April 27, 1954 C. J. COBERLY 2,676,546

FLUID-OPERATED PUMP HAVING CONCENTRIC AND PARALLEL TUBINGS

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Fig. 1

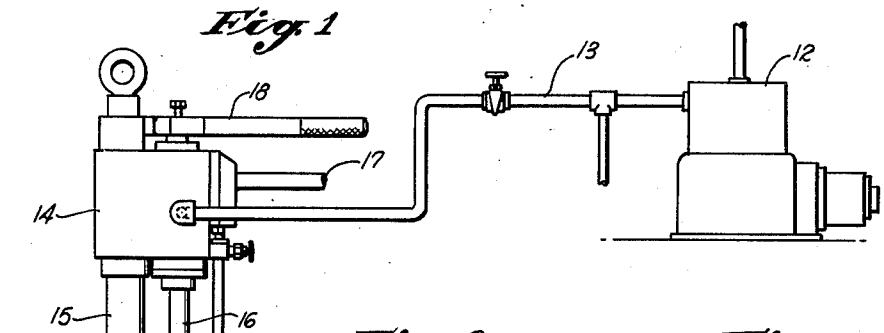

Fig. 2

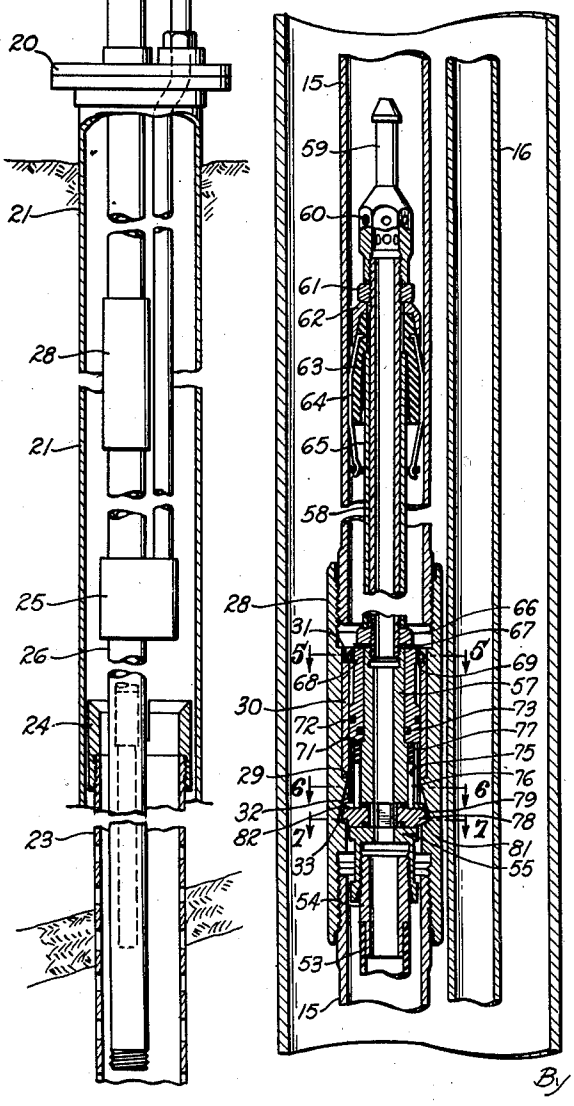

Fig. 3

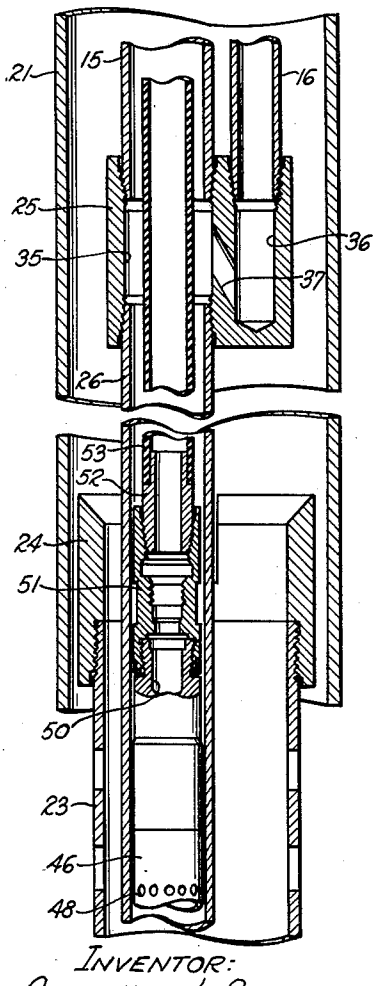

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Fig. 4

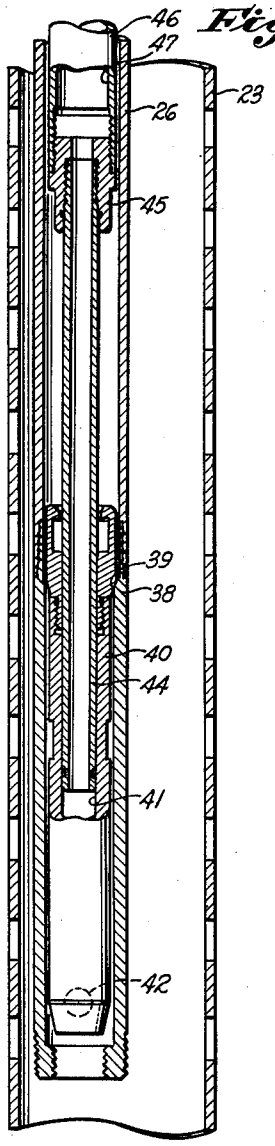

Fig. 5

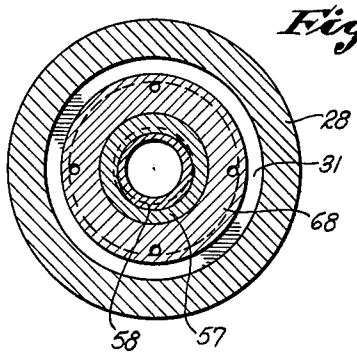

Fig. 6

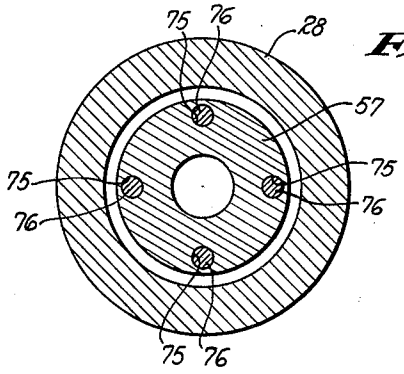

Fig. 7

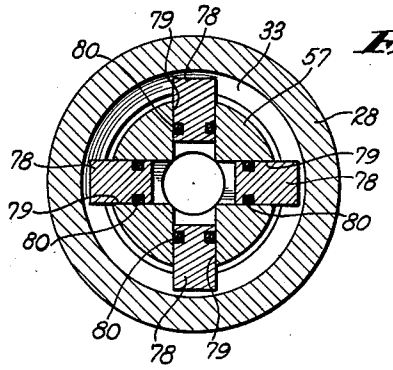

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Fig. 8

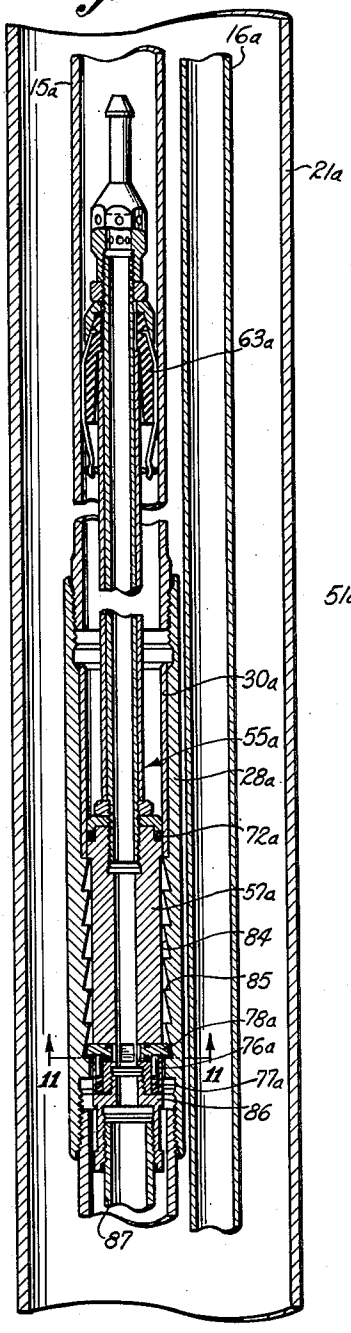


Fig. 9

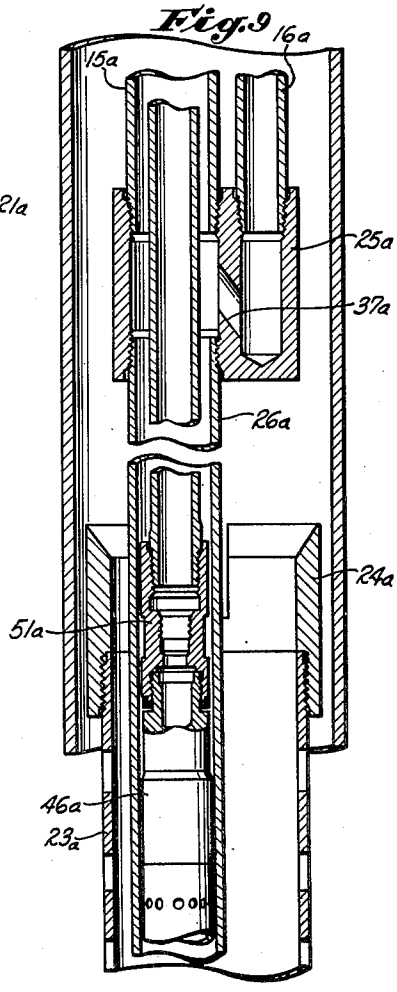
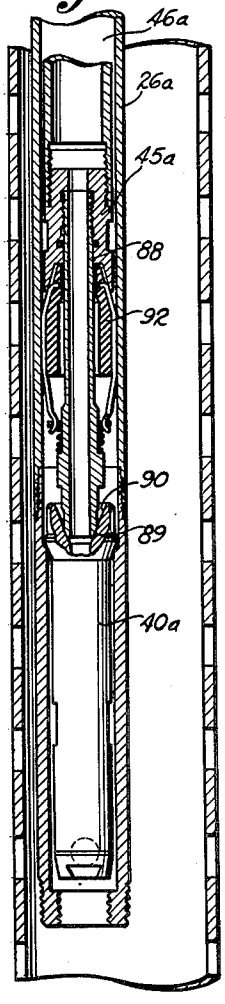


Fig. 10



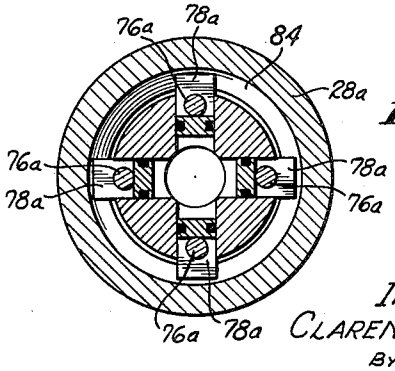


Fig. 11

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FIG. 12

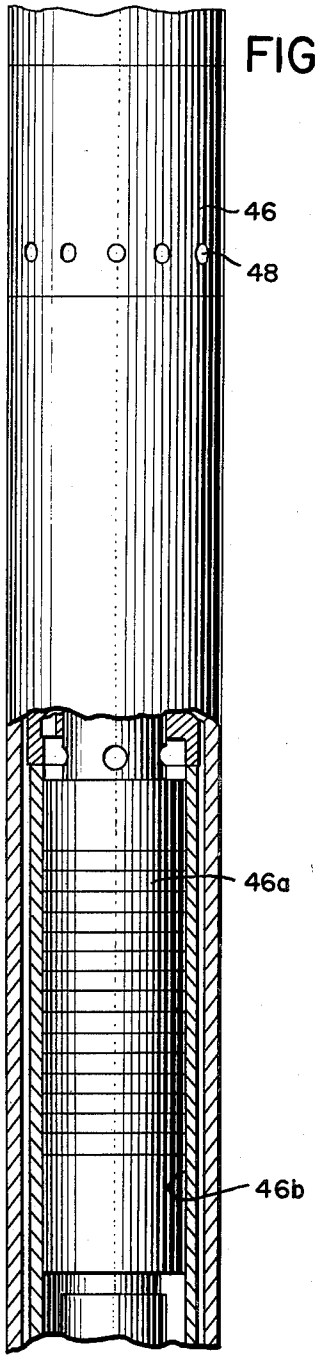
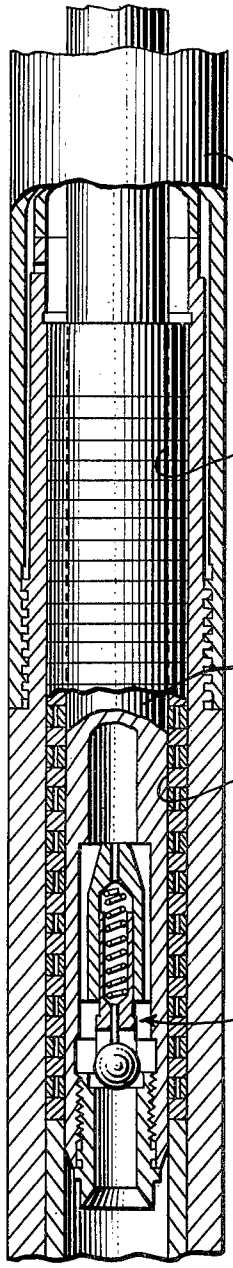


FIG. 13



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Patented Apr. 27, 1954 2,676,546

UNITED STATES PATENT OFFICE

2,676,546

FLUID-OPERATED PUMP HAVING CONCENTRIC AND PARALLEL TUBINGS

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Application May 11, 1948, Serial No. 26,306

10 Claims. (Cl. 103—46)

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This invention relates to fluid-operated pumping systems for wells, and, more particularly, to apparatus adapted to be used for pumping in connection with a fluid-operated pump.

The invention has particular utility in oil well pumping, and will be described in connection therewith, but it is to be understood that it may have other applications and I do not intend to be limited to the specific form and use described herein.

It is conventional practice in the oil industry to provide a pair of parallel tubings in a well, one being a power oil tubing and the other being a production tubing, the lower ends of which are connected together so as to provide fluid communication therebetween, and to dispose a fluid-operated pump in the power oil tubing so that it is supplied therethrough with power oil which operates the pump, to pump well fluid to the ground surface through the production tubing. In such a system, the pump can be removed from the well by reversing the circulation of fluid so that power oil is passed downwardly through the production tubing and upwardly through the power oil tubing to carry the pump to the surface. Such a system is shown and described in detail in my Patent No. 2,338,903, issued on January 11, 1944, to which reference is hereby made for the details thereof.

In such a conventional parallel tubing system the parallel tubings occupy considerable lateral space in the well casing or tubing. In deep oil wells it is common practice to reduce the diameter of the casing as it extends downwardly in the well hole. It is also common practice to utilize a perforated liner in the bottom production zone of the well, which liner is of substantially less diameter than the casing. Under such conditions it is common for the liner or casing in the production zone of the well to be too small in diameter to accommodate the conventional type of parallel tubing system described above. In such a situation heretofore it has been necessary to employ some other more expensive tubing system.

It is a primary object of the present invention to provide a pumping system in which such parallel tubings can be used down to a depth at which the casing or liner is of such reduced diameter as to prevent further downward continuation of the parallel system, and to employ concentric tubings below such depth to accommodate the pump, the over-all diameter of such concentric tubings being substantially less than the casing or liner diameter required for use of the parallel tubings. This permits the parallel tubing system to be used throughout most of the well, with its attendant economy and other desirable features, but also permits the pump to be bottomed

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at a substantially greater pumping depth which is frequently necessary or desirable.

A further object of the present invention is to provide a hydraulic latch mechanism for retaining or supporting a fluid-operated pump in a well tubing, the mechanism being hydraulically operated to both latched and unlatched positions by the application of power oil under high pressure thereto.

Other objects and advantages will appear from the following specification and the drawings, which are for the purpose of illustration only, and in which:

Fig. 1 is a diagrammatic utility view, which shows the invention installed in a well;

Fig. 2 is a vertical sectional view of the upper portion of the invention;

Fig. 3 is a vertical sectional view of an intermediate portion of the invention, being a downward continuation of Fig. 2;

Fig. 4 is a vertical sectional view of the lower portion of the invention, being a downward continuation of Fig. 3;

Fig. 5 is an enlarged cross-sectional view taken on the line 5—5 of Fig. 2;

Fig. 6 is an enlarged cross-sectional view taken in the line 6—6 of Fig. 2;

Fig. 7 is an enlarged cross-sectional view taken on the line 7—7 of Fig. 2;

Fig. 8 is a view similar to Fig. 2 of an alternative embodiment;

Fig. 9 is a view similar to Fig. 3 of said alternative embodiment, being a downward continuation of Fig. 8;

Fig. 10 is a view similar to Fig. 4 of said alternative embodiment, being a downward continuation of Fig. 9;

Fig. 11 is an enlarged cross-sectional view taken on the line 11—11 of Fig. 8;

Fig. 12 is a fragmentary vertical sectional view of the upper end of a typical pump or pump assembly which may be utilized with the present invention; and

Fig. 13 is a downward continuation of Fig. 12.

Referring to the drawings, Fig. 1 diagrammatically shows a complete well installation including the present invention, which includes a triplex pumping unit 12, of conventional design, which is adapted to pump an operating fluid under high pressure such as clean crude oil, hereinafter referred to as power oil, through supply piping 13 and a four-way valve 14 to a column of power oil tubing 15. Also connected to the four-way valve 14 is the upper end of a production tubing 16 adapted to convey well fluid therethrough and to pass such well fluid through the four-way valve to a discharge pipe 17 which is adapted to convey the well fluid to a point of use or disposal (not shown). The four-way valve 14

may be manually operated by a lever 18 to connect the supply piping 13 with the power oil tubing 15 and to connect the production tubing 16 with the discharge pipe 17, which is the position thereof for normal pump operation. The valve 14 may also be adjusted by the lever 18 to a second position in which the supply piping 13 is connected to the production tubing 16 and the power oil tubing 15 is connected to the discharge pipe 17, which is the pump-out position to be described more fully hereinafter.

The power oil tubing 15 and the production tubing 16 pass downwardly through a casing head 20, which is normally positioned above the surface of the ground, and from which extends downwardly a well casing 21. The well casing 21 is of conventional form. Projecting into the lower end of the casing 21 and extending downwardly therefrom is a perforated casing 23 which may be provided at its upper end with a collar 24 adapted to be engaged by a conventional J-tool on the lower end of a drill pipe (not shown), all of which is conventional practice. The perforated casing 23 is of substantially smaller internal diameter than the casing 21 and extends down into the producing formation of the well and either being perforated or provided with a perforated liner (not shown). The perforated casing 23, or a perforated liner substituted therefor, may be 300 or more feet long. Connected to the lower end of the power oil tubing 15 and the production tubing 16 is a foot member 25 from which extends downwardly a lower tubing 26 which is in axial alignment with the power oil tubing 15, and which forms a downward continuation thereof as described more in detail hereinafter.

As best shown in Fig. 2, the power oil tubing 15 is provided near its lower end with a sealing collar 28 which is tubular in form and which is provided with an annular shoulder 29 upon which seats a cylindrical sleeve 30 the upper end of which provides an annular seating shoulder 31. Formed in the collar 28 below the shoulder 29 is an annular recess 32 which provides a lower annular seating shoulder 33.

The lower end of the sealing collar 28 is threadedly connected to the foot member 25, as best shown in Fig. 3. The foot member 25 is provided with a first bore 35 and a second bore 36, fluid communication therebetween being provided by a port 37, and the lower end of the production tubing 16 being threaded into the upper end of the second bore 36. The lower tubing 26 is threaded into the lower end of the first bore 35, and extends downwardly from the foot member 25 into the perforated casing 23. As best shown in Fig. 4, the lower end of the lower tubing 26 is threadedly secured to a lower seating element 38 which is tubular in form and open at its lower end. The lower seating element 38 is provided with an annular seating face 39. Seated on the face 39 is a standing valve assembly 40 provided with a bore 41 therethrough and a ball check valve 42 at the lower end of the bore, the ball check valve being adapted to move upwardly to admit well fluid from the perforated casing 23 into the standing valve assembly but to seat to prevent a reverse flow of such well fluid.

Extending into the bore 41 of the standing valve assembly 40, and adapted to make a fluid-tight fit therewith, is a skeeter bill 44, the upper end of which is connected by a fitting 45 to the lower inlet end of a fluid-operated pump 46, the skeeter bill providing fluid communication between the bore 41 of the standing valve assembly 40 and an inlet 47 of the fluid-operated pump. The fluid-operated pump 46 may be of any conventional type well-known in the art. For example, the pump 46 may be of the type disclosed in my aforementioned patent. Briefly, and referring to Figs. 12 and 13, such a pump may include a motor piston means 46a reciprocable in a motor cylinder means 46b, the motor piston means having connected thereto a pump piston means 46c reciprocable in a pump cylinder means 46d and carrying the usual working valve means 46e. The external diameter of the fluid-operated pump 46 is substantially less than the internal diameter of the lower tubing 26, so as to provide an annular clearance therebetween with which communicates discharge ports 48, best shown in Fig. 3, from which the fluid-operated pump pumps well fluid which enters the pump through the inlet 47, pumping the same upwardly through the lower tubing 26 into the foot member 25.

The upper end of the fluid-operated pump 46 is provided with a power oil inlet 50 through which power oil may be supplied to the fluid-operated pump from the power oil tubing 15 under high pressure, so as to operate the pump, as is well-known in the art. Connected to the upper end of the fluid-operated pump 46 is a tubular fitting 51 into the upper end of which is threaded a nipple 52 connected to the lower end of a flexible tubular conduit 53. The conduit 53 may be made of reinforced rubber, neoprene, or other suitable material, adapted to withstand the expansive force of power oil under high pressure flowing therethrough. As shown in Fig. 2, the upper end of the conduit 53 is connected through an upper nipple 54 with a packer means 55.

The packer means 55 includes a lower tubular element 57 into the upper end of which is threaded an upper tubular element 58 which extends upwardly into the power oil tubing 15. Secured to the upper end of the upper tubular element 58 is a plug member 59 having inlet ports 60 therein which communicate between the interior of the upper tubular element and the interior of the power oil tubing 15. Also threaded to the upper tubular member 58 and engaging the plug member 59 is a nut 61 which is engaged by a follower cup 62 which retains the upper end of a resilient packer element 63. The packer element 63 may be made of rubber, neoprene, or other suitable material, and is expanded outwardly into light sealing engagement with the inner wall of the power tubing 15 by spring arms 64, and is retained in its vertical position relative to the upper tubular element 58 by a tubular sleeve 65 the lower end of which engages a nut 66 threaded on the lower end of the upper tubular element. The nut 66 engages a clamping washer 67, which in turn engages against the upper end of a sealing sleeve 68 provided with an annular, downwardly faced shoulder 69 which, in the position shown in Fig. 2, seats on the shoulder 31 of the sealing collar 28. The lower end of the sealing sleeve 68 engages a shoulder 71 formed on the lower tubular element 57, the parts 67 and 68 being rigidly clamped against the shoulder 71 by the nut 66. The periphery of the sealing sleeve 68 makes a close sliding fit with the inner wall of the cylindrical sleeve 30, the sealing sleeve being preferably provided with an O-ring packing 72 to provide a fluid-tight seal therebetween. Also, the sealing sleeve 68 is provided in its internal wall with a similar O-ring packing

adapted to provide a seal between the sleeve and the outer wall of the lower tubular member 57. It is to be noted that the maximum external diameter of the sealing sleeve 68 is substantially less than the internal diameter of the power tubing 15.

As best shown in Figs. 2 and 6, the lower enlarged portion of the lower tubular element 57 is provided with a plurality of circumferentially spaced vertical bores 75 in each of which is provided a pin 76 resiliently maintianed in its lower position as shown in Fig. 2 by a compression spring 77. The lower ends of the pins 76 engage radial latch elements 78 which, as best shown in Figs. 2 and 7, are slidably retained in their respective rectangular openings 79 formed in the lower tubular element 57. Each of the latch elements 78 is provided with an O-ring packing 80 which entirely encircles the same to provide a fluid seal between the latch element and its opening. Each of the latch elements is provided with a lower seating face 81 which is adapted to rest on the lower annular shoulder 33 of the sealing collar 28, and each of the latch elements is provided in its upper face with a groove 82 in which its respective pin 76 is adapted to enter, the pin serving as a stop to limit inward and outward radial movement of each of the latch elements.

In the position shown in Figs. 1 to 7, inclusive, in the preferred embodiment of the invention, the fluid-operated pump 46 is shown as disposed substantially within the lower tubing 26, adjacent to the upper end of the lower portion of the well casing 21. This is merely for convenience of illustration. In practice, the fluid-operated pump 46 may be many feet below the upper end of the perforated casing 23, in some cases 300 feet or more. In such case, the flexible conduit 53 may be of very substantial length.

In installation, the packer means 55, the flexible conduit 53, the fluid-operated pump 46, and the skeeter bill 44 are assembled preferably at the surface of the ground. The standing valve assembly 40, which has a maximum diameter small enough to pass downwardly through the power oil tubing 15, the sealing collar 28, the first bore 35 of the foot member 25, and the lower tubing 26, is dropped or otherwise passed downwardly through the same to it seated position illustrated in Fig. 4, the tubing first being filled with fluid. The fluid-operated pump assembly is then inserted into the upper end of the power tubing 15, the upper end of the power tubing is suitably plugged, and the triplex pumping unit 12 is then operated to pump high pressure power oil through the supply piping 13, the four-way valve 14, and downwardly through the power tubing 15 to force the fluid-operated pump assembly downwardly through the power oil tubing to the positions thereof shown in Figs. 2, 3, and 4. During this movement of the fluid-operated pump assembly, the skeeter bill 44 enters the bore 41 of the standing valve assembly 40, to the position illustrated in Fig. 4. Before starting downward movement of the fluid-operated pump assembly, the radial latch elements 78 are manually moved inwardly to retracted position so that the fluid-operated pump unit may pass downwardly. The latch elements are held in this position frictionally by the compression springs 77. As little fluid pressure on the upper end of the fluid-operated assembly is required to force it downwardly to its pumping position as illustrated, the latch elements do not move outwardly during this downward movement of the assembly. However, as soon as the shoulder 69 on the sealing sleeve 68 engages the shoulder 31 on the upper end of the cylindrical sleeve 30 further downward movement of the fluid-operated pump assembly is checked thereby, and power oil immediately flows from the power oil tubing 15 through the inlet ports 60 and through the packer means 55 to the flexible conduit 53. Application of the full pressure of the power oil to the inner faces of the radial latch elements 78 force them outwardly to the position shown in Fig. 2 in which the lower seating faces 81 thereof engage and are supported by the lower annular shoulder 33 of the sealing collar 28. As will be noted, the area of engagement between the shoulder 69 and the seating shoulder 31 is relatively small due to space requirements in the packer means, and would not support the full pressure of the power oil, which might provide a pressure differential across the packer means of 2,500 pounds per square inch or more. Consequently, this engagement is not designed to do more than to check the downward movement of the fluid-operated pump assembly and to temporarily support the assembly in the pumping position. As soon as the downward pressure of the power oil starts to rise within the packer means 55 the radial latch elements 78 are moved outwardly as described to their position, as shown in Fig. 2, in which they are adapted to support the entire fluid-operated pump assembly and to withstand any downward pressure differential thereon.

Power oil then flows downwardly through the flexible conduit 53, through the power oil inlet 50, to the fluid-operated pump 46 to operate the same. Operation of the fluid-operated pump 46 causes it to draw well fluid from the perforated casing 23 into the lower end of the lower seating element 36, upwardly through the standing valve assembly 40, the skeeter bill 44, and into the inlet 47 of the fluid-operated pump 46. The pump end of the fluid-operated pump 46 then discharges such well fluid from the discharge ports 48 into the lower tubing 26 through which it flows upwardly around the fluid-operated pump and the flexible conduit 53 into the foot member 25. Such well fluid, which may be termed the production flow, then passes through the port 37 and the second bore 36 and into the production tubing 16 and upwardly therethrough, passing through the four-way valve 14 and into the discharge pipe 17 through which it is conveyed to a point of storage or use. It is also to be noted that since the sealing sleeve 68 forms a fluid-tight seal with the cylindrical sleeve 30, the interior of the power oil tubing 15 below the packer means 55 around the flexible conduit 53 and thereabove is maintained at relatively low pressure of the production flow. This provides a fluid pressure differential across the radial latch elements 78, retaining them in their latched position, shown in Fig. 2.

When it is desired to remove the fluid-operated pump 46 from the well, the four-way valve 14 is adjusted to its reverse position by the lever 18, so as to provide communication between the supply piping 13 and the production tubing 15, and to provide communication between the power oil tubing 15 and the discharge pipe 17. Power oil then flows downwardly through the production tubing 16 and enters the foot member 25, passing through the port 37 into the power oil tubing 15 below the packer means 55. As such fluid pressure builds up, it exerts an inward radial force on the radial latch elements 78, moving them to retracted position in which they are moved in-

wardly until the pins 76 engage the outer ends of the grooves 82. Continued application of such high fluid pressure below the packer means 55 causes the fluid-operated pump assembly, including the packer means, flexible conduit 53, and the fluid-operated pump 46, to move upwardly into the power oil tubing 15. As soon as the sealing sleeve 68 of the packer means 55 passes out of the cylindrical sleeve 30, such fluid pressure below the packer means 55 is then applied on the lower end of the packer element 63 to continue the upward movement of the fluid-operated pump assembly to the surface of the ground. As the fluid-operated pump assembly is relatively light, only a relatively low fluid pressure below the packer means 55, for example, 15 pounds per square inch, is required to move the fluid-operated pump assembly upwardly through the power oil tubing 15. Consequently, there is substantially no tendency for the packer element 63 to blow out during such upward movement of the pump assembly. As soon as the skeeter bill 44 leaves the standing valve assembly 40, during the upward movement of the fluid-operated pump assembly, downward fluid pressure on the ball check valve 42 will close the same, so as to retain oil in the system and prevent the same from bleeding back into the well casing. The use of the flexible conduit 53, where the same must be made very long, is a substantial advantage over the use of metal tubing, as such flexible conduit may be stored on a drum or reel and readily moved to and from the well rig and readily assembled thereat.

The alternative embodiment illustrated in Figs. 8, 9, 10, and 11 is generally similar to the preferred embodiment illustrated in the preceding figures, described above. It differs somewhat in structure, however, which provides certain advantages under certain conditions of operation. Similar parts are given the same reference numerals as used in connection with the preferred embodiment, but with the suffix "*a*" added.

In the alternative embodiment, the packer means 55*a*, as shown in Fig. 8, differs somewhat from the packer means 55. In the packer means 55*a*, there is no shoulder equivalent to the shoulder 69 of the preferred embodiment, although a temporary seating shoulder is provided elsewhere as will be described hereinafter. The sealing collar 28*a* is provided with a plurality of vertically spaced grooves 84, each of which provides an annular seating shoulder 85. Carried in the lower tubing element 57*a* are radial latch elements 78*a*, which are engaged by pins 76*a*, in this case the pins being disposed below the latch elements. Inserted into the lower end of the lower tubular element 57*a*, is a nipple member 86 against which the compression springs 77*a* engage and in the lower end of which is threaded a rigid tubular conduit 87 which is substituted for the flexible conduit 53 in the preferred embodiment, and which is preferably made of metal, the lower end of the conduit 87 being threaded into the tubular fitting 51*a* which, in turn, is connected to the upper end of the fluid-operated pump 46*a*. Inserted into the lower end of the fluid-operated pump 46*a*, as shown in Fig. 10, is a fitting 45*a* with which is threadedly connected a tubular stem 88 which extends downwardly therefrom, the lower end of the stem being provided with a conical seat 89 adapted to seat on a conical seating face 90 provided in the upper end of the standing valve assembly 40*a*. Carried on the tubular stem 88 is a lower packer element 92 which is generally similar in construction to the upper packer element 63*a*. The lower packer element 92 is adapted to provide a low pressure fluid seal between the lower end of the fluid-operated pump 46*a* and the inner wall of the lower tubing 26*a*.

Installation of the alternative embodiment illustrated in Figs. 8, 9, and 10 is substantially similar to that described above in connection with the preferred embodiment except in the following particulars. As the fluid-operated pump assembly, consisting of the packer means 55*a*, the conduit 87, and the stem 88 with its lower packer element 92 thereon, seats on the standing valve assembly 40*a*, the conical seat 89 making fluid-tight engagement with the seating face 90, further downward movement of the fluid-operated pump assembly is stopped. Thus, seating of the conical seat 89 on the seating face 90 has a function equivalent to that of the seating of the shoulder 69 on the seating shoulder 31 in the preferred embodiment. If the full operating pressure of the power oil were applied to the upper end of the fluid-operated pump assembly, however, the tubular conduit 87, which may be formed of relatively thin material, might collapse or otherwise corkscrew, making it impossible to withdraw the fluid-operated pump assembly from the well, which would be very undesirable. Before this can occur, however, the radial latch elements 78*a* are moved outwardly by the increasing fluid pressure within the lower tubular element 57*a* to latch in one of the grooves 84 to support the fluid-operated pump assembly on the annular seating shoulder 85 of such groove. This rigidly supports the fluid-operated pump assembly against further downward movement due to pressure of the power oil in the power oil tubing 15*a* above the packer means 55*a*. A stepped succession of such grooves 84 is provided so as to obviate any necessity of closely controlling the respective lengths of the tubular element fittings therebelow, which would otherwise be necessary if only one such groove were provided.

When it is desired to remove the fluid-operated pump assembly of the alternative embodiment, as shown in Figs. 8, 9, and 10, from the well, the direction of the flow of the power oil is reversed, as described above, so as to flow downwardly through the production tubing 16*a*, through the port 37*a* of the foot member 25*a* and into the lower end of the power tubing 15*a* and into the lower tubing 26*a*. In this alternative form of the invention, it is to be noted there is not sufficient effective area on the downward side of the lower tubing element 57*a* on which power oil therebelow can adequately act to satisfactorily raise the fluid-operated pump assembly into the power oil tubing 15*a*. However, in this form, such power oil passing downwardly through the lower tubing 26*a* readily compresses the lower packer element 92, passes thereby, and acts upon the lower end thereof so as to raise the fluid-operated pump assembly into the power oil tubing. Obviously, as soon as the fluid-operated pump assembly moved upwardly to a point at which the O-ring 72*a* moves out of the cylindrical sleeve 30*a* power oil can then flow therepast and upwardly to exert an upward lifting force on the lower end of the upper packer element 63*a*, to continue the upward movement of the fluid-operated pump assembly. Also, it will be understood, as soon as the flow of power oil is reversed and directed down through the production tubing 16*a*, the pressure differential across the radial

latch elements 78a will be reversed so as to be directed inwardly to move the same inwardly out of engagement with the sealing collar 28a, to permit the fluid-operated pump to move upwardly as described. The alternative embodiment shown in Figs. 8 to 11, inclusive, is particularly adapted for use in deep wells, in which high fluid pressures must be used on the power oil, which pressures will not be withstood by an adequate flexible-type of conduit between the fluid-operated pump 46a and the packer means 55a.

As pointed out above, the primary advantage of the present invention is to permit the "pump-in" and "pump-out" type of fluid-operated pump to be used in deeper wells with greater economy than has heretofore been possible with pumps of this type. For example, in a well using a 9-inch casing and a 7-inch liner at the bottom thereof, it is impossible to use present commercial types of parallel tubings with pumps larger than 2½" as the same cannot be run into the relatively small perforated casing 23. With the present invention, practical pumping depths with this type of equipment may be substantially extended.

A further advantage of the alternative embodiment, illustrated in Figs. 8 to 11, inclusive, is that upon removing the fluid-operated pump assembly from the well, when the packer means 55 is moved upwardly and out of the valve mechanism 14a and detached from the tubular conduit 87, the lower packer element 92 is still operated by the application of power oil at the lower end thereof, which permits the relatively long string of conduit 87 to be pushed upwardly and out of the well so that the fluid-operated pump 46a may be removed. This obviates the necessity of a special pulling rig being brought to the well to accomplish the end operation. It is also to be noted that the fluid pressure required to lift the fluid-operated pump 46a and 300 feet of the tubing 87 and the packer means 55a thereabove is only approximately 150 pounds per square inch, which pressure is readily carried by the lower packer element 92.

Although I have shown and described two preferred embodiments of the invention, it will be apparent to those skilled in the art that substitutions and modifications in both thereof may be made without departing from the spirit of the invention, and, therefore, I do not intend to be limited to the specific constructions shown and described, but desire to be afforded the full scope of the following claims.

I claim as my invention:

1. In a fluid-operated pumping device, the combination of: a well tubing; a fluid-operated pump adapted to be passed downwardly through said tubing; an upper annular seat of relatively small cross-sectional area in said tubing; a lower annular seat of relatively large cross-sectional area in said tubing below said upper seat; a tubular member on said pump; an upper seating face on said tubular member and adapted to engage said upper annular seat to support said tubular member and said pump; hydraulically actuated latch means carried by said tubular member and radially movable to engage on said lower seat; and means for exposing said latch means to fluid pressure.

2. In a fluid-operated pumping device, the combination of: a well tubing; a fluid-operated pump adapted to be passed downwardly through said tubing; an upper annular seat of relatively small cross-sectional area in said tubing; a plurality of vertically spaced steps in the interior of said tubing below said upper seat; a tubular member on said pump; an upper seating face on said tubular member and adapted to engage said upper annular seat to support said tubular member and said pump; hydraulically actuated latch means carried by said tubular member and radially movable to engage on one of said steps and means for exposing said latch means to fluid pressure.

3. In a fluid-operated pumping device, the combination of: a pair of parallel tubings of different lengths; a fluid-operated pump assembly which includes cylinder means having piston means therein and which is insertable into and smaller in diameter than the longer one of said tubings so that it is adapted to be passed through said one tubing to a point adjacent the lower end thereof; a member engageable in sealing relation with the lower end of said pump assembly, said member being carried by said one tubing adjacent the lower end thereof; means providing a fluid communication port between said tubings at the lower end of the other tubing and at a distance above said member greater than the length of said pump assembly so that said pump assembly is disposed entirely below said port when it has been moved downwardly into engagement with said member; tubular means on said pump assembly and adapted to extend upwardly through said one tubing to a level above said port; and packer means adapted to form a fluid-tight seal between said tubular means and said one tubing, said packer means being disposed above said port.

4. In a fluid-operated pumping device, the combination of: a pair of parallel tubings of different lengths; a fluid-operated pump assembly which includes cylinder means having piston means therein and which is insertable into and smaller in diameter than the longer one of said tubings so that it is adapted to be passed through said one tubing to a point adjacent the lower end thereof; a member engageable in sealing relation with the lower end of said pump assembly, said member being carried by said one tubing adjacent the lower end thereof; means providing a fluid communication port between said tubings at the lower end of the other tubing and at a distance above said member greater than the length of said pump assembly so that said pump assembly is disposed entirely below said port when it has been moved downwardly into engagement with said member; tubular means on said pump assembly and adapted to extend upwardly through said one tubing to a level above said port; packer means adapted to form a fluid-tight seal between said tubular means and said one tubing, said packer means being disposed above said port; and means for supporting said pump assembly from said one tubing at a position above said port and independently of said member.

5. In a fluid-operated pumping device, the combination of: a pair of parallel tubings of different lengths; a fluid-operated pump assembly which includes cylinder means having piston means therein and which is insertable into and smaller in diameter than the longer one of said tubings so that it is adapted to be passed through said one tubing to a point adjacent the lower end thereof; a member engageable in sealing relation with the lower end of said pump assembly, said member being carried by said one tubing adjacent the lower end thereof; means providing a fluid communication port between said tubings

at the lower end of the other tubing and at a distance above said member greater than the length of said pump assembly so that said pump assembly is disposed entirely below said port when it has been moved downwardly into engagement with said member; flexible tubular means on said pump assembly and adapted to extend upwardly through said one tubing to a level above said port; packer means adapted to form a fluid-tight seal between said tubular means and said one tubing, said packer means being disposed above said port; and means for supporting said flexible tubular means from said one tubing at a position above said port.

6. In a fluid-operated pumping device for wells, the combination of: a tubing; a fluid-operated pump assembly slidable in said tubing and having a power fluid inlet; tubular means in said tubing connected to said inlet and adapted to convey power fluid to said inlet; a radially slidable latch element carried by said tubular means and having an inner end exposed to the interior thereof, said latch element being adapted to be moved radially outwardly by power fluid passing through said tubular means and acting on said inner end, said latch element having its outer end outside said tubular means but within said tubing; a shoulder in said tubing engageable by said latch element to support said pump assembly, said latch element being adapted to be moved radially inward in response to fluid pressure applied to the outer end thereof in said tubing; and means for selectively controlling the fluid pressure in said tubing and in said tubular means.

7. In a device for use in connection with a fluid-operated well pump having a power fluid inlet, the combination of: a tubing, tubular means in said tubing adapted to be connected to and to extend upwardly from the pump and having a passage adapted to communicate with the inlet, said passage being open at both ends; a radially slidable element carried by said tubular means and having an inner end exposed to the interior thereof and an outer end outside said tubular means, said element being adapted to be moved radially outwardly by a predetermined hydraulic pressure in said passage acting on said inner end, and being adapted to be moved radially inwardly by a predetermined hydraulic pressure applied to the outer end thereof inside said tubing; a shoulder in said tubing engageable by said element to support said tubular means; and means for selectively controlling the fluid pressure in said tubing and in said tubular means.

8. In a fluid-operated pumping device, the combination of: a pair of parallel tubings, one of said tubings being substantially longer than the other thereof; a fluid-operated pump assembly which includes cylinder means having piston means therein and which is insertable into and smaller in diameter than said one tubing so that it is adapted to be passed through said one tubing to a point adjacent the lower end thereof, said pump assembly having a power fluid inlet, a well fluid inlet, and a discharge port communicating with the interior of said one tubing; a member engageable in sealing relation with the lower end of said pump assembly, said member being carried by said one tubing adjacent the lower end thereof; means providing a fluid communication orifice between said tubings at a distance above said member greater than the length of said pump assembly and at the lower end of the other tubing so that said pump assembly is disposed entirely below said orifice when it has been moved downwardly into engagement with said member; an upper tubular element on said pump assembly communicating with said power fluid inlet; upper sealing means between said upper tubular element and said one tubing and disposed above said orifice; lower tubular means forming said lower end of said pump assembly and communicating with said well fluid inlet; and lower sealing means between said lower tubular means and said member and disposed below said discharge port.

9. In a fluid-operated pumping device, the combination of: a pair of parallel tubings, one of said tubings being substantially longer than the other thereof; a fluid-operated pump which includes cylinder means having piston means therein and which is insertable into and smaller in diameter than said one tubing so that it is adapted to be passed through said one tubing to a point adjacent the lower end thereof, said pump having a power fluid inlet, a well fluid inlet, and a discharge port adapted to communicate with the interior of said one tubing; a member engageable by the lower end of said pump carried by said one tubing adjacent the lower end thereof; means providing a fluid communication orifice between said tubings at a distance above said member greater than the length of said pump so that said pump is disposed entirely below said orifice when it has been moved downwardly into engagement with said member; an upper tubular element on said pump communicating with said power fluid inlet; upper sealing means between said upper tubular element and said one tubing and disposed above said orifice; a lower tubular element forming said lower end of said pump and communicating with said well fluid inlet; lower sealing means between said lower tubular element and said member and disposed below said discharge port; and hydraulically operated latch means adapted to latch one of said elements relative to said one tubing.

10. In a fluid-operated pumping device, the combination of: power and production tubings of different lengths; a fluid-operated pump assembly which includes cylinder means having piston means therein and which is insertable into and smaller in diameter than the longer one of said tubings so that it is movable through said one tubing to an operating position adjacent the lower end thereof, said pump assembly having an inlet and an outlet; a member engageable in sealing relation with the lower end of said pump assembly, said member being carried by said one tubing adjacent the lower end thereof; means providing a port connecting said tubings in fluid communication at a distance above said member greater than the length of said pump assembly and at the lower end of the other tubing so that said pump assembly is disposed entirely below said port when it has been moved downwardly into engagement with said member; and a first passage means connecting said power tubing to said inlet and a second passage means connecting said production tubing to said outlet, one of said passage means including said port.

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