

March 25, 1941.

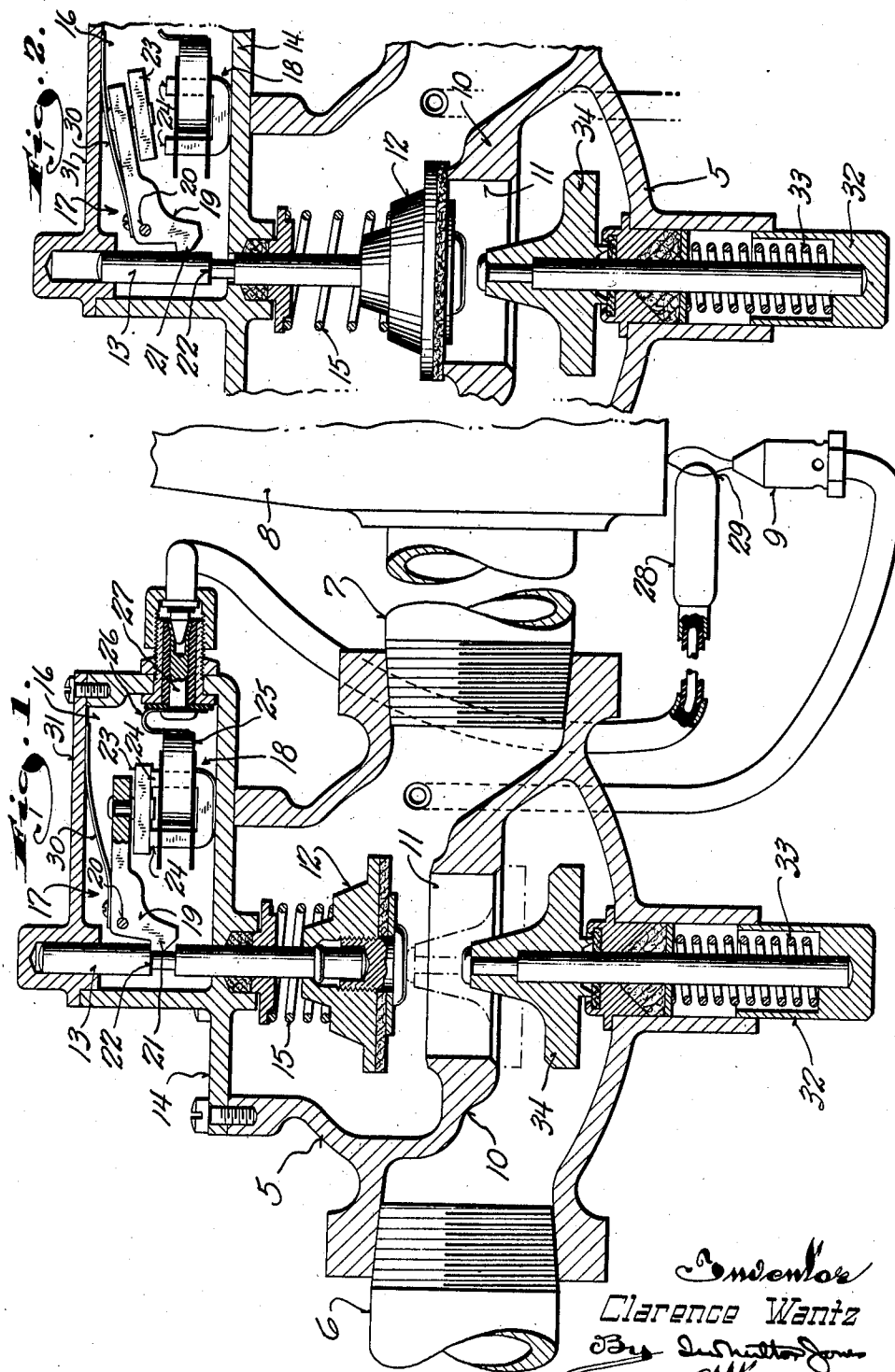
C. WANTZ

2,236,227

VALVE

Filed Aug. 15, 1938

3 Sheets-Sheet 1



March 25, 1941.

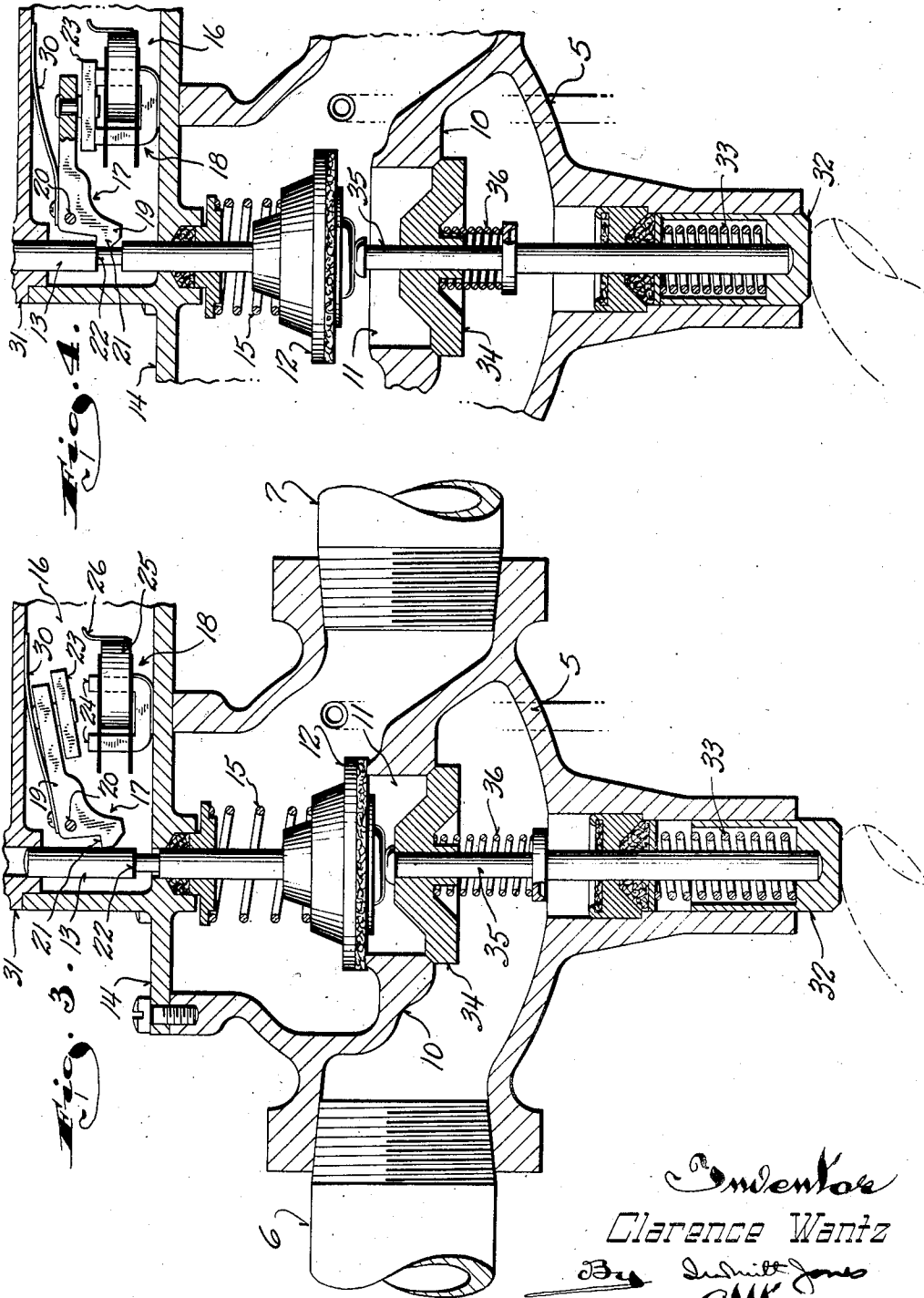
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VALVE

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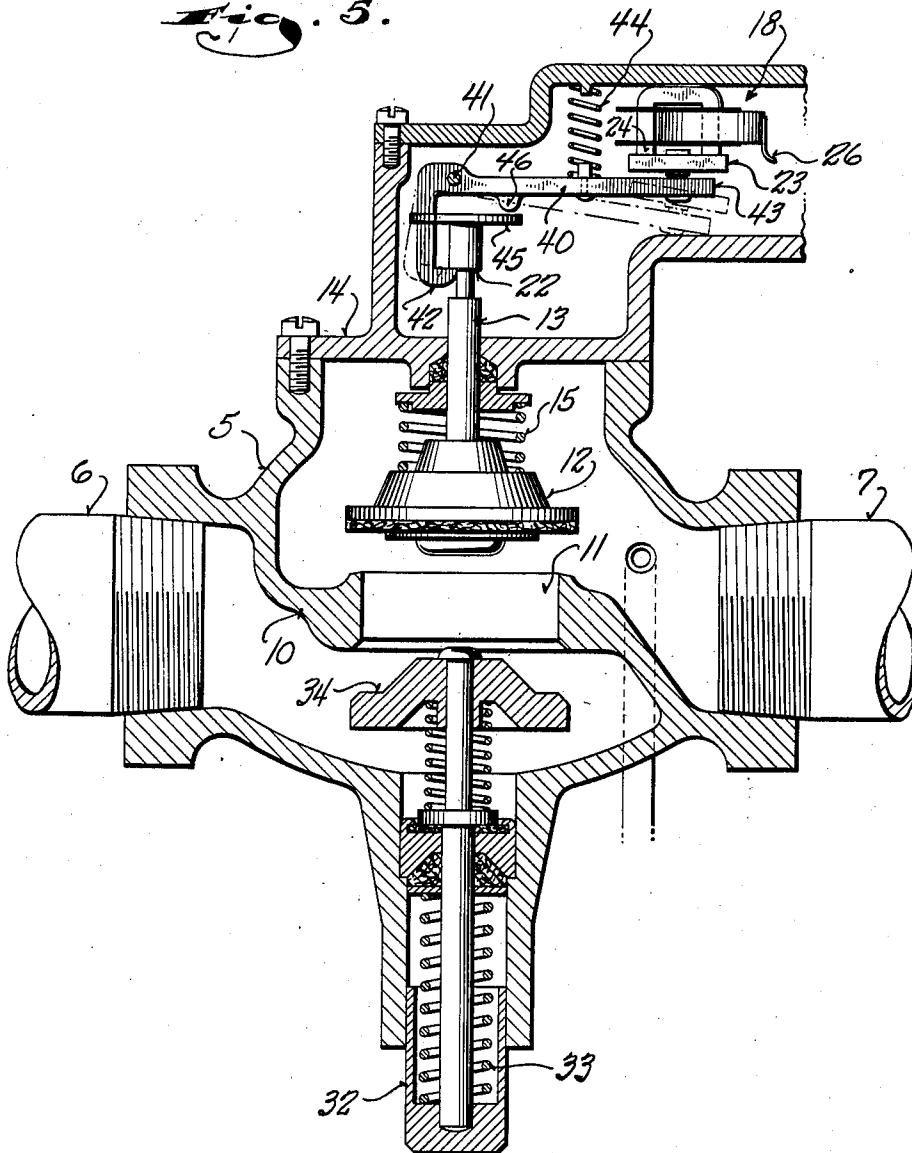
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VALVE

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Fig. 5.



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VALVE

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3 Claims. (Cl. 158—117.1)

This invention relates to gas valves and refers particularly to automatic shut-off valves for stopping the supply of gas to a burner or the like in the event of failure of its pilot light.

While different types of shut-off valves for this purpose have been provided in the past, it has been found expedient to control the same by means of a thermocouple having its junction located in juxtaposition to the pilot flame so that the heat of the flame induces a current flow which is used to hold the valve open. With this arrangement, extinction of the pilot flame is accompanied by closure of the shut-off valve.

Resetting of these valves is done manually, and inasmuch as it requires a short time for the thermocouple to become effective, it is desirable to positively prevent the flow of fuel to the burner during the interim, and this invention therefore has as its primary object to provide means operable concomitantly with the resetting of the valve for positively closing off the flow of fuel to the burner.

Another object of this invention is to provide a simple unitary valve structure for the purpose stated, wherein the movable valve element which is biased to closed position is held open by a latching device maintained operative by an electromagnet deriving its electrical energy from the thermocouple.

Inasmuch as it is desirable to have the valve seat firmly, its spring is preferably quite strong, but regardless of this fact, the valve must be held open by the comparatively weak magnet energized from the E. M. F. of the thermocouple. Hence, it is a further object of this invention to provide novel latch means for connecting the valve with the magnet in such a manner that great mechanical advantage is gained.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate several complete examples of the physical embodiment of the invention constructed in accordance with the best modes so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a vertical sectional view through a

valve embodying this invention, illustrating the same in its operative valve open position;

Figure 2 is a view showing part of the valve, but illustrating the manner in which tripping of the latch is accompanied by closure of the valve;

Figure 3 is a vertical sectional view illustrating a modified embodiment of the invention;

Figure 4 is a similar view illustrating another position of the modified structure; and

Figure 5 is a vertical sectional view through another modified embodiment of the invention.

Referring now particularly to the accompanying drawings in which like numerals indicate like parts, the numeral 5 designates a valve casing having an inlet 6 and an outlet 7. The inlet 6 is connectible with a source of gas supply, and the outlet is connected to a burner 8, or any other device to be supplied with fuel.

A pilot burner 9 mounted in juxtaposition to the burner provides for the ignition of the gas conducted thereto. A partition 10 in the valve casing is interposed between its inlet and outlet and has a valve port 11 adapted to be closed by a valve disc 12. The valve disc is carried by a stem 13 slidably mounted in the cover 14 which closes the top of the casing. A compression spring 15 bearing against the valve disc yieldingly urges the same to its closed position seated on the periphery of the port 11.

The cover 14 is provided with a chamber 16 in which a latch, designated generally by the numeral 17, and an electromagnet 18 are disposed. The latch 17 consists of a lever 19 pivoted as at 20 and having a latching finger 21 adapted to hook over a shoulder 22 formed in the stem 13. The opposite outer end of the lever 19 carries an armature 23 engageable with poles 24 of the electromagnet.

The coil 25 of the electromagnet has one end grounded to the casing and its other end connected by a lead 26 with a center terminal 27 passing through the wall of the chamber 16 but electrically insulated therefrom. A thermocouple 28 having its junction 29 positioned adjacent to the pilot light 9 has one of its leads electrically connected with the center terminal 27, and its other lead formed by its outer tubular shell electrically connected with the body of the housing, as shown.

Hence, electromotive force generated by the thermocouple in response to a temperature rise at its junction 29 effects energization of the electromagnet, which together with a spring 30 acting on the latch, holds the latch in an operative position engaging the shoulder 22 and hold-

ing the valve open. The spring 30 is a flat leaf spring fixed to the latch lever adjacent to the fulcrum 20 and bearing against the cover 31 of the chamber 16.

5 The spring 15 exerts a greater force axially on the stem 13 than does spring 30, but a lesser force than spring 30 plus the magnetic pull on the armature 23.

Upon extinction of the pilot flame, the cessation of current flow in the electromagnet results in deenergization of the magnet. The pull on the armature thus drops to zero; and as the spring 15 is stronger than spring 30, the stem 13 with the valve 12 moves towards closed position 15 rotating the latch lever on its pivot 20 until the latch finger 21 becomes disengaged from the shoulder 22. As soon as disengagement is complete, the force of the spring 30 is no longer transmitted to the stem 13 axially, but only transversely. The slight frictional restraint thus imposed upon the stem 13, however, does not interfere with the secure closure of the valve by the spring 15.

Thus, spring 15 can be made as strong as desired to obtain adequate seat pressure as long as spring 30 is weaker than spring 15 and spring 30 plus pull of armature 23 when magnet 18 is energized is more than spring 15.

To reopen the valve and reset the latch, a manually operable plunger 32 projects up through the bottom of the valve casing. This plunger is yieldingly urged to its lower extended position by a coil spring 33, and upon being pushed up lifts the valve disc 12 off its seat, as indicated 30 in dotted lines in Figure 1. Concomitantly with the lifting of the valve disc in this manner, the port 11 is closed by a valve disc 34 carried by the plunger. Hence, as long as the valve disc 12 is held up manually and for the period of time 40 required for the thermocouple to become active, the flow of gas to the burner 8 is positively prevented.

Ordinarily, this construction affords adequate protection; but if positive assurance against the possibility of holding the valve open manually 45 is required, the plunger may be constructed as illustrated in the modified embodiment shown in Figure 3. With this construction, the valve disc 34 is slidably mounted on the stem 35 of the plunger 32 and is yieldingly urged outwardly thereon by a coil spring 36. Thus, in resetting the valve, the initial movement of the plunger 32 engages the valve disc 34 with its seat prior to contact of the plunger stem 35 with the valve 50 disc 12, and only by continued upward movement is it possible to unseat the valve disc 12 and raise the same to its open position.

It is, of course, desirable to have the valve seat firmly; and to this end, the spring 15 is quite strong, but the electromagnet energized by the E. M. F. of the thermocouple is weak. Hence, it is necessary that the latch mechanism have considerable mechanical advantage.

The construction shown in Figures 1 to 4, inclusive, attains this object; but in the modification illustrated in Figure 5, even greater mechanical advantage is achieved. In this construction, the valve member 12 is mounted in the same manner as hereinbefore described and is 65 urged to its closed position by a heavy spring 15. The manner of resetting the valve is substantially the same as that employed in the modified embodiment illustrated in Figures 3 and 4.

The latch structure, however, is of improved design and comprises a substantially hook-shaped

lever 40 pivoted on a fulcrum 41 and having a hook 42 to engage under the shoulder 22. The outer extended arm 43 of the lever carries the armature 23 of the electromagnet, and a light coil spring 44 presses down on the lever 43 to 5 trip the latch when the electromotive force in the magnet depreciates to a predetermined value.

The shoulder 22 is at right angles to the axis of stem 13 and the fulcrum 41 and the shoulder 22 are in a line which is parallel to the axis of stem 13 so that the force of the spring 15 does not impart a turning moment to the latch lever, and consequently, the movable valve member can be held open against the tension of a comparatively heavy spring by the light force of the 15 electromagnet.

As stated, the light spring 44 trips the latch when the electromotive force in the magnet depreciates to a predetermined value, and thus urges the lever arm away from the magnet. 20 Hence, in resetting the valve, the lever arm must be lifted and to this end, a head 45 on the stem 13 is engageable with a lug 46 depending from the arm 43. The head 45 is slotted to accommodate the hooked end 42 of the latch lever.

From the foregoing description taken in connection with the accompanying drawings, it will be readily apparent to those skilled in the art that this invention provides a simple automatic shut-off valve combination by which the flow of 30 fuel to a burner is positively shut off during the resetting of the valve, and whereby absolute guaranty against defeating the safety feature of the valve is assured.

What I claim as my invention is:

1. In an automatic shut-off valve having a reciprocable valve element biased to closed position with a substantial force and having a surface substantially transverse to the line of motion of the valve element: a latch member having a 40 part engageable with said surface to hold the valve element open against its biasing force; means mounting the latch member to swing about a point lying substantially within a circle normal to and having its center on the axis of the valve element, the radius of said circle being equal to the maximum radial distance that the point of engagement between the latch member part and the surface it engages is from the axis of the valve element so that the biasing force acting 50 on the valve element when held in open position by the latch member is incapable of imparting a latch disengaging turning force to the latch member; a spring acting on the latch member with a force capable of disengaging the same but considerably lighter than the biasing force acting on the valve element; and means for releasably holding the latch element against unlatching motion induced by said spring.

2. An automatic shut-off valve of the character described comprising: a valve body having an inlet and an outlet; a port in the valve body affording communication between the inlet and outlet thereof; a valve member mounted for reciprocating movement to and from a position 65 closing the port; a substantially heavy spring yieldingly urging the valve member to its closed position; means on the valve member having a surface substantially transverse to the line of motion of the valve member; a pivoted latch having a part movable therewith to and from engagement with said surface to hold the valve member in an open position; means mounting the latch for swinging motion about a fulcrum point substantially encompassed by a circle nor-

mal to and having its center on the axis of the valve member, the radius of said circle being equal to the maximum radial distance that the point of engagement between the latch member part and the surface it engages is from the axis of the valve member so that the valve spring is incapable of imparting a latch disengaging turning force to the latch member; an armature carried by the latch member at a distance from its fulcrum; an electromagnet arranged to act on the armature and hold the latch member in its operative latching position; means depending upon the maintenance of a predetermined condition for energizing the electromagnet; a spring acting on the latch member with a substantially light force to effect disengaging motion of the latch member upon deenergization of the electromagnet; a manually operable member for moving the valve member to its open position and to effect setting of the latch; and a valve member movably associated with said manually operable member to close the port in advance of engagement of the manually operable member with the first named movable valve member so that the port is positively closed during the setting of the latch.

3. An automatic shut-off valve of the character described comprising: a reciprocable valve element having means thereon providing a surface transverse to the line of motion of the valve ele-

ment; a substantially heavy spring yieldingly urging the valve element in one direction to a closed position; a latch member having a part engageable with said surface to hold the valve element in open position; means pivotally mounting the latch member for swinging motion to and from its operative latching position about a point substantially encompassed by a circle normal to and having its center on the axis of the valve element, the radius of said circle being equal to the maximum radial distance that the point of engagement between the latch member part and the surface it engages is from the axis of the valve element so that the valve spring while acting on the latch member when the same is engaged with said surface of the valve element is incapable of imparting a latch disengaging turning force to the latch member, whereby the latch member is capable of holding the valve element in an open position unaided; a light spring acting on the latch member with a force sufficient to disengage the latch member part from said surface of the valve element to allow the valve spring to move the same to closed position; and an electromagnet for holding the latch member in its operative latching position against the force of said light spring during energization thereof.

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