

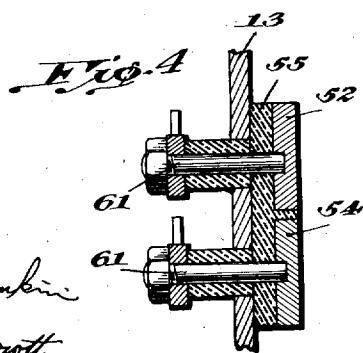
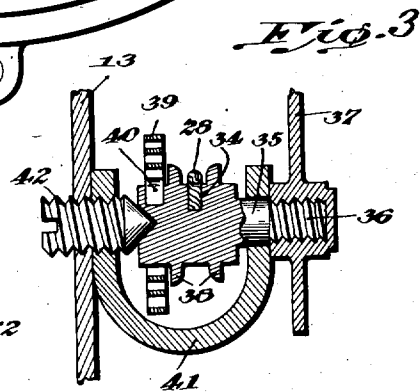
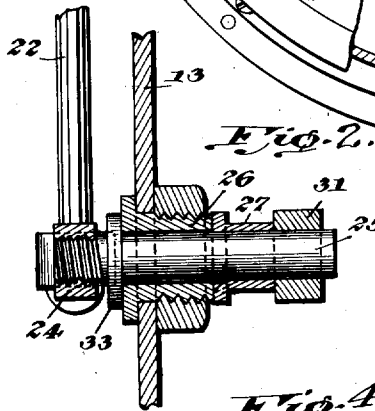
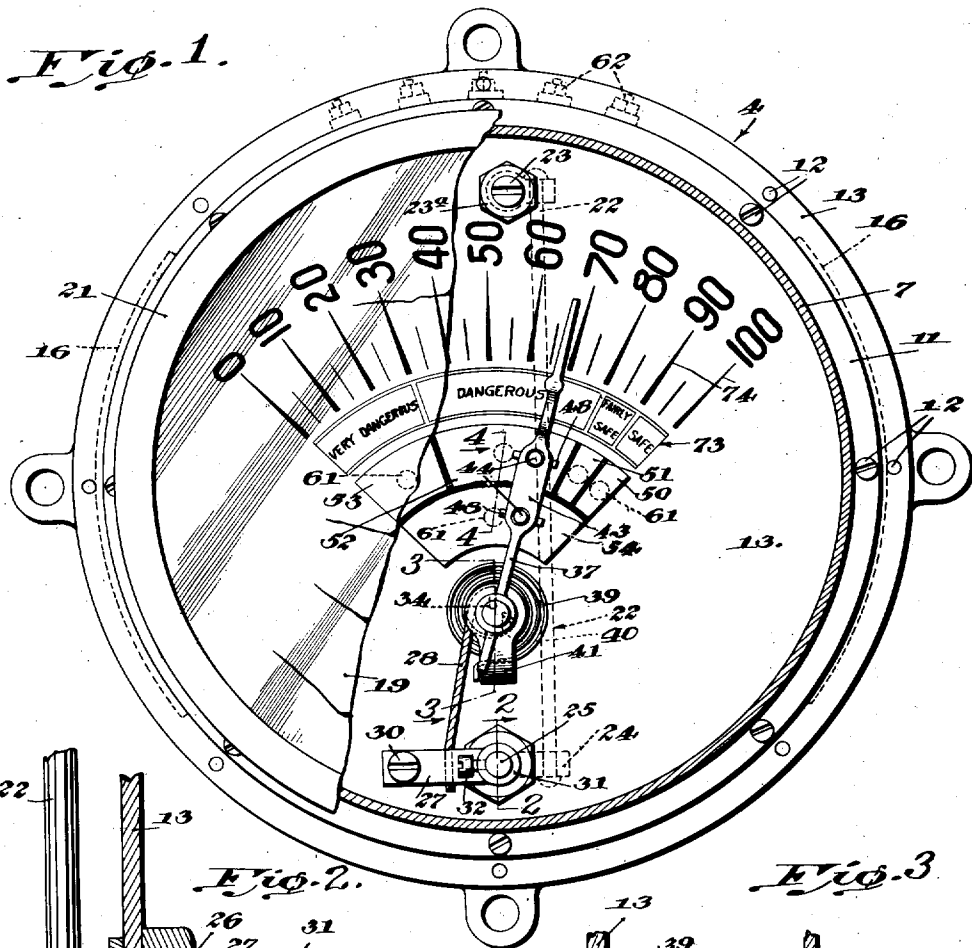
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2,019,635

HYGROMETER OPERATED SWITCH

Original Filed Aug. 31, 1932 2 Sheets-Sheet 1



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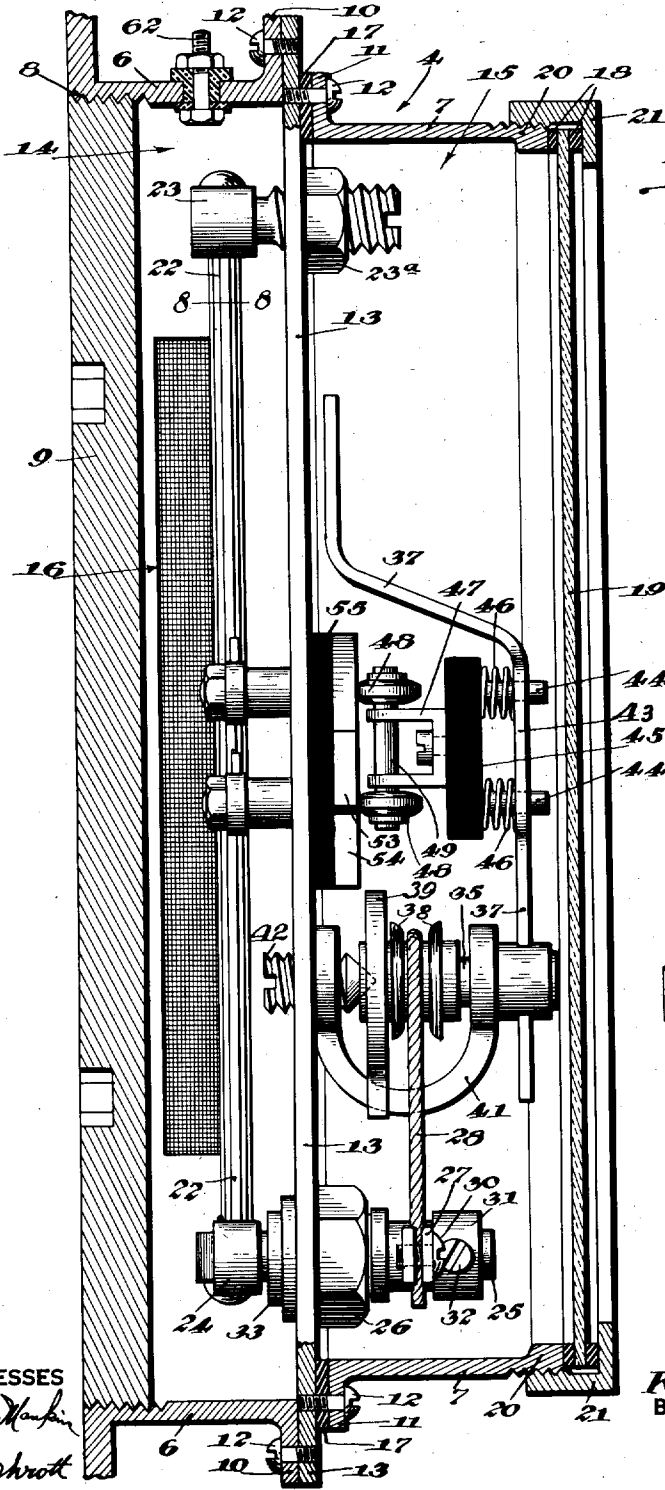


Fig. 5.

Fig. 6.

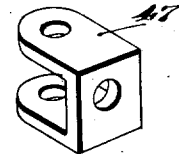


Fig. 7.

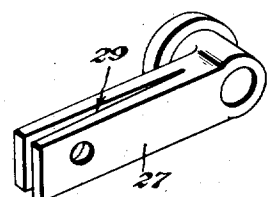
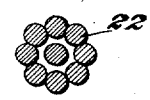


Fig. 8.



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HYGROMETER OPERATED SWITCH

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Application August 31, 1932, Serial No. 631,261

Renewed November 24, 1934

8 Claims. (Cl. 200—52)

This invention relates to improvements in apparatuses for the ascertainment of moisture conditions in various types of enclosures to which persons are confined, and its objects are as follows:—

First, to provide a system of indicating moisture (or the lack of moisture) conditions in places such as mines, tunnels, factories, shops, etc., the principle being to employ an absorption hygrometer as the master switch for actuating a remote electrical signal panel.

Second, to provide an improved hygrometer embodying structural features which adapt it to its service as the master switch for the foregoing electrical signal system.

Third, to include in said structural features a partition to divide the electrical part of the switch from the absorption element and to make said partition the common mount for the electrical parts and said element.

Fourth, to make said partition the foundation of an airtight enclosure for the electrical switch parts so that these cannot be affected by the atmosphere.

In the drawings:

Figure 1 is a partially sectional and elevational view of the hygrometer switch, the structure being shown as though viewing the instrument from the front.

Figure 2 is a detail section taken on the line 2—2 of Figure 1, particularly illustrating the shaft with which the catgut and transmission cord are connected.

Figure 3 is a detail section taken on the line 3—3 of Figure 1, particularly illustrating the pointer shaft.

Figure 4 is a detail section taken on the line 4—4 of Figure 1 illustrating how the binding posts secure the contact segments to the partition.

Figure 5 is a central vertical section of the hygrometer, parts being shown in elevation.

Figure 6 is a detail perspective view of the contact saddle.

Figure 7 is a detail perspective view of the clamp arm to which one end of the transmission cord is secured.

Figure 8 is a detail cross section taken on the line 8—8 of Figure 5 illustrating the stranded construction of the catgut.

Hygrometers of the various known types, are known to be inaccurate in measuring the actual amount of moisture contained in a given amount of air and for that reason are not so successful from a scientific standpoint. However, a hy-

grometer is extremely useful in approximately disclosing the amount of moisture in the air, and inasmuch as an absorption hygrometer possesses certain mechanical elements which other types of hygrometers do not possess, its principle is particularly well adapted to making a master electrical switch out of it for the control of a signal system with a remote signal panel.

One of the uses of the improved hygrometer is that of an electrical switch which is especially adapted to the workings of a mine, but which is equally adaptable to a factory or the like. In Figure 1 the hygrometer 4 comprises a casing of cylindrical shape (but not necessarily so) which is composed of cylindrical members 6, 7 (Fig. 5). The member 6 is internally threaded part way as at 8 to admit a plug 9 which is screwed in place to form a back. Flanges 10 and 11 on adjacent ends of the members 6, 7 (Fig. 5) are screwed as at 12 or otherwise secured in common to a partition 13 which divides the casing into two compartments 14, 15.

The compartment 14 is open to the outer air by means of screened windows 16. The compartment 15 is made as air tight as possible so as to avoid affecting its contained mechanism a least amount, and for that purpose a rubber or other washer 17 is interposed between the flange 11 and partition 13. For the same reason washers 18 are used on each side of the cover glass 19 at the front of the hygrometer, said washers engaging opposite sides of the glass near the rim and being pressed against the enlarged end 20 when the bezel 21 is screwed home.

Situated in the compartment 14 so as to be exposed to air such as is present around the hygrometer is a hygroexpansible or absorption element 22. This element has the property of absorbing moisture. When it absorbs moisture it lengthens, and when it dries it contracts.

It is composed of a plurality of strands (Fig. 8). The illustration shows nine strands, but in practice the number may be more or less. It is this stranding which makes a large contribution to its sensitive absorption qualities. One end of the element is directly secured to an anchor 23. The anchor comprises an adjustable screw stud with means to which one end of the element is directly attached. The stud is screwed through the partition 13 which thus provides its mounting. There is a lock nut 23a on the screw stud, and by loosening the lock nut and turning the screw stud a proper initial tension of the element is obtained, in turn producing a proper initial

reading on the scale (Fig. 1), as well as a proper initial setting of the contactor means 48.

The opposite end of the element is secured to one arm 24 of a shaft 25 (Figs. 1 and 2). This arm is screwed onto the threaded end of the shaft (Fig. 2) or secured otherwise so that lengthening and contraction will cause turning of the shaft.

An appropriate bushing structure 26, fixedly secured to the partition 13, provides a bearing for the shaft. The shaft extends from the compartment 14 into the compartment 15. It is obvious that the one arm 24 is on that end of the shaft 25 projecting into the compartment 14. The opposite end of the shaft in the compartment 15 carries a second arm 27 (Figs. 1 and 7) with which a short transmission cord 28 is connected. The arms 24 and 27 are diverse to each other, the assemblage 24, 25 and 27 constituting a turnable member.

The cord 28 is flexible but it will never sag. One end of it is clamped in the arm 27 which is made forked (Fig. 7) for the purpose. The cut 29 which produces the fork tapers toward the hub of the arm so that an end of the cord 28 can be wedged in to begin with. A screw 30 is then turned home to clamp the cord in place tightly. A collar 31 is fitted onto the end of the shaft 25 to prevent end motion of the shaft 25. This collar is held by a set screw 32 (Figs. 1 and 5). The shaft 25 has an enlargement 33 adjacent to its threaded end (Fig. 2). This bears against the bushing structure, and it is between the enlargement 33 and the collar 31 that the shaft is kept in place.

The remaining end of the transmission cord is suitably secured at 34 (Figs. 1 and 3) to the pointer shaft 35. The front end of this shaft is threaded at 36 to fixedly carry the pointer 37 which is attached by screwing its hub in place. The pointer moves when the shaft turns. The cord 28 is guided by flanges 38 (Fig. 3) which convert the medial portion of the shaft into a sheave.

One end of a spring 39 is secured to the shaft 35 as at 40 (Fig. 3). The other end of the spring is either secured to or is merely hooked over a part of the pointer standard 41. The spring 39 is on the order of a clock spring. Its unwinding tendency is toward the right thus tending to move the pointer 37 toward the right. When the element 22 becomes increasingly moist it lengthens and permits movement of the pointer 37 toward the right by virtue of the spring 39 taking up the slack in the transmission cord 28. When the element dries it contracts and causes movement of the pointer 37 toward the left, the pull transmitted by the cord 28 winding up the spring 39.

A stud 42 (Fig. 3) both secures the pointer standard 41 to the partition 13 and provides a pivot for the shaft 35. For that purpose the stud is pointed. The standard 41 is made in the form of a U. The stud 42 secures one arm of the U and the other arm completes the bearing for the shaft 35.

The substantial mid portion 43 of the pointer 37 (Fig. 1) is broadened and perforated to provide guidance for a pair of pins 44 (Figs. 1 and 5) protruding from a porcelain or other insulating block 45 in which they are fixed. Springs 46 on the pins between the block and pointer press the block toward the shaft (Fig. 5), in other words, toward the partition 13.

A saddle 47 (Figs. 5 and 6) is fixedly secured to the block 45 and supports a pair of rollers 48 or equivalent contactor structure. In the instance of the rollers an axle 49 is provided on which the

rollers may either turn or on which the rollers may be fixed, in which event the axle would turn in the saddle 47, being carried thereby. The roller and axle assemblage 48, 49 provides a contactor bridge.

The rollers 48 traverse contacts which are divided into upper and lower segments. The springs 46 keep the rollers pressed against the contacts. The upper contact comprises segments 50, 51, 52 and 53 which, respectively come into play to indicate "safe", "very safe", "dangerous" and "very dangerous" on the remote indicator board (not shown) of the signal system mentioned before. The lower contact 54 comprises only a single segment, this being a common electrical return.

Insulation 55 (Fig. 5) not only insulates the foregoing segments from each other but also from the partition 13 on which the segments are fixedly mounted by means of the binding posts 61. Each binding post 61 (Fig. 4) is appropriately insulated from the partition 13. These binding posts are connected to outer binding posts 62 on the member 6 by wires only partially shown in Figs. 4 and 5. It is from the binding posts 62 that wires (not shown) lead to the system. It will be understood that the internal connections between the binding posts 61 and 62 are permanent, being made so at the factory, whereas the wire connections between the binding post 62 and the indicator board may be taken down when required.

The operation as described thus far is readily understood. It will be remembered that the spring 39 tends to unwind and so turn the pointer 37 clockwise. The element 22 and its connections with the pointer shaft 35 (including the transmission cord 28) tend to prevent this tendency. When the element lengthens by virtue of the absorption of moisture, the unwinding tendency is permitted and the pointer 37 moves clockwise. When the element dries it contracts and so turns the pointer 37 counter-clockwise against the tension of the spring.

I claim:—

1. A hygrometer operated switch comprising an absorption element capable of lengthening and contraction by moisture conditions to which it is subjected, means coupled with said element transmuting said lengthening and contraction into individual motions, a plurality of contacts forming part of an electrical switch, contactor means completing said switch being actuated by said motions to traverse the contacts, supporting means to separate the absorption element from the electrical switch, and means to commonly mount said element, coupled means and switch on said supporting means.

2. A hygrometer comprising a partition, an absorption element on one side of the partition and means by which one end of the element is anchored to the partition, movable means mounted upon and extending through the partition and having one end connected with the remaining end of said element, the lengthening and contraction of said element with respect to its anchorage causing movement of said movable means, an electrical switch on the other side of the partition, said switch including contacts and a movable contactor, and means for transmitting the movements of said movable means to said contactor.

3. A hygrometer comprising a partition, an absorption element on one side of the partition and means by which one end of the element is anchored to the partition, movable means mounted upon and extending through the partition and having one end connected with the remaining

end of said element, the lengthening and contraction of said element with respect to its anchorage causing movement of said movable means, an electrical switch on the other side of the partition, said switch including contacts and a movable contactor, means for transmitting the movements of said movable means to said contactor, a closed casing member attached to the partition on the switch side providing an air tight enclosure for the structure on that side, and a casing member attached to the other side of the partition, encasing said element but having openings for the ingress of air.

4. A control comprising an electrical switch including contacts and movable contactor means, resilient means acting on said contactor and tending to move it in one direction with respect to its contacts, an absorption element and means for anchoring one end of said element, movable means connected with the other end of said element, and a flexible connector between said movable means and said contactor means opposing said resilient means when the absorption element contracts upon loss of moisture and causing the contactor means to move in the opposite direction.

5. In a control having an electrical switch including contacts and a contactor structure, a pointer carrying said structure and a turnable shaft by which the pointer is carried, resilient means acting on the shaft, tending to turn it and the pointer in one direction, an absorption element and means by which one end of the element is anchored; a second turnable shaft having diverse arms, the remaining end of the element being connected with one of the arms, and a cord connecting the other arm with said turnable shaft, turning said shaft and the pointer in the opposite direction upon contraction of said element by the loss of moisture.

6. A control comprising an electrical switch including contacts and contactor structure, a pointer carrying said structure and means providing for movement of said structure relative to the pointer to insure continuous engagement of said structure with the contacts, resilient means tending to move the pointer and its carried structure in one direction, and means tending to move said pointer and its carried structure in the opposite direction.

7. A control comprising an electrical switch including contacts and contactor structure, a pointer carrying said structure and means providing for movement of said structure relative to the pointer to insure continuous engagement of said structure with the contacts, resilient means tending to move the pointer and its carried structure in one direction, and hygroexpansible means tending to move said pointer and its carried structure in the opposite direction.

8. A hygrometer operated switch comprising two compartments, one open to atmosphere the other closed off, a partition dividing the compartments and sealing means by which said other compartment is sealed against the partition, a shaft turnably mounted on the partition having its opposite ends projecting into the respective compartments, an absorption element in the open compartment and means connecting its respective ends with the partition and with one end of the shaft, electrical switch apparatus contained by the closed compartment comprising a pointer turnably carried by the partition and means connecting the pointer with the other end of the shaft, contacts for signal means said contacts being mounted on the partition, and a contactor structure mounted on the pointer in engagement with at least one contact.

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