

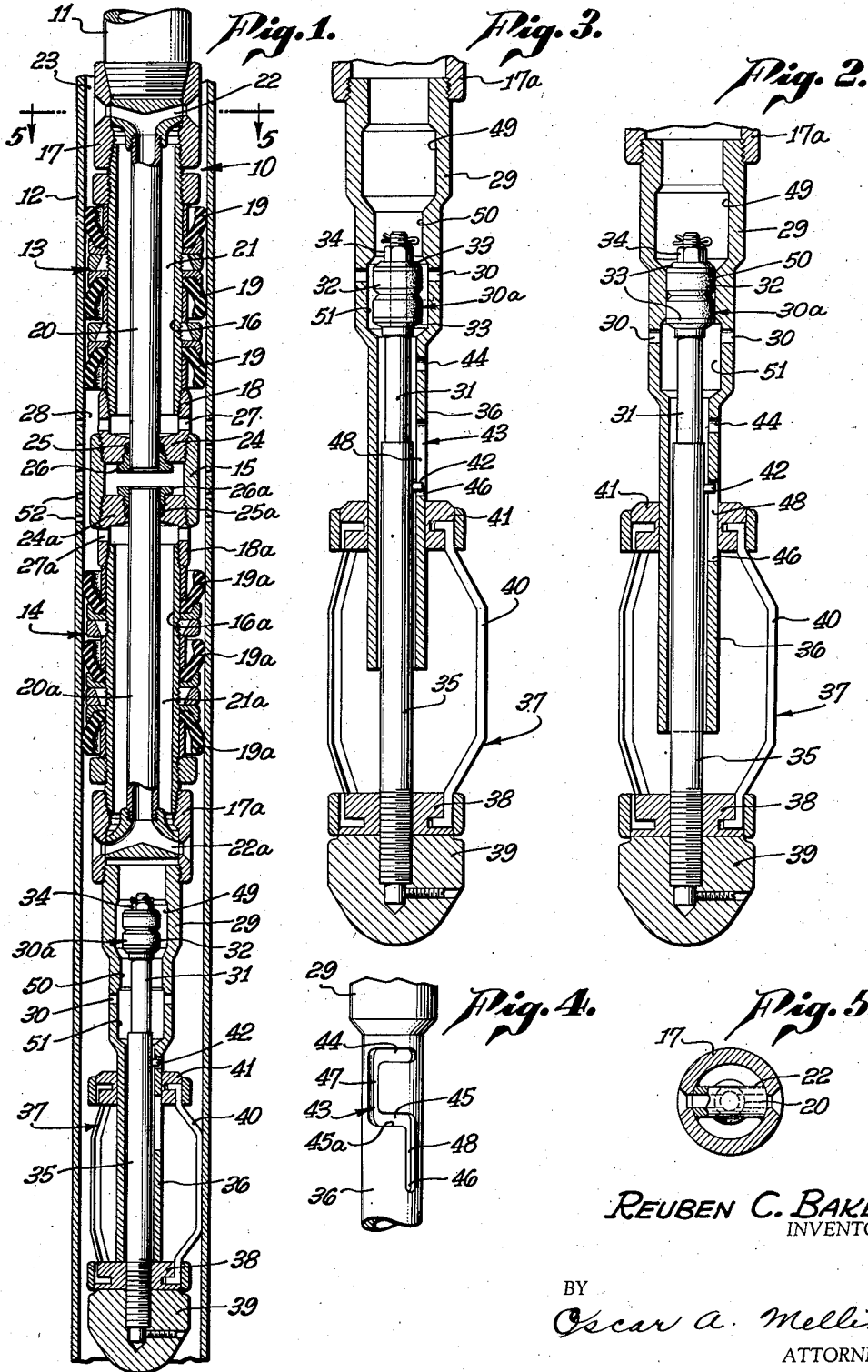
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VALVE CONTROL FOR WELL TOOLS

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VALVE CONTROL FOR WELL TOOLS

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1

This invention relates to well tools, and more particularly to well packer valve mechanisms employed in the cementing, acidizing, testing, washing, production, etc., of oil and gas wells.

It is an object of the present invention to provide a well tool embodying an improved valve mechanism for controlling flow of fluids in the tool.

A further object of the invention is to facilitate the movement of a valve in a well tool between open and closed positions despite the presence of a resisting hydrostatic head of fluid or other fluid pressure.

Still another object of the invention is to provide a valve control in a well tool, such as a well packer, whose movement between open and closed positions is assisted by fluid pressure within the tool itself.

This invention has other objects that will become apparent from a consideration of the embodiment shown in the drawings accompanying and forming part of the present specification. This form will now be described in detail, but it is to be understood that such detailed description is not to be taken in a limited sense, since the scope of the invention is best defined by the claims appended hereto.

Referring to the drawings:

Figure 1 is a longitudinal section through the well tool positioned in a well casing, with parts of the valve device in one position;

Figure 2 is a longitudinal section through the valve device, with its parts in a second position;

Figure 3 is a longitudinal section through the valve device, with its parts in a third position;

Figure 4 is a side elevation of the slotted lock sleeve; and

Figure 5 is a cross-section, taken along the line 5—5 in Figure 1.

The invention is disclosed in the drawings as applied to a well packer of the type designed to force fluid under pressure through casing perforations. It is to be understood, however, that it has application to any type of tubular well tool through or from which fluid flow is to be controlled.

Specifically, the well tool consists of a body 10 suitably secured, as by threading, to the lower end of a string of tubing or drill pipe 11, by means of which the tool is conveyed through the well casing 12 to the desired operating point. The body consists of an upper body member 13, a lower body member 14, and an intermediate body member 15 connecting the upper and lower members together in spaced relation. The general

2

type of well tool shown is a packer described and claimed in the patent application of Charles E. Costello, Serial No. 391,548, filed May 2, 1941 for "Well Devices," now Patent No. 2,466,305. Specific constructional features are also described and claimed in my application for Letters Patent, Serial No. 665,811, filed April 29, 1946, entitled "Well Packers," now Patent No. 2,562,079 granted July 24, 1951.

The upper and lower portions of the tool are substantial duplicates, being connected to the intermediate body member 15 in opposed relation. A description of the upper portion should suffice for the lower portion as well.

The upper body member 13 includes an elongate mandrel or nipple 16 having a sub 17 screwed on its upper end and a lower ported sub 18 secured to its lower end. One or more packing cups 19 of rubber or similar material are suitably secured on the mandrel with the lower cups facing downwardly. These packing cups are adapted for slidable sealing engagement with the wall of the well casing 12 to prevent upward flow of fluid between the upper body member 13 and the casing wall.

An upper by-pass tube 20 is positioned within the upper body member to provide an annular space 21 therewith. Its upper end is threaded into a by-pass T 22, which is suitably secured, as by welding, to the upper by-pass sub 17, through which it opens outwardly into the tubing-casing annulus 23 above the upper packings 19. The lower end of the by-pass tube 20 extends through an inner flange 24 on the lower sub 18, containing a rod packing 25 pressed in leakproof engagement against the exterior of the tube by a suitable packing nut 26 to prevent downward flow of fluid through the annulus 21 beyond the flange 24.

As stated above, the construction of the lower tool portion is substantially the same as the upper, with the parts facing in the opposite direction, so that fluid passage between the lower body member and casing wall in a downward direction is prevented, and upward flow of fluid through the lower annulus 21a beyond the flange 24a is prevented by the flange 24a, packing 25a and packing nut 26a surrounding the lower by-pass tube 20a. For convenience of designation, the lower parts are numbered the same as the corresponding upper parts, with the suffix "a" added.

The upper and lower tool portions are held together in spaced relation by the intermediate body member 15 which actually forms part of the

3

by-pass of the tool. This intermediate body member is secured to the upper and lower subs 18, 18a, and may be made of any length desired, depending upon the spacing required between the upper and lower packing cups 19, 19a. The by-pass around the packings extends from a point outside the tool below the lowermost packing 19a to a point outside the tool above the uppermost packing 19. More specifically, this by-pass passage is constituted by the lower T 22a, lower by-pass tube 20a, intermediate body member 15, upper by-pass tube 20, and upper by-pass T 22.

The upper sub 18 is provided with one or more upper outlets or ports 27 adjacent the packing cup 19 and flange 24, and the lower sub 18a is similarly provided with one or more lower outlets or ports 27a adjacent the lower packing cup 19a and flange 24a. Fluid cannot pass directly from the upper body annulus 21 to the lower body annulus 21a, because of the flanges and packings around the by-pass tubes, but must pursue an indirect course. The fluid may be pumped downwardly through the tubing 11 into the upper body member annulus 21, exiting through the upper ports 27 into the localized annular zone 28 defined by the upper and lower packings 19, 19a, and by the intermediate body member 15 and casing 12. This fluid may flow downwardly through this zone and enter the lower body member 14 through the lower ports 27a, where the fluid can pass downwardly through the annulus 21a around the lower by-pass tube 20a into a valve body or housing 29 screwed into the lower end of the lower sub 17a. The fluid may then pass through the valve outlets or ports 30 in the housing to the exterior of the tool below the lower packing cups 19a, from where it may flow upwardly into the lower by-pass T 22a, through the lower by-pass tube 20a, intermediate by-pass body member 15, upper by-pass tube 20, and upper by-pass T 22 into the tubing-casing annulus 23 above the upper packing cups 19.

The allowing of the fluid to pursue the course just described is dependent upon the control in the flow of fluid through the valve ports 30 at the lower end of the tool. Such control is obtained through a valve mechanism 30a including a valve stem 31 within the housing on which a packing of the piston type is secured. Specifically, the piston valve consists of the valve stem 31, with a generally cylindrical type packing sleeve 32 mounted thereon between end plates or washers 33, and with a suitable clamp nut 34 threaded on the upper end of the stem to hold the piston packing firmly in place on the stem or piston rod 31.

The valve stem 31 has a depending rod extension 35 secured to it surrounded by a lock sleeve 36 fixed to and extending from the valve body or housing 29. The lower end of the rod extension is attached to a drag device 37, which, in the present instance, consists of a lower collar 38 and guide 39 threaded on the rod, with a plurality of outwardly bowed spaced drag springs 40 secured to the lower collar 38 and extending upwardly for attachment to an upper collar 41 slidably mounted on the lock sleeve 36.

The drag device 37 resists movement of the rod extension 35, valve stem 31 and piston 32 in both longitudinal directions within the casing 12. That is, downward movement of the tubing string 11 and attached body 10 of the tool tends to move the valve body or housing 29 downwardly with respect to the piston valve 30a,

4

causing the piston valve to move relatively in an upward direction. Similarly, elevating of the tubing string, body and valve housing tends to cause the piston valve to move relatively in a downward direction.

The positions of the piston valve 30a in the valve housing 29, and with respect to the valve ports 30, are determined positively by a lock device. In the present instance, this device includes a lock pin 42 secured to the rod extension 35 and extending into a lock slot 43 formed in the sleeve 36. This slot has an upper lateral or transverse portion 44, which will receive the pin 42 and hold the piston 32 in an uppermost position; an intermediate transverse or lateral slot portion 45, which will receive the pin and correspondingly hold the piston 32 in an intermediate position; and a lower terminal portion 46, which limits the extent of relative downward movement of the piston 32 in the valve housing 29. The left ends of the upper and intermediate lateral portions 44, 45 (as seen in Figure 4) are connected by a longitudinal slot 47 and the right end of the intermediate slot portion 45 has a depending longitudinal slot 48 whose bottom end forms the lower terminus 46.

When the lock pin 42 is located within the upper transverse slot portion 44, the piston 32 is positioned within an upper valve chamber 49 whose inside diameter is greater than the outside diameter of the piston 32. Fluid may pass in either direction between the lower body annulus 21a and the valve outlets or ports 30 (see Figure 1). When it is desired to close these ports and prevent such passage of fluid, the tubing string 11 is turned in the proper direction, as to the left, to position the lock pin 42 (which is being held stationary by engagement of the drag springs 40 with the casing) in alignment with the upper longitudinal slot 47, as seen in Figure 4. Thereafter, elevation of the tubing string elevates the entire tool, with the exception of the piston 32, valve stem 31 and drag device 37, and allows the piston 32 to move relatively downwardly into a cylindrical seat 50 positioned immediately below the upper chamber 49. The proper positioning of the piston within this seat is determined by engagement of the lock pin 42 with the lower surface 45a of the lower transverse slot 45. The inside diameter of the cylindrical seat 50 is substantially the same as the outside diameter of the piston 32, to effect a leak-proof seal therebetween, preventing passage of fluid around the piston and closing the valve outlets or ports 30 from fluid communication with the lower body member annulus 21a (see Figure 2).

The valve ports 30 may be reopened by a continuance of the relative downward movement of the piston 32 with respect to the valve housing 29. The tubing string and well packer, with the exception of the drag device 37 and connected internal valve parts 35, 31, 32, may be rotated to the right, or opposite to the direction of rotation previously mentioned, until the lock pin 42 aligns with the lower longitudinal slot 48 (as seen in Figure 4). Thereafter, the tubing string and tool are elevated and the piston 32 moved relatively downwardly within the valve housing 29 to an extent limited by engagement of the lock pin 42 with the lower terminus 46 of the lower longitudinal slot. When in this position the piston 32 is located within a lower valve chamber 51, whose inside diameter is greater than the outside diameter of the piston, permit-

5

ting fluid to by-pass around the piston and flow between the valve ports 30 and the lower body member annulus 21a (see Figure 3).

From the foregoing description of the apparatus, it becomes apparent that the valve may be moved from an open position to a closed position, and then again to a new open position, upon movement of the piston 32 in a progressive downward direction. Of course, by reversing the movements described above in connection with control of the valve mechanism, the piston could be caused to move upwardly from an open position to a closed position to an upper open position again, or the piston need only be moved between only two of the positions, depending upon the operation being performed in the well bore and the conditions encountered.

The advantages of the arrangement may perhaps be understood by describing the performance of a cementing operation with the tool in a well casing. If cement slurry is to be pumped through casing perforations 52 the tool is lowered on the tubing string to a position in which the upper packing cups 19 are located above the upper end of the perforations 52 and the lower packing cups 19a below the lower end of the perforations. While running the tool in the well bore to this position, the piston valve 30a is preferably in its uppermost position, as shown in Figure 1, which permits fluid to pass upwardly into the tool through the valve outlets 30, filling the lower body member annulus 21a, thence passing outwardly through the lower outlet 27a into the localized annular zone 28, flowing through the upper ports 27 into and through the upper body member annulus 21, for upward passage through the tubing string 11. Also, during this lowering operation, fluid may by-pass around the packing members 19, 19a by flowing into and through the lower by-pass T 22a, lower tube 20a, intermediate body by-pass member 15, upper tube 20 and upper T 22, and into the upper tubing-casing annulus 23.

The required amount of cement slurry is pumped into the tubing string 11 and started down the hole. The fluid in the tubing ahead of the slurry passes downwardly around the by-pass T 22 and through the upper body annulus 21 and outlet 27 into the localized zone 28, thence through the lower ports 27a into the lower body annulus 21a, from where the fluid passes around the exterior of the lower by-pass T 22a into the valve housing 29, exiting from the tool through the valve ports 30 and then flowing upwardly around the valve housing 29, entering the lower end of the by-pass and flows upwardly through the by-pass 22a, 20a, 15, 20, 22 into and through the casing-tubing annulus 23 towards the top of the well bore.

When the lower end of the charge of cement slurry reaches the tool, the tubing string is rotated a partial revolution to the left to position the lock pin 42 in alignment with the upper longitudinal slot 47, whereupon elevation of the tubing string several inches, say two or three inches, moves the piston 32 relatively downwardly into the cylindrical seat 50, as determined by engagement of the lock pin 42 with the lower wall 45a of the lower transverse slot 45. When the piston is in this position, the valve ports 30 are closed and no further fluid can pass into and through the lower body member annulus 21a. The cement slurry is, accordingly, forced to pursue a course down through the upper body member annulus 21 and out through the upper ports 27

6

into the localized zone 28, from where it is forced outwardly through the casing perforations 52 to the exterior of the casing string. The closed valve precludes flow of the fluid through the lower portion 14 of the tool.

After the required amount of cement slurry has been pumped or forced through the casing perforations 52, any excess cement slurry may be cleared from the tubing string 11, tool 10 and localized zone 28 by turning the tubing string to the right to position the lock pin 42 in alignment with the lower longitudinal slot 48, and by elevating the tubing string several inches to position the piston 32 in the lower valve chamber 51, which permits flow of fluid around the piston 32 and through the valve ports 30. The excess cement slurry may now be pumped from the tubing string 11, upper body member annulus 21 and localized zone 28 into the lower body outlet 27a for downward passage through the lower body annulus 21a and valve body 29, passing out through the ports 30 for upward passage into and through the by-pass 22a, 20a, 15, 20, 22, from where the excess cement slurry and any other fluids may be pumped upwardly through the casing-tubing annulus 23 to the top of the well bore.

If desired, the excess cement slurry may be circulated from the tool by reverse flow of fluid. That is, the flushing or washing fluid may be pumped downwardly through the casing-tubing annulus 23 entering the upper end of the by-pass and flowing down through the by-pass to a point below the packing cups, from where the fluid may pass into the tool through the valve ports 30, flowing upwardly through the valve housing 29 and lower body member annulus 21a and through the lower body ports 27a into the localized zone 28, passing upwardly through this zone and back through the upper body ports 27 into and through the upper body annulus 21 and tubing string 11, carrying the excess cement slurry to the top of the well bore for appropriate disposition.

Control of the valve is dependent upon the frictional resistance offered by the drag device 37 against the wall of the casing. In the event that a large quantity of excess cement slurry remains in the tubing string after the cementing operation has been performed, it might be difficult to re-elevate the piston valve 30a from its cylindrical seat 50 into the upper chamber 49, in order to open the valve ports 30 and permit the excess cement slurry to be flushed from the tubing string and the tool. The hydrostatic head of the cement slurry would be pressing downwardly on the piston valve 30a, and would tend to keep it in a downward position. The resisting force of the friction springs 40 against the wall of the casing 12 would be insufficient to overcome the pressure effect of the heavier cement slurry in the tubing string. The present invention obviates the need for so elevating the piston by causing the hydrostatic head to assist in the movement of the piston to valve opening position. All that is required is to turn the tool a partial revolution to the right, when the piston valve is in its closed position, and the hydrostatic head acting downwardly on the upper end of the piston valve aids in pushing it downwardly into the lower valve chamber 51, in which position the valve ports 30 are open. The excess cement slurry can, accordingly, be readily flushed from the tubing string and tool either by circulating down through the tubing string 11 or by circulating down through the tubing-casing annulus 23, as described above.

It is, therefore, apparent that a valve control for a well tool has been disclosed which is readily movable between open and closed positions under all conditions of operation encountered in a well bore. The valve arrangement is such that the pressure of the fluid in the tubing string itself assists in shifting the valve from open to closed position and also from closed position to open position.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A well tool, including tubular means adapted to be lowered in a well bore and having an open outlet through which well fluid can flow between the interior and exterior of said tubular means when said tubular means is in the well bore, means for controlling fluid flow through said outlet comprising a valve housing forming part of said tubular means, said housing having an upper chamber and an intermediate seat above said outlet and a lower chamber below said intermediate seat, a piston valve movable in said housing to locations within said chambers and in sealing engagement with said seat, said piston valve being spaced laterally from the walls of said chambers when disposed in said chambers to provide a passage for fluid around said piston valve from the interior of said tubular means through said outlet, said piston valve preventing such fluid flow when positioned in sealing engagement with said seat, and means depending from and connected to said piston valve for effecting relative movement of said piston valve in said housing between said chambers and seat.

2. A well tool, including tubular means adapted to be lowered in a well bore and having an open outlet through which well fluid can flow between the interior and exterior of said tubular means when said tubular means is in the well bore, means for controlling fluid flow through said outlet comprising a valve housing forming part of said tubular means, said housing having an upper chamber, an intermediate seat, and a lower chamber, a piston valve in said housing, and coengaging means connected to said piston valve and tubular means for selectively and positively locating said piston valve within either of said chambers or in sealing engagement with said seat, said piston valve being spaced laterally from the walls of said chambers when disposed in said chambers to provide a passage for fluid flow around said piston valve from the interior of said tubular means through said outlet, said piston valve preventing such fluid flow when positioned in sealing engagement with said seat.

3. A well tool, including tubular means adapted to be lowered in a well bore and having an outlet through which well fluid can flow between the interior and exterior of said tubular means when said tubular means is in the well bore, said tubular means comprising an upper chamber, an intermediate cylindrical seat, and a lower chamber, said chambers and seat being communicable with said outlet, an imperforate piston valve in said tubular means, and means for selectively locating said piston valve within either of said chambers or in sealing engagement with said cylindrical seat, said piston valve being spaced laterally from the walls of said chambers to provide a passage for fluid flow around said piston valve from the interior of said tubular means through said outlet when said piston valve is positioned within either of said chambers, such fluid flow being prevented when said

piston valve is positioned in sealing engagement with said cylindrical seat.

4. A well tool, including tubular means adapted to be lowered in a well bore and having an open outlet through which well fluid can flow between the interior and exterior of said tubular means when said tubular means is in the well bore, said tubular means comprising an upper chamber, an intermediate cylindrical seat and a lower chamber, said chambers and seat being communicable with one another and with said outlet, a cylindrical valve in said tubular means movable progressively from said upper chamber into sealing engagement with said cylindrical seat and from said cylindrical seat into said lower chamber, said cylindrical valve being spaced laterally from the walls of said chambers when disposed in said chambers to provide a passage for fluid flow around said cylindrical valve from the interior of said tubular means through said outlet, said cylindrical valve preventing such fluid flow when positioned in sealing engagement with said seat, and means depending from and connected to said cylindrical valve for effecting movement of said cylindrical valve in said tubular means between said chambers and seat.

5. A well tool, including tubular means adapted to be connected to a tubular string for lowering in a well bore; said tubular means having an outlet, an upper chamber and intermediate cylindrical seat above said outlet, and a lower chamber; said tubular means having an inlet for receiving fluid from the tubular string and which inlet communicates with said upper chamber; said chambers and seat being communicable with one another and with said outlet; a piston valve in said tubular means movable progressively from said upper chamber into sealing engagement with said cylindrical seat and from said cylindrical seat into said lower chamber; said piston valve being spaced laterally of said chambers when disposed in said chambers to allow fluid flow from the interior of said tubular means through said outlet and to prevent such fluid flow when positioned in sealing engagement with said seat; and means secured to said piston valve for resisting its movement within said well bore to allow said tubular means to be moved by the tubular string relative to the piston valve to locate said piston valve in said chambers and in sealing engagement with said seat.

6. A well tool, including tubular means adapted to be connected to a tubular string for lowering in a well casing; said tubular means having an outlet, an upper chamber and intermediate cylindrical seat above said outlet, and a lower chamber; said chambers and seat being communicable with one another and with said outlet; a piston valve in said tubular means movable progressively from said upper chamber into sealing engagement with said cylindrical seat and from said cylindrical seat into said lower chamber; said piston valve having an outside diameter less than the inside diameters of said chambers and substantially equal to the inside diameter of said cylindrical seat; and friction means secured to said piston valve and frictionally engageable with the well casing.

7. A well tool, including tubular means adapted to be connected to a tubular string for lowering in a well bore; said tubular means having an outlet, an upper chamber and intermediate cylindrical seat above said outlet and a lower chamber; said tubular means having an inlet for re-

ceiving fluid from the tubular string and which inlet communicates with said upper chamber; said chambers and seat being communicable with one another and with said outlet; and a piston valve in said tubular means movable progressively from said upper chamber into sealing engagement with said cylindrical seat and from said cylindrical seat into said lower chamber; said piston valve having an outside diameter less than the inside diameters of said chambers and substantially equal to the inside diameter of said cylindrical seat.

8. A well tool; including tubular means adapted to be connected to a tubular string for lowering in a well bore; said tubular means having an outlet, an upper chamber, an intermediate cylindrical seat, and a lower chamber; said tubular means having an inlet for receiving fluid from the tubular string and which inlet communicates with said upper chamber; said chambers and seat being communicable with one another and with said outlet; a piston valve in said tubular means adapted to be located within said upper chamber, cylindrical seat, and lower chamber; said piston valve having an outside diameter less than the inside diameters of said chambers and substantially equal to the inside diameter of said cylindrical seat, and means depending from and connected to said piston valve for effecting relative movement of said piston valve in said tubular means between said chambers and seat.

9. A well tool; including tubular means adapted to be connected to a tubular string for lowering in a well bore; said tubular means having an outlet, an upper chamber, an intermediate cylindrical seat, and a lower chamber; said tubular means having an inlet for receiving fluid from the tubular string and which inlet communicates with said upper chamber; said chambers and seat being communicable with one another and with said outlet; a piston valve in said tubular means selectively positionable within said upper chamber, cylindrical seat, or lower chamber; said piston valve having an outside diameter less than the inside diameters of said chambers and substantially equal to the inside diameter of said cylindrical seat; and coengaging means connected to said piston valve and tubular means for positively locating said piston valve in each of said selective positions to which it has been moved in said tubular means.

10. A well packer; including a tubular body adapted to be connected to a tubular string for lowering in a well casing; valve means for controlling fluid flow in said body, comprising a valve housing secured to said body and having an upper chamber, an intermediate cylindrical seat, a lower chamber and an outlet to the exterior of said housing; said chambers and seat being communicable with one another and with said outlet and interior of said body; a piston valve in said housing; means for selectively positioning said piston valve within said upper chamber, cylindrical seat, or lower chamber; said piston valve having an outside diameter less than the inside diameters of said chambers and substantially equal to the inside diameter of said cylindrical seat.

11. A well packer; including a tubular body adapted to be connected to a tubular string for lowering in a well casing; said body having packing means thereon for effecting a seal with the wall of said casing; valve means for controlling fluid flow conditions in said body, comprising a valve housing secured to said body and having

an upper chamber, an intermediate cylindrical seat, a lower chamber and an outlet below said upper chamber and seat forming a passage between the interior and exterior of said housing; said chambers and seat being communicable with one another and with said outlet and interior of said body; a cylindrical valve in said housing; and means for selectively positioning said cylindrical valve within said upper chamber, cylindrical seat, or lower chamber; said cylindrical valve being spaced laterally from said chambers when disposed in said chambers to allow fluid flow from the interior of said body through said outlet and to prevent such fluid flow when positioned within and in sealing engagement with said cylindrical seat.

12. A well packer; including a tubular body adapted to be connected to a tubular string for lowering in a well casing; said body having longitudinally spaced packing means thereon for effecting a seal with the wall of said casing; said body having ported means establishing communication between the interior of said body and its exterior between said packing means; valve means for controlling fluid flow in said body and through said ported means, comprising a valve housing secured to said body and having an upper chamber, an intermediate cylindrical seat, a lower chamber and an outlet below said upper chamber and seat forming a passage between the interior and exterior of said housing; said chambers and seat being communicable with one another and with said outlet and interior of said body; a piston valve in said housing; means for selectively positioning said piston valve within said upper chamber, cylindrical seat or lower chamber; said piston valve having an outside diameter substantially equal to the inside diameter of said cylindrical seat and less than the inside diameters of said chambers.

13. A well packer as defined in claim 12; said selective positioning means including friction means secured to said piston valve for frictional engagement with the wall of the casing.

14. A well packer; including a tubular body adapted to be connected to a tubular string for lowering in a well casing; said body having longitudinally spaced packing means thereon for effecting a seal with the wall of said casing; said body having ported means establishing communication between the interior of said body and its exterior between said packing means; valve means for controlling fluid flow in said body and through said ported means, comprising a valve housing secured to said body and having an upper chamber, an intermediate cylindrical seat, a lower chamber and an outlet below said upper chamber and seat forming a passage between the interior and exterior of said housing; said chambers and seat being communicable with one another and with said outlet and interior of said body; a piston valve in said housing; means for selectively positioning said piston valve within said upper chamber, cylindrical seat or lower chamber; said piston valve having an outside diameter substantially equal to the inside diameter of said cylindrical seat and less than the inside diameters of said chambers; and means for positively locating said piston valve in each of said selective positions in said housing.

15. A well packer; including a tubular body adapted to be connected to a tubular string for lowering in a well casing; said body having longitudinally spaced packing means thereon for effecting a seal with the walls of said casing;

11

said body having ported means establishing communication between the interior of said body and its exterior between said packing means; means providing a by-pass through said body from a point externally thereof below said lower packing means to a point externally of said body above said upper packing means; valve means below said ported means for controlling fluid flow in said body, comprising a valve housing secured to said body and having an upper chamber, an intermediate cylindrical seat, a lower chamber and an outlet below said upper chamber and seat forming a passage between the interior and exterior of said housing below said lower packing means; said chambers and seat being communicable with one another and with said outlet and interior of said body; a piston valve in said housing; means for selectively positioning said piston valve within said upper chamber, cylindrical seat or lower chamber; said piston valve having an outside diameter substantially equal to the inside diameter of said cylindrical seat and less than the inside diameters of said chamber.

16. A well packer, as defined in claim 15; said selective positioning means including friction means secured to said piston valve and engageable with the wall of the casing.

17. A well tool, including tubular means adapted to be lowered in a well bore and having an outlet, means for controlling fluid flow through said outlet comprising a valve housing having an upper chamber and an intermediate seat above said outlet and a lower chamber below said intermediate seat, a piston valve in said housing adapted to be located within said chambers and in sealing engagement with said seat, said piston valve being spaced laterally from the walls of said chambers when disposed in said

12

chambers to allow fluid flow from the interior of said tubular means through said outlet and to prevent such fluid flow when positioned in sealing engagement with said seat, and means operatively connected to said piston valve below said lower chamber for enabling said piston valve and housing to be moved longitudinally relative to each other.

18. A well tool; including tubular means adapted to be connected to a tubular string for lowering in a well casing; said tubular means having an outlet, an upper chamber and intermediate cylindrical seat above said outlet, and a lower chamber; said chambers and seat being communicable with one another and with said outlet; a piston valve in said tubular means movable progressively from said upper chamber into sealing engagement with said cylindrical seat and from said cylindrical seat into said lower chamber; said piston valve having a diameter different from the diameters of said chambers to provide fluid paths between said piston valve and chambers when said piston valve is in said chambers, said piston valve being substantially equal in diameter to the diameter of said cylindrical seat; and means secured to said piston valve and engageable with the well casing.

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