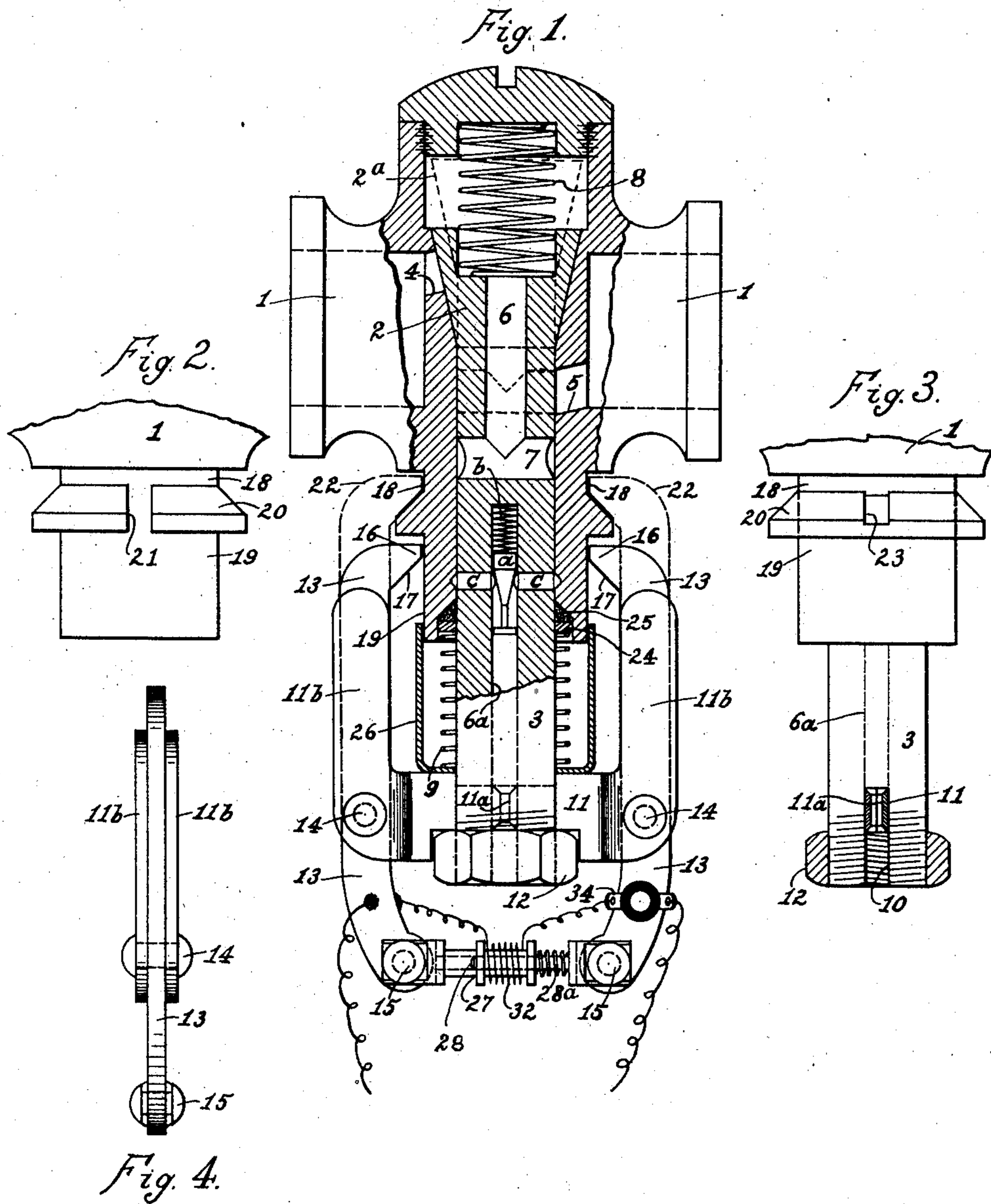


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AUTOMATICALLY OPERABLE VALVE.  
APPLICATION FILED JULY 22, 1909.

998,507.

Patented July 18, 1911.



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# UNITED STATES PATENT OFFICE.

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## AUTOMATICALLY-OPERABLE VALVE.

998,507.

Specification of Letters Patent. Patented July 18, 1911.

Application filed July 22, 1909. Serial No. 508,887.

*To all whom it may concern:*

Be it known that I, CHARLES EDWARD HASTY, a citizen of the United States of America, residing at Elgin, in the county of Kane and State of Illinois, have invented a new and useful Automatically-Operable Valve, of which the following is a specification, reference being had to the accompanying drawings, illustrating same.

My invention relates to valves and also to means for automatically operating such valves under certain conditions.

The principal objects of my invention are, to provide improved means for causing the automatic operation of a valve under certain conditions; to provide improved means for causing the operation of a valve from a distance, by electrical mechanism; to provide improved means for automatically locking the valve in closed position when it is closed; and to provide improved constructions in valves and automatically-operating mechanism therefor as will be hereinafter more fully described.

Other objects will be apparent from the following specification.

The locking features of the valve herein illustrated are particularly claimed in my copending application Serial No. 534,129, filed December 20, 1909, which is a division of the present application.

In the accompanying drawings Figure 1 is a side view of the preferred form of the improved valve of this invention, with portions shown in cross-section to show the interior construction thereof; Fig. 2 is a side elevation of the lower portion of the valve casing, taken the same as Fig. 1, showing the annular recesses in the casing and one of the passageways connecting the said recesses; Fig. 3 is a side elevation of the lower portion of the valve casing and plug stem, taken at right-angles to Fig. 1, showing the annular recesses in the casing around the stem of the plug and also the small depressions for holding the valve-operating mechanism in the position in which the valve is fully opened; and Fig. 4 is an edge elevation of a portion of the operating mechanism of Fig. 1.

Like characters refer to like parts in the several figures.

In certain places and at certain times it is very desirable to be able to cause the operation of a valve, in gas or water systems,

at some distance from the valve, and also to know that the valve has been suitably operated by automatic mechanism when it is impossible to reach the valve to operate it by hand. For instance, in the case of a burning building it is very desirable to shut off the supply of gas to the building, in the main pipe preferably at the meter, to avoid explosions and the possibility of increasing the fire. Oftentimes it is impossible for a person to reach the valve in the main pipe to close it, as when the building or basement of the building is full of fire or smoke, and in this case it is very desirable to have means for automatically closing the valve when the fire produces considerable heat therearound, or means associated with the valve which can be operated at a distance to automatically close the valve as desired. To these ends the valve-operating mechanism of this invention is provided. In such automatically-operable valves it is also very desirable to have means for automatically locking the valve in closed position when it is automatically closed, so that it cannot be again opened until unlocked. This feature is accomplished by the mechanism hereinafter described.

In the valve-operating mechanism shown, the valve is automatically closed by the fusing of a joint, upon abnormal heating, which allows spring mechanism to automatically operate the apparatus and thus close the valve. The valve-operating mechanism besides having the fusible joint, also has a heat-producing element for generating heat to cause the fusion of the joint, the said heating element being connected in circuit with a suitable source of electrical supply for heating and fusing the fusible joint.

In the drawings, 1 is a valve casing and 2 is a valve plug, the said plug having a stem 3 extending from the casing. The casing 1 is provided with an inlet 4 leading to the tapered plug seat, and an outlet 5 leading from the opening for the stem 3. The upper end of the plug 2 is provided with a longitudinal hole 6 extending part way down the plug and meeting a transverse hole 7 through the plug, preferably as shown. When the tapered portion of the plug 2 is raised from its seat, against the action of coil springs 8 and 9, the inlet 4 is connected with the hole 6, and then by properly turning the plug 2 the outlet 5 is connected with

the transverse hole 7 which is now raised into alinement with the outlet 5. Thus it will be seen that when the plug 2 is raised from its seat and properly turned, the passage through the valve is opened, and that when the plug is lowered into its seat the passage through the valve is closed.

The lower end of the plug 2 is provided with a longitudinal hole 6<sup>a</sup> therein within which is placed a plunger *a* and a coil spring *b* acting thereon. The plug 2 also carries a pair of pins *c c* therein, loosely placed within a transverse hole in the plug 2. The outer ends of the pins *c c* project out past the plug stem 3 into an annular groove within the casing 1, as shown in Fig. 1, when the plug 2 is seated in its seat, so as to lock the plug 2 down until it is desired to release same. When it is desired to raise the plug 2 out of its seat to open the valve, it is necessary to raise the plunger *a* against the action of the coil spring *b*, by thrusting an instrument into the hole 6<sup>a</sup> against the plunger *a*. When the plunger *a* is thus raised, the pins *c c* are free to move inwardly, and, therefore, the plug 2 is free to be raised from its seat. Now when the plug 2 is raised from its seat while the plunger *a* is held up, the pins *c c* are pressed inwardly by their contact with the casing 1, until they lie entirely within the plug stem 3, the plug 2 being now free to be raised from its seat as desired. Now when the plug 2 is again seated in its seat, the pins *c c* are lowered with the plug 2 until they are forced out by the plunger *a* into the annular recess in the casing 1, as shown in Fig. 1, thus again locking the valve in closed position. It will be readily understood that when the valve is either open or closed, the plug 2 may be turned around as desired, the pins *c c* in no way limiting such movement.

The lower end of the plug stem 3 carries a cross bar 11, preferably made of two formed metal portions, which extends through a slot 10 in the lower end of the plug stem 3. A nut 12 securely holds the bar 11 in place, by being screwed up tightly against the bar 11 and also squeezing the bifurcated end portions of the plug stem 3 together against the bar 11. The bar 11 is provided with a hole 11<sup>a</sup> therethrough through which the instrument for raising the plunger *a* may be inserted as desired.

The cross bar 11 is provided with a pair of upturned arms 11<sup>b</sup> 11<sup>b</sup> at each end thereof, between which arms are loosely pivoted a pair of operating arms 13 13 at 14 14. The arms 13 13 are connected together at their lower ends by a fusible link 27 28 which is loosely pivoted to the arms 13 13 at 15 15. The upper ends of the arms 13 13 extend inwardly as at 16 16, and are beveled as at 17 17, to cooperate with the annular passageways 18 and 19 and the beveled annular pro-

jection 20 of the casing 1. The annular passageway 19 for the portions 16 16 of the arms 13 13 is the annular corner portion directly beneath the annular projection 20. The annular projection 20 is preferably provided with a pair of diametrically opposite passageways 21 connecting the annular groove 18 and the cylindrical portion 19, and also with a pair of diametrically opposite depressions 23 on the upper beveled surface thereof, located midway between the passageways 21. The ends 16 16 of the arms 13 13 are adapted to slide through the passageways 21 when the arms 13 13 and cross bar 11 are turned around to the proper position and then all raised as a unit with the plug 2 against the action of springs 8 and 9, from the full-line position of Fig. 1 to the height shown in dotted lines 22 22, the plug now taking the dotted-line position 2<sup>a</sup>. It will be readily seen that the arms 13 13 may be turned clear around with the plug 2, in either their lower position or their upper position 22 22, in the latter position the mechanism if so turned opening and closing the outlet passage 5 during a revolution. It will also be seen that when the hole 7 is in alinement with the passage 5 so that the valve is fully open, the ends 16 16 of the arms 13 13 will drop down slightly into the depressions 23 so as to prevent the valve plug 2 from being turned until the operating mechanism is slightly raised. This serves as a latch to hold the valve open against any accidental turning of the operating mechanism.

It will be readily seen that when the arms 13 13 are turned so that the ends 16 16 thereof are directly above the passageways 21 21, in the upper position, the springs 8 and 9 will automatically act to throw the arms 13 13 and the plug 2 to the lower position, thus seating the plug 2 and tightly closing the inlet passage 4. Now if the operating mechanism is turned around in this lower position, the valve will not be opened in the least, because the inlet passage 4 is always tightly closed by the tapered portion of the plug 2. Thus it will be seen that this arrangement provides a safety valve which is also capable of manual operation as desired.

The purpose of the upturned arms 11<sup>b</sup> 11<sup>b</sup> is to protect the upper portions of the operating arms 13 13 from injury from falling objects, as in the case of burning buildings, and from other foreign objects, so as to preserve the usefulness of the valve. If, however, such falling objects strike the lower ends of the arms 13 13 they may in some cases cause the operation of the valve, by breaking the fusible link, even before the fire has heated the said link.

Within the lower end of the portion 19 of the casing 1 is placed a packing ring 24 and suitable packing 25, the ring 24 being held against the packing by spring 9. The

spring 9 is preferably inclosed by a cup-shaped portion 26 which is adapted to slide over the portion 19 when the arms 13 13 are raised.

5 The fusible link shown in Fig. 1, comprises a hollow metallic spool 27 and a metallic pin 28 soldered therein by easily-fusible solder and operable endwise through the spool 27. The portion 27 has a heating  
10 coil 32 wound thereon for producing heat by means of an electric current to fuse or soften the easily-fusible solder. One terminal of the winding 32 is connected to a terminal member 34 which is suitably insulated from  
15 its arm 13 and from the remainder of the valve-operating mechanism, the other terminal of the winding 32 being preferably connected to the valve mechanism.

Of course it is to be understood that various forms of heating elements may be used in the apparatus of this invention.

If the fusible link 27 28 is abnormally heated while the valve is open, either by fire or by an electric current, the easily-fusible  
25 solder is thus softened or melted, whereupon the spring members 8 and 9 acting on the plug 2 and the valve-operating mechanism, automatically force the upper portions 16 16 of the arms 13 13 apart, due to the beveled  
30 surfaces of the depressions 23, and thereby force the valve-operating mechanism and the plug 2 as a whole, to the lower position shown in Fig. 1, the lower ends of the arms 13 13 being forced together. Thus it will be  
35 seen that the fusing or weakening of the fusible link 27 28 causes the valve to be automatically closed. If it is desired to reset the apparatus so that the valve can be again held in opened position, it is only necessary  
40 to heat the link 27 28 in any suitable manner, such as with a soldering copper or an electric current in the coil 32, and place the parts of the link in normal position, whereupon the cooling of the solder restores the  
45 fusible link and the arms 13 13 to normal position and condition.

Of course the device of this invention may be readily made to resolder itself in operative condition, or in other words "self-soldering," by simply equipping same with  
50 spring mechanism, such as a coil spring 28<sup>a</sup> surrounding the portion 28, adapted to automatically throw the upper ends 16 16 of the arms 13 13 inwardly after they have been  
55 spread apart and automatically operated to their lower position by the fusing of the fusible link, before the fusible link cools after operation.

I do not wish to limit this invention to all  
60 of the exact details herein set forth, as various modifications of same may be made without departing from the scope of the appended claims.

What I claim as my invention is:

65 1. A valve having a plug adapted to be

placed in a plurality of positions along the longitudinal axis thereof and to be turned in one of the said positions to regulate the valve passage spring-actuated mechanism adapted to automatically throw the said  
70 plug from one of the said positions to another, and heat-susceptible mechanism normally restraining the said spring-actuated mechanism from operating but permitting the operation of same upon abnormal heating,  
75 whereby the said plug is automatically operated from one of the said positions to another.

2. A valve having a plug adapted to be placed in a plurality of positions and to  
80 be turned in each of the said positions, spring-actuated mechanism adapted to automatically throw the said plug from one of the said positions to another, heat-susceptible mechanism normally restraining the said  
85 spring-actuated mechanism from operating but permitting the operation of same upon abnormal heating, and a separate heater associated with the said heat-susceptible mechanism for heating the latter by an electric  
90 current, to permit the said plug to be automatically operated from one of the said positions to another.

3. A valve having a plug adapted to be raised from its seat to open the valve and  
95 then turned to regulate the valve passage, and spring-actuated mechanism adapted to hold the plug from its seat against the spring tension thereof, whereby the valve is kept  
100 open, the said spring-actuated mechanism having a heat-susceptible portion associated therewith whereby it is normally held intact but adapted upon abnormal heating to automatically seat the plug and close the valve.

4. A valve having a casing and a plug for  
105 controlling the passage through the valve, the said casing having a plurality of annular passageways therein, operable mechanism for the plug having a pair of arms adapted to cooperate with the said passage-  
110 ways, a heat-susceptible link normally holding the said arms intact, and spring mechanism adapted to operate the said arms from one of the said passageways to another upon the abnormal heating of the said heat-susceptible link, for controlling the passage  
115 through the valve.

5. A valve having a casing and a plug for controlling the passage through the valve, the said casing having a plurality of annular  
120 passageways therein, operable mechanism for the plug having a pair of arms adapted to cooperate with the said passageways, a heat-susceptible link normally holding the said arms intact, spring mechanism  
125 adapted to operate the said arms from one of the said passageways to another upon the abnormal heating of the said heat-susceptible link, for controlling the passage through the valve, and means for abnormally  
130

heating the said heat-susceptible link by an electric current to cause the operation of the apparatus.

6. A valve having a casing and a plunger adapted to be placed in a plurality of positions and to be turned in each of the said positions, mechanism for operating the said plunger and adapted to be placed in a plurality of positions, means for holding the said operating mechanism in each of the said positions, said mechanism comprising heat-susceptible mechanism normally holding the said operating mechanism intact, and spring mechanism acting on the said operating mechanism whereby the latter and the said plunger are automatically operated from one of their said positions to another upon abnormal heating of the said heat-susceptible mechanism.

7. A valve having a casing and a plunger adapted to be placed in a plurality of positions and to be turned in each of the said positions, mechanism for operating the said plunger and adapted to be placed in a plurality of positions, means for holding the said operating mechanism in each of the said positions, said mechanism comprising heat-susceptible mechanism normally holding the said operating mechanism intact, and spring mechanism acting on the said operating mechanism whereby the latter and the said plunger are automatically operated from one of their said positions to another upon abnormal heating of the said heat-susceptible mechanism, and means for abnormally heating the said heat-susceptible mechanism by an electric current to cause the operation of the apparatus.

8. A valve having a casing with a plurality of annular passageways therein, a plunger for controlling the valve passage and adapted to be placed in a plurality of positions and to be turned in each of the said positions, mechanism for operating the plunger, the said mechanism having a plurality of arms cooperating with the said annular passageways whereby the said mechanism and plunger may be maintained in said plurality of positions, a heat-susceptible link normally holding the said arms intact and adapted to permit the actuation thereof upon abnormal heating, and spring mechanism adapted to throw the said plunger and operating mechanism therefor from one position to another upon abnormal heating of the said link, whereby the closing of the valve passage is automatically controlled.

9. A valve having a casing with a plurality of annular passageways therein, a plunger for controlling the valve passage and adapted to be placed in a plurality of positions and to be turned in each of the said positions, mechanism for operating the plunger, the said mechanism having a plurality of arms cooperating with the said an-

nular passageways whereby the said mechanism and plunger may be maintained in said plurality of positions, a heat-susceptible link normally holding the said arms intact and adapted to permit the actuation thereof upon abnormal heating, and spring mechanism adapted to throw the said plunger and operating mechanism therefor from one position to another upon abnormal heating of the said link, whereby the closing of the valve passage is automatically controlled, and means for abnormally heating the heat-susceptible link by an electric current to cause the operation of the apparatus.

10. A valve having a casing with a fluid conduit therethrough and with a plurality of annular recesses, said recesses being connected by suitable passages, a valve plug, operable mechanism therefor having arms cooperating with the said recesses whereby the said mechanism may be maintained in a plurality of positions, the said mechanism in one of the said positions being incapable of effecting the flow of fluid through the said conduit and being capable of effecting the flow of fluid through the said conduit when in another of said positions, and being adapted to be turned in each of the said positions, heat-susceptible mechanism normally holding the said operable mechanism intact, and means for automatically throwing the said operable mechanism from one of the said positions to another upon abnormal heating of the said heat-susceptible mechanism.

11. A valve having a casing with a fluid conduit therethrough and with a plurality of annular recesses, said recesses being connected by suitable passages, a valve plug, operable mechanism therefor having arms cooperating with the said recesses whereby the said mechanism may be maintained in a plurality of positions, the said mechanism in one of the said positions being incapable of effecting the flow of fluid through the said conduit and being capable of effecting the flow of fluid through the said conduit when in another of said positions, and being adapted to be turned in each of the said positions, heat-susceptible mechanism normally holding the said operable mechanism intact, and means for automatically throwing the said operable mechanism from one of the said positions to another upon abnormal heating of the said heat-susceptible mechanism, and means for abnormally heating the said heat-susceptible mechanism by an electric current to cause the operation of the apparatus.

12. A valve having a casing with annular passageways therein and a plurality of arms cooperating with the said passageways whereby the said arms may be maintained in a plurality of positions and turned in each of the said positions, the wall between

the said passageways having a plurality of recesses therein cooperating with the said arms to prevent the accidental turning of the latter in one of the said passageways, 5 spring mechanism for throwing the said arms from one position to another upon abnormal conditions, and a heat-susceptible link normally holding the said arms intact but permitting of their operation upon abnormal heating. 10

13. In a valve having valve-operating mechanism adapted to be placed in a plurality of positions and to be turned in each of the said positions, means for holding the 15 said mechanism in each of the said positions, means for preventing the accidental turning of the said mechanism in one of the said positions when the valve is open, the said mechanism comprising spring mechanism 20 for throwing the said valve-operating mechanism from one position to another upon abnormal conditions, and heat-susceptible mechanism normally holding the said valve-operating mechanism intact but permitting 25 of its operation upon abnormal heating.

14. In an automatically-operable valve having arms for maintaining the valve mechanism in set position and a heat-susceptible link for controlling the said arms, 30 secondary arms for protecting the first-mentioned arms from injury from foreign objects, substantially as described.

15. A valve of the character described having a plug adapted to be placed in open 35 and closed positions and to be turned in each of the said positions, means for holding the said plug in open position, a fusible link normally holding the valve intact when in open position, spring mechanism acting to 40 automatically throw the said plug to closing position when the said link is abnormally heated, and mechanism adapted to automatically lock the valve in closed position substantially as described.

16. A valve having a casing with annular 45 passageways therein and a plurality of arms cooperating with the said passageways whereby the said arms may be maintained in a plurality of positions and turned in each 50 of the said positions, the wall between the said passageways having a plurality of recesses therein cooperating with the said arms to prevent the accidental turning of the latter in one of the said passageways, 55 spring mechanism for throwing the said arms from one position to another upon abnormal conditions, a heat-susceptible link normally holding the said arms intact but permitting of their operation upon abnormal heating, and means for abnormally 60 heating the said heat-susceptible link by an electric current to cause the operation of the apparatus.

17. In a valve having valve-operating mechanism adapted to be placed in a plurality of

positions and to be turned in each of the said positions, means for holding the said mechanism in each of the said positions, means for preventing the accidental turning of the said mechanism in one of the said positions when 70 the valve is open, the said mechanism comprising spring mechanism for throwing the said valve-operating mechanism from one position to another upon abnormal conditions, and heat-susceptible mechanism normally 75 holding the said valve-operating mechanism intact but permitting of its operation upon abnormal heating, and means for abnormally heating the said heat-susceptible mechanism by an electric current to cause 80 the operation of the apparatus.

18. In a valve having a valve plug adapted to be placed in a plurality of positions and to be turned in each of the said positions, means for holding the said plug in 85 each of the said positions, means for preventing the accidental turning of the said plug in one of the said positions when the valve is open, and heat-susceptible mechanism for causing the operation of the valve 90 upon abnormal heating.

19. In a valve having a valve plug adapted to be placed in a plurality of positions and to be turned in each of the said positions, means for holding the said plug in 95 each of the said positions, means for preventing the accidental turning of the said plug in one of the said positions when the valve is open, heat-susceptible mechanism for causing the operation of the valve upon 100 abnormal heating, and means for abnormally heating the said heat-susceptible mechanism by an electric current to cause the operation of the apparatus.

20. In a valve having a plug and mechanism 105 for raising the plug from its seat and then turning the plug to open the valve, means for preventing the accidental turning of the said mechanism when the valve is open, and heat-susceptible mechanism for 110 causing the operation of the valve upon abnormal heating.

21. In a valve having a plug and mechanism 115 for raising the plug from its seat and then turning the plug to open the valve, means for preventing the accidental turning of the said mechanism when the valve is open, heat-susceptible mechanism for causing the operation of the valve upon abnormal heating, and means for abnormally 120 heating the said heat-susceptible mechanism by an electric current to cause the operation of the apparatus.

22. In a valve of the character specified having arms for maintaining the valve 125 mechanism in open position and a heat-susceptible link for controlling the said arms, secondary arms for protecting the first-mentioned arms from injury from foreign 130 objects.

23. In a valve of the character set forth having mechanism for maintaining the valve in set position and a heat-susceptible link for controlling the said mechanism, mechanism for protecting the first said mechanism from injury from foreign objects.

24. In a valve of the character set forth having mechanism for maintaining the valve in open position and a heat-susceptible link for controlling the said mechanism, mechanism for protecting the first said mechanism from injury from foreign objects.

25. In a valve of the character set forth having operating mechanism therefor and a heat-susceptible link for controlling the said mechanism, mechanism for protecting the said operating mechanism from injury from foreign objects.

26. In an automatically-operable valve having heat-susceptible mechanism for controlling the actuation of the valve, means for automatically resecuring the said mechanism in operable condition after operation whereby it may be again operated.

27. In an automatically-operable valve having heat-susceptible mechanism for controlling the actuation of the valve, a separate heater associated with the said heat-susceptible mechanism for abnormally heating the latter by an electric current, and means for automatically resecuring the said mechanism in operable condition after operation whereby it may be again operated.

28. In a valve having a plug and a heat-susceptible link normally holding the valve intact, a plunger within the plug, spring mechanism acting on the said plunger, and transverse members carried within the plug, adapted to project therefrom and coöper-

ating with the said plunger, whereby the plug may be automatically locked against operation as desired.

29. In a valve having a plug and heat-susceptible mechanism normally holding the valve intact, a plunger within the plug, and locking members coöperating with the said plunger whereby the plug may be locked against operation.

30. In a valve of the character specified having arms for maintaining the valve mechanism in set position, secondary arms for protecting the first-mentioned arms from injury from foreign objects.

31. In a valve of the character specified having arms for maintaining the valve mechanism in open position, secondary arms for protecting the first-mentioned arms from injury from foreign objects.

32. In a valve of the character set forth having mechanism for maintaining the valve in set position, a plurality of arms for protecting the said mechanism from injury from foreign objects.

33. In a valve of the character set forth having mechanism for maintaining the valve in open position, a plurality of arms for protecting the said mechanism from injury from foreign objects.

34. In a valve of the character set forth having operating mechanism therefor, a plurality of arms for protecting the said operating mechanism from injury from foreign objects.

As inventor of the foregoing I hereunto subscribe my name this 12th day of July, 1909.

CHARLES EDWARD HASTY.

Witnesses:

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