

Sept. 24, 1940.

D. D. WILE

2,215,947

REFRIGERATING APPARATUS

Filed May 14, 1938

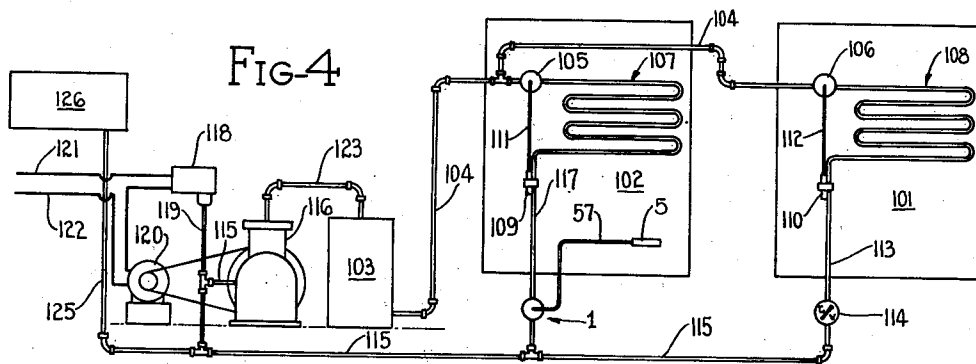
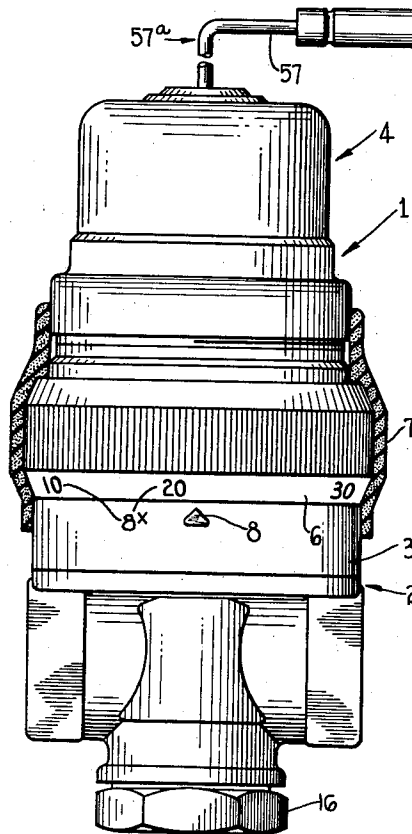


FIG-1

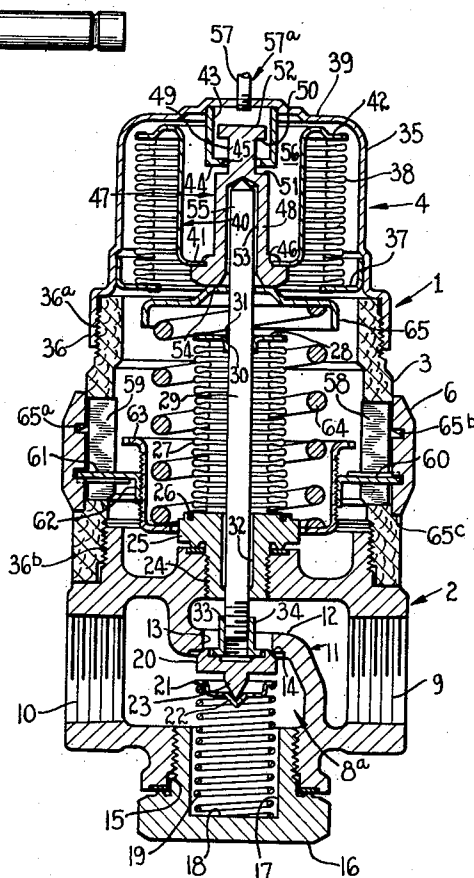


FIG-2

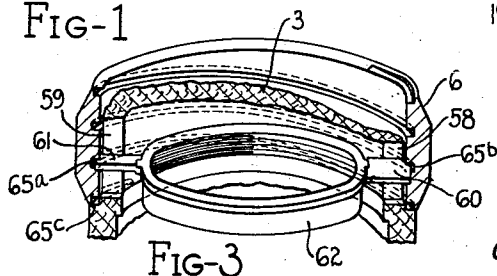


FIG-3

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2,215,947

REFRIGERATING APPARATUS

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Application May 14, 1938, Serial No. 207,907

18 Claims. (Cl. 236—99)

My invention relates to new and useful improvements in refrigerating apparatus and more particularly to a temperature responsive valve for controlling flow of fluid in a refrigeration system.

An object of my invention is to provide a new and improved valve for controlling the passage of gaseous refrigerant from an evaporator in response to the temperature of the refrigerated medium so that a predetermined substantially constant temperature is maintained at the control point.

Another object of my invention is to provide a simple external means for adjusting the valve without otherwise interfering with its operation.

Another object of my invention is to provide a simple, reliable and easily manufactured temperature responsive valve to maintain a substantially constant temperature regardless of the variation of the pressure in the suction line to the refrigerant condensing unit.

The invention consists in the improved construction and combination of parts, to be more fully described hereinafter and the novelty of which will be particularly pointed out and distinctly claimed.

In the accompanying drawing, to be taken as a part of this specification, I have fully and clearly illustrated my invention, in which drawing—

Figure 1 is a side view in elevation of my valve with a surrounding sleeve in longitudinal central section;

Fig. 2 is a view in central vertical section of the valve shown in Fig. 1, but with the sleeve removed;

Fig. 3 is a detail view in perspective and longitudinal central section showing certain of the adjusting means of Fig. 2, and

Fig. 4 is a diagrammatic representation of a refrigerating system including my valve.

Referring to the drawing by characters of reference the numeral 1 designates generally a thermostatic refrigerant controlling valve having a body portion 2, a hollow connecting cylindrical or housing member 3, and a power element 4 including a feeler bulb 5 and a calibrated metal adjusting ring 6 concentric with and fitting around the connecting member 3. A tightly fitting insulating sleeve or jacket 7, of rubber or other pliable elastic material, surrounds the ring or cylindrical member 6 to prevent "sweating" thereof or condensation of moisture thereon should the ring 6 be cooled to a point below the dew-point of the surrounding medium. The sleeve 7 extends beyond the upper and lower ends of the ring 6 and fits tightly the outside walls of mem-

ber 3 to substantially prevent the passage of moisture from the surrounding air to the interior of the hollow connecting member 3, and eliminates the consequent condensation on and "frosting" of the working valve parts which might render the valve inoperative. An arrow 8 on the member 3 cooperates with the calibrating markings or numerals 8^x on the ring 6 to serve as an index for adjustment of the valve.

The body portion 2 has a passageway 8^a there-through which is screw-threaded at each end or port 9, 10 for attachment to the refrigerant conduit system to be hereinafter described. Within the body portion 2 and separating the ports 9, 10 there is a wall member 11 having a lateral portion 12 in which there is a port or orifice 13 defined by a valve seat 14. Located below the orifice 13 and concentric therewith is an opening 15 from the passageway 8^a through the bottom wall of the body portion 2 to the exterior thereof. Screw-threaded into the opening 15 there is a plug member 16 having a well 17 concentric with the orifice 13. Within the well 17 and against the bottom wall 18 thereof is a helical coil spring 19 acting under compression to urge a valve closing member 20 against the valve seat 14 to prevent flow of fluid through orifice 13. The valve member 20 is preferably engaged by a spring cap member 21 having an indented portion 22 in which is received a conical portion 23 of the valve member 20 so that the valve member is free to adjust itself to the contour of the seat 14 for complete closure. Either port 9 or 10 may be taken as the inlet to the valve, the other port being the outlet. Slightly different valve operating characteristics are obtained by changing the direction of flow through the valve and therefore the valve is inserted in the particular system in accord with the characteristics desired. The area of the valve member 20 and the force exerted by the spring 19 may be so arranged, as is described hereinafter, that when fluid flows through the passageway 8^a from port 9 to port 10, a predetermined maximum differential of pressure may be maintained between ports 9 and 10. When fluid flow through the valve is from port 10 to port 9, then if the area of valve member 20 is substantially equal to the effective area of the bellows end member 28, to be hereinafter described, the valve will be unaffected by the pressure in the valve body on the outlet side of the valve member 20 and transmitted through port 9, so that the valve will be entirely responsive to the temperature of bulb 5.

A threaded aperture 24 extends through the

upper wall of the body portion 2 concentric with the orifice 13 and connects the passageway 8^a with the interior of the connecting cylindrical member 3. Into this aperture 24 is screw-threaded one end portion of a carrying member 25 which has sealed to its opposite end portion, as at 26, one end of a thin walled, metallic bellows 27. The other end of the bellows 27 is secured in fluid-tight relation to an end member 28. A thrust rod 29 is sealed into a central aperture 30 through the end member 28, as by solder 31. Part of the rod 29 extends down through the interior of the bellows 27 and through a central aperture or guideway 32 of the member 25, and is screw-threaded at its lower end portion 33. Screw-threaded to the end portion 33 is an abutting member 34 which extends into the orifice 13 and is operable to engage and open the valve member 20 against the force of spring 19.

A cap member 35 overlies the rod 29 and has its edge portion 36, facing the body member 2, screw-threaded as at 36^a, to receive one end of the hollow connecting member 3. The other end of the member 3 surrounds the threaded aperture 24 and is screw-threaded to a cylindrical flange or extension on the body portion 2, as at 36^b. Within the cap member 35 adjacent the edge portion 36 but external of or longitudinally spaced from the member 3, is an annular ring 37 sealed to member 35 and which supports and has secured and sealed thereto one end of a bellows 38, having the other end extending upward toward the bottom or end wall 39 of the cap member 35. A cup-shaped member 40, positioned within the bellows 38, has at its bottom an end wall 41 substantially in the plane of ring 37 and has at its upper end an outwardly extending, surrounding flange portion 42 which is sealed to the upwardly extending end of the bellows 38. Projecting from the cap end wall 39 and within the cap member 35 is a hollow cylindrical member 43 having an end wall 44 through which an oval aperture 45 extends substantially concentric with the aperture 24 of the body member 2.

An aperture 46 extends through the bottom wall 41 of the cup-shaped member 40 and is also substantially concentric with the aperture 24. Secured within and substantially sealing the aperture 46 is a thimble member 47 having a portion 48 extending toward the cap end wall 39. The portion 48 has a reduced diameter portion 49 which provides at its ends, spaced shoulders 50, 51. The end portion 52, located intermediate the reduced diameter portion 49 and the upper end of the extending portion 48, is slightly smaller and of the same shape as the aperture 46 and is located within the member 43. The portion 52 upon insertion through aperture 45 into the member 43, is rotated 90° about the longitudinal axis of the thimble member 47 so that the spaced shoulders 50, 51 cooperate with the end wall 44 of the cylinder portion 43 to form stops to limit expansion and contraction of the bellows 38. It may be noted that member 47 is so rotated before ring 37 is sealed to the cap member 35.

A concentric well 53 extends inwardly from the lower face 54 of the thimble member 47 and receives the upwardly projecting end 55 of the thrust rod 29, which transmits movement of the bellows end wall or cup-shaped member 40 to the valve member 20. The interior of the expansible-collapsible chamber 56 formed by the cap member 35, bellows 38, annular ring 37, cup member

40 and thimble member 47 is connected by means of a conduit 57 to the bulb 5, and a sealed, interconnected system 57^a is thus formed which is evacuated and then charged with a predetermined quantity of volatile, temperature sensitive fluid having a substantial vapor pressure at normal refrigerating temperatures. The predetermined quantity with which the sealed system is charged is preferably entirely receivable by the bulb in a liquid state.

The cylindrical member 3 has, through its side wall, a pair of oppositely disposed, longitudinally extending apertures or slots 58, 59, each receiving one of a pair of oppositely disposed ears or fingers 60, 61 projecting radially from a supporting ring member 62. A tubular supporting member 63 having an apertured end wall is screw-threaded into the central aperture through the ring member 62 and carries the lower end of a helical coil type range spring 64 which surrounds the bellows 30 and thrust rod 29. The other or upper end of the spring 64 is held concentric with the rod 29 by a second supporting or spring abutment member 65 which has a central aperture therethrough loosely receiving the thrust rod 29, and the member 65 is held thereby from excessive lateral movement. The spring 64 which is under compression, holds the member 65 against the face 54 of the thimble member 47, and the spring also operates to modify the valve opening movement of the power element 4. The threaded connection between ring member 62 and supporting member 63 may be used as a factory adjustment so that the variation in individual springs, which might be used in production, can be compensated for and also so that the same spring may be used for valves of different ranges of temperature control. The field or service adjustment is accomplished by means of rotating the adjusting ring 6, which may be calibrated, as shown in Fig. 1. The ring 6 at its inner face has cut or formed therein two helical grooves 65^a, 65^b of substantially identical form, spaced 180° from each other to provide a multiple thread, preferably double, about the circumference of the inner face of the ring 6. These grooves overlie the apertures 58, 59 and the fingers 60, 61, which are preferably plate or wing-like portions oppositely inclined or tiltable at the pitch of the threads 65^a, 65^b. The ring 6 fits the member 3 and seats at its lower end on a circumferential shoulder 65^c spaced from the apertures 58, 59 toward the portion 2, against which it is held by the spring 64. The ring 6 is of sufficient size or height to completely overlie and extend beyond the ends of apertures 58, 59. As the fingers 60, 61 are held against rotation by the walls of apertures 58, 59, and since ring 6 is held against longitudinal movement, rotation of the ring will cause the ring member 62 to move along the longitudinal axis of the cylindrical member 3 to compress or allow spring 64 to expand and thus vary the force which opposes opening movement of the valve 20 by the power element 4. The apertures 58, 59 also serve to guide the longitudinal movement of member 63. In the particular construction shown in the drawing, rotation of the ring 6 toward the left, facing the drawing, will increase the spring force acting on the power element 4 and thereby because of the increased power necessary to open the valve 20, will raise the temperature which will be maintained by the valve 1 in the refrigerated space because of the increased temperature necessary in the bulb 5 to develop enough pressure in the

sealed system to oppose the increased force of spring 64.

Fig. 4 shows the valve 1 connected into a refrigerating system comprising two refrigerated compartments 101, 102, which are to be maintained at two different temperatures. Compartment 102 is preferably maintained at the higher temperature. Liquid refrigerant is supplied from a condenser-receiver 103 by means of a liquid line or conduit 104 to thermostatic expansion valves 105, 106 which regulate the feeding of refrigerant to the evaporating or cooling coils 107, 108 respectively. The coils 107, 108 are located within and in heat exchange relation with compartments 102, 101 respectively, so that the compartments can be maintained at a temperature lower than that of the surrounding medium. The flow of refrigerant is controlled by means of the usual thermostatic bulbs 109, 110 connected by conduit means 111, 112 to the respective expansion valves 105, 106. The bulbs 109, 110 which are sensitive to the temperature of the outlet refrigerant from the respective evaporating coils 107, 108 control admission of refrigerant to the respective coils 107, 108 so that the coils remain substantially in a flooded condition but without any of the liquid refrigerant escaping therefrom. The outlet refrigerant vapor containing the heat absorbed in coil 108 flows through outlet conduit 113 connected to the coil 108, through a check or unidirection flow valve 114 into the common return or suction line 115 and then to the compressor 116. The outlet refrigerant vapor containing the heat absorbed in the evaporator coil 107 flows through outlet conduit 117 connected to coil 107, through valve 1 (shown in detail in Fig. 2) into the common return line 115 to which the valve 1 is connected, and then to the compressor 116. A pressure sensitive switch 118 is operatively connected to the return line 115 by means of conduit 119 and controls the operation of an electrical motor 120 supplied by power from a suitable source of supply through lead wires 121, 122. When a predetermined high pressure 45 in the suction line 115 has been reached, the switch 118 will close the circuit to the motor 120 and upon a predetermined lower pressure in line 115 the circuit to the motor 120 will be opened by the opening of switch 118. The motor 120 drives the compressor 116 which compresses the refrigerant vapor that returns from the evaporating coils 107, 108 through the suction line 115 to raise the temperature thereof, and the compressed and heated refrigerant vapor is then discharged from the compressor 116 through conduit 123 to the condenser-receiver 103. In the condenser-receiver 103 the vapor is condensed to a liquid by a suitable heat abstracting medium which removes some of the heat therefrom. The liquid refrigerant then again repeats its cycle of heat transfer.

Conduit means 125 has one end connected with the return line 115 and the other end with an equalizer or surge tank 126. The tank 126 is an empty container which is operable to receive and discharge refrigerant vapor in the system and acts the same as a flywheel or other inertia means would act in a mechanical system. The length of cycle of operation of the refrigerating mechanism may be altered by changing the volumetric capacity of the tank 126. Thus if a long infrequent cycle of operation is desired, a large tank should be used, while if a short frequent cycle is desired, a small tank or possibly no tank at all would be used.

The valve of Fig. 1 when in the refrigerating system of Fig. 4, will operate substantially to maintain a desired, predetermined temperature within the compartment 102 as determined by the setting of the coil spring 64 of Fig. 2. Suppose that the valve is installed so that the port 10 is connected to conduit 117 and port 9 is connected to line 115, then as the temperature in the compartment 102 increases, the fluid in bulb 5 will expand and some of it will be vaporized to increase the pressure in the communication system, and the bellows member 38 will expand in opposition to spring 64 and spring 19 and the valve member 20 will be opened to allow refrigerant vapor to flow through the valve into the return line 115. The coils 107, 108 should always be chosen so that the required pressure in coil 108 and connected line 115 is below that required by coil 107 so that the vapor will always flow from the coil 107 to maintain the desired temperature within the compartment 102. The actual desired pressure to be maintained in line 115 is directly related to the temperature desired in the compartment 101 and the direct connected coil 108, and is the pressure for which the control 118 is set to maintain in line 115. The valve 114 in the line 113 prevents the increase of pressure within the coil 108 by the higher pressure refrigerant vapor which issues from the valve 1 should the pressure build-up in the line 115, due to a high cooling demand on the coil 107, or otherwise back-up therein due to temporary overloading of the compressor 116 or line 115.

If the temperature in compartment 102 is higher than that called for by valve 1, the valve will be in open position and the vaporous refrigerant will leave the coil 107 and more of the liquid refrigerant therein will vaporize and thereby remove heat from the compartment 102 to be carried away by the refrigerant vapor until the predetermined temperature for which the valve 1 is set is reached, when the bulb 5 will have cooled sufficiently and have condensed therein enough of the fluid in the communicating control system so that the spring 64 will act against the bellows to collapse the same. The thrust rod 29 will be raised and the valve 20 will be closed by the spring 19 and will stop the flow of vapor through the valve 1. The valve connected in this manner will maintain a very even temperature in the compartment 102 regardless of the pressure in line 115, so long as that pressure is maintained lower than the pressure in coil 107. This is true when the effective area of the valve 20 and bellows end member 28 are substantially equal, for the pressure on the bellows member tending to open the valve, is substantially equal to the opposed differential pressure acting directly on the valve 20 and tending to close the valve.

Should the valve 1 be connected so that port 9 is connected to conduit 117 and port 10 is connected to line 115, then slightly different operation will prevail. As the pressure in suction line 115 is decreased, the valve 20 will have a tendency to open at lower temperatures and the temperature of compartment 102 will become somewhat lower at a constant setting of valve 1. Should the pressure in line 115 be decreased sufficiently, then the valve will open against its spring and the maximum pressure differential possible between ports 9 and 10 will have been reached. This maximum differential is determined by the relative area of the seat and the closing force of spring 19. Should the area of valve 20 be $\frac{1}{4}$ square inch and the spring exert

a force of five pounds, then the maximum pressure differential across the valve would be twenty pounds per square inch. There are some installations where this action might be desirable.

- 5 Should it be desired to change the temperature within the compartment 102 for any reason, the insulating sleeve 7 may be slipped from over the ring 6 and then the ring may be rotated to give the setting to the valve for the new desired temperature within chamber 102.

10 It may thus be seen that I have invented a new and useful valve for use in multiple systems so that with one condensing unit I may maintain the compartments at various different temperatures, and which temperatures may be uninfluenced by the temperatures within the other compartments or the operating pressures of the condensing unit, provided of course that the operating pressure range is below that required by any of the compartments controlled by my valve. It may also be seen that by my valve and the associated adjusting ring I can raise the temperature of the evaporating coil controlled thereby so that the coil will be defrosted by merely adjusting the valve for a high temperature, and after the defrosting is complete I can readjust the valve to the desired setting without interfering with the operation of the rest of the system.

- 30 What I claim and desire to secure by Letters Patent of the United States is:

1. A fluid flow controlling valve of the character described, comprising a casing having a passageway therethrough with a valve port, a valve member cooperable with said port, automatically operable means for actuating said valve member, a housing member secured to said casing and supporting said means, said housing member having oppositely disposed apertures through side walls thereof, means within said housing member and operable to regulate the operation of said valve member by said automatic means, means within said housing member and operable on movement to adjust said regulating means and having portions extending through said apertures, and means carried externally of said housing member and cooperable with said extending portions to move said adjusting means.

2. A fluid flow controlling valve of the character described, comprising a casing having a passageway therethrough with a valve port, a valve member cooperable with said port, automatically operable means for actuating said valve member, a housing member secured to said casing and supporting said means, said housing member having an aperture through the wall thereof, means within said housing member and operable to regulate the operation of said valve member by said automatic means, means operable on movement to adjust said regulating means and extending through said aperture, means carried externally of and by said housing member and operable to move said adjusting means, and means surrounding said external means and co-operable with said housing member to seal said aperture to prevent passage of fluid therethrough.

3. A fluid flow controlling valve of the character described, comprising a casing having a passageway therethrough with a valve port, a valve member cooperable with said port, automatically operable means for actuating said valve member, a housing member secured to said casing and supporting said means, said housing member having an aperture through the wall thereof, means within said housing member and operable

to regulate the operation of said valve member by said automatic means, means operable on movement to adjust said regulating means and extending through said aperture, means carried externally by said housing member and operable to move said adjusting means, and a flexible resilient sleeve member covering and extending beyond the ends of said externally carried means and having tight fitting engagement with said housing member thereby to seal said aperture.

4. A fluid flow controlling valve of the character described, comprising a casing having a passageway therethrough with a valve port, a valve member cooperable with said port, automatically operable means for actuating said valve member, a supporting member secured to said casing and supporting said means, said supporting member having a guide passageway, means within said supporting member and operable to regulate the operation of said valve member by said automatic means, means operable on movement to adjust said regulating means and extending through said guide passageway and held thereby from rotational movement, and a ring member carried by and external of said supporting member and operable on rotational movement to move said adjusting means.

5. A fluid flow controlling valve of the character described, comprising a casing having a passageway therethrough with a valve port, a valve means controlling flow through said port, power means operable to urge said valve means in one direction relative to said port, resilient means operable to urge said valve means in the opposite direction relative to said port, means for regulating the operation of said power means, a supporting member supporting and holding said regulating means in engagement with said power means, and having guide portions, means to guide said supporting member guide portions for longitudinal movement and to hold said supporting member against rotational movement and means cooperable with said guide means and operable to adjust said supporting member to change the operation of said power means.

6. A fluid flow controlling valve of the character described, comprising a casing having a passageway therethrough with a valve port, a valve means controlling flow through said port, power means operable upon increase in fluid pressure to urge said valve means toward open position, resilient means operable to urge said valve means toward closed position, lost motion means between said valve means and said power means so that said valve means can move in one direction with respect to said power means regardless of the position of said power means, means for regulating the operation of said power means, a supporting member supporting and holding said regulating means in engagement with said power means, and means engaging and operable to adjust said supporting member to change the operating range of said power means.

7. A fluid flow controlling valve of the character described, comprising a casing having a passageway therethrough with a valve port, a valve means controlling flow through said port, power means, thrust means operatively connecting said power means and said valve means, said power means acting through said thrust means to move said valve means toward open position, spring means operable to urge said valve means toward closed position, resilient means surrounding said thrust means and operable to oppose

movement of said power means, a supporting member supporting and holding said resilient means in engagement with said power means and having a pair of oppositely disposed ears, and an internally threaded ring means cooperable with said supporting member ears and operable to adjust the distance from said supporting member to said power means to change the resilient force opposing said power means thereby to change the operating range of said power means.

8. In a fluid flow valve of the character described, a casing having a passageway therethrough and having a valve port, a valve member cooperable with said port, automatically operable means operable to actuate said valve member, a heat insulating member having one end secured to said casing and having the other end supporting said automatic means, said insulating member having an aperture in a wall thereof and an annular shoulder thereon adjacent said aperture, means within said insulating member and operable to modify the operation of said means, a supporting member within said insulating member and having a portion extending through said aperture, an internally threaded ring member surrounding said insulating member in overlying relationship to said aperture and seating on said shoulder, said extended portion of said supporting member engaging the threads on said ring member, said ring member being operable upon rotational movement to position said supporting member to modify the operative effect of said modifying means on said automatic means.

9. A fluid flow controlling valve of the character described, comprising a casing having a passageway with a valve port, valve means controlling flow through said port, a power means operable to urge said valve means toward open position, resilient means operable to urge said valve means toward closed position, lost motion means between said valve means and said power means so that said valve means can move in one direction with respect to said power means regardless of the position of said power means, said resilient means and said valve means having a predetermined interrelation so that the maximum differential in fluid pressure across said port is limited to a predetermined amount, a regulating means, a supporting member supporting and holding said regulating means in engagement with said power means, and a ring member engaging said supporting member and operable through said regulating means to change the operating range of said power means.

10. A fluid flow controlling valve of the character described, comprising a casing having a passageway for flow of fluid therethrough and having a valve port, valve means controlling said port, said casing having an aperture overlying said port, a hollow cylindrical member having a low rate of conduction of heat and having one end secured to said casing and concentric with said aperture, an expansible-contractible temperature sensitive power element secured to the opposite end of said cylindrical member, means connecting said power element and said valve means so that expansion of said element will open said valve means, means urging said valve means toward closed position, lost motion means so that said connecting means may follow the contraction of said power element even though said valve means is in full closed position, said cylindrical member having an external shoulder and oppositely positioned guide slots through the wall

thereof above said shoulder, a ring member surrounding said cylindrical member and seating on said shoulder, the inside surface portion of said ring member having a pair of helical grooves spaced 180° apart, a holding member having a pair of oppositely disposed ears projecting through said slots and engaging in said helical grooves so that rotation of said ring member will cause said holding member to move toward and away from said power element, and a helical coil spring carried by and having one end supported on said holding member and having the other end abutting said power element so that the force of said spring will urge said power element into a contracted position, said spring being operable to regulate the range at which the controlling valve will operate.

11. A fluid flow controlling valve of the character described, comprising a casing having a passageway therethrough with a valve port, a valve member cooperable with said port, means urging said valve member toward closed position, a thrust means engaging said valve member, a tubular housing member having oppositely positioned longitudinally extending guide slots through its side wall and being secured and sealed at one end to said casing, a cap member secured and sealed to the other end of said housing member and having a movable wall receiving said thrust means, said housing member having a circumferential shoulder spaced from the casing end of said slots, a cylindrical member seating on said shoulder and fitting and being rotatable on said housing member, said cylindrical member overlying and closing said slots and having an internal screw-thread, a ring member within said housing member and having fingers projecting through said slots into engagement with said thread, a spring supporting member adjustably supported in said ring member, a helical coil spring surrounding said thrust means and seating at one end on said supporting member, and a spring abutment member receiving the other end of said spring and engaging said movable wall, said spring being held under compression to oppose movement of said movable wall and to hold said cylindrical member in engagement with said shoulder.

12. A fluid flow controlling valve of the character described, comprising a casing having a passageway therethrough with a valve port, a valve member cooperable with said port, means urging said valve member toward closed position, a thrust means engaging said valve member, a tubular housing member having oppositely positioned longitudinally extending guide slots through its side wall and being secured and sealed at one end to said casing, a cap member secured and sealed to the other end of said housing member and having a movable wall receiving said thrust means, said housing member having a circumferential shoulder spaced from the casing end of said slots, a cylindrical member seating on said shoulder and fitting and being rotatable on said housing member, said cylindrical member overlying and closing said slots and having an internal screw-thread, a ring member within said housing member and having fingers projecting through said slots into engagement with said thread, a spring supporting member adjustably supported in said ring member, a helical coil spring surrounding said thrust means and seating at one end on said supporting member, a spring abutment member receiving the other end of said spring and engaging said movable wall, said

spring being held under compression to oppose movement of said movable wall and to hold said cylindrical member in engagement with said shoulder, and a flexible resilient sleeve member covering and extending beyond the ends of said cylindrical member and having tight fitting engagement with said housing member thereby to seal said slots.

13. A fluid flow controlling valve of the character described, comprising a casing having a passageway therethrough with a valve port, a valve means controlling flow through said port, power means operable to urge said valve means in one direction relative to said port, resilient means operable to urge said valve in the opposite direction relative to said port, means for regulating the operation of said power means, a supporting member supporting and holding said regulating means in engagement with said power means, a housing member surrounding and enclosing said regulating means and rigidly supporting and securing said power means to said casing, said housing member having an opening through the wall thereof and having an external shoulder, adjustable means supported by said shoulder externally on said housing member, and means extending through said opening and operable to transmit movement from said adjustment means to said supporting member.

14. In an adjusting mechanism, a casing member having a plurality of apertures therethrough, a ring member having an internal multiple thread surrounding said casing member, a holding member having a plurality of fingers extending through said apertures and engaged in said thread, said holding member being held against rotational movement by the walls of said apertures so that rotation of said ring member will cause said holding member to move perpendicularly to the diameter of said ring member in said apertures, an adjustable member, resilient means interposed between said holding member and said adjustable member so that the position of said ring member will determine the force exerted by said resilient means against said adjustable member.

15. A fluid flow controlling valve comprising a valve casing having a passageway therethrough with a valve port, a valve member controlling flow through said port, a casing having oppositely facing side walls extending from said valve casing and overlying said port, a power element for operating said valve member and carried by said second-named casing, a thrust member extending through said second-named casing and operatively connecting said power element and said valve member, a helical coil spring within said second-named casing and opposing operation of said valve member by said power element, said second-named casing having longitudinal guide slots through said side walls, a screw-threaded member externally movable on said second-named casing and overlying said slots, and a supporting member holding said spring under compression, arms extending from said supporting member through said slots and entering the threads of said screw-threaded member, said guide slots serving to hold said arms against rotation so that movement of said screw-threaded member will impart longitudinal movement to said supporting member.

16. A fluid flow controlling valve comprising a valve casing having a passageway therethrough

with a valve port, a valve member controlling flow through said port, a cylindrical casing extending from said valve casing and concentric with said port, a power element for operating said valve member and carried by said cylindrical casing, a thrust member extending through said cylindrical casing and operatively connecting said power element and said valve member, a helical coil spring within said cylindrical casing and opposing operation of said valve member by said power element, said cylindrical casing having longitudinal guide slots therethrough, an internally screw-threaded ring member externally rotatable on said cylindrical casing and overlying said slots, a supporting member holding said spring under compression, and arms extending from said supporting member through said slots and entering the threads of said ring member, said guide slots serving to hold said arms against rotation so that rotary movement of said ring member will impart longitudinal movement to said supporting member.

17. A fluid flow controlling valve comprising a valve casing having a passageway therethrough with a valve port, a valve member controlling flow through said port, a cylindrical casing extending from said valve casing and concentric with said port, a power element for operating said valve member and carried by said cylindrical casing, a thrust member extending through said cylindrical casing and operatively connecting said power element and said valve member, a helical coil spring within said cylindrical casing and opposing operation of said valve member by said power element, said cylindrical casing having longitudinal guide slots therethrough, an internally screw-threaded ring member externally rotatable on said cylindrical casing and overlying said slots, a supporting member holding said spring under compression, arms extending from said supporting member through said slots and entering the threads of said ring member, said guide slots serving to hold said arms against rotation so that rotary movement of said ring member will impart longitudinal movement to said supporting member, and means to adjust said supporting member relative to said arms.

18. A fluid flow controlling valve of the character described, comprising a casing having a passageway for flow of fluid therethrough, valve means controlling flow through said passageway, a temperature sensitive power means comprising a sealed expansible-contractible chamber and a feeler bulb interconnected by a flexible conduit member, means connecting said chamber and said valve means so that expansion of said chamber will move said valve means to open said passageway to flow of fluid, lost motion means between said valve means and said chamber so that contraction of said chamber may be continued after said valve means reaches the limit of its closing movement, resilient means operable to oppose expansion of said chamber and modify its valve controlling operation, a supporting member supporting and holding said resilient means and having an extending portion, and a ring member separate from and movable relative to and engaged by said supporting member portion, said supporting member portion being moved upon movement of said ring member thereby to change the operating range of said power means.

DANIEL D. WILE.

CERTIFICATE OF CORRECTION.

Patent No. 2,215,947.

September 24, 1940.

DANIEL D. WILE.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 6, first column, line 24-25, claim 13, for the word "adjustable" read --adjustment--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 14th day of January, A. D. 1941.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.