June 19, 1923. 1,459,149

L. E. FRENCH

AUTOMATIC CUT-OFF FOR OIL BURNERS

Filed Dec. 28, 1921 2 Sheets-Sheet 1

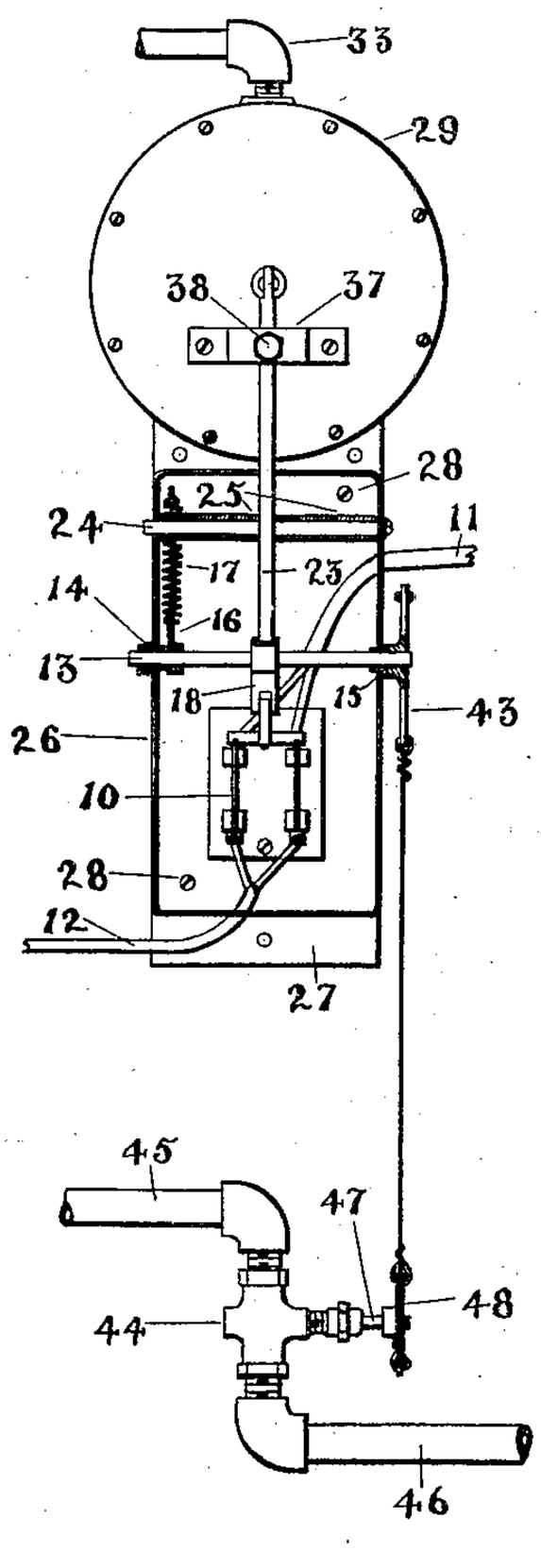

Fig. 1.

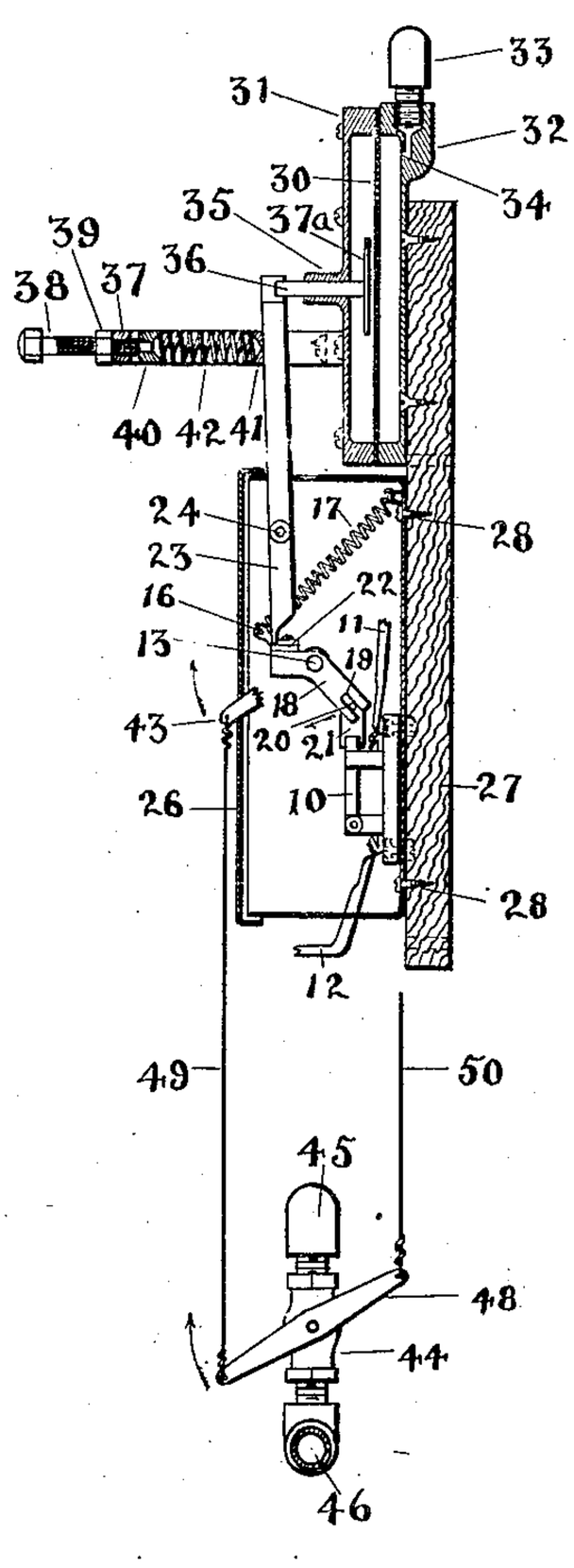

Fig. 2.

INVENTOR.
LAURENCE E. FRENCH.
BY Chas. E. Townsend
ATTORNEY

June 19, 1923. 1,459,149

L. E. FRENCH

AUTOMATIC CUT-OFF FOR OIL BURNERS

Filed Dec. 28, 1921 2 Sheets-Sheet 2

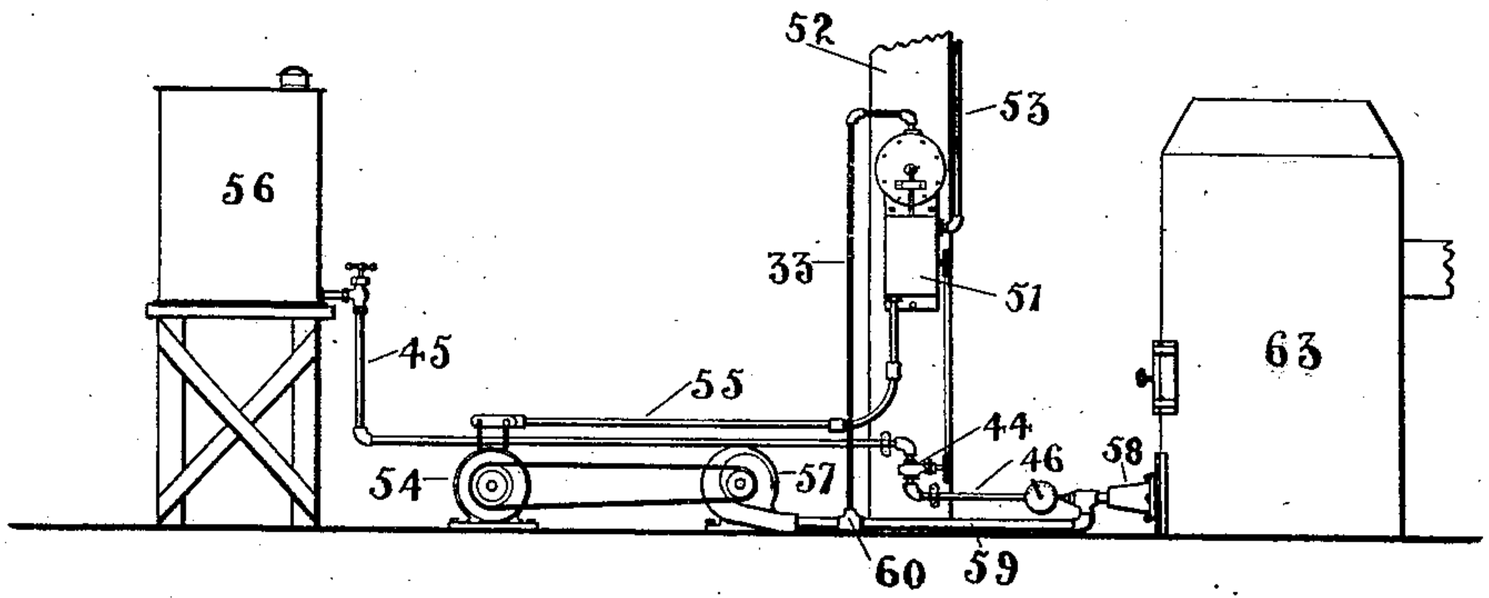

Fig. 3.

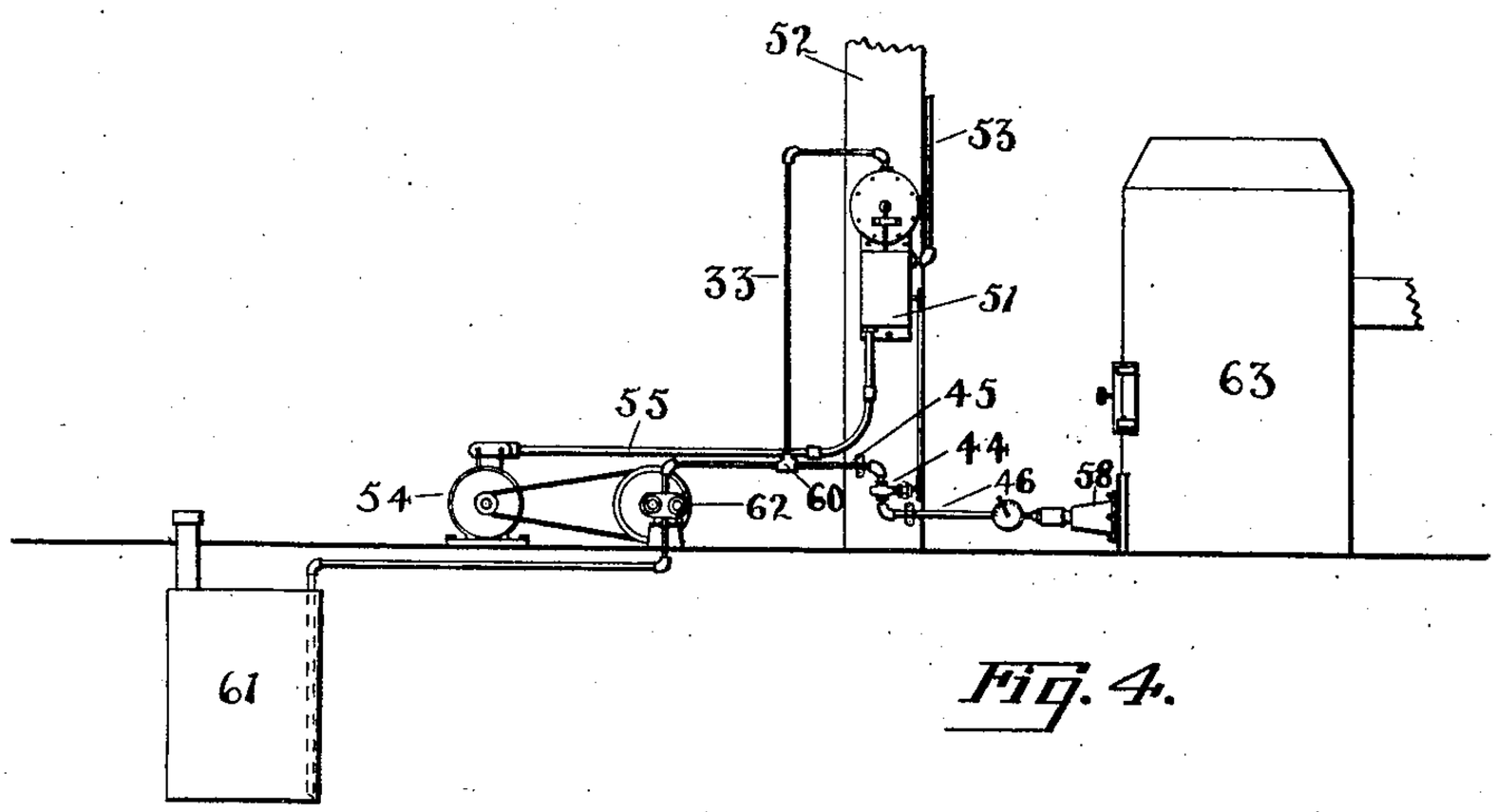

Fig. 4.

INVENTOR.
LAURENCE E. FRENCH.
BY Chas. E. Townsend
ATTORNEY

Patented June 19, 1923. 1,459,149

UNITED STATES PATENT OFFICE.

LAURENCE E. FRENCH, OF SEBASTOPOL, CALIFORNIA.

AUTOMATIC CUT-OFF FOR OIL BURNERS.

Application filed December 28, 1921. Serial No. 525,303.

To all whom it may concern:

Be it known that I, LAURENCE E. FRENCH, a citizen of the United States, residing at Sebastopol, in the county of Sonoma and State of California, have invented new and useful Improvements in Automatic Cut-Offs for Oil Burners, of which the following is a specification.

This invention relates to fuel burners, and particularly pertains to automatic switch and valve cut-outs therefor.

In the use of electrically driven oil burning apparatus, danger is often occasioned by the temporary interruption of the electric current supply for the fuel atomizing motor, at which times the burner flame will become extinguished, allowing the oil to flow into the furnace and when the motor again projects an unlighted oil spray against the incandescent walls of the furnace a disastrous explosion is likely to occur.

It is the principal object of the present invention, therefor, to provide automatically operating unit positively breaking the motor circuit, and discontinuing the flow of oil when there is a partial or complete interruption of the current supply, or an abnormal reduction in the pressures of either the air or fuel delivered to the burner, said unit being conveniently placed at a remote point from the oil line and supply.

The present invention contemplates the use of means actuated by the pressure of air or liquid supplied by an electrically driven appliance, and which means actuates a suitable device for releasing an electric switch and oil valve connected therewith, the device being applied to an oil burning apparatus in a manner to insure that abnormal reduction in the pressure of either the air or oil supplied to such apparatus will automatically release the switch operating mechanism and in turn open the electric switch and close the oil valve.

The invention is illustrated by way of example in the accompanying drawings, in which:

Figure 1 is an enlarged view in front elevation disclosing the apparatus with parts broken away for the sake of convenience.

Fig. 2 is a view in central vertical section through the device, showing the relation of the electric switch to a pressure diaphragm and trip, and also showing the relation of an oil valve to the switch.

Fig. 3 is a view in elevation illustrating the application of the invention in relation to apparatus by which air pressure is supplied to an oil burner.

Fig. 4 is a view in elevation illustrating the application of the invention in relation to an apparatus by which oil pressure is supplied to an oil burner.

Referring more particularly to the drawing, 10 indicates an electric switch connecting line wire 11 with wires 12 of an electric motor. Above the switch a shaft 13 is supported by bearings 14 and 15. A lever 16 is keyed to the shaft 13 and a spring 17 is attached to this lever. A simple lever 18 is also keyed to the shaft 13. One end of this lever is slotted as shown at 19, in Fig. 2, to engage a pin 20 which extends through a switch handle 21. At the opposite end of the lever 18 there are two hardened steel plates forming a seat for a lever 23, and at the lower end thereof. The lever 23 is pivoted onto shaft 24 and is held in proper position by means of tubular sleeves 25.

The electric switch 10 is located in a closed steel box 26, the sides of which box form supports for the shafts 13 and 24. The box 26 is attached to the base board 27 by means of screws 28. Located above the box 26 and attached to the base board 27 is a pressure diaphragm 29 which comprises a sheet of flexible material 30 supported between two housings 31 and 32. Gaseous or liquid pressure is communicated to the rear side of the diaphragm 30 through a pipe 33 and a port 34. At the center of the casing 31 a boss 35 forms a bearing for a movable shaft 36. Mounted on the inner end of the shaft 36 a circular disc 37^a forms a suitable bearing surface for the flexible plate 30. The outer end of the shaft 36 is notched to form a bearing for the lever 23. Mounted on the casing 31 and embracing the lever 23 is a yoke 37. This yoke, at its outer end, carries an adjusting screw 38 which is held in position by a lock nut 39. The inner end of the screw 38 carries a circular cup 40. A similar cup 41 is mounted on the lever 23. The two cups 40 and 41 form end bearings for a spring 42.

To the outer end of the shaft 13 a lever 43 is centrally and rigidly keyed. At any convenient point directly below the box 26 an oil valve 44 is located. The valve is fitted upon line pipes 45 and 46 which may be rigidly anchored to any convenient support. The oil valve is of such construction that a

60 degree rotary motion of the valve stem will effect a complete opening or closing of the valve port. To the valve stem 47 a lever 48 is centrally secured. The ends of the lever 48 are connected to the ends of the lever 43 by means of wires 49 and 50, the length of these wires being equal, the levers being in the same plane to permit simultaneous motion.

In Figures 3 and 4 a cut-out switch 51 and the oil valve 44 are shown located on a post 52. The electric line wires are shown entering the cut-out box 51 through conduit 53, and from thence leading to electric motor 54 through the conduit 55. In Fig. 3 oil is shown as supplied from a gravity feed tank 56 through pipes 45 and 46. The electric motor 54 drives an air blower 57 which supplies air to the burner head 58. The air line 59 is tapped at the point 60 and the air pressure thus communicated to the pressure diaphragm through the pipe 33.

In Fig. 4 oil is supplied from an underground tank 61 by means of a gear pump 62 driven by the electric motor 54. The oil pressure from the oil line 45 is tapped at the point 60 and conducted to the pressure diaphragm through the pipe 33. The burner head 58 is shown attached to a furnace 63.

In operation of the present invention the outer end of the lever 43 is pressed downward. This places the spring 17 in tension and at the same time closes the electric switch 10 and opens the oil valve 44. The closing of the switch 10 starts the electric motor 54 and this revolving the blower or gear pump builds up the air or oil pressure. The air or oil pressure is communicated to the inner surface of the diaphragm 30 by means of the tube 33 and this pressure causes the diaphragm to be distended against the plate 37^a. The pressure acting on the diaphragm 30 is thus communicated to the disc 37^a and this in turn is imparted through the rod 36 and the lever 23 to the spring 42. The pressure on the spring 42 may be varied by means of the adjusting screw 38 to balance the pressure exerted by the plate 30.

In starting the burner the switch is closed by lever 43. This is held down by hand long enough to allow the electric motor 54 to attain full speed, and the fluid pressure to build up, at which time the pressure of air or oil acting on the diaphragm 30 causes the lower end of the lever 23 to move inwardly until it rests in its seat on the hardened plates 22. The lever 43 is then released and the electric switch 10 retained in its closed position by the trip lever 23, preventing any rotary motion of the shaft 13.

In the event that the electric current is partially or completely interrupted, causing the electric motor to slow down or stop, or in case the motor should burn out or the overheating of the bearings should cause it to slow down, the pressure on the diaphragm 30 will be abnormally reduced, and will not counterbalance the pressure of the spring 42. This unbalanced pressure causes the upper end of the lever 23 to move inwardly and the lower end to move outwardly. A slight motion of the lower end of the lever 23 causes it to clear the seat on the hardened blocks 22 and when this occurs the expansion of the spring 17 causes the shaft 13 to revolve about its axis in the direction of the arrow —*a*—. This exerts pressure on the pin 20 in the direction of the arrow and forces the switch levers 10 outwardly, thus breaking the electric circuit, which circuit will then remain open until the switch is manually re-set. The movement of lever 43 is simultaneously imparted to the lever 48 through the wires 49 and 50 and the lever 48, thus closing the oil port in the valve 44 which port will remain closed until re-set manually.

It will thus be seen that by the use of the device here described fire risk will be eliminated, and that in addition the device will act as an overload circuit breaker in case a mechanical overload causes the motor to slow down much below normal speed. At the same time the design of the device is such as to enable it to be conveniently located in an accessible position, separated by any distance required from either motor, blower or oil pump.

While I have shown the preferred form of my invention as now known to me, it will be understood that various changes might be made in the combination and arrangement of parts by those skilled in the art, without departing from the spirit of the invention, as claimed.

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

1. In combination with an electrically driven apparatus for impelling fluid under pressure through a conduit, of pressure actuated means operatively connected to said apparatus and adapted to cause the same to cease operations immediately in the event that the pressure of said fluid drops below a predetermined amount.

2. In combination with an electrically driven apparatus for impelling fluid under pressure through a conduit, of a normally open valve in said conduit, and pressure actuated means operatively connected to said apparatus and to said valve and adapted to cause the apparatus to cease operations and to close the valve in the event that the pressure of said fluid drops below a predetermined amount.

3. In combination with an apparatus for impelling fluid under pressure through a conduit, of an electric motor for driving said apparatus, an electric circuit for said motor, and means operatively connected to

said apparatus and adapted to break said circuit in the event that the pressure of said fluid drops below a predetermined amount.

4. In combination with an apparatus for impelling fluid under pressure through a conduit, of an electric motor for driving said apparatus, an electric circuit for said motor, a normally closed switch in said circuit, pressure actuated means operatively connected to said apparatus and said switch whereby a drop in pressure of said fluid will cause said means to release the switch and break the motor circuit.

5. In combination with an apparatus for delivering fluid under pressure through a conduit, of an electric motor for driving said apparatus, an electric circuit for said motor, a switch in said circuit, pressure actuated means operatively connected to said apparatus and said switch adapted to normally maintain said switch closed, said pressure act means adapted to release said switch and break said circuit upon a drop in pressure of said fluid.

6. In combination with an apparatus for delivering fluid under pressure through a conduit, of an electric motor for driving said apparatus, an electric circuit, for said motor, a switch in said circuit, a valve in said conduit, pressure actuated means operatively connected to said apparatus and to said valve and switch and adapted to normally maintain said switch closed and said valve open, said means also adapted to release said switch to break the circuit and to close said valve upon a drop in pressure of said fluid.

7. In combination with an apparatus for delivering fluid under pressure through a conduit, and an electric motor for driving said device, of an electric circuit for said motor, a switch in said circuit, a valve in said conduit, and means influenced by the pressure of the fluid in said conduit of automatically opening said switch and closing said valve in the event that said pressure drops below a predetermined amount.

8. In combination with an apparatus for delivering fluid under pressure through a conduit, and an electric motor for driving said device, of an electric circuit for said motor, a switch in said circuit, a valve in said conduit, a pressure diaphragm operatively connected to said conduit, and means actuated by the diaphragm normally maintaining said switch closed and said valve open, said means adapted to open said switch and close said valve in the event that the pressure in the conduit influencing the diaphragm drops below a predetermined amount.

9. In combination with an oil burner, means operatively connected therewith for delivering fluid under pressure thereto, a valve in the connection between the burner and said means, and other means influenced by the pressure of said fluid to close said valve when said pressure drops below a predetermined amount.

10. In combination with an oil burner, an electric motor and means driven by said motor and connected by a conduit to said burner for delivering fluid under pressure thereto, an electric circuit for said motor, a valve in said conduit, and pressure actuated means operatively connected to the first named means whereby said circuit will be broken and said valve closed in the event that the pressure in said conduit drops below a predetermined amount.

11. In combination, an electric switch, a pressure diaphragm, a trip lever, and means whereby said trip lever will be actuated to release said switch upon a reduction in pressure on said diaphragm.

12. In combination, a normally open fluid shut-off valve, an electric circuit having a normally closed switch, a pressure diaphragm, a trip lever, and means whereby said trip lever will be actuated by said diaphragm to release said switch and close said valve upon a reduction in pressure on said diaphragm,

LAURENCE E. FRENCH.