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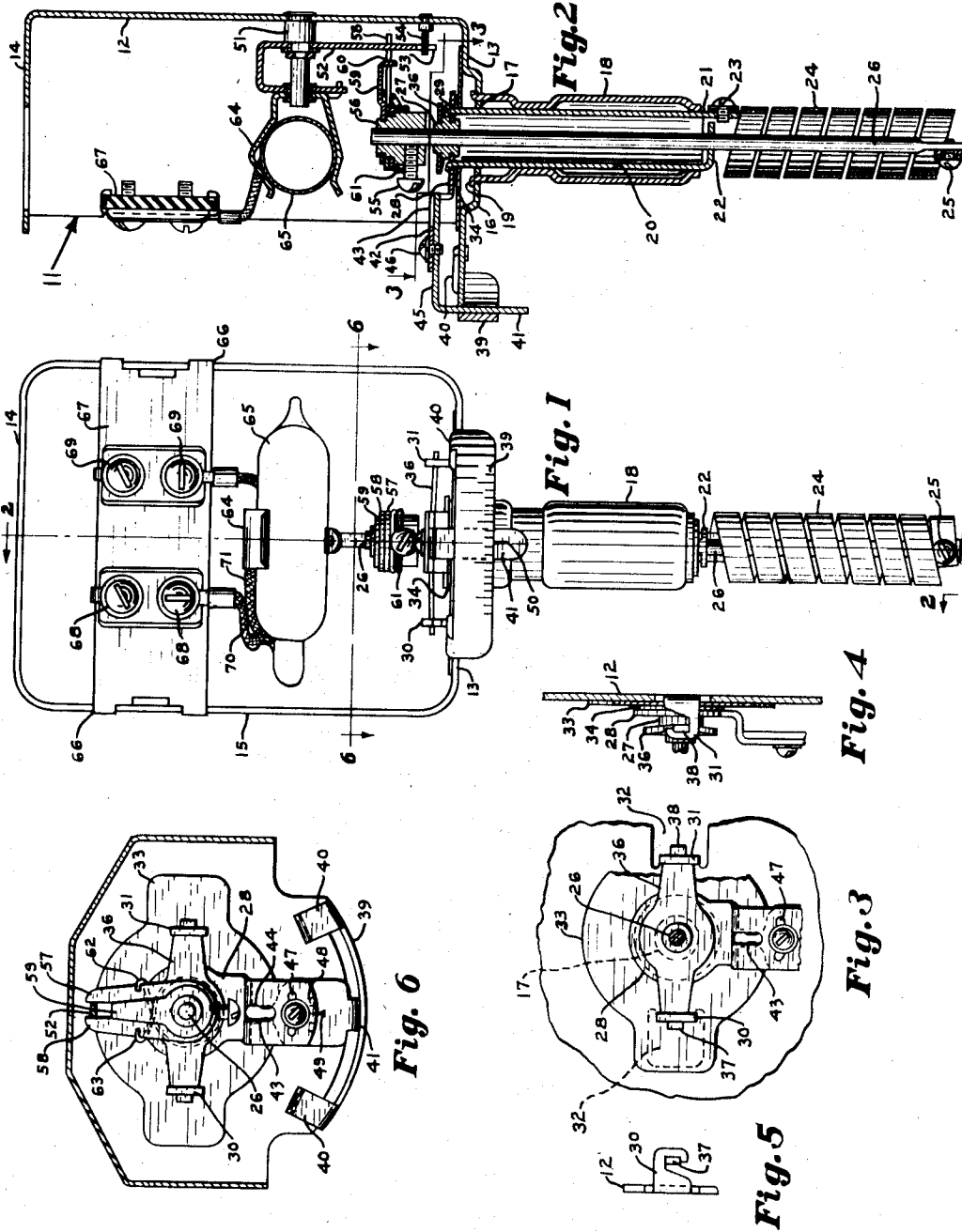
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2,196,507

THERMOSTATIC SWITCH

Filed March 17, 1938

2 Sheets-Sheet 1



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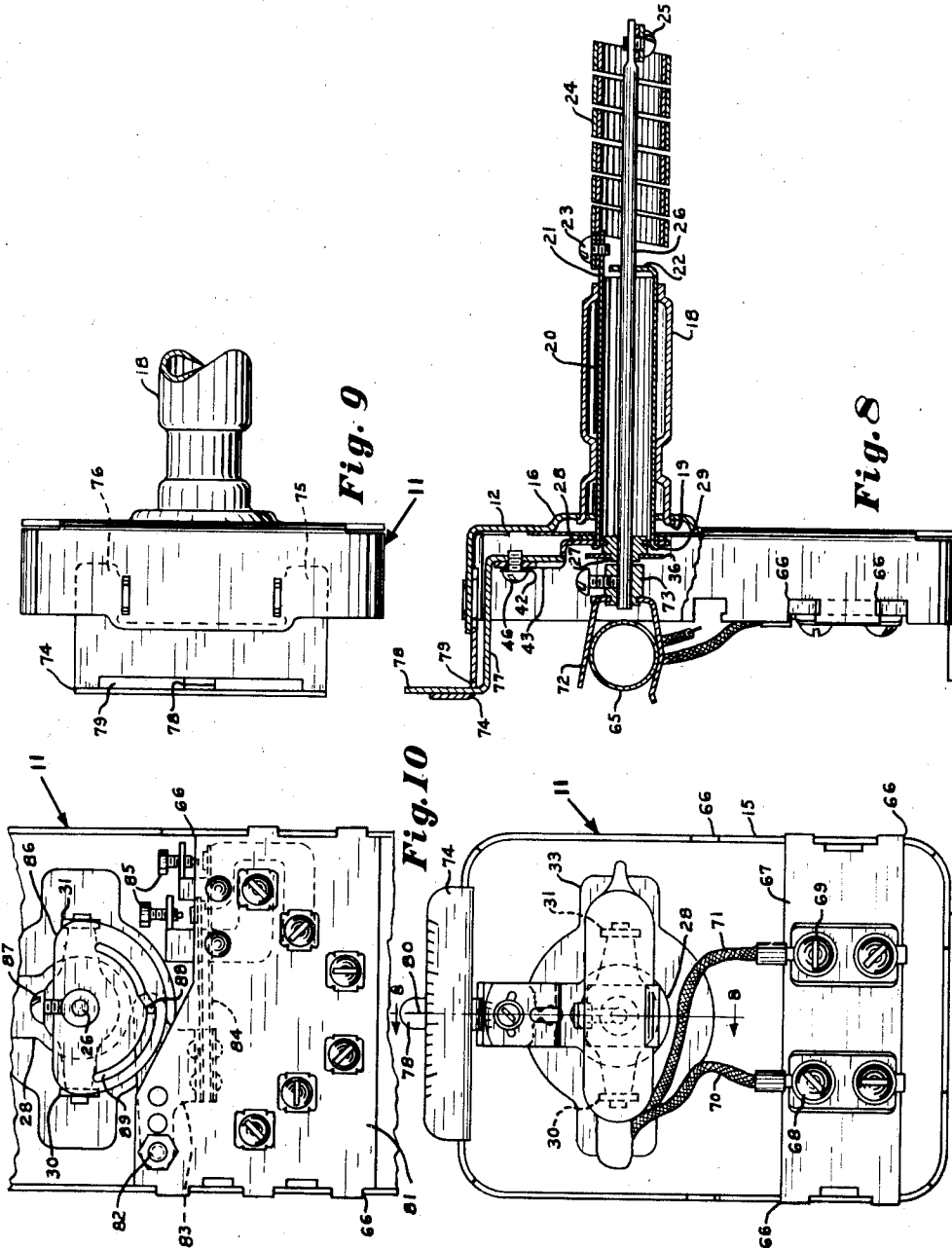
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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THERMOSTATIC SWITCH

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17 Claims. (Cl. 200—139)

This invention relates generally to thermostatic switches and is directed more particularly to the assembly of the various parts.

One of the main objects of this invention is to provide a thermostatic switch which is easy to assemble and disassemble whereby the initial assembly and replacement of parts will be greatly facilitated.

Another object is to provide a bimetallic spiral thermostat which is supported by a tube and which rotates a rod which in turn actuates a switch, wherein the parts are releasably held in operative position in a switch casing by means of a resilient latch.

Another object is to provide a device of the type set forth in the preceding paragraph wherein the resilient latch is inserted under hook members bent up from the switch casing.

Still another object of the invention is to provide an adjustment for a thermostatic switch having a scale which indicates the temperature for which the switch is adjusted and which has a simple and novel way of calibrating the switch.

These and other objects will become readily apparent as the following specification is read in the light of the accompanying drawings in which:

Figure 1 is a front elevation of a thermostatically operated mercury switch adapted for vertical mounting and embodying the present invention;

Figure 2 is a section taken on the line 2—2 of Figure 1 and looking in the direction of the arrows;

Figure 3 is a view, partially in section, looking down at the bottom of the switch casing and taken along the line 3—3 of Figure 2;

Figure 4 is a detailed view of the assembly looking to the left in Figure 3;

Figure 5 is a view of one of the hook members looking toward the right in Figure 3;

Figure 6 is a view taken on the line 6—6 of Figure 1 looking in the direction of the arrows;

Figure 7 is a front elevation of a thermostatically operated mercury switch adapted for horizontal mounting and embodying the principles of this invention;

Figure 8 is a side elevation of the same device, part of which is in section taken along the line 8—8 of Figure 7 looking in the direction of the arrows;

Figure 9 is an elevation looking down on the switch casing, and

Figure 10 is a partial front elevation of an open

contact type of switch which also embodies the principles of the present invention.

Like reference numerals refer to like parts throughout the several views of the drawings.

Referring first to Figures 1 to 6, inclusive, it will be seen that I have provided a switch casing generally indicated at 11 which comprises a back plate 12, a bottom plate 13, a top plate 14, and two sides 15. The bottom plate 13 of the casing has in it a depressed portion 16 in which is cut a round hole 17. A sleeve 18 is located outside of the casing around the hole 17 and is attached securely to the casing by means of projections 19 on the sleeve which are inserted through small holes in the casing and bent over to provide a permanent connection. Inserted through hole 17 and extending within the sleeve 18 is a tube 20, one end of which is provided with two ears 21 and 22. The ear 21 carries by means of screw 23 one end of a bimetallic spiral 24, the other end of which is connected by means of screw 25 to an end of a rod 26 which extends through the bimetallic member and tube 20 to a point within the switch casing 11. The ear 22 on the tube 20 is bent inwardly and is provided with a hole through which the rod 26 is passed and therefore acts as a bearing member for the rod.

Located within the casing and mounted on the rod 26 so that it can rotate freely thereon is a shouldered bearing member 27 to which is fixedly attached a circular plate 28. The plate 28 is provided with a series of small holes through which projections 29 on the tube 20 are inserted in order to provide a permanent connection between the plate and the tube. Two hook members 30 and 31 are stamped out of the bottom of casing 11 and are bent up as shown more clearly in Figures 1, 3, 4, and 5. This construction leaves two holes 32 in the bottom of the casing 11 and a plate member 33 is provided in order to cover these holes. This plate member is adapted to slip over the tube 20 and has in it two holes through which the hook members 30 and 31 may project. Located between this plate member 33 and the circular retaining plate 28 is a small friction washer 34 whose purpose is to offer a resistance to movement of the plate 28 with respect to the plate 33.

The bearing member 27 is provided with a shoulder on which a resilient latch member 35 is adapted to seat. This latch member has reduced ends 37 and 38 which are adapted to be inserted beneath the two hook members 30 and 31. It will be noted with reference to Figures 4 and 5 that the hook members 30 and 31 are facing

in opposite directions so that the latch 36 may be engaged with these hook members by merely depressing the two ends and rotating the latch in a clockwise direction until the ends are beneath the hook members. The latch 36 will then exert a downward force on the bearing member 27 which will hold the members 28, 34 and 33 tightly against the bottom of the casing 11 which will maintain the tube 23 in fixed relationship with respect to the casing 11.

An arcuate scale 39 is attached to the bottom of the casing 11 by means of two legs 40 which are permanently connected to the casing by inserting the ends thereof through small holes in the casing and bending the ends over. An arcuate space is left between the face of the scale 39 and the edge of bottom 13 of the casing 11 to permit an indicating arm 41 to move therein. The circular plate 28 has an extension 42 which is bent upwardly and then horizontally and is provided with a slot as shown at 43. The indicating arm 41 has a horizontally extending portion 45 with a reduced end which is inserted in the slot 43. Riding freely in an arcuate slot 47 cut in the horizontal extension 42 on the plate 28 is a screw 46 which screw-threadedly engages the horizontally extending portion 45 of indicating arm 41. If the screw is tightened, the indicating arm 41 and the extension 42 will be held in fixed relation but if the screw 46 is loosened the indicating arm may be moved rotatably with respect to the extension 42 throughout the length of the arcuate slot 47. A small scale 48 is applied to the end of the extension 42 and a small arrow 49 on the indicating arm 41 indicates the relative adjustment of the extension 42 and the indicating arm 41. This adjustment is provided for the purpose of permitting factory calibration of the instrument, and after the instrument has once been properly calibrated the screw is sealed with a small amount of cement to make this adjustment permanent. The face of the scale 39 is provided with indicia with which an indicating mark 50 on arm 41 cooperates to indicate the temperature setting of the switch.

Attached to the back 12 of the switch casing is a pin 51 on which is rotatably mounted a U-shaped arm 52 which has a bifurcated end 53 straddling a stop pin 54. Adjustably positioned on the end of rod 26 by means of screw 55 is a shouldered member 56 on which two arms 57 and 58 freely rotate. Fixedly mounted on member 56 is a third arm 59 which has a depending end 60 which is inserted between the two arms 57 and 58. A coil spring 61 is wrapped about member 56 and has one end 62 curved around arm 57 and its other end 63 curved around arm 58 which biases the two arms for movement toward each other. Also located between the two arms 57 and 58 is one leg of the U-shaped member 52.

Rigidly connected to member 52 and also mounted for pivotal movement about pin 51 is a clip 64 which carries a mercury switch 65. Above the switch 65 the two sides 15 of the switch casing 11 are provided with notches 66 which support a panel 67 on which are mounted two pairs of terminals 68 and 69. Conductors 70 and 71 are connected to the terminals of the mercury switch 65, and the conductor 70 is connected to one terminal of the pair 68 and conductor 71 is connected to one terminal of the pair 69. The other terminals of these pairs are adapted to be connected to an external circuit which it is desired to control by the operation of the mercury switch.

The operation of this device should now be

clear. If the temperature increases the bi-metallic spiral 24 will unwind and rotate the rod 26 in a counter-clockwise direction as viewed in Figure 6 which will move the arm 59 and hence the arms 58 and 57 in a counter-clockwise direction which will cause the member 52 to rotate about the pin 51 until its bifurcated end 53 is stopped by the pin 54. Movement of the member 52 will, of course, tilt the mercury switch, with which it is connected, in a direction to break the connection between its contacts. Any further movement of the arm 59 by the thermostat 24 after pin 54 has stopped the member 52 will be absorbed by the coil spring 61, which will permit further movement of the arms 58 and 59 in a counter-clockwise direction after the arm 57 has been stopped by the member 52. A decrease in temperature will, of course, cause the spiral 24 to wind which will move the parts in a clockwise direction until the arm 59 strikes arm 57 which will cause a pivotal movement of the member 52 in the opposite direction to cause the mercury switch to close its contacts. Any further contraction of the spiral 24 after the member 52 has been stopped by pin 54 will be permitted by the coil spring 61 in the same manner as in the case just described on a rise in temperature.

The modification disclosed in Figures 7, 8, and 9 is very similar to the modification just described except that in this case the thermostat is arranged for horizontal mounting whereas in the first modification it was arranged for vertical mounting. In Figure 8, it will be seen that the depression 16 in the switch casing 11 is located in the back plate 12 rather than in the bottom 13 as in Figure 2. The mounting for the thermostat and the resilient latch is otherwise identical with the other modification. In this instance, however, the clip 72 for the mercury switch 65 is directly mounted on the rod 26 by means of the adjustable connection 73. The panel 67 is mounted in the lower portion of the casing below the mercury switch but is otherwise the same as in the other modification. In this modification, however, the scale plate 74 is straight instead of arcuate and is mounted by means of its legs 75 and 76 to the top of the switch casing 11. The indicating arm 77 is attached to the extension 42 of the plate 28 in the same manner as before and has an upstanding arm 78 which moves back and forth through slot 79 in the scale plate 74. The face of the scale plate is provided with indicia with which cooperates a pointer 80 on the indicating arm 77.

An increase in temperature causes the bi-metallic spiral 24 to unwind and rotate the rod 26 and hence the mercury switch 65 in one direction while a decrease in temperature will cause the spiral to wind up and rotate the rod 26 and the mercury switch in the opposite direction.

The first two modifications disclose the operation of a mercury switch and the modification disclosed in Figure 10 shows an open contact type of switch. In this case a panel 81 is mounted in the lower part of the switch casing and carries on its reverse side by means of a pivot pin 82 and a carrier member 83 pivoted thereon a set of flexible switch arms 84. Mounted on the panel 81 is a pair of stationary contacts 85 with which the flexible switch arms cooperate. In this case a cam 86 is adjustably mounted on the rod 26 by means of a screw 87 for operating the switch arms 84. The switch carrier 83 is provided with a forwardly extending pin 88 which is located in

a curved slot 89 in the cam so that rotation of the cam 86 by means of the thermostat 24 will cause the pin 88 to be moved up and down due to the curved shape of the slot 89. Movement up and down of the pin 88 will pivot the switch carrier 83 about the pin 82 and cause actuation of the switch arm 84. The mounting for the thermostat and indicating arm in this modification is exactly the same as that for the modification disclosed in Figures 7, 8, and 9 and therefore it need not be described in detail at this time.

It will be seen that this device is extremely easy to assemble and disassemble in that the parts are held together by means of a spring latch arrangement and there are a minimum number of permanent connections to remove. To disassemble the switch of Figure 8 for example, it is only necessary to remove the screws 23, 25, and 46. After this has been done, the ends 37 and 38 of the resilient latch 36 are depressed and the latch turned in a counter-clockwise direction which will release the entire mechanism. The panel 67 may also be removed from the casing merely by slipping it out of the notches 66.

It will also be noted that the factory calibration for the indicating arm is very simple and effective in that it is only necessary to loosen the screw 46 which will permit the arm 77 to be rotated about its reduced end which is inserted in the slot 44 until the pointer 80 indicates the temperature at the terminal 24. Merely removing the screw 46 will permit the arm 77 to be removed from the casing 11.

It is therefore apparent that the thermostatic switch which I have devised is one which is efficient in operation and yet has a minimum number of parts and which is easy to assemble and disassemble and may be manufactured at a low cost.

Certain other modifications and changes in this invention may occur to those who are skilled in the art, and it is therefore to be understood that I will be limited by the scope of the appended claims and not by the specific embodiments disclosed.

I claim as my invention:

1. In combination, a casing, a hole in said casing, a tube extending through said hole, a rod located within said tube, means for causing relative rotation between said tube and said rod, a radially enlarged member attached to the end of the tube within said casing for preventing said end from passing through said hole in said casing, latch holding means, a resilient latch engageable by rotation with said latch holding means for holding said enlarged member against said casing, and means actuated by said rod.

2. In combination, a casing, a hole in said casing, a tube extending through said hole, a rod located within said tube, means for causing relative rotation between said tube and said rod, a radially enlarged member attached to the end of the tube within said casing for preventing said end from passing through said hole in said casing, hook members bent up from said casing, a resilient latch engaging under said hook members for holding said enlarged member against said casing, and switch means actuated by said rod.

3. In combination, a casing, a hole in said casing, a tube extending through said hole, a rod located within said tube, thermostatic means for causing relative rotation between said tube and said rod, a radially enlarged member attached to the end of the tube within the casing for preventing said end from passing through said hole in

said casing, hook members bent up from said casing on opposite sides of said hole in said casing, a plate surrounding said tube and covering the holes in said casing produced by bending up said hook members, a resilient latch engaging under said hook members for holding said plate and enlarged member in assembled relation against said casing, and switch means operated by said rod.

4. In combination, a casing, a hole in said casing, a tube extending through said hole, a rod located within said tube, a thermostat of the bimetal coil type connected at one end to said tube and at the other end to said rod, a radially enlarged member having an extension arm, said member being located within said casing and attached to the end of the tube, latch holding means, a resilient latch engageable by rotation with said latch holding means for holding said member against said casing, a switch operated by said thermostat, and means for moving said extension arm for adjusting the temperature at which the thermostat will actuate said switch.

5. A thermostatic switch comprising in combination, a casing, a hole in said casing, a tube extending through said hole, a rod located within said tube, thermostatic means located outside of said casing and causing relative rotation between said tube and said rod on temperature changes, hook members formed and bent up from said casing on opposite sides of said hole, a plate surrounding said tube inside of said casing and adapted to lie against said casing to cover the holes formed by bending up said hook members, a member attached to the end of said tube within said casing, a friction washer between said plate and member, resilient means engaged under said hook members for keeping said parts in assembled relation, a mercury switch operated by said rod, and means for moving said member to adjust the temperature at which said thermostat actuates said switch.

6. A thermostatic switch comprising in combination, a casing, a hole in said casing, a tube extending through said hole, a rod located within said tube, thermostatic means located outside of said casing and causing relative rotation between said tube and said rod on temperature changes, hook members formed and bent up from said casing on opposite sides of said hole, a plate surrounding said tube inside of said casing and adapted to lie against said casing to cover the holes formed by bending up said hook members, a member attached to the end of said tube within said casing, a shouldered sleeve surrounding said rod and attached to said member, a friction washer located around said tube between said member and plate, resilient means surrounding said rod and seated on a shoulder of said shouldered sleeve and having its ends engaged under said hook members so as to hold the parts in assembled relation, and switch means actuated by said rod.

7. A thermostatic switch comprising in combination, a casing, a hole in said casing, a tube extending through said hole, a rod located within said tube, thermostatic means located outside of said casing and causing relative rotation between said tube and said rod on temperature changes, hook members formed and bent up from said casing on opposite sides of said hole, a plate surrounding said tube inside of said casing and adapted to lie against said casing to cover the holes formed by bending up said hook members, a member attached to the end of said tube within said casing, a shouldered sleeve surrounding said

rod and attached to said member, a friction washer located around said tube and between said member and plate, resilient means surrounding said rod and seated on a shoulder of said should-
 5 ered sleeve and having its ends engaged under said hook members so as to hold the parts in assembled relation, switch means actuated by said rod, an adjustable connection between said rod
 10 and said switch means, an adjusting arm connected to said member for imparting rotation thereto whereby the temperature at which the thermostatic means actuates the switch may be varied, indicating means cooperating with said
 15 adjusting arm, and means for varying the relationship between the adjusting arm and said member whereby the thermostatic switch may be properly calibrated.

8. A thermostatic switch comprising in combination, a casing, a hole in said casing, a tube
 20 extending through said hole, a rod located within said tube, thermostatic means located outside of said casing and causing relative rotation between said tube and said rod on temperature
 25 changes, a member located within said casing and attached to the end of the tube to prevent it from passing through said hole, an extension on said member having a bend, a slot in said extension
 at the bend, an operating arm having a portion inserted in said slot and another portion adjust-
 ably supported by said extension, resilient means for holding said member against said casing, and
 switch means actuated by said rod, said operating arm adjusting the temperature at which said
 thermostatic means will actuate said switch means.

9. A thermostatic switch comprising in combination, a casing, a hole in said casing, a tube
 extending through said hole, a rod located within said tube, thermostatic means located outside of
 said casing and causing relative rotation between said tube and said rod on temperature changes,
 a member located within said casing and attached to the end of the tube to prevent it from
 passing through said hole, an extension on said member having a bend, a slot in said extension
 at the bend, another arcuate slot in said extension the center of curvature of which is at said bend,
 an adjusting arm having a portion inserted in said first named slot, a screw threaded into a
 hole in said adjusting arm and extending through the arcuate slot in said extension, and means
 for loosening the screw to permit the relative adjustment of the two members and for tighten-
 ing the screw to clamp the members together.

10. A thermostatic switch comprising in combination, a casing adapted to be mounted in a
 vertical position, a hole in the back of said casing, a tube extending horizontally through said
 hole, a rod located within said tube and extend-
 65 ing longitudinally thereof, a bimetallic thermostat located outside of said casing for causing
 relative rotation between said rod and said tube, a member within said casing attached to the end
 of said tube to prevent it from passing through
 70 said hole, a resilient latch for clamping said member against said casing, an extension on said
 member comprising a horizontal portion and an upwardly extending vertical portion, a slot in said
 extension, an adjusting arm for moving said
 member and hence adjusting the temperature
 setting of said thermostatic switch, said arm hav-
 ing a downwardly extending vertical portion with
 an end inserted in said slot, and means for ad-
 justing said adjusting arm relatively to said ex-

tension rotatably about said end in order to cali-
 brate the switch.

11. A thermostatic switch comprising in combination, a casing adapted to be mounted in a
 vertical position, a hole in the bottom of said
 5 casing, a tube extending vertically through said hole, a rod located within said tube and extending
 longitudinally thereof, a bimetallic thermostat located outside of said casing for causing relative
 rotation between said rod and said tube, a mem-
 10 ber within said casing attached to the end of said tube to prevent it from passing through said
 hole, a resilient latch for clamping said member against said casing, an extension on said mem-
 15 ber comprising a vertical and a horizontal portion, a slot in said extension, an adjusting arm for
 moving said member and hence adjusting the temperature setting of said thermostatic switch,
 said arm having a horizontally extending portion
 20 with an end inserted in said slot, and means for adjusting said adjusting arm relatively to said
 extension rotatably about said end in order to calibrate the switch.

12. A thermostatic switch comprising in combination, a casing adapted to be mounted in a
 vertical position, a hole in the back of said cas-
 ing, a tube extending horizontally through said
 hole, a rod located within said tube and extending
 longitudinally thereof, a bimetallic thermostat lo-
 cated outside of said casing for causing relative
 rotation between said rod and said tube, a mem-
 ber within said casing attached to the end of
 said tube to prevent it from passing through said
 hole, a resilient latch for clamping said member
 against said casing, an extension on said member
 comprising a horizontal portion and an upwardly
 extending vertical portion, a slot in said exten-
 sion, an adjusting arm for moving said member
 and hence adjusting the temperature setting of
 said thermostatic switch, said arm having a
 downwardly extending vertical portion with an
 end inserted in said slot, means for adjusting
 said adjusting arm relatively to said extension
 rotatably about said end in order to calibrate
 the switch, a forwardly extending L-shaped
 bracket attached to the upper end of said casing,
 a scale at the forward end of said bracket, a slot
 in said bracket at the bend therein, said adjust-
 ing arm having a forwardly extending part and
 another upwardly extending vertical part, said
 50 last named vertical part extending through the
 slot in said bracket and cooperating with said
 scale whereby the temperature to which the
 switch has been set by said adjusting arm may
 be read on the scale.

13. A thermostatic switch comprising in combination, a casing adapted to be mounted in a
 vertical position, a hole in the bottom of said
 casing, a tube extending vertically through said
 hole, a rod located within said tube and extend-
 60 ing longitudinally thereof, a bimetallic thermo-
 stat located outside of said casing for causing
 relative rotation between said rod and said tube,
 a member within said casing attached to the end
 of said tube to prevent it from passing through
 65 said hole, a resilient latch for clamping said
 member against said casing, an extension on said
 member comprising a vertical and a horizontal
 portion, a slot in said extension, an adjusting
 arm for moving said member and hence adjusting
 70 the temperature setting of said thermostatic
 switch, said arm having a horizontally extend-
 ing portion with an end inserted in said slot,
 means for adjusting said adjusting arm relative-
 ly to said extension rotatably about said end in

order to calibrate the switch, a forwardly extending L-shaped bracket attached to the lower end of said casing, a scale at the forward end of said bracket, a slot in said bracket at the bend therein, said operating arm having a downwardly extending vertical part extending through the slot in said bracket and cooperating with said scale whereby the temperature to which the switch has been set by said adjusting arm may be read on the scale.

14. In combination, a condition responsive means, a switch actuated thereby, a member for adjusting the value of the condition at which said condition responsive means actuates said switch, said member having an elongated slot therein, an adjusting arm carried by said member and having one end reduced to a width substantially equal to the width of said slot, said end being inserted in said slot, and means for adjusting the position of said arm relatively to said member rotatably about said reduced end.

15. In a thermostatic switch, a thermostat, a switch actuated thereby, a member for adjusting the temperature at which the thermostat actuates said switch, said member having an elongated slot therein, an adjusting arm having one end reduced to a width substantially equal to the width of said slot, said end being inserted in said slot, an arcuate slot in said member, and a screw threaded in said adjusting arm and extending through said arcuate slot whereby said adjusting arm and said member may be adjusted relative to each other throughout the length of said slot.

16. In a thermostatic switch, a thermostat, a switch actuated thereby, a member for adjusting the temperature at which the thermostat actuates said switch, said member having an elongated slot therein, an adjusting arm having one end reduced to a width substantially equal to the width of said slot, said end being inserted in said slot, an arcuate slot in said member, a screw threaded in said adjusting arm and extending through said arcuate slot whereby said adjusting arm and said member may be adjusted relative to each other throughout the length of said slot, a scale on said member, and a pointer on said adjusting arm so that the relative adjustment of these two parts may be read directly from the scale.

17. In combination, a casing, a hole in said casing, a sleeve mounted in said hole, a rod located within said sleeve, a bimetallic thermostat connected at one end to said sleeve and at the other end to said rod for rotating said rod in accordance with temperature changes, a disc located within said casing and connected to said sleeve, said disc being of such size as to be incapable of passing through said hole, means for rotating said disc for adjusting said thermostat, and an elongated resilient latch mounted over said rod, the ends of said latch being forcibly engaged beneath portions of said casing whereby the center portion of said latch resiliently maintains said disc and sleeve in assembled relation with respect to said casing.

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