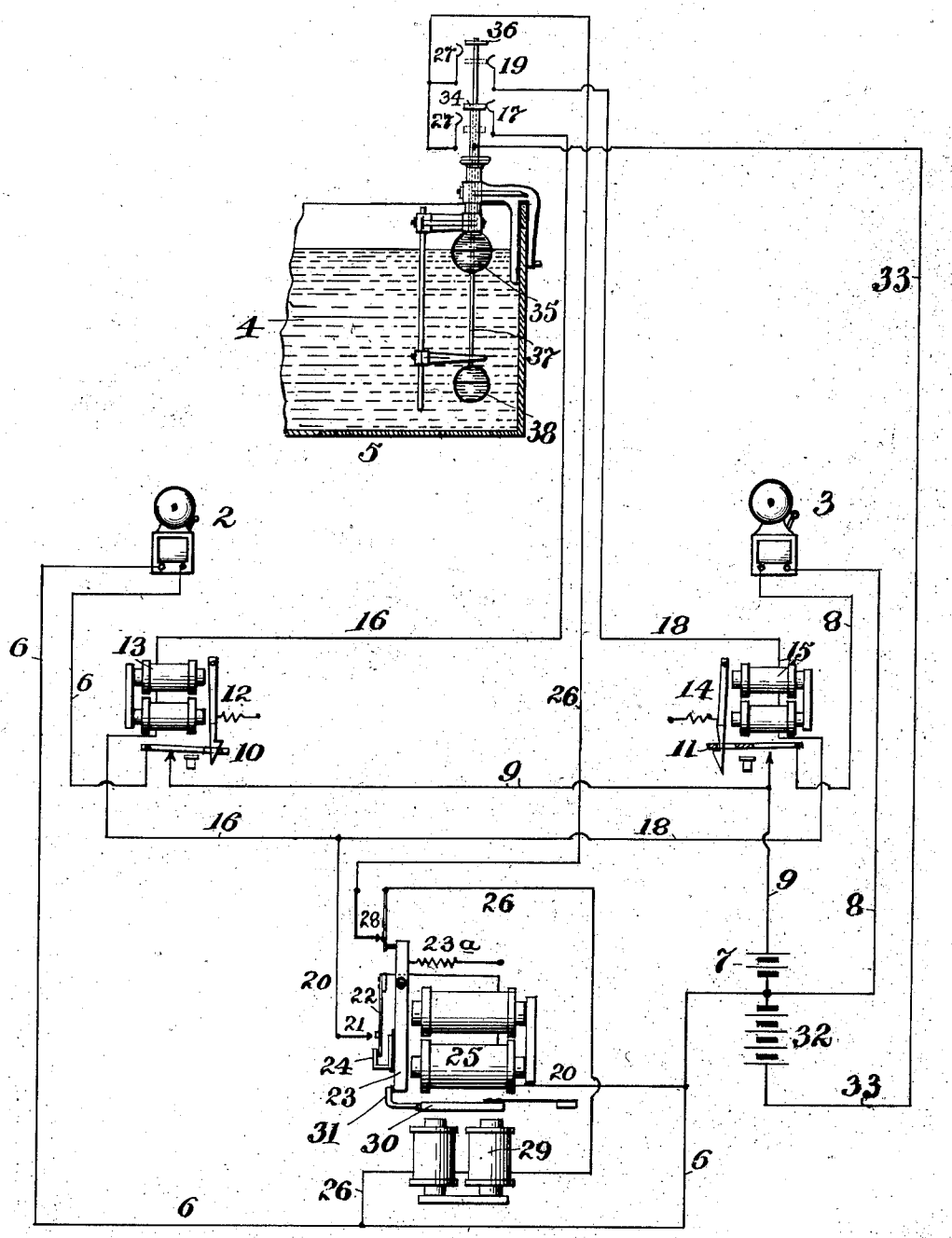
L. STERN.

AUTOMATIC CONTROLLER FOR ELECTRIC CIRCUITS.

APPLICATION FILED OCT. 29, 1912.

1,096,470. Patented May 12, 1914.



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AUTOMATIC CONTROLLER FOR ELECTRIC CIRCUITS.

1,096,470. Specification of Letters Patent. Patented May 12, 1914.

Application filed October 29, 1912. Serial No. 728,359.

To all whom it may concern:

Be it known that I, LOUIS STERN, citizen of the United States, and resident of Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented an Improvement in Automatic Controllers for Electric Circuits, of which the following is a specification.

The object of my invention is to provide suitable automatic means for controlling electric circuits and alarms or indicators therefor, so that the battery or source of electric energy which actuates the control magnets of the bell or alarm circuits is automatically cut out of circuit and maintained in such condition except immediately at and preceding the time the bell, alarm or indicator is to become energized to notify the attendant of a definite condition of the apparatus whose conditions at all times must be known.

My object is further to provide one automatic battery controlling means for a plurality of alarm or indicator circuits, such for example, as will in the one case indicate a high water level in a tank, and in the other case, indicate the low water level.

My invention is not restricted to any particular application of the alarm or indicator devices as these are adapted for a large variety of purposes, such for example, as indicating the water condition of large water tanks on roofs of buildings and other places, burglar alarms for windows, high and low water indicators for steam boilers, and any and all purposes where definite positions or levels are to be assumed under predetermined conditions. By way of example, I have described my invention hereinafter in its application to the first of these uses.

My invention consists of apparatus for carrying out the above objects, said apparatus having the construction and adapted to operate in the manner more fully described in the specification and defined in the claims.

My invention will be better understood by reference to the drawings, in which are shown, diagrammatically, the essential or characteristic features of my improvements.

For the purpose of showing the adaptability of my invention to a plurality of alarm or indicator circuits, I have illustrated and will now describe it as applied to two circuits, such as would be required to indicate high and low water conditions in a water storage tank of the kind used for fire protection purposes.

5 is a portion of the water tank and 4 is the water therein. 2 is an electric bell for indicating a condition of high water in said tank and 3 is an electric bell for indicating a condition of low water in the tank. The electric or alarm bells 2 and 3 may be of any ordinary construction, but in practice would emit different sounds so that the operator may know by the sound whether the condition is a high water or a low water condition. These electric bells receive their electric energy from a battery 7, by a circuit 6 to bell 2, and circuit 8 to bell 3, said circuits being connected with one pole of the battery and completed by the common circuit 9 connecting with the other pole of the battery. Circuit closing switches 10 and 11 respectively control the connection of the circuits 6 and 8 with the common return circuit 9. These switches 10 and 11 act as drops and are normally held up in open position by latch armatures. The drop switch 10 is controlled by the latch armature 12 and electro-magnet 13, and likewise the drop switch 11 is controlled by latch armature 14 and electro-magnet 15. The battery 7 is therefore common to both bells or alarms 2 and 3, but its action upon the bells is controlled by the drop armatures 10 and 11.

32 is the battery for energizing the electro-magnets 13 and 15 and also the remaining electro-magnetically operated devices constituting elements of my invention. As shown, this battery 32 is connected by one of its poles with the circuits 6 and 8 before referred to, but this is immaterial as to the latter, as it is only the common circuit 6 which is in any way utilized as a part of the circuit of battery 32. Circuit 16 includes electro-magnet 13 and circuit 18 includes electro-magnet 15, and these circuits respectively terminate at one end in the contacts 17 and 19. The other ends of these circuits connect with the common circuit 20 which is in electrical communication with one pole of the battery 32 through a portion of circuit 6. This circuit 20 includes the electro-magnet 25, the spring actuated circuit closing contact or switch 22 and the contact terminal 21 which part 22, when held by the armature 23, operates to constitute a nor-

mally open switch or circuit-breaker, as shown. This armature 23 is arranged to be attracted by electro-magnet 25 against the pull of a spring 23ª, and by means of a finger 24 acting upon the spring contact 22, pulls it away from contact 21 to open circuit 20. The armature is normally held in the position shown by the latch 31 on the armature 30. This latch is made to release the armature 23 by the attraction of the armature 30 by the electro-magnet 29, whose function will now be referred to.

The electro-magnet 29 is in a circuit 26, which has one end in electrical connection with one pole of battery 32 by part of circuit 6 and at its other end, it terminates in two contacts 27 arranged near the contacts 17 and 19, before referred to. This circuit 26 also includes a self-opening or circuit-breaking switch 28, which is normally maintained in a closed condition by the armature 23, the construction being such, that when this switch 28 is closed, the switch 22 is open, and vice versa. The electrical condition of this circuit 26 controls the position of the latch 31 and also the armature 23 and switch 22. When the circuit 26 is open (as shown at 27), the switch 22 is open and consequently, neither of the electro-magnets 13 and 15 can be energized; no current is flowing from battery 32, but the circuit-breaker switch 28 is mechanically held closed by the armature 23. In this condition of the apparatus, the latch switch 10 may be raised and latched and then both of the bell or alarm circuits 6 and 8 will be open. This is the normal condition of the apparatus and there is no drain upon the energy of the batteries.

Referring now to the means shown for controlling circuits 16, 18, 20 and 26, I have provided two floats 35 and 38. Float 35 has a vertically sliding contact 34 which is normally in electric communication with circuit 33 leading from battery 32. Float 38 has an upright rod 37 extending through the upper float 35 and its contact and at its top is provided with a contact 36. It is immaterial as to the means for supporting and guiding the floats; they are vertically movable and if the water level descends, the float 35 and its contact first descend, and finally when low water level is reached, the float 38 and its contact descend. Assuming the parts to be in the condition shown and the high water alarm 2 having been rung, the latch 10 is raised to stop bell 2 from ringing. Assuming further, that the water level was being gradually lowered from high to low water level, the following actions would take place, to wit: Contact 34 would descend and close on contact 27 to put circuit 26 in energized condition from battery 32. This will energize magnet 29 and release armature 23; switch 28 would then open to break circuit 26, and at the same time circuit 20 would be closed by switch 22 coming into contact with contact terminal 21. In this condition of the apparatus, there is no current flowing, because switch 28 is opened before switch contact 22 closes, and further because both switch contacts 10 and 11 are open. Now, as the water level descends, contact 34 breaks from contact 27 and remains clear. The circuits 6 and 8 are now open by switches 10 and 11, circuits 16 and 18 are open by contacts 17 and 19, and circuit 26 is open both by contact 27 and switch 28. At the time contact 34 contacts with contact 17 (high water position), the switch 22 is open as shown, so that no current is flowing through the magnet 13 to release the drop switch 10, but when contact 34 contacts contact 27, the operation above described takes place, but still without sounding an alarm. If the water level continues to be lowered, it will finally reach the float 38 and carry it down with the result that contact 36 contacts with contact 27, but as circuit 26 is open, this accomplishes nothing. As the water level descends still lower, the contact 36 leaves contact 27 and makes contact with the contact terminal 19, to energize circuit 18; this causes magnet 15 to attract armature 14 and release switch 11, which drops to close circuit 8 and ring low water alarm bell 3. This bell will continue to ring until the attendant opens the alarm circuit 8 by raising latch switch 11. Simultaneously with the energizing of the magnet 15, the magnet 25 is energized and pulls its armature 23 into the latched position shown, opening circuit 20 and thereby cutting magnet 15 out of circuit and stopping waste from battery 32, and also allowing latch armature to be restored to normal position.

After sounding the low water alarm 3, it will be presumed that the attendant will refill the tank 5 with water. In this operation, the raising of the float 38 and its contact 36 will cause the circuit 26 to be energized to release the armature 23 to close the circuit 20 and to open the said circuit 26. As the water level still rises, the contact 36 passes out of contact with the contact terminal 27, as shown, and in due time the float 35 begins to rise. The contact 34 then moves up to first contact with contact terminal 27 without result, as the circuit 26 is already open. A further upward movement, caused by the water level reaching the high water mark will make contact with contact terminal 17 and cause circuit 16 and magnet 13 to be energized with the result that drop switch 10 is released as shown. This switch closes circuits 6 and 9 and causes an alarm to be rung on bell 2. The energizing of the circuit 16 operates electro-magnet 25 and opens circuit 20. The latch 31 holds

armature 23 so as to retain the circuit 20 open and permit the latch switch 10 to be raised and held up.

In all cases, the battery 32 will be protected against waste of its energy and this is important, as there is no way to detect its condition, as would be the case with the alarm battery.

In the operation of the self-closing switch 22, it is desirable that it be permitted to remain closed for a part of the movement of the armature 23 to insure its positive movement, as distinguished from vibrating, for which reason I employ a spring actuated circuit closing switch 22 and a finger 24 which comes into contact with said switch 22 only after a considerable movement of the armature. This feature is important for good positive action, but is not essential. In the operation of this apparatus, the controlling mechanism employing the electro-magnets 25 and 29 is automatic for temporarily closing the circuits of the magnets 13 and 15, and then opening such circuits after either of said magnets has operated. In other words, this mechanism guards the battery and puts it in and out of circuit just as needed, and normally maintains it in open circuit. Its operation is effective with a single alarm or with a plurality of alarms, two being shown by way of example.

It will be understood that while two batteries 7 and 32 are shown, this is not at all essential, as a portion of the cells of the battery 32 may be employed for operating the bells 2 and 3. I prefer, however, to employ a separate series of cells 7 for the bells so as not to endanger the operativeness of the automatic electro-magnetic devices, which would occur if the main battery were abnormally weakened. It will also be understood, that while bells 2 and 3 are shown as the indicators or alarms, any other suitable devices may be employed to indicate the conditions for which the apparatus is adapted.

As before stated, the opening and closing of the circuits by means of variation of water levels in a tank, are described merely by way of example of the application of my improvements, and not as a limitation, as the invention may be employed for any use where conditions of apparatus are required to be indicated, by alarm or otherwise, to show abnormal conditions, termination of movements, etc. It will also be understood, that the apparatus is illustrated diagrammatically in the drawings for the purpose of making the arrangement of the circuits and coöperation of the parts clearly understood, and I do not restrict myself in any way to the mere details of the apparatus, as these may be made in any suitable manner so long as they control the circuits under the conditions and in the manner described.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In means for controlling electric circuits, the combination of an indicator, an electric circuit and a source of energy for operating the indicator, a movable device whose position is to be indicated, an electro-magnetically controlled switch for controlling the indicator circuit, a source of energy and circuit including the coils of the electro-magnetically controlled switch, a circuit controlling device for closing or opening the circuit of the coils of the electro-magnetically operated switch, a circuit closing switch arranged in and which will automatically close to maintain the circuit of the coils of the electro-magnetically operated switch, an electric control circuit energized from the second named source of energy and having therein a circuit opening switch, an electro-magnetically operated device also in the circuit of the coils of the electro-magnetically operated switch for positively opening the circuit closing switch and closing the circuit opening switch, a latch for holding the circuit closing switch in open condition, an electro-magnet arranged in the control circuit for actuating the latch to permit the circuit closing switch to close and the circuit opening switch to open, and means to close the control circuit by the condition of the means to be indicated in advance of the closing of the circuit containing the coils of the electro-magnetically operated switch.

2. In means for controlling electric circuits, the combination of an alarm, an electro-magnetically operated control device for the alarm, mechanically operated devices whose condition is to be indicated arranged for controlling the operation of the electro-magnetically operated control device, electro-magnetically operated means for putting the electro-magnet of the electro-magnetically operated control device out of action immediately after being operated to sound the alarm, a source of energy, a circuit from the source of energy including the electro-magnetically operated means, an electro-magnetically operated latch for holding the electro-magnetically operated means out of action, a circuit energized from the source of energy including means for operating the latch, and a switch to control said last mentioned circuit and thus control the electro-magnetically operated latch actuated by the mechanically operated devices.

3. In means for controlling electric circuits, the combination of an alarm, an electro-magnetically operated control device for the alarm, mechanically operated devices whose condition is to be indicated arranged for controlling the operation of the electro-magnetically operated control device, electro-magnetically operated means for putting the electro-magnet of the electro-magneti-

cally operated control device out of action immediately after being operated to sound the alarm, a source of energy, a circuit from the source of energy including the electro-magnetically operated means, an electro-magnetically operated latch for holding the electro-magnetically operated means out of action, a circuit energized from the source of energy including means for operating the latch, a switch to control said last mentioned circuit and thus control the electro-magnetically operated latch actuated by the mechanically operated devices, and a switch to automatically open the last mentioned circuit when the electro-magnetically operated means are released by the latch.

4. In means for controlling electric circuits, the combination of an alarm, electrical means for putting the alarm into action, an electric circuit for operating the electrical means, a self-closing switch in said circuit, an electro-magnetically operated means in said circuit for opening the self-closing switch upon sounding the alarm, and means for locking the self-closing switch in open condition when opened by the electro-magnetically operated means.

5. In means for controlling electric circuits, the combination of an alarm, electrical means for putting the alarm into action, mechanically operated devices for causing the electrical means to be energized, an electric circuit for operating the electrical means, a self-closing switch in said circuit, an electro-magnetically operated means in said circuit for opening the self-closing switch upon sounding the alarm, means for locking the self-closing switch in open condition when opened by the electro-magnetically operated means, and means controlled by the mechanically operated device for releasing the self-closing switch.

6. In means for controlling electric circuits, the combination of two alarms, separate electro-magnetically operated means for controlling each of the alarms, mechanically operated devices for operating the electro-magnetically operated means for the respective alarms at different times, an electro-magnetically operated switch common to both of the electro-magnetically operated means for controlling both alarms whereby they are deënergized, a latch to normally hold the switch in open position, an electro-magnetic means for releasing the latch, and means operated by the mechanically operated device to energize the electro-magnetic means for releasing the latch.

7. In means for controlling electric circuits, the combination of two alarms, separate electro-magnetically operated means for controlling each of the alarms, mechanically operated devices for operating the electro-magnetically operated means for the respective alarms at different times, an electro-magnetically operated switch common to both of the electro-magnetically operated means for controlling both alarms whereby they are deënergized, a latch to normally hold the switch in open position, an electro-magnetic means for releasing the latch, means operated by the mechanically operated device to energize the electro-magnetic means for releasing the latch, and a self-opening switch to put the electro-magnetic means for releasing the latch out of action when the electro-magnetically operated switch is closed.

8. In means for controlling electric circuits, the combination of an electro-magnet and an armature therefor, a self-closing switch adapted to be opened by said armature, a circuit including the self-closing switch and the electro-magnet, a self-opening switch adapted to be closed by the switch operating armature, a latch armature for holding the switch operating armature in position for retaining the self-closing switch in open condition and the self-opening switch in closed condition, an electro-magnet for operating the latch armature, and a circuit including the last mentioned electro-magnet and the self-opening switch.

In testimony of which invention, I hereunto set my hand.

LOUIS STERN.

Witnesses:
R. M. HUNTER,
R. M. KELLY.