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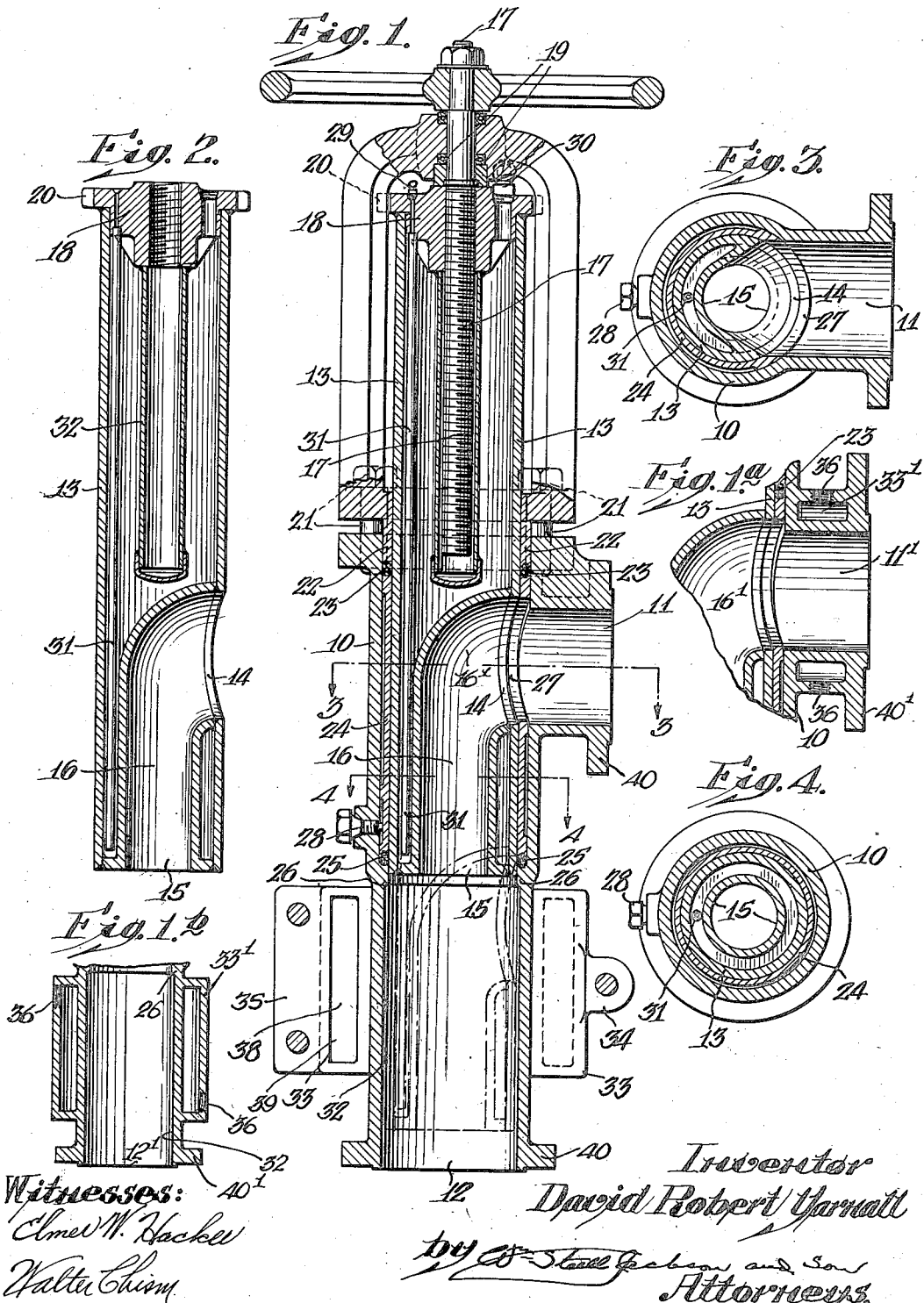
D. R. YARNALL

2,015,024

STEAM HEATING CONNECTION FOR VALVES

Filed April 13, 1934

2 Sheets-Sheet 1



Sept. 17, 1935.

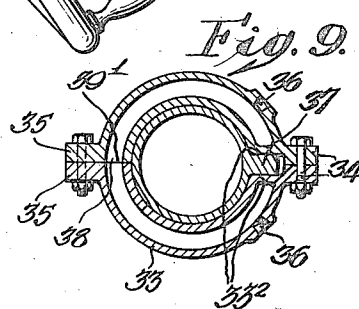
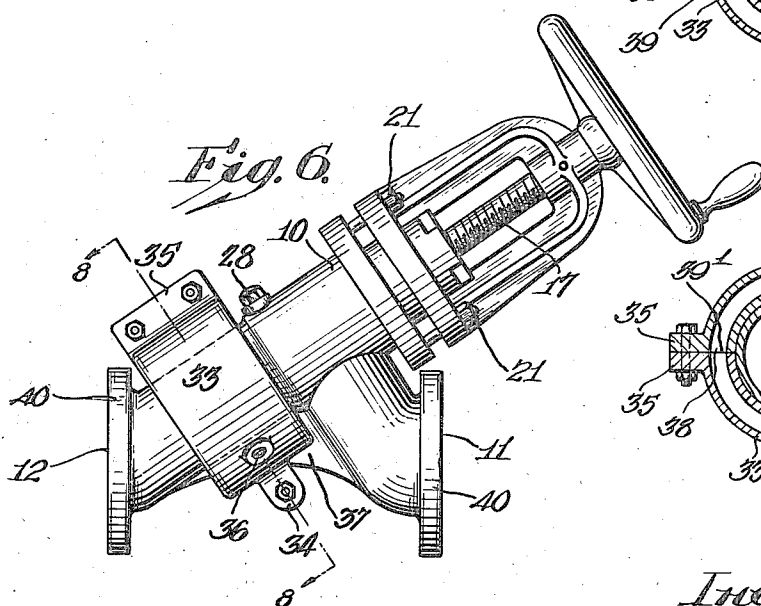
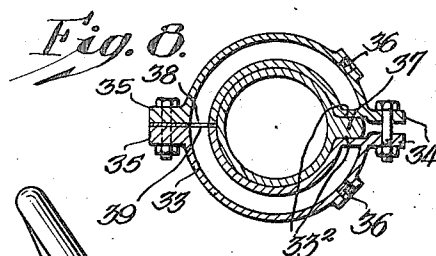
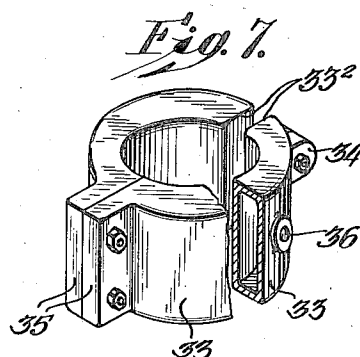
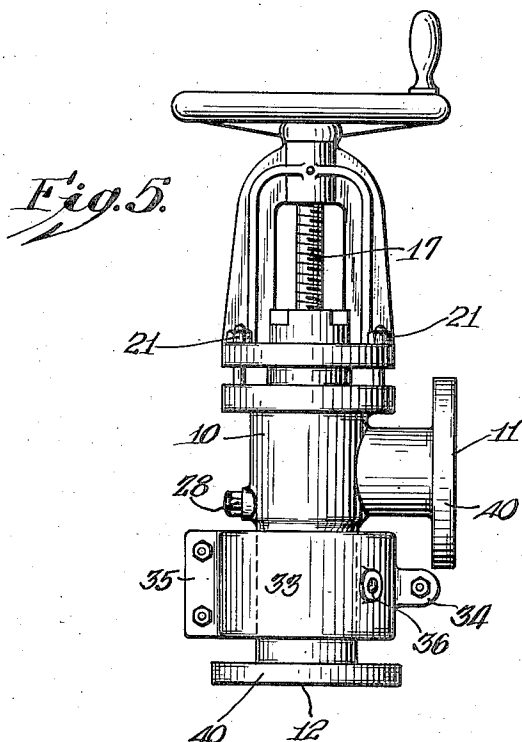
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STEAM HEATING CONNECTION FOR VALVES

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,015,024

STEAM HEATING CONNECTION FOR VALVES

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9 Claims. (Cl. 251—80)

The present invention relates to devices for temperature control of the body and plunger of a so-called seatless valve.

A purpose of the invention is to use the hollow interior of a valve plunger to jacket the walls of the passage connecting the side and end ports, that is, the flow passage of the plunger.

A further purpose is to circulate a temperature control fluid inside the hollow interior of a valve plunger, preferably admitting and discharging the circulating fluid at the outer end of the plunger and providing the inlet or the outlet with a tubular connection to a point near the inner end of the plunger interior.

A further purpose is to avoid the sticking of a valve plunger operating in a line carrying a more or less viscous fluid by a hot jacket outside the flow passage of the body or/and a hot lining within the plunger surrounding the flow passage of the plunger.

A further purpose is to heat the walls of the flow passage of the plunger and of the outlet passage of the body of a seatless valve so as not only to heat the entire passage when the valve is open but particularly the walls of the space between the inner end of the plunger and the body when the valve is closed.

A further purpose is to provide a novel form of temperature control jacket well adapted to clamp about the outlet end of a valve body of the character indicated or the like and preferably to avoid a fin projection of the body.

Further purposes will appear in the specification and in the claims.

I have elected to illustrate one main form only of my invention showing however a minor modification and selecting forms of both that are practical and efficient in operation and which well illustrate the principles thereof.

Figure 1 is a longitudinal section of valve structure illustrating a desirable form of my invention.

Figures 1a and 1b are corresponding fragmentary sections showing modifications.

Figure 2 is a fragmentary part of Figure 1 comprising the valve plunger.

Figures 3 and 4 are sections of Figure 1, taken, respectively, upon the lines 3—3 and 4—4 thereof.

Figures 5 and 6 are side elevations illustrating the invention embodied upon slightly different types of valve, the structure of Figure 5 being optionally identical with that of Figure 1.

Figure 7 is a broken perspective illustrating a detail.

Figure 8 is a section taken upon the line 8—8 of Figure 6.

Figure 9 is a view similar to Figure 8, but showing a modified form of fastening.

Like numerals refer to like parts in all figures. Describing in illustration and not in limitation and referring to the drawings:—

What is intended to represent a typical valve structure of the character indicated but modified to embody a desirable form of my present invention is best seen in Figure 1.

The valve body 10 is ported at side and end at 11 and 12, usually for inlet and outlet respectively.

A hollow valve plunger 13, longitudinally movable in the body, has side and end ports 14 and 15 and an intermediate connecting flow passage 16, with the end port 15 open continuously to the end 12 (the outlet flow passage) of the body and the side port 14 open or closed with respect to the side port 11 of the body according to the longitudinal position of the plunger.

An operating stem 17 threads through an end cap 18 of the plunger and has journal support at 19 in the bonnet structure of the body.

The plunger cap has an angular interlock longitudinal slide connection at 20 with rail portions of the bonnet. The bonnet is bolted down at 21 to the upper end of the body, the pull of the bolts being supported through the upper lower gland 22, packing ring 23, lower gland 24 and packing ring 25 upon an inward shoulder 26 of the body. The lower gland is ported at 27 in registry with the port 11 of the body and is prevented from angular movement from its registry position by a screw and longitudinal slot connection with the body at 28.

I form the plunger so that the inner part of the hollow interior thereof surrounds the flow passage 16 (including the curved portion 16') connecting the inlet and outlet ports of the plunger, and provide connections for means for circulating a temperature control fluid through the hollow interior of the plunger, outside the passage 16.

As illustrated the plunger cap is provided with ports 29 and 30, of which either one according to the circumstance may be inlet and the other outlet of the temperature control fluid. Preferably one of the ports as 29, is provided with a tubular extension 31 to a portion of the hollow near the inner end of the plunger.

I seal the threaded connection between the stem 17 and cap 18 from the hollow interior of the plunger by a well 32, suitably a pipe surround-

ing the stem, closed at its lower end and at its upper end welded to the cap 18 to in effect form an integral portion of the cap 18.

The temperature control fluid to be circulated through the hollow plunger may be hot or cold as required, to prevent cooling or heating of the gas or liquid which is to be passed through the valve, to add to or withdraw heat from the content or to prevent chemical reaction upon the valve or destruction of the packing. Avoidance of improper expansion and contraction of the plunger may in itself justify the control.

One use contemplates heating the content to maintain fluidity of the flow content or prevent its adhesion to the valve. Such materials for example may be glue, sugar, tarry materials or any of different condensate products.

If the valve be closed to the dot-and-dash line position of Figure 1, without my present invention the valve passage 16 may not satisfactorily clear of such contents—also the annular space 32 between the outside of the inner end of the plunger and the inside of the outlet from the body may not satisfactorily clear, so that during periods of valve closure the material imprisoned at these places will set or become viscous or/and sticky to an extent that may make valve operation very difficult, ineffective and unsatisfactory, the opening extremely difficult and when open the passage 16 may still be plugged with material wholly or partially solid, highly resistant to flow and possibly undesirable because of deterioration.

In the present showing I may maintain the hollow of the plunger continuously full of steam, as by introducing steam at 30 for discharge as condensed water and possibly some steam at 29. On the other hand steam can be introduced at 29 and allowed to accumulate as condensate or hot water may be admitted, the condensate or the partly cooled water to discharge at 30. The temperature of the condensate will be determined by the rate of steam insertion (and can exceed the boiling point of water if back pressure be provided or the outlet be sufficiently restricted) and the hottest condensate will be that immediately about the flow passage through the plunger.

Similarly refrigerating liquid can be applied through either 29 or 30 with like colder temperature at the bottom if applied at 29.

The temperature of the sufficiently liquid material in the supply line may be considerably lower than that of the steam inside the hollow plunger, which will result in relatively low adhesion between the hot liquid and the still hotter inside surface of the flow passage 16 and will secure easy clearance of the passage 16 after closure.

To secure more complete clearing or more complete cooling of the walls of the outlet passage of the body between the shoulder 26 and the end port 12, I surround this passage of the body with a hot or cold jacket 33, (which may be cast in as at 33' in Figure 1b), thereby avoiding sticking (or undue heating) of the flow material in the outlet passage of the body beyond the shoulder 26. The inlet of the body may also be heated or cooled by fluid acting within the body as seen in Figure 1a.

Cast channels have the advantage of closer thermal connection with the passage walls to be heated, but suffer the disadvantage of not being applicable to existing valves. This makes little difference in the inlet 11', because the normal inlet 11 does not lend itself well to a supplemental casing, but may be a controlling item in the case of the outlet 12'.

I thus heat or cool both the inside and the outside surfaces of material in the annular space 32 when the valve is closed, inside by means of the internally heated or cooled outside wall of the plunger and outside by means of the externally heated interior wall of the body. This is particularly effective in handling flow materials which are viscous when cool as, when the valve is closed, both the inside and outside surfaces of the material in the annular space 32 may be heated highly, keeping this material relatively quite fluid, for easy discharge from the valve body or/and easy clearing from the plunger when the plunger is moved to open the valve.

While more broadly the invention includes the combined internal and external heat-jacketing of the annular space 32 in a valve of the character indicated, however, secured, to accommodate more easy and more effective operations of the valve, there are features of intermediate breadth and other features apply to the type of fluid jacketing shown, some internal, some external.

The external jacket 33 is illustrated as interiorly of C section, and is made in the form of a split clamp, with the portions thereof preferably alike, their plane of division being along a diametral plane midway between the ends of the C, bolted together at one side at facing lugs 34 and at the other at facing flanges 35, and with ports at 36 for temperature control fluid respectively into and from the jacket interior.

Preferably the ports 36 are located near the C ends, so that the heating (or cooling) fluid enters the jacket near one end of the C interior and discharges near the other end thereof.

I space the lugs 34 bodily radially outward some distance from the C ends, and may space the faces 33' circumferentially, thereby permitting these ends to clear any fin 27 or the like on the valve body. This desirable feature makes an application of the jacket to an existing valve body easy that would otherwise be hard, and avoids need for any exact diametral or circumferential fitting of the clamp, it not being at all essential that the lugs at 34 can come together. Particularly if a gasket be placed between the flanges 35 the faces 33' and lugs 34 can be tightened toward each other somewhat to give good heat-conducting contact between the interior cylindrical surface 33 of the clamp and the exterior surface of the body of the valve.

The clamp portions are placed so that their open interiors at 39, adjacent the flanges 35, fit together, with an intermediate gasket or/and intermediate cement as in Figure 8, or without it or them as in Figure 9. The need for any such gasket or/and cement will usually depend on how closely the duplicate portions fit the valve body without need for so straining the members as to upset the exactness of their relative registry at the facing openings 39'.

It will be understood I may omit one or other of the internal and external jacketing structures and still get part of the benefit of my invention and that whether this be desirable or not will depend upon circumstance such as upon the special characteristics of the material in the supply line to the valve.

Figures 1a and 1b show external jacketing of the inlet and outlet body openings 11' and 12' by fluid within the passages cast into the valve body. The inlet and outlet openings 36 in Figures 1a and 1b are useful not only for that purpose but for the purpose of removing the core by which

the channels are formed. They are located at diametrically opposite points and in Figure 1b at opposite ends of the channel.

In the form shown in Figure 1b the channel is high enough on the end of the valve not to interfere with the use of the normal coupling flange 40 such as is shown about the outlet in Figure 1. However in Figure 1a with a choice of using studs about the normal bolt diameter or flanges I have shown slightly enlarged flanges 40'.

Figures 5 and 6 show the external jacket supplied to somewhat different types of valve, and it should be understood that in each of these figures the valve plunger may or may not be provided with internal heating as already described.

It will be evident that in the full line position of Figure 1, the open position, the flow content engages heated or cooled walls—as the case may be—from the time when it enters the plunger from the side until it passes out at the end of the body, and that any flow content which adheres to the walls of the body outlet until the plunger is closed to the dash-and-dot position of Figure 1, is heated or cooled on both sides concurrently. With a hot jacketing, however, this assists in getting rid of a flow content which becomes more fluid by heat, or reduces its frictional hold upon the inner walls of the body outlet and the outer walls of the plunger, respectively, when the valve is to be opened. With cold jacketing this maintains the preservative or other effect of the cooling medium during the interim before again opening the valve.

It will be evident that there are advantages in favor of both the opening at 29 and that at 39 for inlet opening with the other for the outlet, particularly where the plunger is to be heated, permitting the use of a complete body of condensate at whatever temperature is defined by the rate of steam admission where inlet is made at 29 and providing a full steam filling of the plunger when the inlet is at 30. However water can be inserted through either as an inlet.

It will be evident that the combination between the two heat-treating devices (for the plunger and for the body about the outlet) exists entirely independently of the character of the individual heating or cooling arrangements by which they are carried out.

It will be noted that in Figure 1 I have not provided heating or cooling for the inlet part of the body shown at 11. This is for the reason only that heating or cooling is not ordinarily needed there. The plunger has movement transversely to this inlet; the range of possible sticking is very short; and the heating or cooling from the plunger will take care of the adjoining surface between the plunger and the body of the valve about this inlet 11.

It will be obvious that the fluid where heated may be warm or hot water, or steam and where cool may be cool water or brine solution or any special refrigerating solution.

In view of my invention and disclosure variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the structure shown, and I, therefore, claim all such in so far as they fall within the reasonable spirit and scope of my invention.

In view of my invention and disclosure what I claim as new and desire to secure by Letters Patent is:—

1. A seatless valve having a hollow body and a plunger having a longitudinal central passage, both ported at the side and at the end, said plunger comprising walls forming a hollow casing about the passage in the plunger and means for moving the plunger to provide fluid flow through said passage and out through the body or to close such passage, said hollow casing adapted to receive fluid for temperature control of the plunger, acting adjacent the plunger passage.

2. A hollow valve body ported at one side and at one end, a hollow plunger longitudinally movable inside the body, having an end port continuously opening into the body toward the end port thereof and a side port adapted to register with the side port of the body, at one longitudinal position of the plunger, and to be out of register with said side port at another longitudinal position thereof, said plunger having a walled flow passage between the plunger ports, with the hollow of the plunger about the flow passage walls intermediate the plunger ports, a closure for the other end of the plunger and operative connection between the plunger and body for opening and closing the valve, there being fluid inlet and outlet openings into the hollow of the plunger for temperature control of the plunger by circulating fluid through the hollow thereof.

3. The hollow body ported at one side and one end, a hollow plunger longitudinally movable inside the body, having an end port continuously opening into the body toward the end port thereof and a side port adapted to register with the side port of the body at one longitudinal position of the plunger, and to be out of register with said side port at another longitudinal position thereof, said plunger having a walled flow passage between the plunger ports, with the hollow of the plunger about the flow passage walls intermediate the plunger ports, a cap across the other end of the plunger and operative connection between the plunger and body for opening and closing the valve, fluid inlet and outlet openings at the cap into the hollow of the plunger for temperature control of the plunger by circulating fluid through the hollow thereof, said openings connecting with the hollow near opposite ends thereof.

4. A hollow valve body ported at one side and at one end, a hollow plunger longitudinally movable inside the body having an end port continuously opening into the body toward the end port thereof and a side port adapted to register with the side port of the body at one longitudinal position of the plunger, and to be out of register with said side port at another longitudinal position thereof, said plunger having a walled flow passage between the plunger ports, with the passage walls surrounded by the hollow of the plunger intermediate the plunger ports, a cap across the other end of the plunger and operative connection between the plunger and body for opening and closing the valve, fluid inlet and outlet openings at the cap into the hollow of the plunger for temperature control of the plunger by circulating fluid through the hollow thereof, one of said openings including a tube extending into the hollow and terminating near the flow passage end of the plunger.

5. A hollow body ported at one side and at one end, a hollow plunger longitudinally movable inside the body having an end port continuously opening into the body toward the end port thereof and a side port adapted to register with the side port of the body at one longitudinal position of the plunger, and to be out of register with said side port at another longitudinal position thereof,

said plunger having a walled passage between the plunger ports, with the hollow of the plunger about the passage walls intermediate the plunger ports and a cap across the other end of the plunger and operative connection between the plunger and body for opening and closing the valve, there being fluid inlet and outlet openings at the cap into the hollow of the plunger for temperature control of the plunger by circulating fluid through the hollow thereof, said operative connection including a stem threading through the cap into the hollow of the plunger having a stationary journal support from the body and a tubular well inside the hollow of the plunger surrounding the screw and sealing the screw from said hollow.

6. In a seatless valve, a hollow plunger having a curved through transmission passage whose wall is in part surrounded by the hollow of the plunger, threaded means for shifting the plunger sealed from the hollow of the plunger, a valve casing about the plunger and means providing for entrance of fluid into the hollow of the plunger to alter the temperature of the plunger, the fluid being adapted to be delivered to or withdrawn from a point at the inner end of the plunger.

7. A hollow plunger for a seatless valve having a curved passage through it from a side inlet to an end outlet enclosed within the hollow of the plunger, and two openings, one an inlet and the other an outlet, both located in the outer part of the plunger, and a pipe leading from one of the openings to the inner end of the plunger close to the curved passage whereby heating or cooling fluid may be delivered to the hollow of the plunger at this point or withdrawn from the hollow of the plunger at this point.

8. A seatless valve having a hollow body and a

plunger, both ported at the side and at the end, the plunger having a passage and a hollow space adjacent the passage, means for moving the plunger to provide fluid flow through said passage and out through the body or to close such passage, means providing for entrance of fluid into the hollow space within the plunger for temperature control of the plunger, and walls providing a hollow space for fluid for temperature control from the outside of the body opposite the passage through the plunger when the valve is in closed position.

9. A seatless valve having a body having body passages and a hollow plunger in the body ported at the side and at the end, the plunger having a continuous passage and a hollow space adjacent the passage, threaded means for moving the plunger axially to provide a continuous passage for fluid flow through said plunger passage and body passages in open position or to close such passages, ports providing for entrance of heating fluid into the hollow space within the plunger and removal of heating fluid therefrom for temperature control of the plunger, effective from the interior of the plunger about its passage, a jacket surrounding the body and ports in the jacket for entrance and removal of heating fluid to control the temperature of the wall forming the body passage through the end of the body, whereby the heating fluid in the plunger and said jacket act separately to heat the walls of different parts of the continuous passage when the valve is opened and are arranged concentrically to additionally heat the plunger passage and from both sides to heat the space between the plunger and body when the valve is closed.

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