamp 86 is also broken by the contact 71 leaving the contact fingers 76 and 77. When the switch is closed and the weight and drum have come to rest in its mid position the contact fingers 77 and 78 are again bridged by the contact 72 and the circuit through the indicating lamp 87 is closed. It is seen that the weight and drum 26 have made a complete revolution, but, as the shaft 20 was stationary during the half revolution of the weight, the switch contacts have been moved through a half revolution only.

It is evident that very many changes can be made in the details in the switch and in the operating mechanism and I aim in my claims to cover all changes and modifications which do not depart from the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent is:—

1. In a switch or circuit breaker, movable and stationary contacts, a shaft operatively connected to the movable contact, switch operating means movable about the shaft axis and serving by one movement to close

the switch and by a further movement in the same direction to open the switch, said switch operating means having an intermittent driving connection with the shaft, and means for storing potential energy in said switch operating means.

2. In a switch or circuit breaker, movable and stationary contacts, a shaft operatively connected to the movable contact, means for shifting said shaft so as to close and open the switch, said means comprising a gravity actuated member mounted on the shaft and movable about the axis of the same said member serving by successive movements in the same direction to close and open the switch and a motor for storing potential energy in said member.

3. In a switch or circuit breaker, a movable and a stationary contact, a pivotally mounted weight completely revoluble about an axis and acting during a portion of a revolution to quickly separate the contacts to open the switch, and a motor for moving the weight independently of the contacts to an operative position.

4. In a switch or circuit-breaker, a movable contact and a stationary contact, a weight pivotally mounted in operative relation to said movable contact, a motor for moving the weight through a portion of a revolution to store potential energy in it, and means for releasing the weight to allow it to move through another portion of a revolution to quickly move the contacts out of engagement.

5. In a switch or circuit-breaker, movable and stationary contacts, a weight completely revoluble about an axis and mounted in operative relation to said movable contact, a motor for raising the weight in position for successively moving the movable contact into and out of engagement with the stationary contact to close and open the switch, and means for stopping and holding said weight stationary when the switch is closed.

6. In a switch, stationary and movable contacts, a shaft operatively connected to the movable contact, a weight for operating the switch, said weight being mounted on said shaft and being completely revoluble about the axis of the same, means for raising the weight relative to the shaft and movable contact, and a clutch for connecting the weight to the shaft when said weight moves downward.

7. In a switch, movable and stationary contacts, a shaft operatively connected to the movable contact, a weight for operating the switch, said weight being mounted on the shaft and movable about the axis of the same, means operatively connecting the weight and shaft during a certain movement of the weight, and means for disconnecting the weight and shaft after such movement.

8. In a switch, movable and stationary contacts, a shaft operatively connected to the movable contact, a weight mounted on said shaft and movable about the axis of the same, said weight having a driving connection with said shaft during a portion of its movement and serving through said connection to close and open the switch, and means for stopping the movement of said weight and for holding the weight stationary when the switch is closed.

9. In a switch or circuit-breaker, stationary and movable contacts, a weight pivotally mounted in operative relation to said movable contact for opening the switch, means for releasing the weight whereby the contacts will be quickly separated, and means for moving the weight to an operative position by a path different from that in which it moves to open the switch.

10. In a switch, movable and stationary contacts, a pivotally mounted weight in operative relation to the movable contact and serving by one movement to close the switch and by a further movement to open the switch, means for stopping the movement of the weight when the switch is closed, and a motor for raising the weight to operative position.

11. In a switch or circuit-breaker, stationary and movable contacts, a rotatable drum on which the movable contacts are mounted, a weight rotatably mounted in operative relation to the contact carrying drum for rotating the latter to open the switch, and an electric motor for raising said weight in position to rotate the drum.

12. In a switch or circuit-breaker, stationary and movable contacts, a rotatable member on which the movable contacts are mounted, a weight rotatably mounted in operative relation to the contact carrying member for rotating the latter to open and close the switch at different intervals, and a motor for raising the weight into operative position.

13. In a switch or circuit breaker, stationary and movable contacts, a weight rotatably mounted in operative relation to said contacts for moving the contacts successively into and out of engagement, to close and open the switch, a motor for raising the weight, and means for automatically breaking the motor circuit when the weight is in operative position.

14. In a switch or circuit breaker, stationary and movable contacts, a weight rotatably mounted in operative relation to said contacts for quickly separating the contacts to open the switch, a motor for moving the weight in position to separate the contacts, means for automatically breaking the motor circuit when the weight is in a predetermined position, and means for releasing the weight to separate the contacts.

15. In a switch or circuit-breaker, stationary and rotary switch members, a weight rotatably mounted in operative relation to said rotary switch member for successively moving the contacts into and out of engagement, a motor for raising the weight into operative position to close the switch, means for automatically stopping the motor after a predetermined movement of the weight, and means for releasing the weight to separate the contacts.

16. In a switch or circuit-breaker, stationary and movable contacts, rotatably mounted contact operating means for moving the contacts successively into and out of engagement to close and open the switch, a motor for storing potential energy in said means, and means for controlling said contact operating means whereby approximately half of said energy is expended to close the switch and the other half to open the switch.

17. In a switch or circuit-breaker, stationary and movable contacts, a weight pivotally mounted in operative relation to the movable contacts, a motor for moving the weight through approximately a half revolution to its operative position, means whereby the contacts will be moved into engagement during further movement of the weight through a portion of a revolution, and means whereby the contacts will be moved out of engagement during the remainder of a revolution.

18. In a switch or circuit-breaker, stationary and movable contacts, a rotatable drum on which said movable contacts are mounted, a rotatable member for driving the drum to close and open the switch, a motor for rotating said driving member through a portion of a revolution, means for automatically stopping the motor, means whereby further rotation of the driving member moves the drum into the closed position of the switch, means for holding the driving member in a stationary position with the switch contacts in engagement, and means for releasing said driving member for moving the drum to open the switch.

19. In a switch or circuit-breaker, stationary and movable contacts, a revolubly mounted weight for closing and opening the switch, a motor for moving the weight to its operative position, means whereby the fall of the weight through a portion of a revolution will close the switch, means for checking and stopping the weight after a predetermined movement, and means for releasing the weight whereby further fall of the weight will open the switch.

20. In a switch or circuit breaker, stationary and movable contacts, a weight for closing and opening the switch, a motor for moving the weight through a portion of a revolution, means whereby the weight will move the switch contact during a portion of a revolution, a dash-pot for breaking the fall of the weight, a latch for holding the latter after a predetermined fall with the switch closed, and means for releasing the weight to open the switch.

21. In combination, a switch, a shaft operatively connected to the movable member of the switch, a weight loosely mounted on said shaft, a clutch between the weight and shaft, a motor for lifting the weight to an operative position, means for automatically breaking the driving connection between the motor and weight and for clutching the weight to the shaft whereby the weight in falling will move the switch contact, means for stopping the weight when the switch is closed, and means for releasing the weight to open the switch.

22. In combination, a motor, a shaft, a weight movably mounted on said shaft and connected thereto by a clutch, a plurality of switches each having a movable member connected to said shaft, means whereby the motor will lift the weight, to a position from which it can fall to close and open the switches, means for stopping the weight when the switches are closed, and means for releasing the weight to open the switches.

23. In a switch, movable and stationary switch members, a pivotally mounted weight for operating the switch, a motor for lifting the weight to its upper position, said weight serving by one movement downward through a certain portion of a revolution to close the switch and by a further movement through another portion of a revolution to open the switch, and a contact member fixed relatively to the weight for controlling the motor circuit.

24. In a switch, movable and stationary switch members, a weight for operating the switch, a motor for lifting the weight to its upper position, said weight in its downward movement being operatively connected to the movable switch member and serving to both close and open the switch, and a contact drum connected to the weight and movable therewith for controlling the motor circuit.

25. In a switch, stationary and movable contacts, a revoluble weight for moving the contacts into and out of engagement, a motor for lifting the weight to its uppermost position, lamps for indicating respectively the open and closed position of the switch, and a contact drum operated by said weight for controlling the circuits of the motor and indicating lamps.

26. In a rotary switch, stationary and movable contacts, a shaft operatively connected to the movable member of said switch, a revoluble weight and a contact drum mounted on said shaft, a motor for lifting the weight to its operative position from which it can move, in successive steps, to

rotate the shaft to move the contacts into and out of engagement, means for stopping and holding the weight in position with the contacts in engagement, means for releasing the weight to open the switch, lamps for indicating the open and closed positions of the switch, and contacts carried by the drum for controlling the motor and indicating lamps.

27. In a rotary switch, stationary and movable contacts, a shaft operatively connected to the movable contact, a revoluble weight and a contact drum mounted on the shaft, a motor for lifting the weight to its upper operative position, and a clutch between the weight and the shaft whereby the former will in falling, successively move the contacts into and out of engagement, a dash-pot for checking and a latch for stopping the weight after a predetermined movement with the contacts in engagement, means for releasing the weight for further movement to quickly separate the contacts, lamps for indicating the open and closed positions of the switch, and contacts carried by the drum for controlling the motor and indicating lamps.

28. In a switch or circuit breaker, a movable contact, a stationary contact, a weight rotatably mounted in operative relation to said movable contact, means for lifting the weight relative to the movable contact to a position such that it may move by gravity to close the switch, means forming a driving connection between the weight and movable contact during such movement, and means for stopping the weight between its uppermost and lowermost positions when the switch is closed.

29. In a switch or circuit-breaker, rotary bridging contacts, stationary contacts, a weight operatively connected to the rotary contacts, means for lifting the weight to its uppermost position, and means for connecting the weight and rotary contacts to carry the latter in a given direction to close the switch, and in the same direction to open the switch.

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

HERBERT W. CHENEY.

Witnesses:
FRED J. KINSEY,
LAURA E. WELCH.