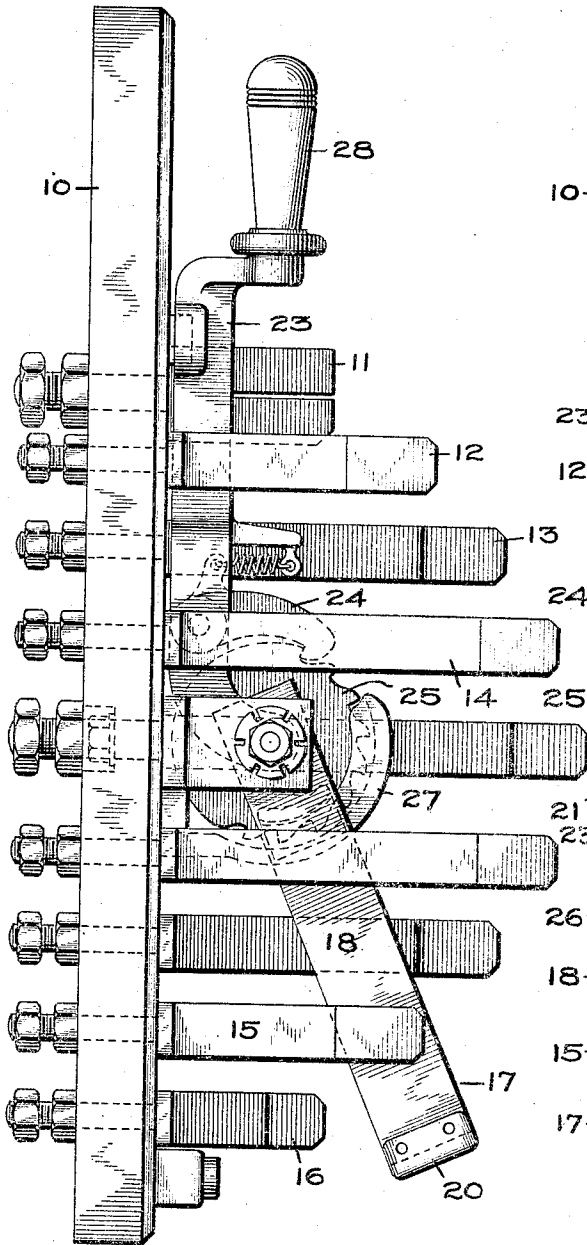


996,336.

Patented June 27, 1911.

3 SHEETS-SHEET 1.

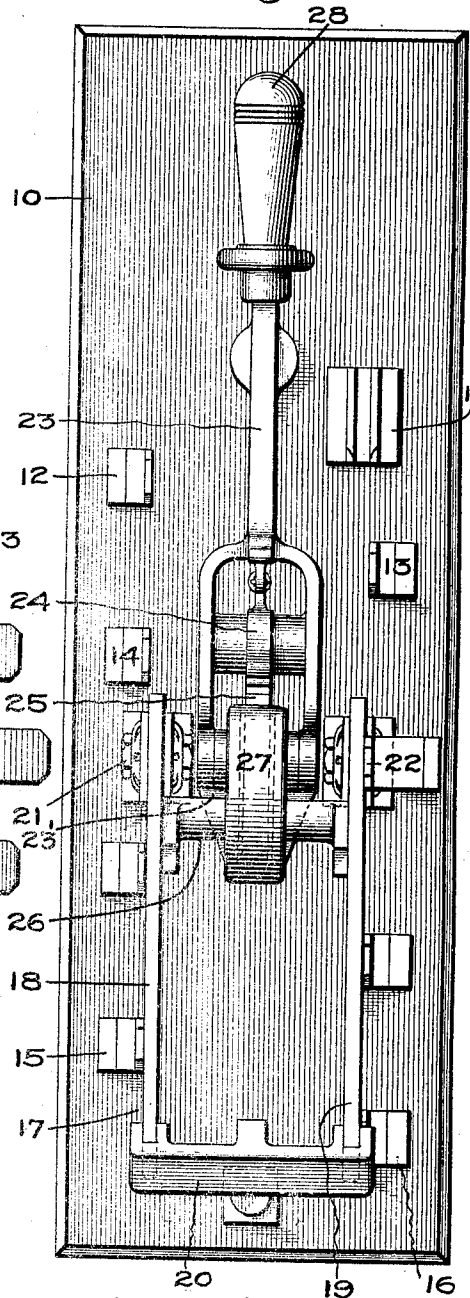
Fig. 1.



Witnesses:

J. Earl Ryan
J. Ellis Glen

Fig. 2.



Inventor:

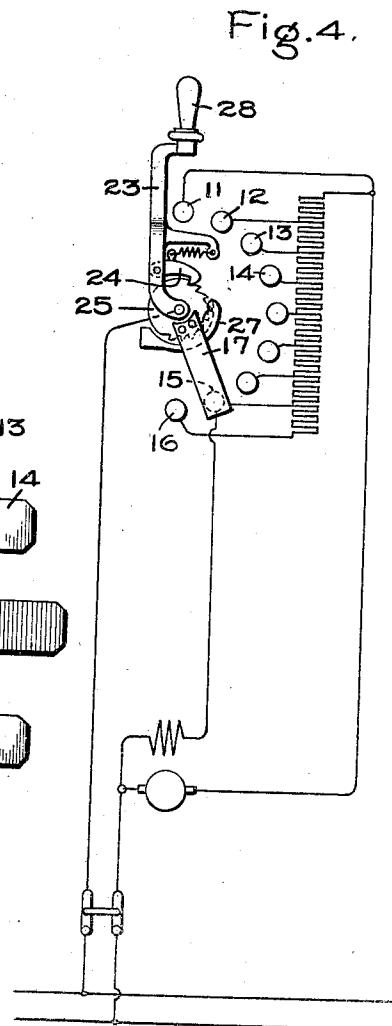
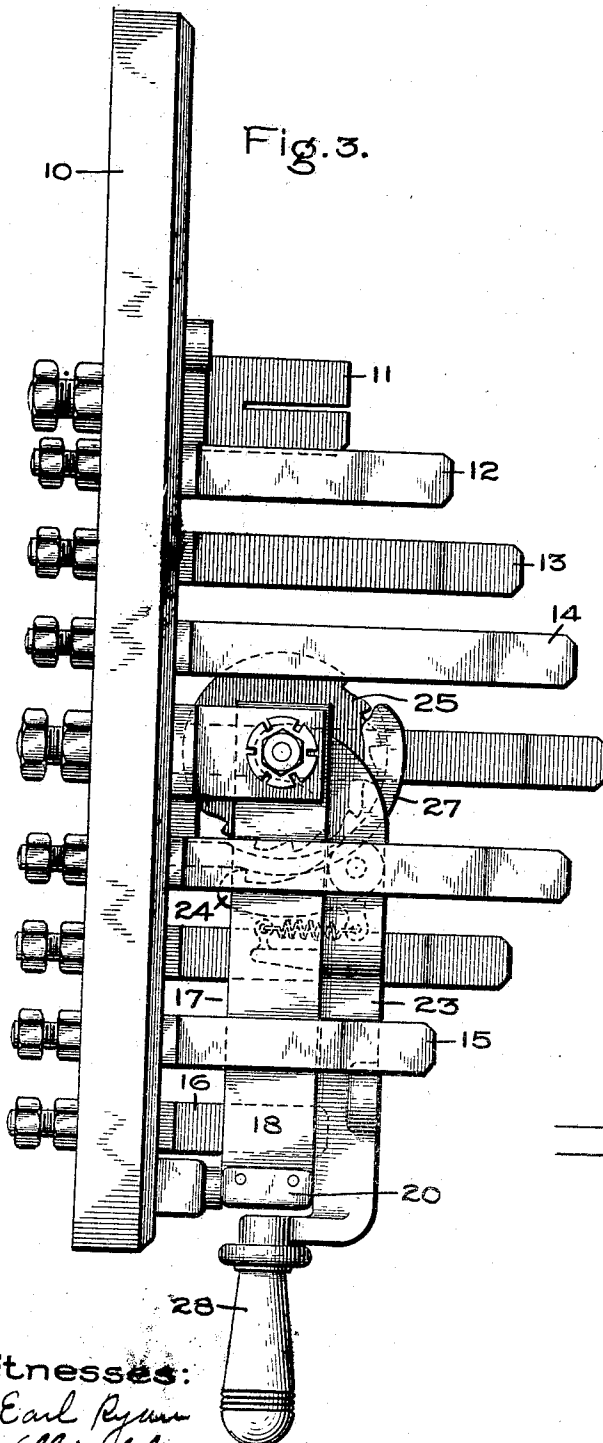
Charles H. Hill,
by *Albert H. Davis* Att'y

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C. H. HILL.
CIRCUIT CONTROLLING SWITCH.
APPLICATION FILED JAN. 13, 1909.

Patented June 27, 1911.

3 SHEETS—SHEET 2.



Witnesses:

J. Earl Ryan
J. Ellis Allen

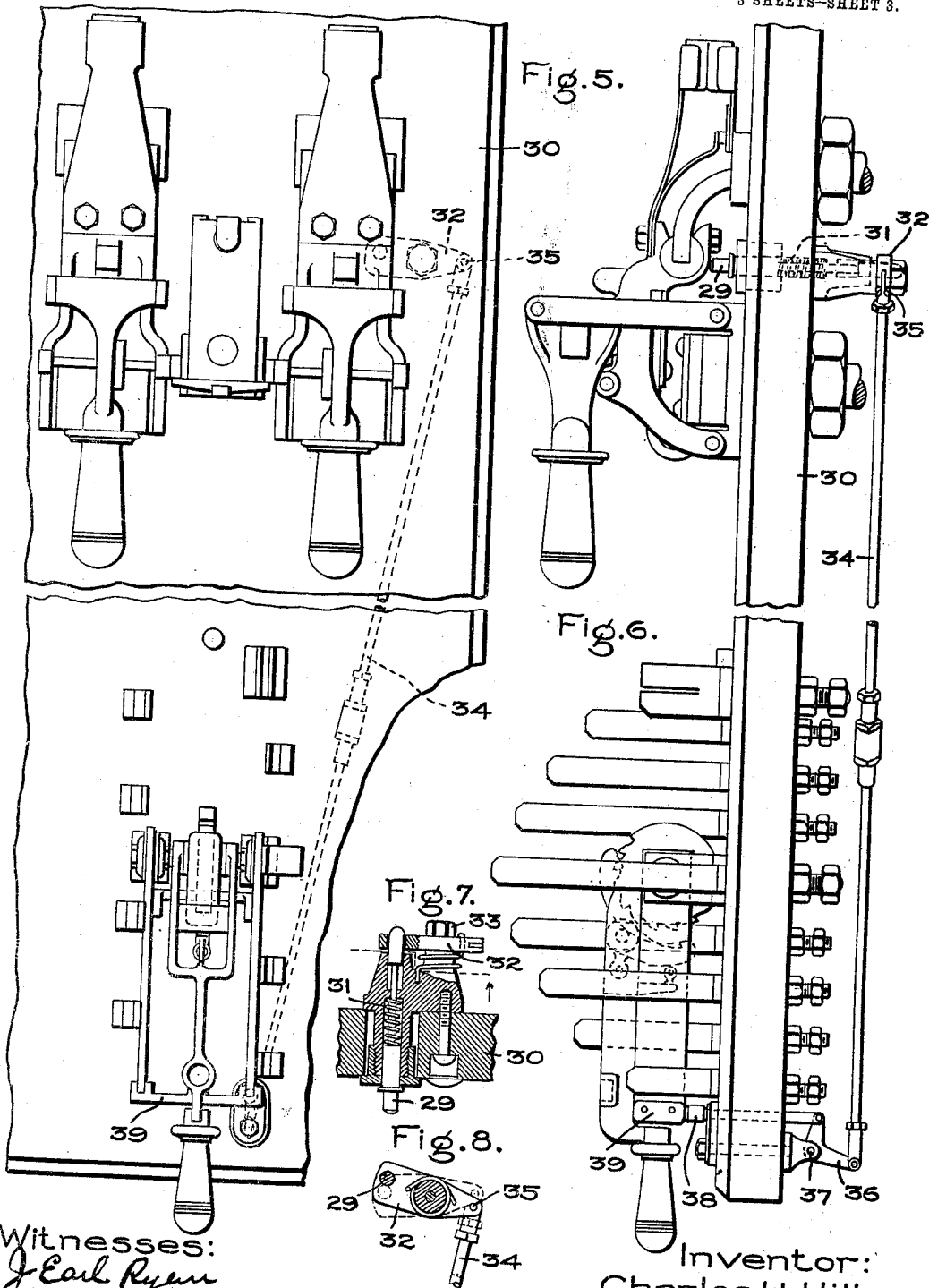
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3 SHEETS-SHEET 3.



Witnesses:
J. Earl Ryan
J. Ellis Allen

Inventor:
Charles H. Hill,
by *Alfred Davis*
Atty

UNITED STATES PATENT OFFICE.

CHARLES H. HILL, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

CIRCUIT-CONTROLLING SWITCH.

996,336.

Specification of Letters Patent. Patented June 27, 1911.

Application filed January 13, 1909. Serial No. 472,051.

To all whom it may concern:

Be it known that I, CHARLES H. HILL, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Circuit-Controlling Switches, of which the following is a specification.

This invention relates to devices for controlling electric circuits and has for its object the provision of a device of this character in which the controlling member is operated to vary the circuit in a reliable, safe and efficient manner.

One of the objects of my invention is to provide a starting switch operated step by step, the arrangement being such that it is impossible to operate the mechanism more than one step at a time.

Other objects of my invention will appear in the course of the following specification, in which I have shown my invention embodied in concrete form for the purpose of illustration.

In the accompanying drawings, Figure 1 represents a side elevation of my starting switch; Fig. 2 represents a plan view of the same; Fig. 3 represents a side view of the starting switch with the controlling member in starting position; Fig. 4 represents my device diagrammatically together with the circuit connections thereof; Fig. 5 represents a plan view of my starting switch with the interlocking features; Fig. 6 represents a side elevation of the same; and Figs. 7 and 8 a detail of the interlocking mechanism.

Referring to the form shown in Figs. 1 to 4, 10 represents a base, preferably of insulating material, such as slate or soap stone. Mounted on this base are a plurality of contacts 11, 12, 13, 14, etc., the last two contacts being 15 and 16. These contacts are arranged in two sets parallel with each other and are of varying length so that their ends may be engaged consecutively by the controlling member. The construction is such that the controlling member engages the contact of one set and next engages the contact of the adjacent set, which is of slightly greater length. The controlling member 17 is compound and consists of two blades 18 and 19 connected by the cross bar 20 pivoted at 21 and 22. The contacts have

their ends off set, as shown, so that the controlling member will only engage the off set 55 or end portions. This controlling member is moved by an operating member 23 pivoted concentrically with the controlling member in a bracket 23'. This operating member is bifurcated, as shown, and provided 60 with a spring pressed pawl 24, which is arranged to cooperate with the ratchet wheel 25 mounted in the bracket 23' to move independently of the operating member. This ratchet wheel is fixed to switch blades 18 65 and 19 by means of supporting bars 26, so that as the ratchet wheel is rotated it carries with it the switch blades. A cover or hood 27 is mounted adjacent the ratchet wheel and is curved over the wheel so as to cover a 70 portion of the ratchet. The end of this hood is so shaped that when the pawl 24 is moved by the operator a certain distance, it will engage the hood and lift the pawl out of engagement with the ratchet teeth. 75 The hood leaves enough of the teeth uncovered so that the operator is able to engage only one tooth at a time so that the switch blades will only be moved one step. If the operator attempts to move any farther the 80 pawl will be lifted and ride over the hood. The contacts 12, 13, 14, etc., are connected with resistances, as shown in Fig. 4.

The position of the parts of the device in readiness for starting is shown in Fig. 3, the 85 operator having moved the operating member to the lowermost position, thereby having forced the controlling member to the starting position. This is possible since the operating member engages the cross bar 20 90 of the controlling member and moves it to starting position. In operating the handle 28 is grasped and moved downward to the position shown in Fig. 3, the pawl 24 riding on the hood. The handle is then moved back- 95 ward and, as it approaches the top, the pawl engages one of the teeth and the parts are forced into the position shown in Fig. 1, in which the controlling member is moved from the starting position on to the contact 15. 100 By moving the arm backward and forward so as to engage the teeth of the ratchet wheel the operating member will move step by step to consecutively engage the contacts. As above pointed out, however, only one step 105 can be taken at a time. It will be observed

also that contact is made first on one side and then on the other. With this arrangement a greater number of contacts can be accommodated in a small space and there is considerable economy in the amount of metal used for these contacts. Moreover, an exceedingly good and efficient electrical contact is made in this way. Finally the controlling arm is brought to the top of the panel and the switch is in running position. Before starting the motor again the parts must be brought back to the position shown in Fig. 3.

In order to prevent the closing of the motor circuit while the parts are in any other position than the starting position, I have arranged an interlocking mechanism between the line switch or circuit breaker and the starting switch, so that the switch or circuit breaker cannot be closed unless the switch is in starting position. This I accomplish by means of a plunger 29 which is engaged by one arm of the circuit breaker and must be forced through a panel board in order to close the circuit breaker. This plunger is normally forced outward through the panel board 30 by means of the spring 31. A barrier 32 prevents the plunger from being forced through the panel excepting when the starting switch is in starting position. This barrier 32 is pivoted at 33 and spring pressed so as to normally prevent the plunger from passing through. The barrier, however, is provided with an opening through which the plunger may pass when the parts are in the position shown in Fig. 6. An interlocking rod 34 connects the free end of the barrier at 35 with one arm of bell crank lever 36 pivoted at 37. To the opposite arm of this bell-crank lever is connected a plunger 38 arranged to be engaged by the cross bar 39 of the operating member of the switch. The arrangement is such that when the switch is in starting position cross bar 39 engages the plunger forcing it inward, thereby pulling the interlocking rod 34 downward. This rotates the barrier so that the opening therein comes opposite the plunger 29. In this position then, the circuit breaker may be closed, since the plunger 29 may be forced through the panel board. As soon as the controlling member leaves the starting position, however, and the circuit breaker is opened, the plunger 29 will be pressed outward and the barrier will be shifted so as to cover up the opening. It will therefore be necessary to again bring the parts to starting position before closing the circuit breaker.

This type of starting switch is found to be particularly desirable when used upon a vertical panel board, although it is obvious that its utility is not limited to this particular application. The interlocking feature between the circuit breaker and the starting

switch is desirable in some cases, but not always necessary, since the starting switch is perfectly operative without this feature.

While I have described my device as embodying a specific construction and as operated in a definite manner in accordance with the patent statutes, it should be understood that I do not limit my invention thereto, since various modifications of my invention will suggest themselves to those skilled in the art without departing from the spirit of my invention, the scope of which is set forth in the annexed claims.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. A controlling device for electric circuits comprising a base, a resistance varying element pivoted for movement in a plane perpendicular to the base, manually operated ratchet mechanism for shifting said member step by step, and a plurality of contacts mounted on the base at varying distances from the pivotal point of the element and having engaging surfaces substantially equidistant from said point so as to be successively engaged by said element.

2. A controlling device for electric circuits comprising a base, a resistance varying element pivoted for movement in a plane perpendicular to said base, manually operated ratchet mechanism for shifting said member step-by step, and a plurality of contacts mounted on the base at varying distances from the pivotal point, the ends of said contacts forming engaging surfaces which are substantially equidistant from the pivotal point of said member.

3. A controlling device for electric circuits comprising a base, a resistance varying element pivoted for movement in a plane perpendicular to said base, manually operated ratchet mechanism for shifting said member step by step and a plurality of elongated contacts of varying lengths mounted perpendicular to said base so that their free ends are concentric with the pivotal point of said member and successively engaged thereby.

4. A controlling device for electric circuits comprising a support, a resistance varying member pivoted for movement in a plane perpendicular to said support, a plurality of contacts mounted thereon in the plane of movement of said member and engaging said contacts at substantially equal distances from the pivotal point of said member, and a ratchet mechanism for shifting the resistance member step by step.

5. A controlling device for electric circuits comprising a support, a plurality of contacts mounted thereon, a resistance member pivoted to move in a plane perpendicular to said support and arranged to engage said contacts in an arc of a circle at varying distances from the base, an operating

member, ratchet connections between said members for shifting the resistance varying member step by step, and means for preventing the operator from exceeding a predetermined step movement.

6. A controlling device for electric circuits comprising a support, two sets of contacts mounted thereon in parallel planes and in staggered relation, a resistance varying member pivoted for movement between said sets and engaging the contacts thereof alternately at varying distances from base and means for shifting said member step by step.

7. A controlling device for electric circuits comprising a support, two sets of contacts mounted thereon, a compound resistance varying member pivoted for movement in a plane perpendicular to said sets and arranged to engage the contacts of said

sets alternately at varying distances from the base, and means for shifting said member step by step.

8. A controlling device for electric circuits comprising a support, two sets of contacts mounted thereon, a compound resistance varying member pivoted for movement in a plane perpendicular to said sets and arranged to engage the contacts of said sets alternately at varying distances, ratchet mechanism for shifting said member step by step, and means for preventing the operator from exceeding a predetermined step movement.

In witness whereof, I have hereunto set my hand this 11th day of January, 1909.

CHARLES H. HILL.

Witnesses:

BENJAMIN B. HULL,
HELEN ORFORD.