No. 728,523. PATENTED MAY 19, 1903.

S. S. WALES.

CIRCUIT BREAKER FOR HOISTS.

APPLICATION FILED FEB. 19, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

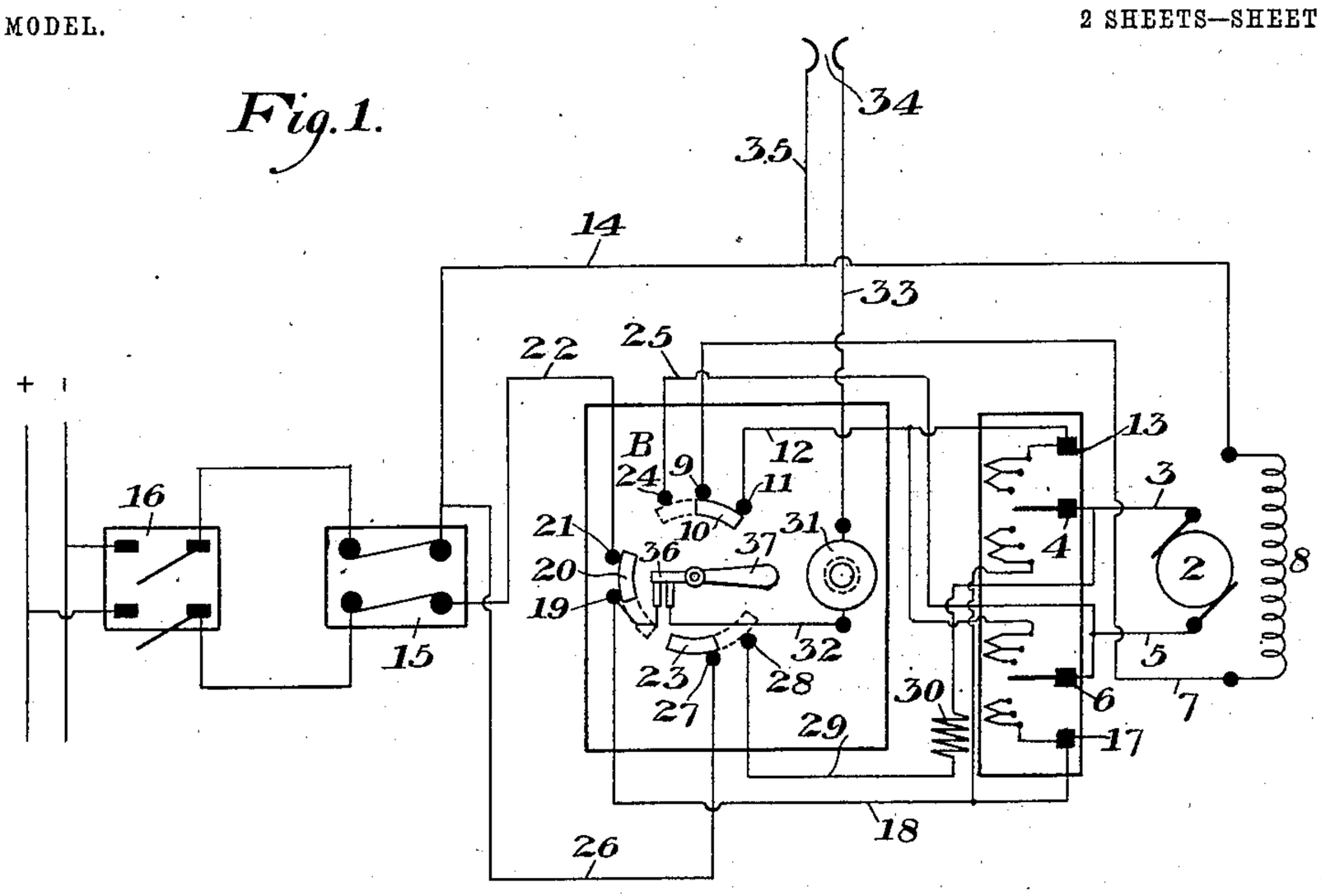
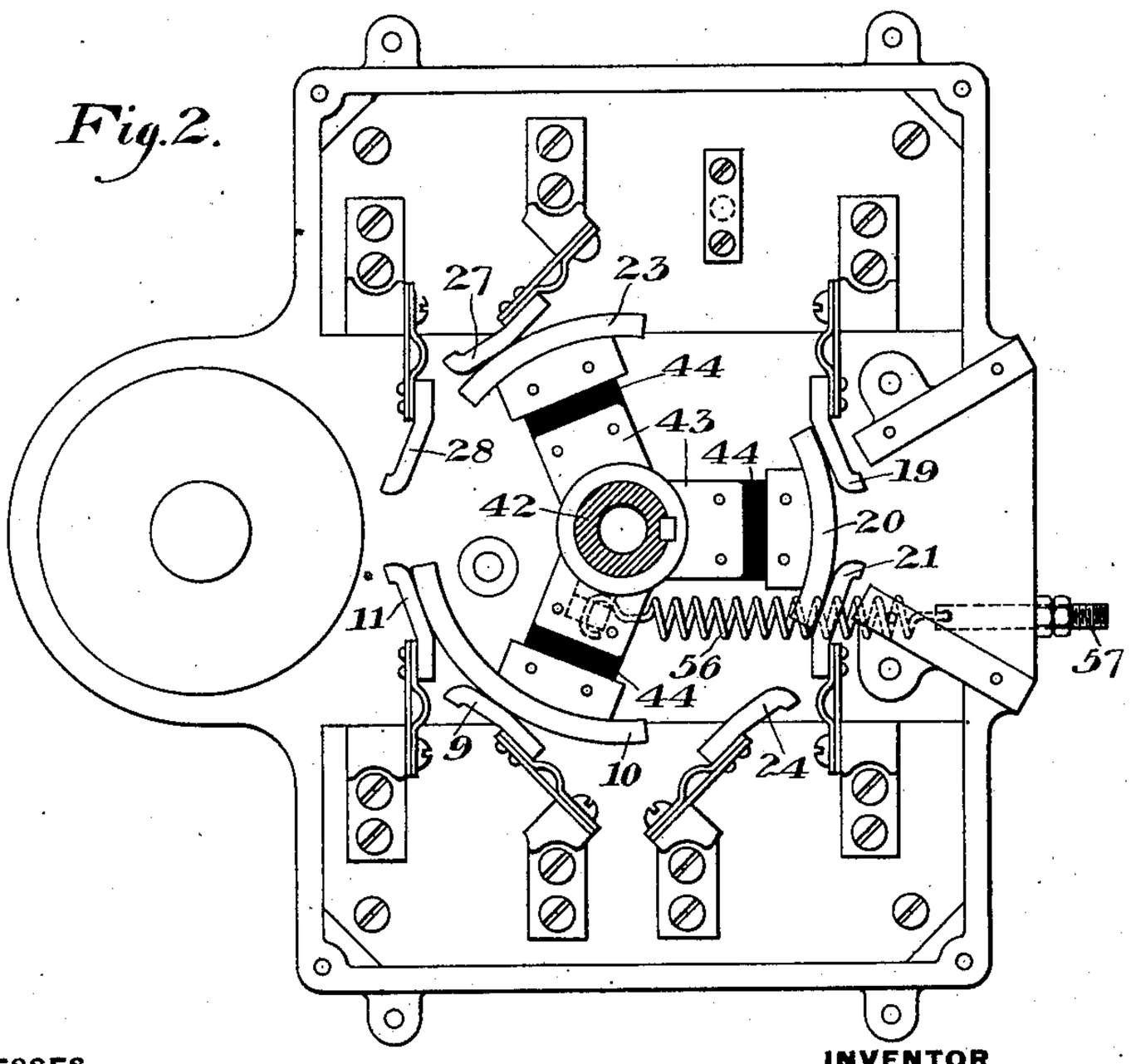


Fig. 2.



WITNESSES

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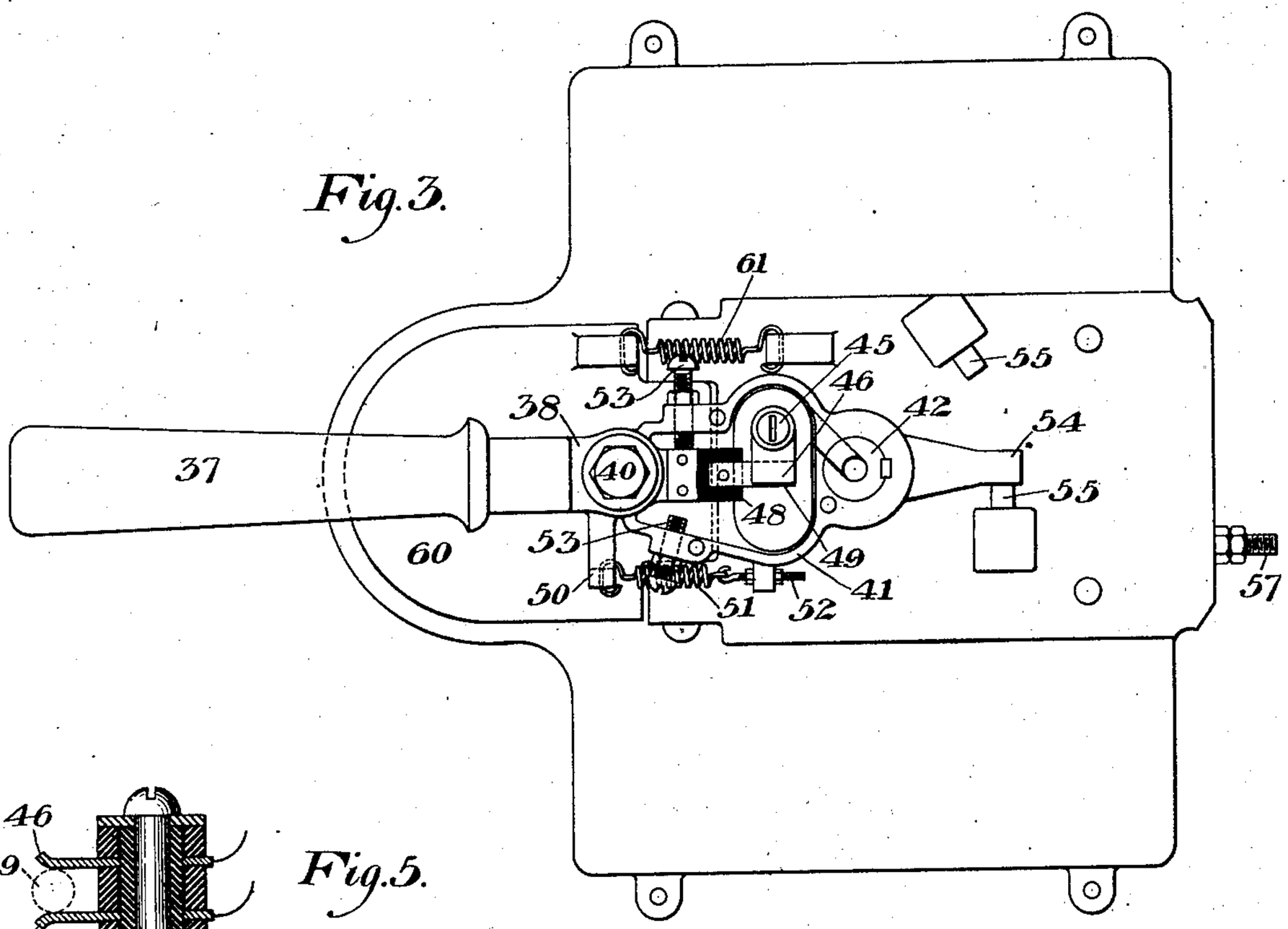
NO MODEL. 2 SHEETS—SHEET 2

Fig. 3.



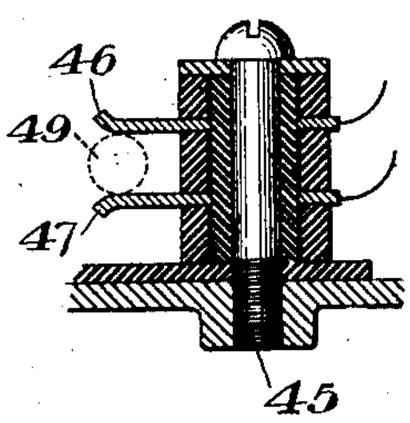
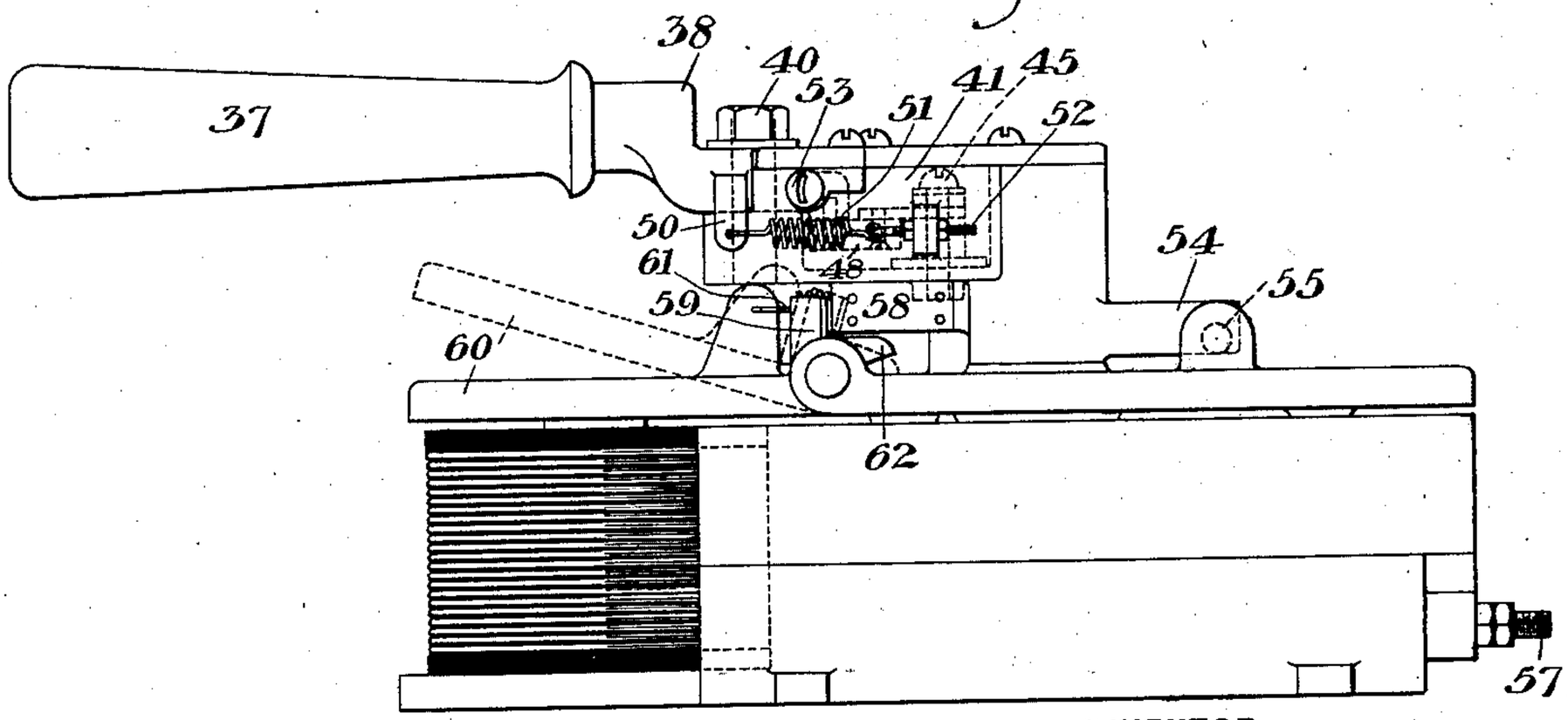


Fig. 5.

Fig. 4.



WITNESSES

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UNITED STATES PATENT OFFICE.

SAMUEL S. WALES, OF MUNHALL, PENNSYLVANIA.

CIRCUIT-BREAKER FOR HOISTS.

SPECIFICATION forming part of Letters Patent No. 728,523, dated May 19, 1903.

Application filed February 19, 1903. Serial No. 144,052. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL S. WALES, of Munhall, Allegheny county, Pennsylvania, have invented a new and useful Circuit-Breaker for Hoists, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a diagrammatic view showing the connection for one motor with my improved circuit-breaker and stop-switch. Fig. 2 is a plan view, with the top removed, of a circuit-breaker. Fig. 3 is a top plan view of the same. Fig. 4 is a side elevation, and Fig. 5 is a detail view of the switch-posts.

My invention relates to the circuit connections for electric hoists, wherein automatic stop mechanism is provided which limits the vertical movement of the hoists in both directions.

The object of the invention is to prevent mishandling of the apparatus and to avoid accidents from negligence of the operator and, further, to provide an improved circuit-breaker mechanism and automatic brake.

In the drawings, referring to Fig. 1, 2 represents a motor having a line 3 leading from one brush to the point 4 of a reversing-controller. The line 5 connects the other brush of the motor with the point 6 of the controller. The line 7 connects the end of the field 8 of the motor with the point 9 of the stop-switch B, which may be connected by contact-segment 10 with point 11 of the switch, from which the wire 12 leads to point 13 of the controller. The line 14 connects the other end of the field 8 with the negative side of the main line through the fuse-block 15 and switch 16.

The point 17 of the controller is connected by line 18 to the point 19 of the switch B and through the contact-segment 20, point 21, wire 22 to the positive side of the line through the fuse-block 15 and switch 16. These connections form a complete circuit throughout the switch B, the controller A, the armature 2, and the fields 8 of the motor when the switch is closed and in its normal position. The circuit-breaker is provided with a third conducting-segment 23, and when the segments 10, 20, and 23 are moved to the position shown in dotted lines the contact 10 connects the line 7 with point 24 and through line 25 to the line 5, there being no connection between the points 9 and 11 through the segment when in this position. In such position the contact 20 has broken connection between 19 and 21, and the contact 23 has moved so that it connects the line 14 through the line 26, points 27 and 28, through the line 29 to line 3. In this position the path from the main lines is interrupted between the points 9 and 11 and 19 and 21 of the circuit-breaker, so that power is no longer transmitted to the motor. At the same time the armature 2 is short-circuited through its own fields at the points 24 and 9 and 27 and 28 of the circuit-breaker. The armature connections are also reversed, so that the motor acts as a generator, since the current generated will flow in a reverse direction through the armature. The effect of this current will be to retard and stop the motor, and to prevent too great a rush of current I may provide a permanent resistance 30 in the line 29, as shown.

The circuit-breaker is tripped by a solenoid-magnet 31, which is connected with the plus line through line 32 and points 19 and 21 and to the minus side through line 33, contact 34, and line 35 to line 14.

In the normal position the switch 36 is closed, leaving the solenoid-circuit open only at the contact 34. If the circuit is closed at 34, the solenoid is energized and the circuit-breaker is tripped, the contact-segments being moved to the positions shown in dotted lines. In resetting the circuit-breaker the handle 37 is thrown to the left, which motion first opens the switch 36 and then moves the contacts back to their normal position in full lines. It is necessary to hold the handle in this position until the contact 34 is opened by running the hoist in a direction opposite to that which caused the safety device to operate. When the contact 34 is thus opened, the handle may be released and a spring closes the switch 36. The breaker is then again ready for action. If the breaker were reset without opening the circuit at the switch, a destructive arc would be formed at contact 34, since this is opened at comparatively slow speed.

The preferred construction of the circuit-breaker and stop-switch is shown in Figs. 2

to 5, inclusive. In these figures the hand-lever 38, having a wooden handle 37, is pivoted upon a pin 40, secured to a swinging switch-box 41, which is keyed to the hollow shaft 42, extending downwardly through the box and carrying within the box a spider 43, with insulating-pieces 44, carrying the contact-segments 10, 20, and 23. The contact-points 9, 11, 24, 21, 19, 27, and 28 are preferably spring-mounted, as shown in Fig. 2, these points coacting with the contact-pieces on the spider.

The switch-box 41 consists of a hollow casting containing at one side a post 45, carrying the contact-pieces 46 and 47, which are insulated from each other and from the post, as shown in Fig. 5. The hand-lever has an extension 48, of insulating material, carrying the circuit-closer or switch-blade 49, which is adapted to make connection between the points 46 and 47 in one position of the lever-handle. The handle is provided with a side lug 50, which engages a spiral spring 51, connected to the adjustable tension-bolt 52. This spring normally holds the lever-handle in the closing position for the blades 46 and 47. The movement of this lever within the switch-box is limited by set-screws 53. The two blades 46 and 47 are connected one with the wire 32 and the other with the short wire leading to point 19. These wires lead upwardly through a central hole in the hollow shaft 42 and thence lead to the blades through a groove cut in the switch-box, as shown in Fig. 3.

The switch-box itself, which forms the main body of the handle, is provided with a forwardly-extending lug 54, adapted to engage stops 55 to limit its movement, and this switch-body of the handle is normally drawn into open position by a strong spiral spring 56, connected to one of the arms of the spider and also to the adjustable screw-bolt 57. The switch-box is provided with a depending wing 58, which acts as a stop to hold the circuit-breaker in closed position, this stop engaging the end of a lug 59, which projects upwardly from the trunnion of a swinging armature 60. This armature is in the form of a plate, which is normally held open in lifted position by means of a spring 61, engaging a lug on the top plate and also a lug on the armature, as shown in Fig. 3. The upward movement of the armature is limited by a lip or lug 62, which engages the cover-plate when the armature is in the upper position. (Shown in dotted lines in Fig. 4.)

In the operation of this combined circuit-breaker and stop-switch the parts are normally in the closed position shown in the figures. When the circuit is closed at 34, the magnet is energized and the armature 60 is drawn down toward it, thus tripping the latch and releasing the entire handle and switch-box. The spring 56 then turns the hollow shaft 42, and thus opens the circuit-breaker and pulls the entire lever-handle to the right until its stop-piece 54 engages one of the stops 55. To reset the device, the operator seizes the wooden handle and pushes it toward the left. The first action thus given is to withdraw the blade 49 from between the contact-plates 46 and 47, thus opening the solenoid-circuit. When the pivoted handle portion strikes the stop-screw 53 at the right-hand side, a further pressure on the wooden handle swings the entire handle and switch-box with the hollow shaft 42 with its spider. During this movement the depending wing on the switch-box forces back the latch on the armature until it passes beyond it, when the spring 61 will pull the latch into stopping position. The circuit-breaker is thus closed. The operator then moves the hoist backwardly until the contact 34 is opened and then releases the wooden handle, and the spring 51 immediately acts to connect the plates 46 and 47, and thus close the solenoid-circuit. It is therefore clear that the operator is prevented from actuating the circuit-breaker and hand-switch in the wrong manner. He cannot leave the hand-switch open, and the mere act of moving the handle back to its normal position closes and locks the circuit-breaker. If he should fail to open the contact 34 before releasing the wooden handle, the device would at once be again tripped, thus compelling him to again push back the handle and hold the wooden handle until he has opened the contact 34.

The advantages of my invention will be obvious to those skilled in this art, since in prior devices the operator must open the hand-switch, then close the circuit-breaker, and then close the hand-switch, and if he fails to close the hand-switch the safety-circuit will be entirely cut out and would not be operative, and, on the other hand, if he failed to open the hand-switch before closing the circuit-breaker he would burn out the contact 34. By the present system all liability to improper actuating of these parts is removed, since by making them a part of the same lever system by the common handle the operator is prevented from omitting any of the movements or from making them in the improper order.

It will be noted that in addition to thus combining the hand-switch and circuit-breaker to insure their proper movements I employ a stop-switch which exerts a braking action upon the hoist when the contact 34 is closed by reason of short-circuiting the fields of the motor across the armature, thus converting it into a generator. The resistance upon the shaft will thus brake down the movement of the hoist and prevent excess movement by reason of the momentum of the parts. This drift or excess movement in ordinary hoists is usually about three feet, whereas in my system it is less than an inch.

Many changes may be made in the form and arrangement of the circuit connections, the combined stop-switch and circuit-breaker, and the other parts without departing from

my invention, since I consider myself the first to connect the hand-switch and circuit-breaker, whether mechanically or otherwise, to insure the correct relative movement of these two devices. This connected system may be used with or without the connection to convert the motor into a generator.

I claim—

1. In hoists, a motor-circuit having a circuit-breaker, a safety-circuit having a hand-controlled switch, and an actuating connection between the circuit-breaker and switch; substantially as described.

2. A hoist having a motor-circuit, a circuit-breaker interposed therein, a stop-switch arranged to convert the motor into a generator to exert a braking action, and mechanism arranged to actuate the stop-switch when the circuit-breaker is actuated; substantially as described.

3. A hoist having a motor-circuit and a combined circuit-breaker and stop-switch arranged as a single instrument and containing mechanism for simultaneously actuating the stop-switch to convert the motor into a generator whenever the circuit-breaker is opened; substantially as described.

4. A hoist having a motor-circuit, a circuit-breaker and stop-switch in said circuit, and mechanism actuated by the hoist and arranged to actuate both the circuit-breaker and the stop-switch at a certain predetermined limit of movement; substantially as described.

5. A hoist having a motor-circuit with a circuit-breaker and stop-switch therein, and a safety-circuit containing a hand-controlled switch; substantially as described.

6. A hoist having a motor-circuit containing a circuit-breaker, and a safety-circuit containing a hand-controlled switch, said switch having a connection to the circuit-breaker, arranged to automatically open the safety-circuit while the circuit-breaker is being closed; substantially as described.

7. A hoist having a motor-circuit containing a circuit-breaker, a safety-circuit containing a hand-controlled switch, said switch having a connection to the circuit-breaker arranged to automatically open the safety-circuit while the circuit-breaker is being closed, and mechanism for automatically closing the safety-circuit after the circuit-breaker is closed; substantially as described.

8. In hoists, a motor-circuit having a circuit-breaker, a safety-circuit having a hand-controlled switch, an actuating connection between the circuit-breaker and said switch, and a tripping device arranged to open the circuit-breaker without opening the hand-controlled switch; substantially as described.

9. In hoists, a motor having a circuit-breaker, a safety-circuit having a hand-controlled switch, an actuating connection between the circuit-breaker and switch, a spring arranged to open the circuit-breaker and move the switch without opening said switch, and a lighter spring arranged to hold the hand-switch in closed position; substantially as described.

10. In hoists, a motor-circuit having a circuit-breaker, a safety-circuit having a hand-controlled switch, and a handle arranged to open the hand-switch and thereafter in its continuous movement close the circuit-breaker, and mechanism for closing the hand-switch when the handle is released; substantially as described.

11. In hoists, a motor-circuit having a circuit-breaker, a safety-circuit having a hand-controlled switch, an actuating connection between the circuit-breaker and switch, and connections actuated by the circuit-breaker and arranged to convert the motor into a generator when the circuit-breaker is opened; substantially as described.

In testimony whereof I have hereunto set my hand.

SAMUEL S. WALES.

Witnesses:

L. M. REDMAN,

H. M. CORWIN.