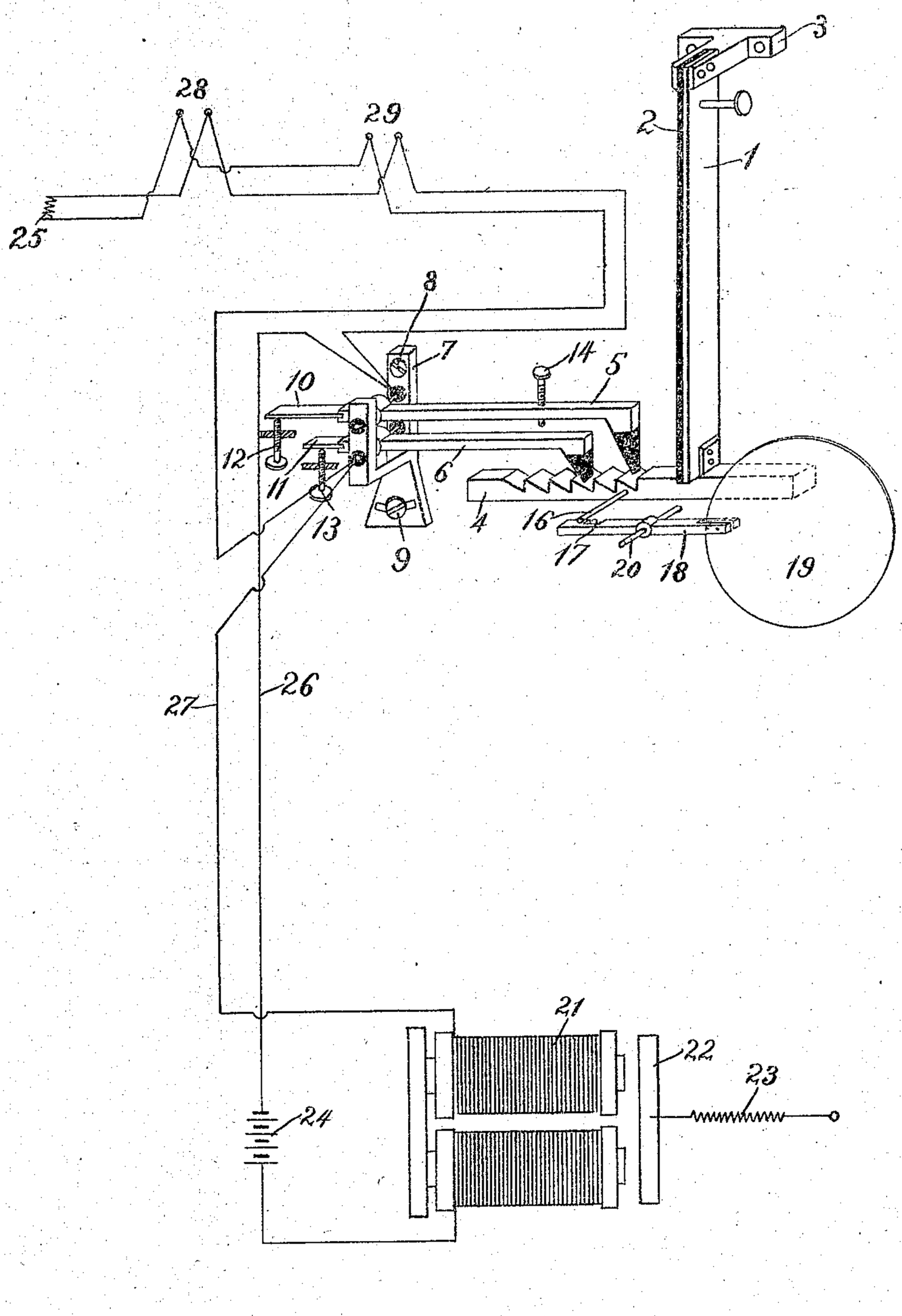
W. H. KIRNAN.

THERMOSTATIC CIRCUIT CONTROLLER.

APPLICATION FILED FEB. 17, 1909.

930,972. Patented Aug. 10, 1909.

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# UNITED STATES PATENT OFFICE.

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## THERMOSTATIC CIRCUIT-CONTROLLER.

No. 930,972. Specification of Letters Patent. Patented Aug. 10, 1909.

Original application filed November 7, 1908, Serial No. 461,452. Divided and this application filed February 17, 1909. Serial No. 478,347.

*To all whom it may concern:*

Be it known that I, WILLIAM H. KIRNAN, a citizen of the United States, residing at Bayonne, county of Hudson, State of New Jersey, have invented certain new and useful Improvements in Thermostatic Circuit-Controllers, of which the following is a full, clear, and exact description.

My invention relates to thermostatic circuit controllers and has for its object to provide a controller which shall be simple and accurate in its operation, and operate so as to change the condition of the circuit controlled a predetermined number of times during changes in temperature in one direction.

It further has for its object to eliminate any possibility of undesired accidental changes in the condition of the circuit.

It further has for its object to provide a thermostatic controller with a semaphore so as to indicate whether or not the thermostat has been actuated so as to vary the circuit, and consists of the features hereinafter described and referred to in the claims.

The following is a description of apparatus embodying my invention, reference being had to the accompanying drawing, which shows in perspective a thermostat circuit controller together with a circuit controlled thereby.

Referring more particularly to the drawings, 1 and 2 are two members of a thermostat consisting preferably of zinc or steel and hard rubber strips, connected at the top and supported by a bracket 3 and having their lower ends connected together. The members so connected constitute a thermostatic couple and actuate a toothed member 4. Upon this toothed member are two pawls 5 and 6 pivotally mounted in insulating bearings in a yoke 7. This yoke is pivotally supported at 8 and has a slot at its lower end through which passes a screw 9, so that the yoke may be adjusted circumferentially about the pivotal support 8. The pawls 5 and 6 act quickly and positively by reason of gravity but preferably have spring extensions 10 and 11 which are engaged by adjusting screws 12 and 13, so as to tend to keep the forward ends of the pawls in engagement with the toothed member 4, and render the action still quicker. One of the pawls has an adjustable contact screw 14. the lower end of which engages with the lower pawl 6 under certain circumstances hereinafter described.

The two pawls 5 and 6 and the rack 4 are so proportioned and located relatively to one another that the pawls are out of step, that is, so that when the rack 4 is moved, the pawls 5 and 6 escape from the teeth with which they engage at different times. When the pawl 5 engages the first tooth, as shown in Fig. 1, the parts are so related that as the toothed member 4 moves, the pawl 5 will escape from its tooth first. This causes the contact 14 to engage the pawl 6 and form an electrical connection between the two pawls so as to vary the condition of an electric circuit whose branches are connected to the pawls 5 and 6. After the pawl 5 has escaped the first tooth of the rack 4 and so long as the pawl 6 is still engaging the third tooth, the pawl 6 supports the pawl 5 and there is an electrical engagement between the two pawls. If the rack 4 is moved still farther to the right, the first action will be for the pawl 6 to escape from the third tooth, thereby breaking the electrical engagement between the contact 14 and the pawl 6, the pawl 5 being supported by the second tooth. As the toothed member 4 moves still farther to the right, so that the pawl 5 escapes the second tooth, the electrical engagement between the two pawls is made again and is broken when the pawl 6 escapes the fourth tooth. The making and breaking operation will be further repeated upon a further movement of the rack 4 to the right. Whenever the electrical engagement is made or broken one of the pawls acts as a detent to prevent the toothed member from moving to the left. The pawls when once in engagement, remain in engagement until the pawl 6 escapes its tooth, howsoever the toothed member 4 may move by reason of varying degrees of temperature or accident. There is practically no danger of having the electrical engagement between the pawls 5 and 6 made and broken, except upon a predetermined temperature change in one direction. The pivotal adjustment of the yoke 7 permits the relative relations of the pawls 5 and 6 to the rack 4 to be varied. Thus, as the yoke 7 is moved in either direction, the movement of the pawl 5 would be different from the movement of the pawl 6, and their relations to the rack 4 and also the degree to which they are out of step can thus be modified.

The rack 4 carries a projection 16, which, when the rack moves so as to disengage the pawl 5 from the first tooth, comes over a notch 17 in the arm 18 of a semaphore 19, permitting the semaphore to swing on its pivot 20 and thereby indicate that the thermostat corresponding thereto has been actuated so as to move its rack into the second position.

Where the toothed member 4 is made of conducting material, the parts of the pawls 5 and 6 bearing thereon should preferably be made of insulating material, as shown in the drawing, so that their engagement with the toothed member 4 will not establish an electrical connection between their conducting portions.

21 represents a relay magnet having an armature 22 retracted by a spring 23 in circuit with a battery 24. This magnet is in series with a resistance 25. One branch 26 of the circuit is electrically connected to the pawl 5, while the other branch 27 is electrically connected to the pawl 6. The resistance 25 is such that the battery 24 will not energize the magnet 21 when the resistance is in circuit. When, however, the pawls 5 and 6 are in electrical engagement, the resistance 25 is short-circuited thereby and the battery 24 then energizes the magnet 21. Other thermostats having pawls 5 and 6 can be connected at various stations, such as 28 and 29, if desired, so that the magnet 21 will be operated by whichever thermostatic controller may be in abnormal condition.

It will be seen from the foregoing that the controller is one which is positive in its action and which will not permit accidental making or breaking of electrical engagement due to jar, vibration or other causes so as to send in undesired signals. It will positively both close and open the circuit through the magnet 21 for given degrees of temperature varying in one direction only.

The rack 4, together with the pawls 5 and 6 adapted to engage said rack and each other, constitutes a quick positively acting switch, controlling the terminals of the circuit of the battery 24. The switch is actuated by a movement of the thermostat in one direction but not by a movement in the other direction, and whenever so actuated produces a plurality of alternate makes and breaks upon a predetermined movement of the thermostat, so that for successive degrees of temperature the circuit is made and broken. Thus with the arrangement shown, the circuit can be made three times as the temperature increases. It is not, however, affected by a decrease in temperature. The quick action eliminates the danger of a sneaking or false contact, and assures a positive and permanent contact when a given temperature is attained.

My invention permits of various modifications without departing from the spirit thereof, and I do not limit it to the particular embodiment shown in the drawings.

This application is a division of my application Ser. No. 461,452 filed November 7, 1908.

What I claim is:

1. The combination of a quick acting switch locked against movement in one direction, circuit terminals controlled thereby, and a thermostatic couple actuating said switch by a movement in one direction only, said thermostatic couple causing said switch to produce a plurality of positive alternate makes and breaks of the electrical continuity between said terminals upon a predetermined movement.

2. The combination of a circuit having terminals, movable means for electrically connecting and disconnecting said terminals, and a thermostatic couple acting to move said means positively to vary the electrical connections between said terminals only during an increase in temperature.

3. The combination of a thermostat, a circuit having contacts connected therewith, and means controlled by said thermostat for electrically connecting said contacts upon a given movement of said thermostat, and a semaphore released by said thermostat when moved from its normal position.

4. In an electric system, the combination of a thermostat having a plurality of abnormal positions under various abnormal conditions, circuit contacts actuated thereby when in a plurality of said positions, and a semaphore released by said thermostat when in the first abnormal position.

5. In an electric system, the combination of a thermostat, a member carrying teeth-like projections moved by said thermostat, two pawls engaging teeth on said member, the relations of one pawl with its tooth differing from the relations of the other pawl with its tooth, said pawls having contact surfaces adapted to be electrically connected and disconnected by the movements of said pawls.

6. In an electric system, the combination of a thermostatic couple, a member carrying teeth-like projections moved by said thermostatic couple, two pawls engaging teeth on said member, the relations of one pawl with its tooth differing from the relations of the other pawl with its tooth, and circuit contacts carried by said pawls and brought into engagement and disengagement by the movement of said member.

7. In an electric system, the combination of a thermostat, a member carrying teeth-like projections adapted to be moved by said thermostat, a plurality of pawls engaging said teeth and out of step with one another as said member moves, and a contact carried by one of said pawls and en-

gaging the other when one pawl leaves a tooth on said member, and being disengaged when the other pawl leaves a tooth on said member.

8. In an electric system, the combination of a thermostat, a toothed rack, two pawls engaging teeth on said rack and located so as to be out of step with one another as the rack is moved longitudinally relatively to said pawls, said thermostat being adapted to cause a relative longitudinal movement between said rack and pawls said pawls having contact surfaces adapted to be electrically connected and disconnected by the movements of said pawls.

9. In an electric system, the combination of a thermostat, a toothed rack moved thereby, two pawls engaging teeth on said rack and located so as to be out of step with one another as the rack is moved, an angularly adjustable member carrying said pawls, the connections of said pawls with said member being out of line with one another and at least one of them out of line with the axis of adjustment of said member said pawls having contact surfaces adapted to be electrically connected and disconnected by the movements of said pawls.

10. In an electric system, the combination of a thermostat, a toothed rack moved thereby, two pawls engaging teeth on said rack and located so as to be out of step with one another as the rack is moved, an angularly adjustable member to which said pawls are pivoted, the axes of said pawls being out of line with one another said pawls having contact surfaces adapted to be electrically connected and disconnected by the movements of said pawls.

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