

Dec. 15, 1942.

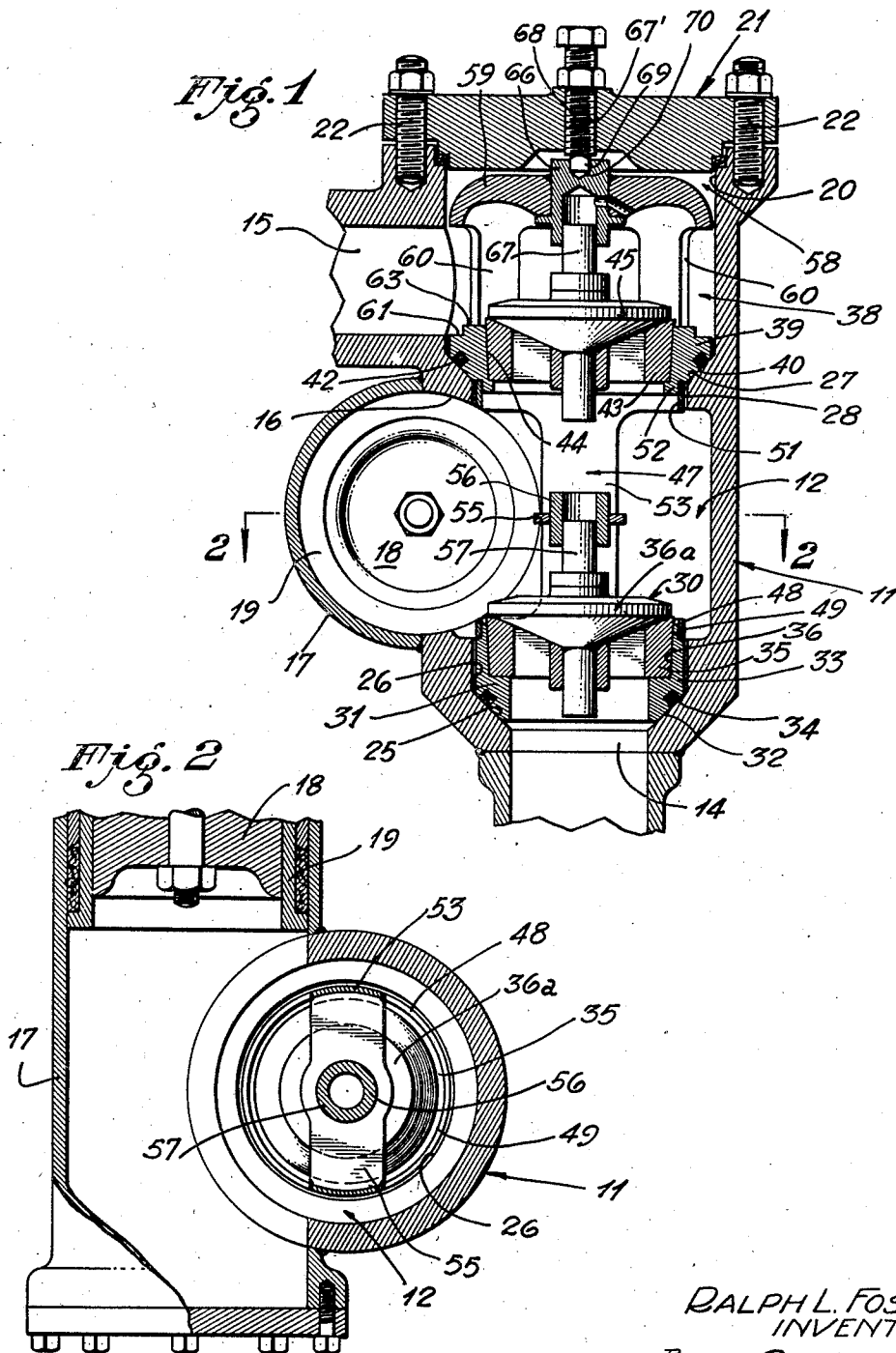
R. L. FOSTER

2,304,991

VALVE POT

Filed Sept. 13, 1940

2 Sheets-Sheet 1



RALPH L. FOSTER,
INVENTOR.

By *R. L. Foster*
ATTORNEY.

Dec. 15, 1942.

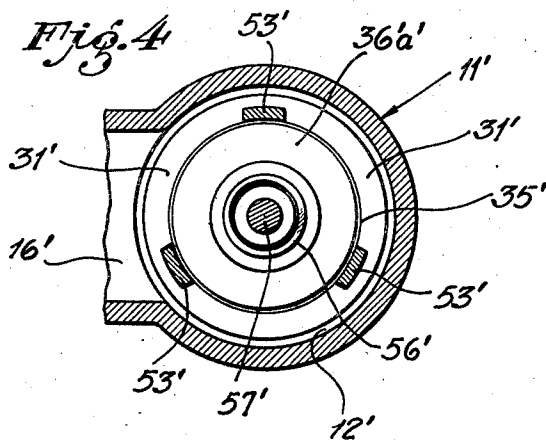
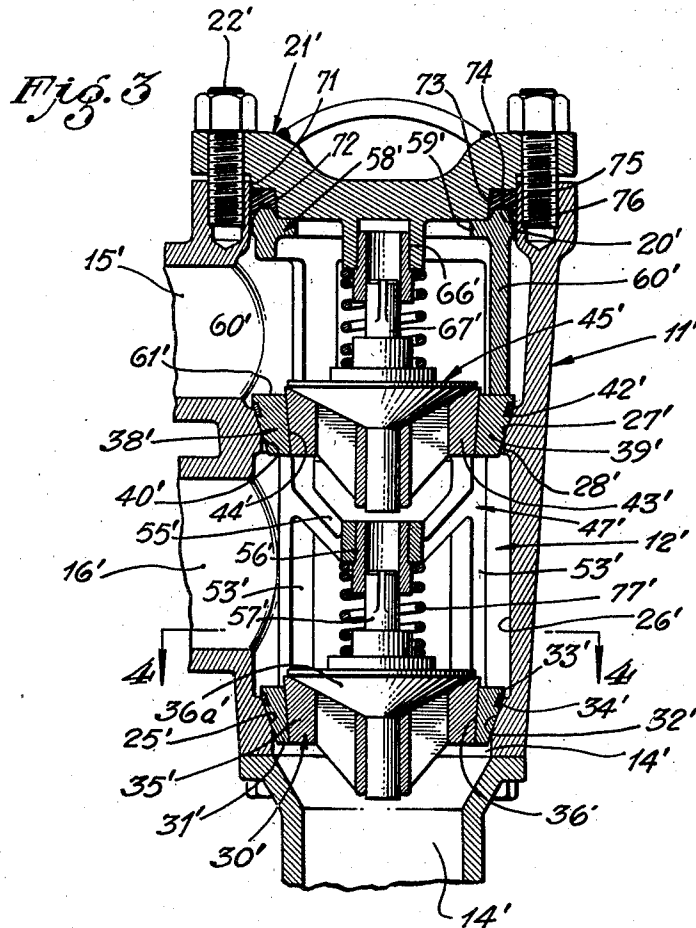
R. L. FOSTER

2,304,991

VALVE POT

Filed Sept. 13, 1940

2 Sheets-Sheet 2



RALPH L. FOSTER,
INVENTOR.
By *[Signature]*
ATTORNEY.

UNITED STATES PATENT OFFICE

2,304,991

VALVE POT

Ralph L. Foster, Houston, Tex., assignor to Emsco
Derrick & Equipment Company, Los Angeles,
Calif., a corporation of California

Application September 13, 1940, Serial No. 356,576

16 Claims. (Cl. 277—61)

This application is a continuation-in-part of my copending application, Serial No. 252,433, filed January 23, 1939, for Valve pot.

My invention relates to a unique valve pot assembly for pumps, engines, or the like, and relates particularly to one designed especially for use on slush pumps such as are commonly employed in the oil well drilling industry.

In slush pumps in general use at the present time the suction and discharge valves are placed in separate suction and discharge pots. In the double acting two cylinder slush pumps now generally found on the market there are eight separate valve pots.

It is an object of my present invention to provide a valve pot assembly containing both a suction and a discharge valve. By this arrangement the number of valve pots for a given slush pump is cut in half, thus effecting a decrease in cost and weight and in replacement or inspection time. I am aware that some work has been done by inventors in this art on idea of placing a discharge and an intake valve in a single valve pot, but the fact that the problem has not been practically solved is strongly indicated by the present extensive use in slush pumps of individual valve pots for the separate intake and discharge valves.

It is one of the objects of my invention to provide a valve pot assembly in which there are no press fits between the valve structures and the valve pot body, with the result that the parts may be readily removed for inspection, replacement, or repair.

Slush pumps as employed in the oil drilling industry are required to handle rotary mud which contains a great amount of abrasive, with the result that the valve closures and valve seats are subjected to considerable wear. It is necessary to frequently inspect and replace these parts. My invention makes possible facility of inspection, removal and replacement of the valves of the character indicated.

It is an object of my invention to provide a valve pot assembly of the character pointed out in which the valve seats of the valve structures are supported in retainers and in which the retainers are in turn clamped in place. When it is necessary to replace the valve seats or valve closures, the retainers may be removed without the use of a valve puller, as is required at the present time, and the valve seats or valve closures may be removed in a conveniently accessible place.

It is a further object of my invention to pro-

vide a valve pot assembly of the character pointed out in which the retainers carry the valve seats and the valves and in which the retainers are connected together to form a unitary assembly which is inserted and removed from the valve pot body as a unit.

A further object of the invention is to provide a valve arrangement of the character described wherein a seat or stationary portion of the upper of two superimposed valve structures carries in depending relation the guide for the closure of the lower valve structure.

Other objects and advantages of my invention will be pointed out in the course of the following detailed description of a preferred form of my invention. It should be understood that my invention may be embodied in various forms, and I therefore do not wish to be limited to the details of construction to be hereinafter described in detail and illustrated in the accompanying drawings, but wish my invention to be broadly construed in accordance with the spirit and scope of the appended claims.

Referring to the drawings in detail:

Fig. 1 is a vertically sectioned view illustrating my invention.

Fig. 2 is a fragmentary sectional view taken on the line 2—2 of Fig. 1.

Fig. 3 is a vertically sectioned view showing an alternative form of the invention.

Fig. 4 is a cross-section taken as indicated by the line 4—4 of Fig. 3.

Referring to Figs. 1 and 2 of the drawings, the numeral 11 represents a valve pot body which is of general cylindrical shape and arranged on a vertical axis. The body 11 provides a valve chamber 12 having a lower port 14 and an upper lateral port 15. In the form of my invention illustrated the lower port 14 is a suction or intake port, while the upper port 15 is a discharge port. Connected to the central part of the body 11 and in communication with the central part of the valve chamber 12 is a central pump cylinder opening 16 through which fluid may pass between a pump cylinder 17 and the valve chamber 12 when a pump piston 18 shown in Fig. 2 is reciprocated in a liner 19 of the cylinder 17. The upper end of the body 11 has an entrance opening 20 which is normally closed by a cover 21 secured in place by suitable studs 22.

In the lower part of the body 11 is a lower valve supporting structure which surrounds the suction port 14. This supporting structure may be referred to as an inner supporting structure due to its remote position from the entrance

opening 20. The lower seat structure includes a conical seat 25 which is formed at the lower part of a cylindrical wall 26. The body 11 is also provided with an upper valve supporting structure which is positioned between the central opening 16 and the discharge port 15. Due to the position of this supporting structure near the entrance opening 20, it may be referred to as an outer valve supporting structure. The outer supporting structure includes a conical shoulder 27 which is formed above a depending cylindrical wall 28. The inner and outer seats 25 and 27, are axially aligned and the inner or lower seat 25 is of smaller diameter than the outer seat 27. The cylindrical walls 26 and 28 are preferably of substantially the same diameter.

Adapted to be supported by the inner seat structure 25 is an inner valve structure 30 having a lower or inner valve seat retainer 31 having a conical seating face 32 and a cylindrical wall 33 which is of smaller diameter than the walls 26 and 28. The inner retainer carries suitable packing means 34 in the conical seating face 32 to assure a fluid-tight seal with the conical shoulder or seat 25. The retainer 31 carries an inner valve seat 35 which may be a press fit in the cavity 36 of the retainer 31, and cooperating with the valve seat 35 is a lower valve closure 36a. Herein I employ the terms "valve" or "valve structure" as embracing a valve seat and its co-operating valve closure.

The numeral 38 represents an upper or outer valve structure which has an outer seat retainer 39 having a conical seating face 40 adapted to engage the outer conical seat 27. The retainer 39 is provided with a sealing member 42 formed within the conical seating face 40 to assure a fluid-tight seal with the outer conical seat or shoulder 27. The outer retainer 39 carries an outer valve seat 43 which may be a press fit in the cavity 44 of the retainer 39, the seat 43 supporting an outer valve closure 45.

Positioned within the valve chamber 12 between the valve structures 30 and 38 is a lower cage or connecting means 47 which includes a lower band 48 which is a light press fit on a reduced upper end 49 of the retainer 31, an upper band 51 is a light press fit on a lower reduced extension 52 of the outer retainer 39, and connecting arms 53 arranged in diametrically opposing relationship which connect the lower and upper bands 48 and 51. The cage 47 is of smaller diameter than the outer conical seat 27 and the cylindrical wall 28 so that it may pass through these parts. The arms 53 support a crossweb 55 which in turn supports an upper valve-stem guide 56 which guides the upper valve stem 57 of the inner valve closure 36a.

Placed in the valve chamber 12 above the outer valve structure and between the outer valve structure and the entrance opening 20 is an upper cage or clamp member 58 having a crown 59 and depending legs 60. The depending legs 60 engage an upper shoulder 61 of the outer retainer 39 and may be a light press fit on the upper reduced end 63 of the retainer 39. Secured to the central part of the crown 59 is a hub 66 which acts as an upper valve-stem guide for the upper valve-stem 67 of the valve closure 45.

Cooperating with the clamp member 58 is a jack screw 67' which is extended through a threaded opening 68 of the cover 21 and has an inner bearing end 69 which extending into a socket 70 of the hub 66 of the clamp member 58. By advancing the jack screw 67' downwardly

the clamp member is forced against the retainer 39, thus forcing the retainer 39 against its seat, and this force is transmitted through the connecting means 47 to the retainer 31, thus clamping the retainer 31 in place.

The valve structures and associated parts may be assembled as a unit, and when the cover 21 is removed from place it may be inserted as a unit into the valve chamber 12. The inner valve structure and the lower cage or connecting means 47 are of smaller diameter than the outer seat 27 and entrance opening 20 and therefore may be readily inserted into place through these parts. The outer valve structure and the outer cage or clamp member 58 are of smaller diameter than the entrance opening 20 and may therefore be inserted into place.

The connecting means 47 is preferably secured to the retainers 31 and 39 so that when the outer retainer is removed from place the inner retainer and inner valve structure will be removed with it in order that all of these parts may be readily removed from the valve chamber. However, this feature need not be employed, under which circumstances the lower cage 47 acts as a means for transmitting a seating force to hold the inner retainer 31 against its seat and also as a means for supporting the upper valve stem guide 56. As stated heretofore, the outer cage of clamp member 58 may, if desired, be a light press fit on the reduced end 63, and when the outer cage 58 is removed all of the parts of the assembly will be removed with it. However, this may be eliminated and the outer cage 58 separately removed, whereafter the workmen may very conveniently remove the remainder of the assembly.

It is an important part of the invention that there are no press fits between the valve structures of the removable assembly and the valve pot body, and therefore it is unnecessary to employ a valve puller or equivalent for removing any of the valve assembly parts. To this end, I have in Fig. 1 shown the seats 25 and 27 formed at a cone angle of substantially 45° relative to the vertical axis of the valve pot 11. When the parts have been removed the retainers 31 and 39 are easily separated from the connecting means 47 and the clamp member 58, whereafter the valve seats 35 and 43 may be removed from the retainers.

In the Figs. 3 and 4 showing the alternative form of my invention, those parts which are similar to parts shown in Figs. 1 and 2 are designated by the same numerals as employed in Figs. 1 and 2 with a prime mark added thereto. In the form of the invention shown in Figs. 3 and 4, the valve pot or body 11' has an inlet port 14', a central opening 16' for communication with a pump cylinder, and a discharge port 15'. A lower or inner seat or shoulder 25' is disposed between the intake port 14' and the central opening 16', and an outer seat or shoulder 27' is disposed between the opening 16' and the discharge port 15'. On the shoulder 25' a valve assembly 30' is supported, this valve assembly 30' having a retaining ring 31', the external diameter of which is smaller than the diameter of the opening defined by the shoulder 27'. The retaining ring 31' has an outer face 32' to cooperate with the shoulder 25' and the retaining ring 31' carries therein a pump valve seat 35' on which a valve closure 36a' rests.

The outer or upper shoulder 27' supports a valve assembly 38' comprising a retainer 39' having an outer face 40' to cooperate with the slop-

ing face of the shoulder 27'. The retainer 39' supports in its tapered opening 44' a valve seat 43' with which a valve closure 45' cooperates. Between the shoulders 25' and 27' and the respective retainers 31' and 39' sealing means are provided, such sealing means being shown as packing rings 42' carried in channels in the outer faces of the retainers so as to have pressural engagement with the shoulders 25' and 27' when the retainers 31' and 39' are supported thereon. The entrance opening 20' of the hollow valve body 11' is formed by a cylindric wall, as shown, and to close the entrance opening 20' a cover 21' is provided, this cover having a cylindric portion 71 to project down into the entrance opening, such cylindric portion 71 having an annular recess 72 to receive a sealing ring 73 of yieldable material. The sealing ring 73 is of approximately rectangular form with a downwardly faced groove 74 in the lower face thereof, the outer margin of this groove 74 being defined by a downwardly projecting flange 75.

To hold the outer valve assembly 38' against the shoulder 27', an upper cage 58' is provided, this cage 58' having an upper annular wall 59' in a position to be engaged by the lower part of the cover 21', and having downwardly extending means in the present instance shown in the form of legs 60', to engage the retainer 39' and press the same downward with the force exerted by the cover securing screw means 22'. The hold-down member 58' has an annular, upwardly projecting lip 76 around the periphery of the top portion 59' thereof, this rib being tapered in upward direction and being positioned so as to enter the channel 74 in the sealing ring 73, to compress the sealing ring whereby it will be expanded laterally into engagement with the adjacent walls of the cover 21' and the entrance opening 20', and to force the flange 75 of the sealing ring 73 outward against the wall of the entrance opening 20', thereby effectively sealing the entrance opening against escape of fluid therethrough. It is not necessary to provide hold-down means in direct engagement with the valve seat 43', for the reason that this seat is a press fit in the opening 44' of the retainer 39' and will not be dislodged from the valve assembly 38' when in service.

The invention also provides hold-down means 47' for the lower valve assembly 30', whereby pressure may be transmitted from the upper valve assembly 38' to hold the retainer 31' against the shoulder 25'. This hold-down means 47' comprises legs 53' which are preferably formed integrally with the upper retainer 39' and project downwardly therefrom into engagement with the upper face of the retainer 31'. A further feature of the invention is to provide as a part of the upper or outer valve assembly 38', means for guiding the upper valve stem 57' of the valve closure 36a' forming a part of the inner or lower valve assembly 30'. To accomplish this, a spider 55' extends down from the upper retainer 39', and under the valve seat 43' and carries a guide sleeve 55' in a position to receive the upper portion of the valve stem 57', and a spring 77 is disposed between the valve guide means and the valve closure 36a' to urge the same down toward the seat 35'. In this arrangement it is not necessary, for inspection of the lower valve structure, to remove the lower retainer 31' and the valve seat 35' from their positions in the bottom of the valve pot 11', for the reason that removal of the outer or upper valve assembly 38' carries therewith the lower valve guide 56' so that the lower

valve closure 36a' may be lifted from place without the necessity of removing the entire inner valve assembly 30', and in carrying out this part of the invention the valve guide means for the stem 57' of the closure 36a' may be used independently of the hold-down legs 53' which may be in some instances omitted in the use of the valve pot assembly herein disclosed.

An important part of the form of my invention shown in Figs. 3 and 4 is that the bolts 22' which secure the cover 21' in place constitute the means for clamping the valve seat retainer 39' against its seat. It will be noted that there is metal-to-metal end thrust engagement between the cover 21' and the shoulder 59' of the cage 58', and that there is metal-to-metal end thrust engagement between the cage 58' and the valve seat retainer 39'. It will also be noted that there is metal-to-metal end thrust engagement between the valve seat retainer 39' and the conoidal seat 27'. By reason of this construction, when the cover is secured in place by tightening up on the bolts 22' the end thrust is in effect transmitted from the cover to the cage which constitutes a clamp means from the cage to the valve seat retainer and from the valve seat retainer through the seat 27' to the pot. Therefore, whenever the cover is secured in place the valve seat retainer 39' will also be secured in place. In view of the metal-to-metal contact all of these parts will be immovably secured in place so that there can be no relative movement between parts when the pump is in operation. For the purpose of sealing between the valve pot and the cover, I provide the seal 72 which may be placed under an initial compression, as previously pointed out, but this type of sealing means is a pressure sealing means, and when there is fluid under pressure in the upper part of the valve pot this fluid under pressure will press against the sealing ring 73 and thus provide a seal between the cover and the pot, the tightness of which increases in proportion to the pressure in the valve pot. The sealing ring 42' acts on the same principle. It will be noted that in this form of my invention the sealing ring 42' is placed at the upper part of the seat 27' so that it is in communication with the chamber in the valve pot above the valve arrangement in order that when there is a pressure in the upper part of the chamber in the valve pot this pressure will press against the sealing ring 42' and thus produce a sealing engagement which increases in proportion to the pressure within the upper part of the chamber in the valve pot. It will be seen, therefore, that the sealing means effectively forms a seal between the cover and the pot and the seat retainer and the pot, but at the same time is not interposed between the end thrust relationship between the cover 21', the cage 58', and the valve seat retainer 39', and that all of these parts are in metal-to-metal end thrust engagement.

A further advantage of my invention resides in the use of upper and lower valve seat and valve closure assemblies which are identical and are therefore interchangeable. The capacity of each valve is the same as the other valve, which is important. By the use of the separate retainers secured in place as illustrated, all of the advantages of both forms of my invention are employed. If, as suggested heretofore, it is not desired to employ the arms 53' in the form of my invention shown in Figs. 3 and 4, these arms may be eliminated and the lower valve structure

secured in place by some other means or by providing tapers on the parts which are of themselves sufficient to secure the valve structure to the valve pot. Furthermore, the features and advantages of the structure shown in Fig. 3, whereby the upper valve seat retainer is secured in place, may be employed independently of the other features of my entire valve assembly.

It is believed that the features and advantages and principle of my invention may be readily understood from the foregoing description and operation of the form of my invention which I have found to be satisfactory for use on slush pumps. As stated heretofore, my invention is not limited to the form illustrated, but the principle of the invention may be embodied in various other forms or structures. My invention therefore should be construed in accordance with the spirit and scope of the appended claims.

I claim as my invention:

1. In combination: a body having a valve chamber, suction and discharge ports, a central opening for said valve chamber, and a normally closed entrance opening; an inner seat in said chamber between said central opening and one of said ports; an outer seat in said chamber between said central opening and the other of said ports, said inner seat being of smaller diameter than said outer seat and said outer seat being of smaller diameter than said entrance opening; an inner valve structure on said inner seat, being insertable into place through said entrance opening and said outer seat, said inner valve structure including a seat member and a valve closure with a projecting stem; an outer valve structure on said outer seat, said outer valve structure comprising a stationary part and movable closure and being insertable into place through said entrance opening; an inner cage in said valve chamber extending from said outer valve structure to said inner valve structure and detachably engaging said inner valve structure, said inner cage having a guide to receive said stem and being disengageable therefrom when said inner cage is detached from said inner valve structure; and clamp means for clamping the stationary part of said outer valve structure against said outer seat, said inner cage clamping the stationary part of said inner valve structure against said inner seat.

2. A combination as defined in claim 1 in which said clamp means is detachable from said outer valve structure and includes an upper valve stem guide for said outer valve structure.

3. In a valve assembly of the character described, for use with a valve body having a valve chamber, a central opening for said valve chamber, relatively larger and smaller conical annular supporting seats on opposite sides of said central opening, and a normally closed entrance opening spaced outward from said larger annular supporting seat, the combination of: an inner annular valve seat element inserted through said entrance opening and said larger supporting seat into engagement with said smaller supporting seat; an outer annular valve seat element inserted through said entrance opening into engagement with said larger supporting seat, said valve seat elements having packing means to engage said supporting seats; an outer valve cage engaging the outer part of said outer valve element; means to apply a force to said valve cage to force said outer valve element toward said larger supporting seat; an inner valve cage extending from the inner part of said outer valve

seat element and releasably engaging said inner valve seat element to transmit force from said outer valve seat element; a valve closure engaging said inner valve seat element and having a stem which projects outward within said inner valve cage; and a member extending inwardly in said inner valve cage and having a guide to receive said stem and being disengageable from said stem when said inner valve cage is released from said inner valve seat element.

4. In a pump, a valve pot comprising: a body having a valve chamber, suction and discharge ports, a central opening for the valve chamber, a normally closed entrance opening, an inner seat in said chamber between said central opening and said suction port and an outer seat in said chamber between said central opening and said discharge port, said inner seat being of smaller diameter than said outer seat and said outer seat being of smaller diameter than said entrance opening; an inner valve structure on said inner seat, insertable into place through said entrance opening and said outer seat, said inner valve structure comprising an inner valve seat and a valve closure with a projecting stem; an outer valve structure on said outer seat, insertable into place through said entrance opening; clamp means for holding a stationary part of said outer valve structure against said outer seat; holding means extending from a stationary part of said outer valve structure to said inner valve structure to hold the same against said inner seat; and valve guide means connected to a stationary part of said outer valve structure and projecting therefrom toward said inner valve structure to make guiding engagement with said valve stem.

5. In a pump, a valve pot comprising: a body having a valve chamber, suction and discharge ports, a central opening for the valve chamber, a normally closed entrance opening, an inner seat in said chamber between said central opening and said suction port and an outer seat in said chamber between said central opening and said discharge port, said inner seat being of smaller diameter than said outer seat and said outer seat being of smaller diameter than said entrance opening; an inner valve structure on said inner seat, insertable into place through said entrance opening and said outer seat, said inner valve structure comprising an inner valve seat and a valve closure with a projecting stem; an outer valve structure on said outer seat, insertable into place through said entrance opening; clamp means for holding a stationary part of said outer valve structure against said outer seat; and valve guide means extending inward from a stationary part of said outer valve structure toward said inner valve structure to make guiding engagement with said stem of said valve closure, whereby removal of said outer valve structure will remove said guide means.

6. In a pump, a valve pot comprising: a body having a valve chamber, suction and discharge ports, a central opening for the valve chamber, a normally closed entrance opening, an inner seat in said chamber between said central opening and said suction port and an outer seat in said chamber between said central opening and said discharge port, said inner seat being of smaller diameter than said outer seat and said outer seat being of smaller diameter than said entrance opening; an inner valve structure on said inner seat, insertable into place through said entrance opening and said outer seat, said

inner valve structure comprising an inner valve seat and a valve closure with a projecting stem; an outer valve structure on said outer seat, insertable into place through said entrance opening, said outer valve structure comprising a valve seat retainer formed for cooperative engagement with said outer seat; clamp means for holding the retainer of said outer valve structure against said outer seat; and valve guide means extending inward from said valve seat retainer of said outer valve structure toward said inner valve structure to make guiding engagement with said stem of said valve closure, whereby removal of said outer valve structure will remove said guide means.

7. In a valve means of the character described, the combination of: a hollow valve body having an entrance opening defined by a cylindric wall, and an annular seat spaced from said entrance opening; a valve structure supported on said seat; a closure for said entrance opening having an annular portion extending into said entrance opening, there being a circular recess formed between the periphery of said portion of said closure and said cylindric wall of said entrance opening; a sealing ring in said circular recess, said sealing ring having a channel in the exposed face thereof; and means for clamping the stationary portion of said valve structure against said seat, comprising a member extending from said closure to said valve structure and having a face in relatively non-resilient end thrust engagement with said closure independently of said sealing ring whereby a clamping force may be transmitted from said closure directly to the stationary portion of said valve structure, said member having an annular part extending into said channel of said sealing ring for a distance limited by said end thrust engagement to cause lateral expansion of said sealing ring.

8. In a pump, a valve pot comprising: a body having a valve chamber, suction and discharge ports, a central opening for the valve chamber, a normally closed entrance opening, an inner seat in said chamber between said central opening and said suction port and an outer seat in said chamber between said central opening and said discharge port, said inner seat being of smaller diameter than said outer seat and said outer seat being of smaller diameter than said entrance opening; an inner valve structure on said inner seat, insertable into place through said entrance opening and said outer seat, said inner valve structure comprising an inner valve seat and a valve closure with a projecting stem; an outer valve structure on said outer seat, insertable into place through said entrance opening, said outer valve structure comprising a valve seat retainer formed for cooperative engagement with said outer seat, an outer valve seat supported by said valve seat retainer, and an outer valve closure operative on said outer valve seat; clamp means pressing against said valve seat retainer for holding said valve seat retainer against said outer seat; and valve guide means extending inward from said valve seat retainer of said outer valve structure toward said inner valve structure to make guiding engagement with said stem of said valve closure, whereby removal of said outer valve structure will remove said guide means.

9. In a pump, a valve pot comprising: a body having a valve chamber, suction and discharge ports, a central opening for the valve chamber,

a normally closed entrance opening, an inner seat in said chamber between said central opening and said suction port and an outer seat in said chamber between said central opening and said discharge port, said inner seat being of smaller diameter than said outer seat and said outer seat being of smaller diameter than said entrance opening; an inner valve structure on said inner seat, insertable into place through said entrance opening and said outer seat, said inner valve structure comprising an inner valve seat and a valve closure with a projecting stem; an outer valve structure on said outer seat, insertable into place through said entrance opening, said outer valve structure comprising a valve seat retainer formed for cooperative engagement with said outer seat, an outer valve seat supported by said valve seat retainer, and an outer valve closure operative on said outer valve seat, said inner and outer valve seats and valve closures being of the same size; clamp means pressing against said valve seat retainer for holding said valve seat retainer against said outer seat; and valve guide means extending inward from said valve seat retainer of said outer valve structure toward said inner valve structure to make guiding engagement with said stem of said valve closure, whereby removal of said outer valve structure will remove said guide means.

10. In a pump, a valve pot comprising: a body having a valve chamber, suction and discharge ports, a central opening for the valve chamber, a normally closed entrance opening, an inner seat in said chamber between said central opening and said suction port and an outer seat in said chamber between said central opening and said discharge port, said inner seat being of smaller diameter than said outer seat and said outer seat being of smaller diameter than said entrance opening; an inner valve structure on said inner seat, insertable into place through said entrance opening and said outer seat, said inner valve structure comprising an inner valve seat and a valve closure with a projecting stem; an outer valve structure on said outer seat, insertable into place through said entrance opening, said outer valve structure comprising a valve seat retainer formed for cooperative engagement with said outer seat; clamp means for holding said outer valve structure against said outer seat; and valve guide means extending inward from said valve seat retainer of said outer valve structure toward said inner valve structure to make guiding engagement with said stem of said valve closure, whereby removal of said outer valve structure will remove said guide means, said valve guide means including a depending spider, formed integrally with said valve seat retainer, and a central valve guide carried by said spider.

11. In a pump, a valve pot comprising: a body having a valve chamber, suction and discharge ports, a central opening for the valve chamber, a normally closed entrance opening, an inner seat in said chamber between said central opening and said suction port and an outer seat in said chamber between said central opening and said discharge port, said inner seat being of smaller diameter than said outer seat and said outer seat being of smaller diameter than said entrance opening; an inner valve structure on said inner seat, insertable into place through said entrance opening and said outer seat, said inner valve structure comprising an inner valve seat and a valve closure with a projecting stem; an outer valve structure on said outer seat, insertable into

place through said entrance opening, said outer valve structure comprising a valve seat retainer formed for cooperative engagement with said outer seat, an outer valve seat supported by said valve seat retainer, and an outer valve closure operative on said outer valve seat; clamp means pressing against said valve seat retainer for holding said valve seat retainer against said outer seat; and valve guide means extending inward from said valve seat retainer of said outer valve structure toward said inner valve structure to make guiding engagement with said stem of said valve closure, whereby removal of said outer valve structure will remove said guide means, said valve guide means including a depending spider, formed integrally with said valve seat retainer, and a central valve guide carried by said spider.

12. In combination: a valve pot having an entrance opening and an annular seat spaced from said entrance opening; a valve structure having a valve seat retainer engaging said annular seat, a valve seat removably supported by said valve seat retainer, and a valve closure operative on said valve seat; a cover for closing said entrance opening; a clamp member engaging said cover and said valve seat retainer and being in metal-to-metal and end thrust engagement therewith, said valve seat being accessible through said entrance opening upon removal of said cover and clamping member; means for securing said cover to said pot whereby end thrust is transmitted from said cover to said clamp member and from said clamp member to said seat retainer for securing said seat retainer against said annular seat; and pressure sealing means between said cover and said valve pot.

13. In combination: a valve pot having an entrance opening and an annular seat spaced from said entrance opening; a valve structure having a valve seat retainer which has metal-to-metal, unyielding engagement with said annular seat, a valve seat removably supported by said valve seat retainer, and a valve closure operative on said valve seat; a cover for closing said entrance opening; a clamp member engaging said cover and said valve seat retainer and being in metal-to-metal and end thrust engagement therewith; securing means cooperating between said cover and said valve pot for forcing said cover inwardly against said clamp member whereby end thrust is transmitted from said cover to said clamp member and from said clamp member to said seat retainer so that the thrust placed on said cover by said securing means is substantially non-resiliently applied to said valve pot through said clamp member and said seat retainer, thereby immovably and unyieldably securing said seat retainer against said annular seat; and pressure sealing means between said cover and said valve pot.

14. In combination: a valve pot having an entrance opening and an internal conoidal seat spaced from said entrance opening; a valve structure having a valve seat retainer which is conoidal shaped to have metal-to-metal, solid engagement said internal conoidal seat, a valve seat removably supported by said valve seat retainer, and a valve closure operative on said valve seat; a cover for closing said entrance opening; a clamp member engaging said cover and said valve seat retainer and being in metal-to-metal and end thrust engagement therewith; means for securing said cover to said pot whereby end thrust is transmitted from said cover to said clamp member and from said clamp member to said seat retainer for securing said seat retainer against said annular seat; and pressure sealing means between said cover and said valve pot, and between said valve seat retainer and said valve pot.

15. In combination: a valve pot having an entrance opening and a pair of coaxially disposed annular seats spaced from said entrance opening and from each other; a valve structure having a valve seat retainer engaging the one of said annular seats nearer said opening, a valve seat supported by said valve seat retainer, and a valve closure operative on said valve seat; a cover for closing said entrance opening; a clamp member engaging said cover and said valve seat retainer and being in end thrust engagement therewith; securing means cooperating between said cover and said valve pot for forcing said cover inwardly against said clamp member whereby end thrust is transmitted from said cover to said clamp member and from said clamp member to said seat retainer so that the thrust placed on said cover by said securing means is applied to said valve pot through said clamp member and said seat retainer, thereby immovably securing said seat retainer against said one of said annular seats; pressure sealing means between said cover and said valve pot; another valve structure disposed in the other of said annular seats including a valve closure; and valve guide means for said last mentioned valve closure secured to and depending from said valve seat retainer.

16. The combination as defined in claim 14 in which the pressure sealing means between the valve seat retainer and the valve pot is positioned in the outer conoidal valve seat engaging face of said retainer whereby the sealing action of said pressure sealing means is directly responsive to the fluid pressure above said valve seat when said fluid pressure has a value relative to said end thrust sufficient to cause a pressure between said valve seat and valve seat retainer.