A. T. MARSHALL.

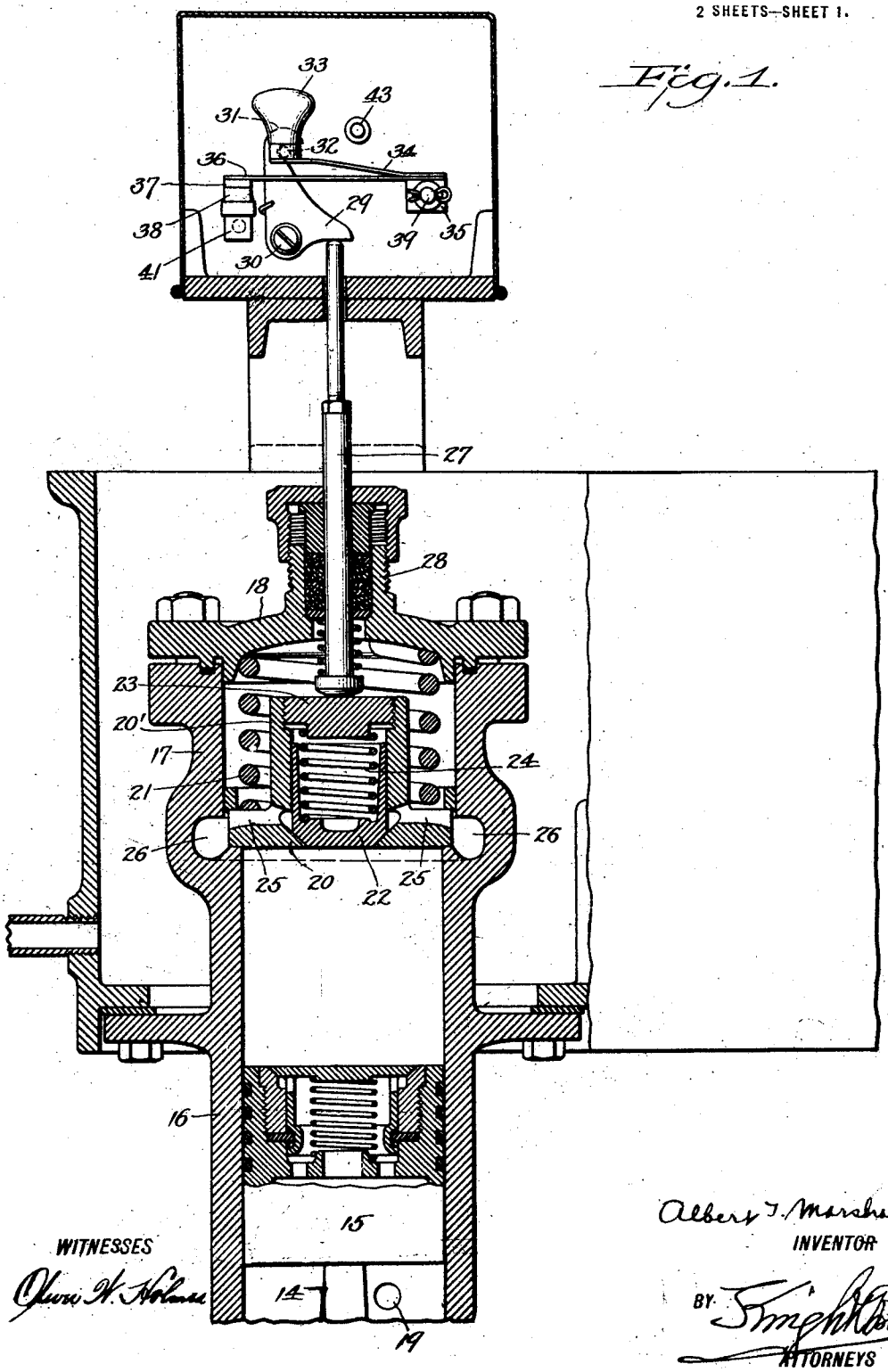
SAFETY DEVICE FOR GAS OR VAPOR PUMPS.

APPLICATION FILED MAR. 23, 1920.

1,411,054. Patented Mar. 28, 1922.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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2 SHEETS—SHEET 2.

Fig. 2.

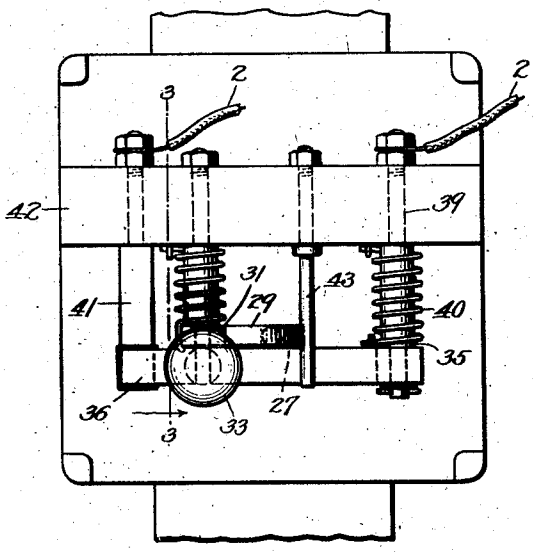


Fig. 3.

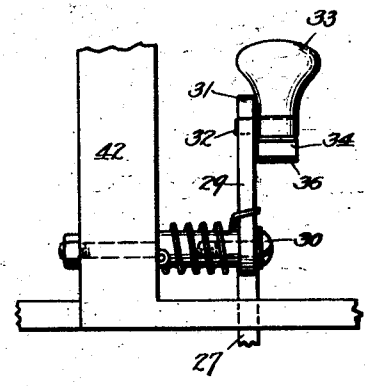
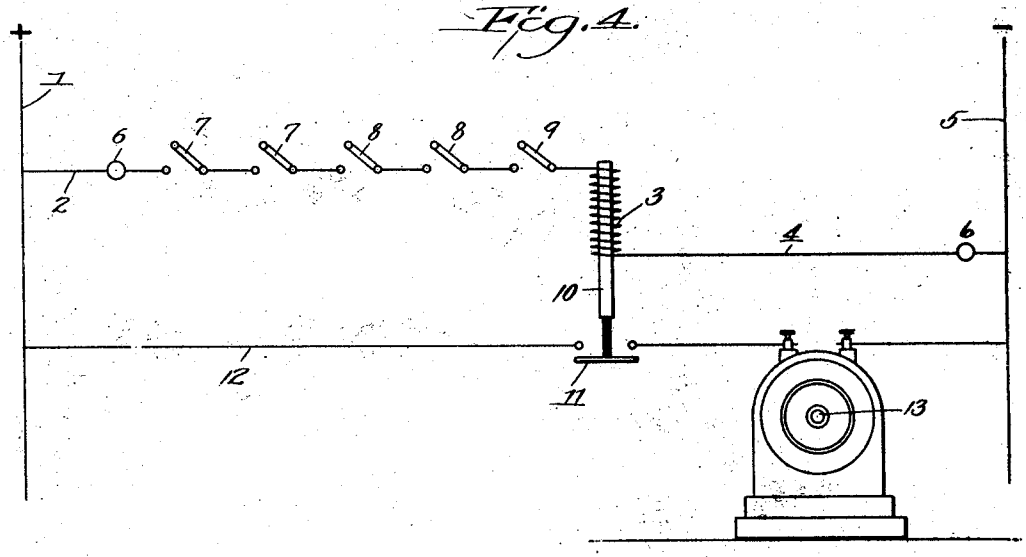


Fig. 4.



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UNITED STATES PATENT OFFICE.

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SAFETY DEVICE FOR GAS OR VAPOR PUMPS.

1,411,054. Specification of Letters Patent. Patented Mar. 28, 1922.

Application filed March 23, 1920. Serial No. 368,189.

To all whom it may concern:

Be it known that I, ALBERT T. MARSHALL, a citizen of the United States, residing at Hartford, county of Hartford, and State of Connecticut, have invented certain new and useful Improvements in Safety Devices for Gas or Vapor Pumps, of which the following is a specification.

This invention relates to safety devices for gas or vapor pumps and more particularly to high speed compressors such for example as those used in refrigerating systems in which the compressors exhaust from the refrigerating coils the vapor which forms during the refrigerating process from the fluid contained in said coils. In refrigerating systems, it not infrequently happens that a slug of the unvaporized fluid is drawn into the pump cylinder and in some cases causes the cylinder heads to be knocked out. In low speed compressors, the danger is not as great as in high speed machines which are likely to do considerable damage and even cause loss of life before they can be shut down.

The present invention has for its primary object to provide an improved safety device which automatically controls the operation of the compressor so as to avoid serious trouble whenever a slug of liquid reaches the compressor. In the present embodiment of my invention in which an electric motor is connected up with the compressor and drives it at high speed, the first safety head to be lifted by the liquid slug, is arranged to operate a switch which interrupts the motor energizing circuit. Preferably, one of these devices should be placed on each cylinder with the trip switch connected up in series with the high pressure cut out and electric overload cut out so that said trip switch need carry but a very small current instead of a very much larger current which it would be necessary to control were a larger trip switch connected up in the main electric supply to the motor. Specific objects of invention will appear in the specification and be pointed out in the claims. In the drawings, which represent a preferred embodiment of my invention.

Figure 1 is a side elevation of the trip switch and operating connections, parts of the compressor being shown in section;

Figure 2 is a top plan view of the trip switch;

Figure 3 is a fragmentary side elevation of the same, parts being shown in section:

Figure 4 is a wiring diagram.

Referring more particularly to the drawings, in Figure 4 is shown a wiring diagram in which a positive main 1 is connected by a wire 2 to one end of a solenoid 3, the other end of said solenoid being connected by a wire 4 to the negative main 5. Said wire 2 includes fuses 6, compressor trip switches 7, current overload trip switches 8 and a high pressure cut out switch 9. Reciprocable within the solenoid 3 is a plunger 10 which carries an insulated contact bridge 11 which is adapted to complete the main feed line 12 of a motor 13 which drives the piston of the compressor which is now to be described. Referring to Figure 1, the motor 13 is connected to the compressor by means which include a piston rod 14, said piston rod being connected to a piston 15 which reciprocates in a cylinder 16 having an extension 17 at its upper end closed by a fixed head 18. The cylindrical wall of said cylinder 16 is provided with an inlet port 19 which is connected up to the exhaust end of a refrigerating coil (not shown). Closing the upper end of the piston chamber is a yieldable head or wall 20 which is ordinarily retained in closed position with respect to the piston chamber by means of a spring 21 which is interposed between the yieldable wall 20 and the fixed cylinder head 18. According to the present embodiment of my invention, the yieldable wall 20 is provided with a central valve opening which is closed by a valve 22 reciprocably mounted in a cylindrical extension 20′ of the yieldable wall. Said cylindrical extension 20′ is provided with a removable cap 23 between which and the valve 22 is interposed a compression spring 24 which yields to permit the valve 22 to open under predetermined conditions to admit the compressed gas or vapor by means of ports 25 to the channels 26 which preferably lead to the condenser (not shown). As has been indicated above, the spring 21 is constructed of such strength as to normally retain the wall 20 in closed position. Should, however, a slug of liquid, i. e. gas or vapor in its liquid condition, be drawn into the piston chamber, the yieldable wall 20 will be displaced upwardly, the cap 23 being adapted to transmit this movement to a plunger 27 which passes through a stuffing box 28 and

has its upper end abutting against one arm of a trip lever 29 which is pivotally mounted on a stud 30 and has its other arm provided with a hook 31 which normally engages a pin 32 which projects laterally from a hand grip 33 carried by the outer end of a leaf spring 34 which is mounted upon an oscillatory block 35 which carries a spring switch 36. The blade of the spring switch 36 diverges from the leaf spring 34 and is provided with a contact 37 which cooperates with a lower contact 38 when said contacts are together. The block 35 and spring switch 36 is pivotally mounted on a post 39, a spring 40 (see Figure 2) being mounted on the post 39 and operating to throw the switch 36 into open position whenever said switch is released by the hook 31. The lower contact 38 is carried by another post 41, both of the posts 39 and 41 being mounted in a slate panel 42. Connected to the inner ends of the posts 39 and 41 are sections 2—2 of the wire 2 shown in Figure 4. Mounted in the slate panel 42 above the leaf spring 34 is a stop pin 43 which prevents overthrow of the switch. The operation of my improved safety device will now be readily understood and briefly described is as follows.

Normally, the plate or wall 20 retains the position shown in Figure 1. Whenever a slug of liquid is drawn into the piston chamber, said plate or wall is forced upwardly, compressing spring 21, raising plunger 27, oscillating trip 29 and releasing the switch 36. The motor is thereby stopped by having the solenoid 3 deenergized and permitting the bridge contact 11 to drop.

I claim:

1. The combination with a compressor having a pumping chamber provided with a movable wall adapted to be operated by an abnormal pressure of the medium in said pumping chamber, of a pumping element movable in said pumping chamber, means for operating said pumping element, and means operated by said movable wall for controlling the operation of said pumping element operating means.

2. The combination with a compressor provided with a pressure fluid chamber, of an element movable therein, said chamber having a movable wall, means for driving said movable element, and means operated by said movable wall of the chamber for controlling the operation of said movable element driving means.

3. The combination with a compressor comprising a cylinder provided with a yieldable wall portion adapted to be displaced by an abnormal pressure, and a piston reciprocable in said cylinder, of means for driving said piston, and an electric circuit including a switch operated by said yieldable wall portion of the cylinder.

4. The combination with a cylinder provided with a yieldable wall portion, a piston reciprocable in said cylinder, a motor for driving said piston, an electric circuit including a switch for controlling the operation of said motor, and means operated by said yieldable wall portion for moving said switch.

5. The combination with a cylinder having a piston chamber provided with a movable wall, a piston reciprocable in said piston chamber, means for driving said piston, an electric circuit for controlling the operation of said piston driving means, said electric circuit being provided with a switch, and a plunger operated by said movable wall and controlling the movement of said switch.

6. In a compressor, a piston chamber provided with a movable wall, a piston movable in said chamber, means for driving said compressor, and means operated by said movable wall for controlling the operation of said compressor driving means.

ALBERT T. MARSHALL.