Feb. 23 , 1926. 1,574,129

I. E. SMITH

SAFETY SWITCH FOR OIL BURNING SYSTEMS

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Fig. 1

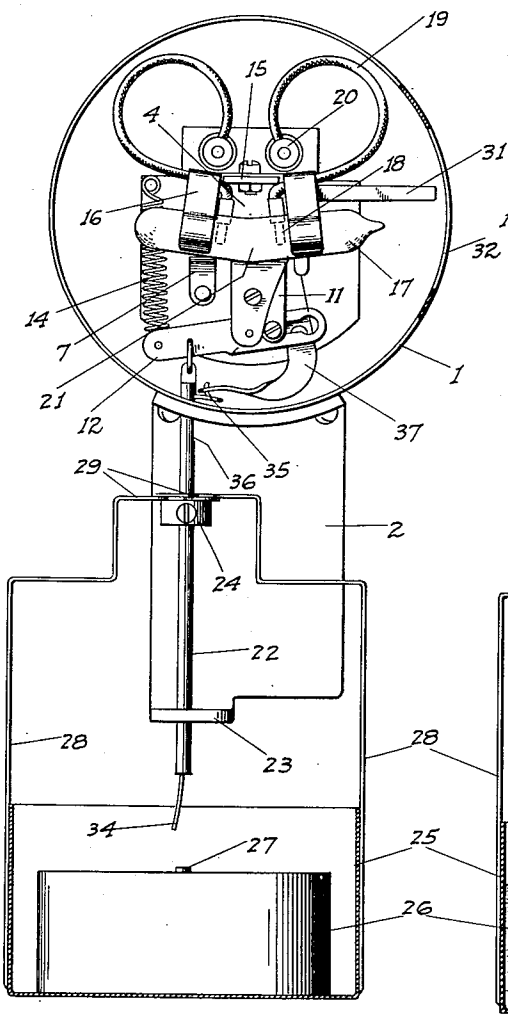
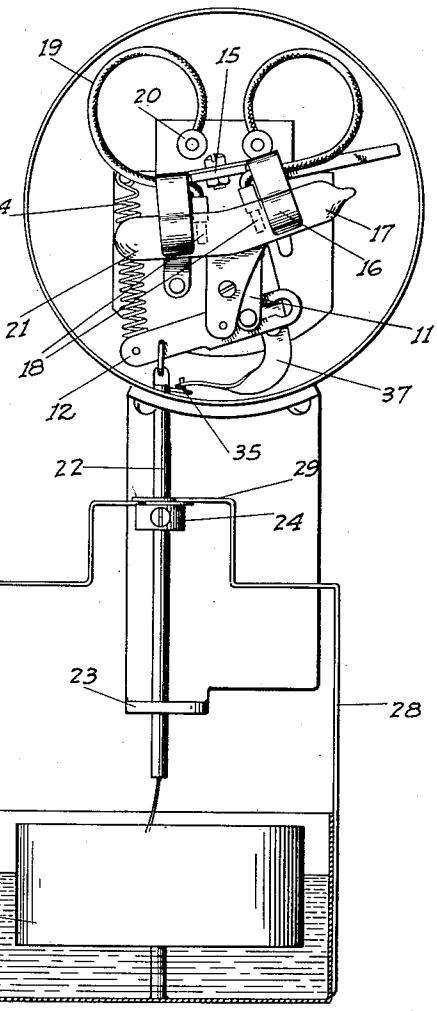


Fig. 2



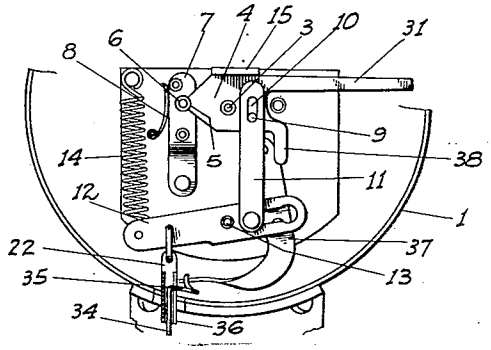


Fig. 5

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SAFETY SWITCH FOR OIL BURNING SYSTEMS

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Fig. 3

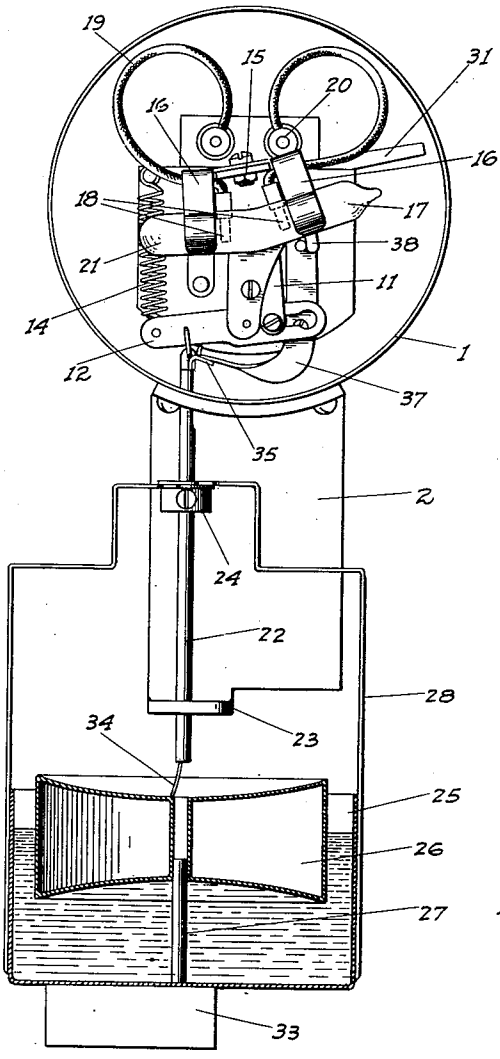


Fig. 4

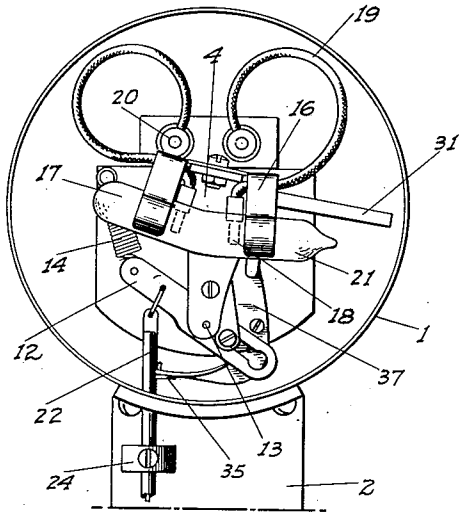


Fig. 6

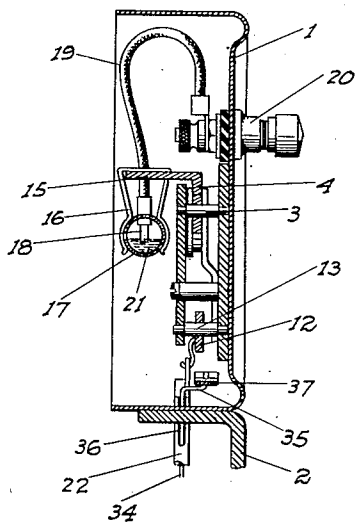
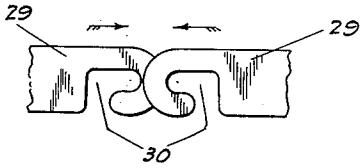


Fig. 7



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Patented Feb. 23, 1926. 1,574,129

UNITED STATES PATENT OFFICE.

IRA EDWARD SMITH, OF STOCKTON, CALIFORNIA.

SAFETY SWITCH FOR OIL-BURNING SYSTEMS.

Application filed May 11, 1925. Serial No. 29,386.

To all whom it may concern:

Be it known that I, IRA E. SMITH, a citizen of the United States, residing at Stockton, county of San Joaquin, State of California, have invented certain new and useful Improvements in Safety Switches for Oil-Burning Systems; and I do declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this application.

This invention relates to improvements in electric switches, and particularly to a type adapted to be used in connection with the fuel supply of an oil burner of an electrically driven type, and especially to the burner arrangement or system shown in my co-pending application for patent, Serial No. 750,248 filed November 17th, 1924.

Such an oil burner includes a burner plate onto which the oil is fed, an electric motor for driving the burner and an oil feed pump, and float controlled means controlling the initial flow of oil to the pump from the main reservoir.

At times with the operation of the burner, an excess of oil, which is not all burnt, may possibly be fed to the burner plate, or an amount of excess oil will gradually accumulate and will overflow from the burner. It is also possible that the float means may fail to function properly and allow the oil to overflow. If the fire is allowed to continue to burn, in the event that either of the above form of overflow is taking place, without being noticed or stopped, there is great danger of fire due to the present of unconfined oil adjacent to the burner. In any event a certain amount of oil will be thus going to waste. It is therefore desirable to have the motor, which controls the fire, stopped and the fire discontinued at such times in order to prevent the possibility of disaster, and also to warn the operator that the system is not functioning properly. This will allow him to make the necessary investigation and adjustments before again permitting the apparatus to be operated.

In the above mentioned copending application I showed a switch for causing the motor to be stopped when an excess of overflow of oil was had, and the switch of the present application particularly represents an improvement over the type of switch disclosed in said application, the present device being simpler and more positive in operation.

The principal object of the present invention is to provide such a switch, of a non-arching character and one capable of operating with any reasonable amperage, mounted in connection with a vertically movable weight in the form of a removable bowl or reservoir to receive excess or overflow oil. The bowl is provided with a float, and the weight of the bowl and float, when empty, is just sufficient to hold the switch closed. When the bowl becomes filled with oil above a certain amount, the switch is automatically opened. Similarly when the bowl is removed from its supporting means on the switch structure, the switch is also opened.

In the event that the bowl is held so that it cannot move down with the additional weight imparted thereto by an amount of oil flowing therein, I have provided means whereby the switch will then be opened by the raising of the float in the bowl.

The circuit to the motor will therefore be automatically broken when the bowl becomes filled and it will remain broken when the bowl is removed and until the latter is replaced in an empty condition.

The device therefore meets the requirements of the Fire Underwriters in providing a structure which automatically operates under any and all conditions.

These objects I acomplish by means of such structure and relative arangement of parts as will fully appear by a perusal of the following specification and claims.

In the drawings similar characters of reference indicate corresponding parts in the several views:

Fig. 1 is a front view of the device showing the switch as closed when the bowl is empty, and connected to the switch.

Fig. 2 is a similar view showing the switch opened by the lowering of the bowl when the latter has received a predetermined amount of oil.

Fig. 3 is a similar view showing the switch opened by the raising of the float when the bowl is held against downward movement.

Fig. 4 is a similar fragmentary view of the structure showing the switch as opened by the removal of the bowl.

Fig. 5 is a fragmentary front view of the

switch casing, the switch contact member being removed to show the operating mechanism.

Fig. 6 is a vertical cross section of the switch.

Fig. 7 is a fragmentary plan view of the bowl clips.

Referring now more particularly to the characters of reference on the drawings, the numeral 1 denotes a casing of suitable dimensions supported in an upright position by a bracket 2 of suitable character.

Pivotally mounted in the back of the casing on a pin 3 is a plate 4. One side edge of the plate is tapered and has a shallow apical notch 5, which normally engages a pin 6 mounted on a pivotal arm 7. This arm is pivoted in the casing and is pressed toward the plate by a spring 8. This provides a necessary snap action structure, and it will therefore be seen that if the plate is turned in either direction on the pin 3 so as to withdraw the notch 5 from the pin 6, said pin will then press against one or the other of the tapered sides of the plate 4, and will tend to further move said plate in the same direction.

Projecting outwardly from the plate 4 on the side of the pin 3 opposite to the notch 5 is a pin 9, which is slidable in a vertical slot 10 provided in a vertical link 11. This link in turn is connected to a lever 12 pivoted intermediate its ends on a pin 13 which is secured to the casing a certain distance below the plate 4. A tension spring 14 fixed at one end onto the casing and at the other end onto one end of the lever 12, acts to pull the latter upwardly at said end and lower the link 11. This movement in turn causes the plate 4 to be turned on its axial pin 3. On the other hand if the resistance offered by the spring is overcome, the plate will be turned in the opposite direction. Owing to the presence of the slot 10, a certain amount of movement of the lever 12 and link 11 will be had before any movement is imparted to said plate.

To utilize this plate movement in operating a switch, I provide the following structure:

Projecting outwardly from the top of the plate 4 is a horizontal flange 15 from which depends an inverted cradle 16. This cradle supports a glass tube 17 whose longitudinal axis lies in a plane at right angles to the pin 3. The tube is curved or bent between its ends so that the center of the tube is lower than its ends when the tube is disposed in a horizontal plane. Projecting into the tube in spaced relation on each side of the longitudinal center thereof are contacts 18 connected by flexible leads 19 to binding posts 20 mounted in the casing, to which posts the circuit wires of a motor are connected.

The tube contains a quantity of mercury 21 sufficient to engage both contacts and close the circuit only when the tube is horizontally disposed as in Fig. 1. It will therefore be seen that with the tilting of the plate 4 on its axis, the tube will be similarly tilted. The mercury will then flow to one end or the other of the tube, becoming disengaged from one or the other of the contacts as shown in Figs. 2, 3 and 4, and causing the circuit to be broken.

As above stated, the spring 14 if unrestricted will cause the lever 12 to be raised, and the plate 4 turned so that the circuit will then be broken by the tilting of the tube.

To normally counterbalance this action of the spring, and actually overcome the tension of the same under certain conditions to cause the tube to be tilted in the opposite direction I employ the following structure:

Flexibly connected to the lever 12 on the opposite side of the pin 13 from the connection of the link 11 therewith is a tubular stem 22. This stem projects through the bottom of the casing and through the guide element 23 on the bracket 2 a certain distance below the casing. The stem carries a vertically adjustable collar 24 intermediate the casing and the guide.

A bowl 25 having a float 26 is slidable on a vertical stem 27 in the bowl, is provided with opposed hanger arms 28 projecting upwardly therefrom. The upper ends of the arms are bent horizontally toward each other in the form of superimposed elements 29 separated from each other.

The arms are of spring metal, and the elements 29 tend to spread apart longitudinally of each other. At their ends the elements 29 have bayonet lock slots 30 of a size to receive the stem 22, said slots opening to the same side of the elements at opposed ends of the slots. It will therefore be seen that if the arms are pressed toward each other so that the side openings of the slots register, the stem 22 may be received into the slots and when the pressure on the arms is removed, the slot openings will move apart and the stem will be confined in the slots. The bowl may thus be removably mounted on said stem, with the elements 29 resting on the collar 24.

The strength of the spring 14 relative to the weight of the bowl, float, and hanger arms, when the bowl is empty, is such that the spring will be drawn out just sufficient to cause the tube 17 to be maintained in a horizontal or circuit closing position.

In order to be able to accurately set the tube in such position should it be necessary, the plate 4 is provided with a rigid laterally extending arm 31 which projects to a point adjacent the side of the casing 1, and is in alinement with a circumferential slot 32

in the latter. Therefore if a rigid pin or the like is projected through the slot and engaged with the arm 31, the latter may be moved up or down as may be necessary to aline the notch 5 with the pin 6, which is the normal setting of these parts. At the same time the arm does not actually project through the slot 32 so that it cannot be accidentally disturbed.

As above stated, the bowl when empty holds the spring 14 and lever 12 at such a point that the tube 4 will be horizontally disposed, in which case the notch 5 in the plate 4 is engaged with the pin 6. Now if a quantity of oil flows into the bowl and the weight of the same is increased, the resistance of the spring is overcome. The lever 12 is therefore lowered and the resistance of the spring 8 holding the pin 6 in the notch 5 is also overcome, allowing the plate 4 to turn, and causing the circuit to be broken by the tilting of the tube 17 as previously stated.

If the bowl is removed, the spring 14 can act without resistance, and the plate 4 will be turned in the opposite direction. The tube 17 will likewise be tilted beyond a horizontal position to again break the circuit and maintain the same broken.

Now in the event that the bowl is prevented from lowering with the addition of a weight of oil therein, as for instance if a block 33 or other obstruction was accidentally or intentionally placed under the bowl, the switch would not be opened if independently functioning means were not provided.

I take care of such a contingency in the following manner:

Disposed inside the stem 22 and projecting therebelow is another stem 34, movable independent of the stem 22. The lower end of the stem 34 is bent sideways to engage the float 26 to one side of the guide 27, and the collar 24 is adjusted so that the float must rise a certain distance before it engages and raises the stem 34.

The upper end of the stem is bent laterally as at 35 to project through a slot 36 in the stem 22, this lateral portion engages the lower end of a bent lever 37 which is pivoted in the casing 1 independent of the lever 12. The upper end of the lever 37 engages a lug 38 depending from the plate 4. The position of this lug with respect to the pin 3 is such that when the lever 37 is moved by vertical movement of the stem 34, the plate 4 is turned on its pin, and the contact tube 17 is tilted to break the circuit as before.

In this case no movement is imparted to the lever 12, owing to the link slot 10 in which the pin 9 rides, which allows of turning movement of the plate 4 to be had in the necessary direction without imparting any movement to said lever 12.

The mercury contact tube is never failing in operation, the contacts never need cleaning or replacing, as no arcing is had at the contacts, no matter how great an amperage within reasonable limits is passed through. The switch may therefore be interposed directly in a main line circuit to a motor, and can be depended on to function continuously without attention for a long period of time.

From the foregoing description it will be readily seen that I have produced such a device as substantially fulfills the objects of the invention as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described my invention what I claim as new and useful and desire to secure by Letters Patent is:

1. A safety switch for oil burners comprising a bowl to receive excess oil, switch contact means, means removably supporting the bowl in freely suspended relation, and means between said supporting means and the contact means, whereby when the bowl is empty the contact means will be closed; and when said bowl either contains a certain amount of oil or is removed from the supporting means, the contact means will be opened.

2. A structure as in claim 1, in which a float is provided in the bowl, with means between said float and the contact means for causing the latter to be opened with the upward movement of the float a predetermined distance relative to the contact means.

3. A safety switch for oil burners comprising a bowl to receive excess oil, switch contact means, means removably supporting the bowl in freely suspended relation for vertical movement, means between the supporting means and the contact means whereby with the vertical movement of the former in either direction from a predetermined position the contact means will be opened, and closed when said supporting means is in such position, and means counteracting the weight of the bowl when empty for then holding said supporting means in such position.

4. A structure as in claim 3, in which said last named means comprises a tension spring attached to the supporting means, said spring being capable of expansion when weight is added to the bowl and of contraction when the bowl is removed, whereby to then draw the supporting means upwardly from its normal contact-closing position.

5. A safety switch for oil burners com-

prising a bowl to receive excess oil, switch contact means, a vertically movable stem on which the bowl is mounted for movement with said stem, a connecting structure between the stem and contact means whereby the contacts will be opened at the opposite limits of movement of the stem and closed when the stem is intermediate said limits, and means acting on the stem to normally hold the latter, with the weight of the bowl when empty, in said contact closing position.

6. A structure as in claim 5, in which said contact means comprises a tube disposed in a horizontal plane when the stem is in said intermediate position, the tube being pivotally mounted on said connecting structure for longitudinal tilting movement and sloping upwardly in both directions from its center of length, spaced contacts depending into the tube adjacent said center, and a quantity of mercury in the tube to engage the contacts only when said tube is horizontally disposed.

7. A safety switch for oil burners comprising a bowl to receive excess oil, switch contact means, a vertically movable stem on which the bowl is suspended for movement with said stem, a connecting structure between the stem and contact means whereby the contacts will be opened, when the stem moves down from a predetermined position and will be closed when the stem is at such position, yieldable means acting to hold the stem in such position when the bowl is empty and yielding to allow the stem to move down when the weight of the bowl is augmented by a certain amount of oil, and means acting independently of any movement of the stem to open the contacts when oil is in the bowl but the latter is prevented from downward movement.

8. A safety switch for oil burners comprising a bowl adapted to receive excess oil, switch contact means, means for mounting the bowl in connection with the contact means for free vertical movement, means whereby when the bowl is empty the contact means will be closed, and when the bowl moves down with the added weight of an amount of oil therein the contact means will be opened, and additional means whereby the contacts will be opened when oil is in the bowl but the latter is prevented from moving.

9. A safety switch for oil burners comprising a bowl arranged for vertical movement and adapted to receive excess oil, switch contact means, means for mounting the bowl in connection with the contact means, means whereby when the bowl is empty the contact means will be closed, and when the bowl moves down with the added weight of an amount of oil therein the contact means will be opened, a float in the bowl, and means actuated by the rising of the float in the bowl for opening the contacts and functioning only when the bowl is held from downward movement.

10. A safety switch for oil burners comprising a bowl to receive excess oil, switch contact means, a vertically movable and tubular stem means for connecting the bowl to the stem so that said bowl is below the stem, operating means between said stem and the contacts whereby the latter will be opened with a downward movement of said stem from a predetermined position, the contacts being closed when the stem is in such position, a float in the bowl, a stem slidable in the tubular stem and adapted to be engaged by the float after a certain upward movement of the latter, and means actuated by an upward movement of the inner stem for opening the contacts.

11. A safety switch for oil burners including a bowl to receive excess oil, normally closed switch contact means, and separate control means operating independent of each other but both actuated by reason of the presence of a certain amount of oil in the bowl, for opening the contact means.

12. A safety switch for oil burners comprising a bowl to receive excess oil, switch contact means, a vertically movable and tubular stem means for connecting the bowl to the stem so that said bowl is below the stem, operating means between said stem and the contacts whereby the latter will be opened with a downward movement of said stem from a predetermined position, the contacts being closed when the stem is in such position, a float in the bowl, a stem slidable in the tubular stem and adapted to be engaged by the float after a certain upward movement of the latter, and instrumentalities between the upper end of said inner stem and the operating means for causing the latter to function to open the contact means independent of any movement of the tubular stem.

13. A safety switch including a bowl to receive oil, switch contact means, a vertical movable supporting means for the bowl and means between said supporting means and the contact means for causing the latter to be closed when said supporting means is intermediate its limits of movement; and to be opened when the supporting means is at either of such limits of movement.

14. A structure as in claim 13 in which a vertically float is mounted in the bowl, and means is provided between the float and the contact means for causing the latter to be opened when the float moves upwardly a certain distance in the bowl irrespective of any vertical movement of the supporting means.

In testimony whereof I affix my signature.

IRA EDWARD SMITH.