This invention relates to improvements in electrical switches, and its objects are as follows:

First, to provide an electrical switch with an associated hygrometer for operating said switch according to varying moisture conditions in the surrounding atmosphere, especially in the atmosphere of mines wherein the switch is adapted to be used for the purpose of actuating certain signal apparatus.

Second, to make an effective air seal between the air chamber and electrical switch compartment for the chief purpose of excluding explosive gases from said compartment and thereby preventing their ignition by any sparking that might occur therein.

Third, to utilize the partition which separates the air chamber from the electrical switch compartment as the mount for the means which makes the foregoing air seal around the turnable pointer shaft which shaft extends from the chamber into the compartment.

In the drawing:

Figure 1 is a sectional view of the improved switch, parts being shown in elevation, and the electrical wiring being indicated diagrammatically.

Figure 2 is a cross section taken on the line 2—2 of Fig. 1.

Figure 3 is a detail section of the structure which makes the air seal around the pointer shaft.

Figure 4 is a vertical section taken on the line 4—4 in Fig. 2.

Figure 5 is a vertical section taken on the line 5—5 of Fig. 3.

Figure 6 is a detail view of the swingable switch arm, illustrating the use of a spring for returning said arm in lieu of the weight for that purpose illustrated in Fig. 1.

This application is a continuation in part of an application for patent for hygrometer operated switch filed by Karl F. Schoew, August 31, 1932, Serial No. 631,261, issued November 5, 1935, as patent Number 2,019,633. The instant construction is identical in principle with the chief structure on which the foregoing application is based, but embodies some changes which it has been found are an additional advantage.

The switch, generally designated 4, comprises a casing of cylindrical shape (but not necessarily so), which casing is composed of cylindrical members 6, 7. The member 8 is internally threaded part way as at 8 to admit a closure 9 which is screwed in place to form a back. Flanges 10 and 11 on adjacent ends of the members 6, 7 are suitably secured in common to a partition 13 which divides the casing into an air chamber 14 and an electrical switch compartment 15.

A screened window 16 provides access of the outer air to the interior of the chamber 14. The compartment 15 is made as air tight as possible, chiefly for the purpose of excluding explosive gases from the electrical switch parts which it contains. It is regarded desirable to state that in mines containing a gaseous atmosphere electrical apparatus is permitted only when the electrical parts are sealed from the air. The sealing means herein provided is, therefore, a provision for safety in that it prevents the ignition of an explosive gaseous mixture.

Rubber washers 18 are used on each side of a cover glass 19 at the front of the switch, said washers engaging opposite sides of the glass near the rim and being pressed against the enlarged end 20 of the cylindrical member 7 when the bezel 21 is screwed home. Situated in the air chamber 14 is a hygroscopic metallic absorption element 35. This is made in spiral form (Fig. 4) and it is capable of lengthening and contracting by the atmospheric moisture conditions to which it is subjected. One end of it is anchored to the partition 13. The other end of it is secured at 96 to the pointer shaft 25.

A bracket 97 (Fig. 2) constitutes the foregoing anchorage for the first end of the absorption element; this together with a screw 98 which secures the bracket in place on the partition. The bracket, screw and pointer shaft are electrically separated from the partition by insulation 99. The bracket has holes 100 in which the arms of a clamp yoke 101 have limited sliding movement when a set screw 102 is tightened or loosened. The bent ends 103 (bent to position after inserting the arms of the yoke) bear down upon the absorption element near its free end and hold the element to whatever adjustment the screw 102 may have been set for. The adjustment is made, taking in more or less of the loose end of the element (Fig. 4), until a proper reading on the humidity scale is obtained, whereupon the set screw 102 is tightened.

A plurality of contacts is under control of the pointer 37, one of these being a freely swingable brass (or similar metal) arm 104 the other a pin 105. This pin and a similar one 106 limit the swinging of the arm 104. Swinging in one direction is accomplished by a stud 107. This stud is carried by an arm 108 which is indirectly affixed to the shaft 25 as is the pointer 37. The stud 107 can be made integral with the pointer, thus eliminating the arm 108, but the arm 108 with its integral stud 107 is here shown because as a manufacturing proposition it is usually better to make the arrangement this way, the pointer, generally being stamped from stock which is too thin to satisfactorily carry the stud.

The stud 107 constitutes contactor means, and it forms part of a switch box 109 for the purpose of opening a circuit by disengaging 104 from 105, and closing a circuit by its own engagement with

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The arm 104 is freely swung from a support 105 fixed on the partition 13 (Fig. 2), the arm being held in engagement with the pin 105 (unless disengaged by the stud 107), by a weight 110 which is affixed to said arm in any convenient way.

While the foregoing weight constitutes the preferred means for normally holding the arm 104 in engagement with the pin 105, it is contemplated that a spring 22 (Fig. 6) shall be used in substitution. The opposite ends of this spring are attached to an ear 23 on the arm 104 and a pin 24 on the support 15. The spring is partly wrapped around the support as shown, and its position between the ear and pin offers the additional advantage of holding the hub of the arm in place on the support.

Indicia 12 comprises the words dangerous and safe. "Safe" means a relative humidity of 80% or over, while "Dangers" applies to any condition less than 80% relative humidity. This indication is now printed or otherwise applied to an arcuate target 113 which is supported on the partition 13 by spacers 114 (Fig. 2).

Signal means are used in conjunction with the switch, these being shown as consisting of white and red lamps 63 and 65. A suitable source of current is designated 116. A wire 118 connects one side of the lamps. A spring 25 is partly wrapped around the support as shown, and the position between the ear and pin offers the additional advantage of holding the hub of the arm in place on the support.

Clamping means 32 is applied to the sleeve in the region of the slit, and when these gaskets are moistened with oil which improves their sealing qualities. The operation is readily understood. The clamping means 32 is applied to the sleeve in the region of the slit, and when these gaskets are moistened with oil which improves their sealing qualities. The operation is readily understood.

The pointer shaft 25 is adapted to turn either clockwise or counter-clockwise, these turnings being the direct result of a lengthening of the element 99 (Fig. 4) as by the accretion of moisture, or a shortening thereof by the loss of moisture. When the atmospheric condition is such that the pointer 31 points to the left of 80% relative humidity (Fig. 1) the arm 104 and pin 105 remain in constant contact by force of the weight 110 (or spring 22, Fig. 6) thereby lighting the red lamp 66 by closure of the following circuit: current from one side of the source 116, wire 117, support 109, arm 104, pin 105, wire 118, lamp 65 and wire 116 to the other side of the current source.

As the atmosphere becomes more loaded with moisture the element 95 lengthens by virtue of the additional absorption, the resulting clockwise turning of the pointer shaft and pointer so that the pointer assumes the position 120, (Fig. 1) will move the stud 107 to position 121 thereby lighting the white lamp 63 while the red lamp 65 remains lighted, thus indicating the beginning of the safe condition, the circuit being as follows: current previously traced down to the arm 104 divides in its flow to the stud 107, arm 108, pointer shaft 25, bracket 97, screw 98, wire 116, lamp 63 and wire 116 to the other side of the current source.

The further addition of moisture both to the atmosphere and element 95 causes continued turning of the pointer to the position 122. The stud 107 then assumes the position 123. In doing so it moves the arm 108 away from pin 109. This breaks the circuit through the red lamp 66, but the circuit through the white lamp 63 is continued, and remains unbroken as long as the stud 107 keeps contact with arm 108. The stud 107 thus comprises contactor means which controls the switch 104, 105, and when it touches the arm 104 it closes a circuit independent of the one controlled by the switch. The white light indicates a safe operating condition. Signals other than lamps may be used in lieu of lamps 63, 65.

I claim:

1. In a hygrometer operated switch, an absorption element of spiral form, means coupled with said element for operation of the coupled element by lengthening and contraction of the element, and an anchorage for the free end of the element, said anchorage comprising a bracket, a yoke carried by the bracket having means to engage the element, and means to actuate the yoke in order to clamp down on the element.

2. In a hygrometer operated switch, an open air chamber, and a closed switch compartment, a partition dividing the chamber from the compartment, electrical switch apparatus located in the compartment, a shaft for actuating said apparatus extending from the compartment through the partition into the chamber, an absorption element located in the chamber and connected with the shaft for moving the shaft, said switch apparatus including an arm, a sleeve and gaskets motor for clamping the shaft, and when it touches the arm 104 it closes a circuit independent of the one controlled by the switch. The white light indicates a safe operating condition. Signals other than lamps may be used in lieu of lamps 63, 65.

Karl F. Schoew.