

Jan. 17, 1950

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2,494,819

MATERIAL RESPONSIVE SWITCH ACTUATOR

Filed Sept. 26, 1947

2 Sheets-Sheet 1

FIG. 1

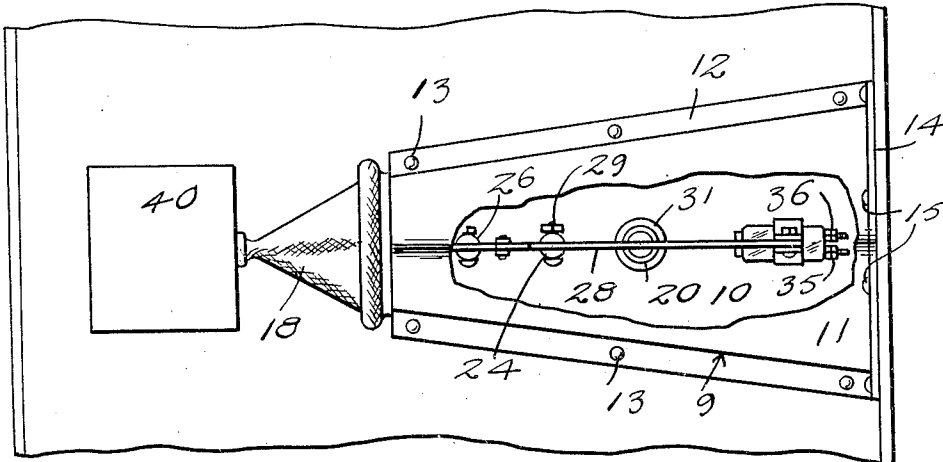
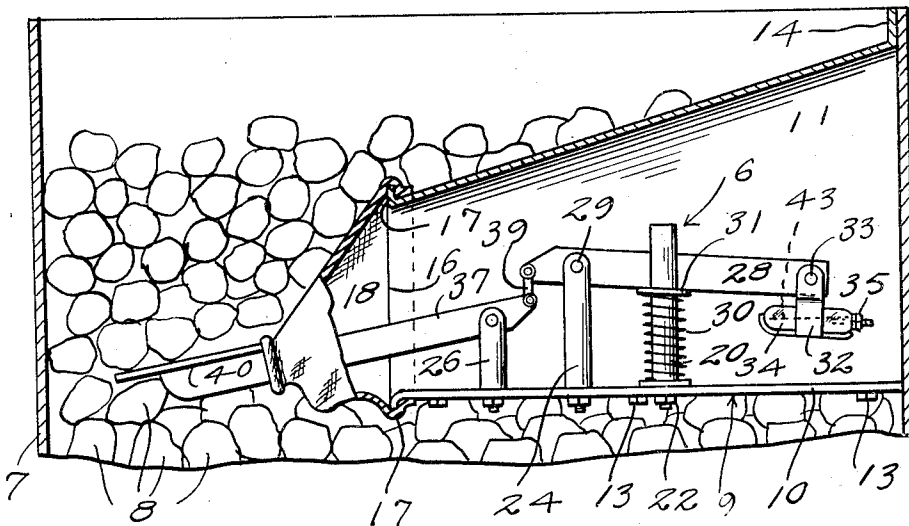


FIG. 2



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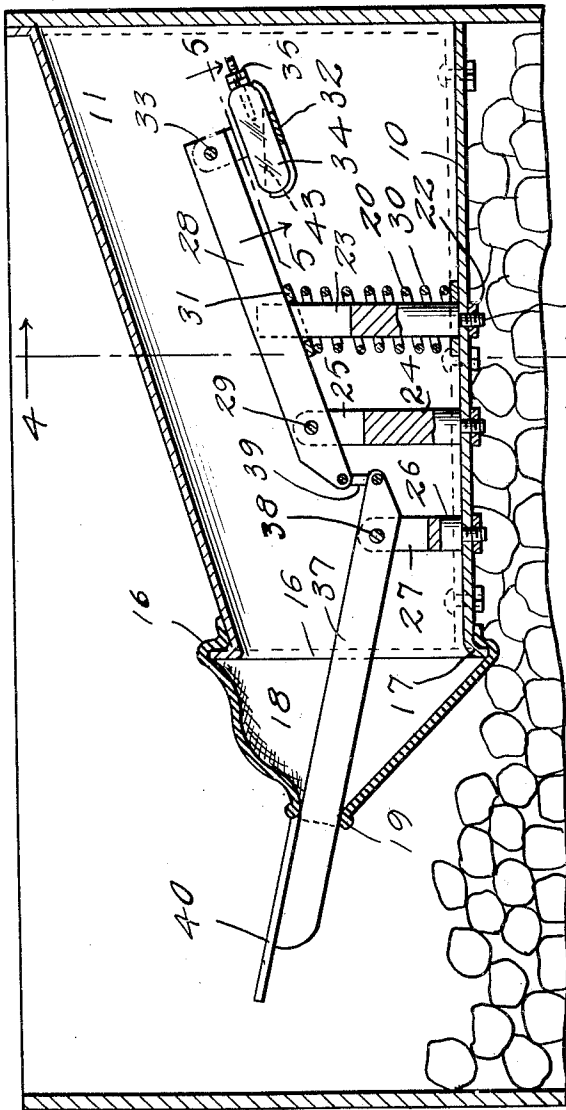
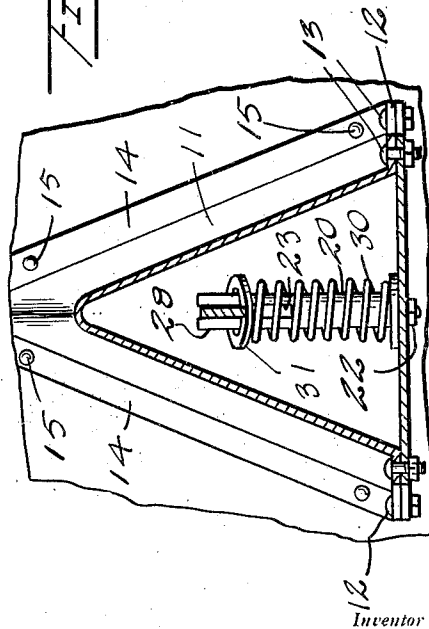


FIG. 3



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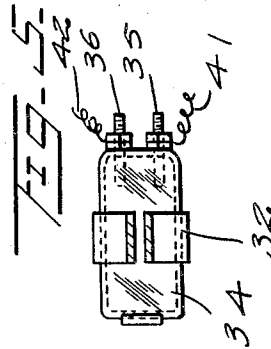


FIG. 4

FIG. 5

## UNITED STATES PATENT OFFICE

2,494,819

MATERIAL RESPONSIVE SWITCH  
ACTUATOR

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2 Claims. (Cl. 200—52)

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This invention relates to an actuating switch for hoppers, feed boxes or other similar containers and more particularly to a switch actuating mechanism contained therein and actuated by the contents of the hopper or feed box for closing or interrupting an electric circuit.

More particularly, an object of the present invention is to provide a switch actuator of extremely simple construction which is capable of being readily mounted in feed boxes or hoppers and which is provided with means for supporting a conventional mercury switch which may be interposed in any suitable electric circuit and whereby the switch will be rocked in unison with a part of the actuating mechanism for completing the circuit in one position thereof or for interrupting the circuit in another position of said mercury switch.

Various other objects and advantages of the invention will hereinafter become more fully apparent from the following description of the drawings, illustrating a preferred embodiment and application thereof, and wherein:

Figure 1 is a top plan view, partly in section showing the switch actuator disposed in a feed box or hopper of a stoker;

Figure 2 is a longitudinal, substantially central sectional view, partly in side elevation thereof;

Figure 3 is an enlarged substantially central longitudinal sectional view showing the parts in a different position than that assumed in Figure 2;

Figure 4 is a cross sectional view of the switch actuating mechanism taken substantially along a plane as indicated by the line 4—4 of Figure 3, and

Figure 5 is a substantially horizontal sectional view taken along a plane as indicated by the line 5—5 of Figure 3.

Referring more specifically to the drawings, for the purpose of illustrating a preferred application and use of the switch actuator, designated generally 6 and comprising the invention, a portion of a feed box or hopper is shown at 7 containing coal or other material 8 which is fed outwardly through the bottom thereof, not shown, by gravity into a stoker conduit, not shown. In employing the feed box or hopper for supplying coal to a furnace stoker, it is desirable to maintain a quantity of the coal in the feed box or hopper at all times so as to function as a smoke and combustion gas seal to prevent the smoke and combustion gases, escaping through the stoker conduit and feed box or hopper into the room or enclosure in which said hopper or feed box is located.

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Accordingly, it is the primary object of the present invention to provide an actuator mechanism for a switch that is normally maintained in a position for closing a circuit of an electric drive means, not shown, for actuating a stoker screw or other feed mechanism, by the coal or other material in the feed box or hopper and which, when said coal falls below a predetermined level so that further operation of the stoker would break the gas and smoke seal by emptying the feed box, the actuating mechanism will move to a position for interrupting the electric circuit for stopping operation of the stoker.

The switch actuator, designated generally 6 and comprising the invention includes a housing, designated generally 9 which is disposed within the feed box or hopper and which is suitably secured to one side or end wall thereof. The housing 9 includes a bottom or base 10 which is fixedly positioned with respect to the hopper 7 and a cover 11 of substantially inverted V-shaped cross section, as best seen in Figure 4, which is provided with outturned flanges 12 at the bottom thereof which rest upon the housing bottom 10 adjacent the side edges thereof and which are detachably secured thereto by fastenings 13. The cover 11 at its large, rear end is provided with an outturned flange 14 on each side thereof which is detachably secured to the aforementioned side or end wall of the hopper or feed box 7 by additional fastenings 15.

The inner end 16 of the housing 9 is open and the inner end of the cover 11 and bottom 10, defining said opening 16, are provided with outturned flange portions 17 over which is stretched and detachably secured the enlarged end of a boot 18 which is formed of a flexible material and preferably of a material which is also resilient, such as rubber. The boot 18 has a restricted opening 19 in the opposite end thereof.

The housing 9 is provided with an upstanding post 20 which is detachably secured by a threaded extension 21 and nut 22 to the bottom 10, intermediate of its ends and substantially intermediate of its side edges. The upper portion of the post 20 is longitudinally slotted as seen at 23 and with said slot opening in a direction longitudinally of the housing 9. Another shorter post 24 is likewise provided with a longitudinal slot 25 in its upper end which aligns with the slot 23. A still shorter post 26 is similarly secured detachably to the bottom 10 and between the open end 16 of the housing and the post 24 and also has the slotted upper end 27, aligning with the slot 25; said posts 20, 24 and 26 being disposed in

longitudinal alignment, as clearly illustrated in Figure 1.

A lever 28 is pivotally supported adjacent one end thereof in the slot 25 of post 24 by a pivot pin 29 which extends through the slotted portion thereof and the longer end of said lever 28 extends rearwardly or toward the large end of the housing 9 and away from the open end 16 thereof and has a portion extending through the slot 23 of the post 20 for oscillating movement therein, when the lever 28 rocks on its pivot 29. An expansion coiled spring 30 is disposed loosely on the post 20 and has its lower end resting on the housing bottom 10 and its upper end bearing against a washer 31 which in turn bears against the bottom edge of the lever 28 for urging said lever to rock in a counterclockwise direction on its pivot 29.

The lever 28, at the end thereof remote to the pivot 29 and the housing end 16, is provided with a demountable supporting hanger or bracket 32 which is detachably clamped thereto by a fastening 33 for detachably and resiliently supporting a conventional mercury switch 34 therein, beneath said end of the lever 28 and preferably substantially parallel thereto.

The mercury switch 34 is shown disposed in the bracket 32 so that the end thereof provided with the laterally spaced contacts 35 and 36 are disposed at the outer end of the bracket 32.

A lever 37 is pivotally mounted adjacent one end thereof in the slot 27 of the post 26 by a pivot pin 38 which extends therethrough and the shorter end of the lever 37 is disposed substantially beneath the shorter end of the lever 28 and is connected thereto by a link 39 which is pivotally connected at its ends to the shorter ends of said levers. The opposite, longer end of the lever 37 extends outwardly through the open end 15 of the housing, through the boot 18 and outwardly through the open restricted end 19 thereof which engages closely around a portion of the lever 37. The outer portion of said longer end of lever 37, which is disposed outwardly of the boot 18, has attached to the upper edge thereof a platform or treadle 40 which is disposed in substantially a horizontal plane within the feed box or hopper 7.

The spaced contacts 35 and 36 are adapted to be connected to conductor wires 41 and 42, respectively, forming a part of an electric circuit, not shown, between a source of electric current and the electrical motor or driving means, not shown, of the stoker.

When the hopper or feed box 7 is sufficiently filled with coal or other material 8, as seen in Figure 2, the weight of said material on the treadle or platform 40 will depress said part to cause the lever 37 to assume the position of Figure 2 and through the connection of the link 39, the lever will be caused to assume a similar position with the longer end of the lever disposed in lowered position and so that the spring 30 is compressed.

With the levers 37 and 28 thus disposed, the mercury 43 within the tube of the mercury switch 34 will flow toward the end containing the contacts 35 and 36 for bridging the gap therebetween for completing or maintaining the circuit, previously referred to. Should the coal or material 8 be fed from the hopper or feed box 7, without being replenished, sufficiently so that the level thereof falls below the level of the position of the treadle or platform 40 of Figure 2, the weight on said platform will be thereby diminished sufficiently so that the spring 30 can react

to cause the lever 34 to rock counter-clockwise from its position of Figure 2 to its position of Figure 3 thereby causing the lever 37 to rock clockwise from its Figure 2 to its position of Figure 3 and which will cause the mercury switch 34 to be inclined in the other direction so that the mercury 43 contained therein, will flow away from the contacts 35 and 36 for interrupting the circuit therebetween thereby interrupting the circuit for operating the stoker to shut off the stoker before the coal or material 8 has been depleted from the feed box 7, sufficiently to break the smoke and gas seal provided thereby. Likewise, it will be readily apparent that the circuit will thus be maintained in an interrupted position until the coal or material 8 is replenished in the feed box 7 sufficiently so that the weight thereof will cause the platform 40 to return to its position of Figure 2 to thereby return the switch actuating parts 6 to the positions as illustrated in Figure 2 for bridging the gap in the electric circuit provided between the contacts 35 and 36 by the mercury 43 flowing back into engagement with both of said contacts. Obviously, the flexible boot 18 will allow the lever 37 to swing freely between the positions of Figures 2 and 3 while at the same time affording a closure to prevent any of the coal or material 8 from entering the housing 9.

The actuating mechanism 6 could also be utilized for other purposes such as regulating the supply of a material 8 to the hopper or bin 7 by an electrically driven feeder means through the simple expedient of reversing the position of the mercury switch in the bracket 32 so that when the parts were in their positions of Figure 3 a circuit would be completed through the mercury switch actuating the feeder means for supplying the hopper or bin 7 but when the supply of the material 8 therein rose to a certain level, as seen in Figure 2, the weight of the material 8 on the platform 40 would rock the parts to their positions of Figure 2, so as to interrupt the feeder drive means circuit to prevent overflowing of the hopper or bin 7.

Various other modifications and changes are contemplated and may obviously be resorted to, without departing from spirit or scope of the invention as herein after defined by the appended claims.

I claim as my invention:

1. In a material responsive switch actuator, a housing mounted in a container, a pair of levers pivotally supported near adjacent ends thereof within said housing, a link connecting said adjacent ends and pivotally connected to each of said ends, one of said levers having its opposite end extending outwardly of said housing into the container and provided with a platform adapted to be engaged by material within said container for retaining the platform and the lever end connected thereto in a depressed position, a mercury switch connected to the opposite end of the other lever for movement therewith and disposed whereby when the remote ends of the levers are depressed the mercury switch will be in a circuit closing position, and spring means for biasing said levers as a unit in a direction for causing the adjacent ends thereof to swing downwardly and the remote ends thereof to swing upwardly when the weight of the contents of the container is removed or substantially removed from said platform for moving the mercury switch to a circuit interrupting position, said housing having longitudinally spaced upstanding slotted posts de-

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tachably mounted therein for receiving the adjacent end portions of said levers and in which said adjacent end portions are pivotally mounted.

2. A material responsive switch actuator comprising, a housing mounted in a container, a pair of levers pivotally supported near adjacent ends thereof within said housing, a link connecting said adjacent lever ends and pivotally connected to each of the levers, one of said levers having its opposite ends extending outwardly of the housing into the container, a platform mounted on said last mentioned lever end and adapted to be engaged by material within said container for retaining the platform and the lever end connected thereto in a depressed position, a mercury switch connected to the opposite end of the other lever for movement therewith and disposed in a circuit closing position at one extremity of the swinging movement of said last mentioned lever end and in a circuit interrupting position at the other extremity of the swinging movement of said last mentioned lever end, spring means for biasing said levers as a unit in a direction for causing the adjacent ends thereof to swing downwardly and the remote ends of the levers to swing upwardly when the weight of the material in the

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container is removed or substantially removed from said platform, said last mentioned lever end being swung downwardly in unison with the platform and the lever end on which said platform is supported, said housing having longitudinally spaced upstanding slotted posts for receiving the adjacent end portions of said levers and in which said adjacent end portions are pivotally mounted, and said housing having an upstanding slotted post for guiding the longer end of the last mentioned lever in its oscillating movement and providing a guide for said spring means.

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