Jan. 18, 1944. W. J. BRIGHTWELL 2,339,319

VALVED WELL PACKER

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Fig. 1.

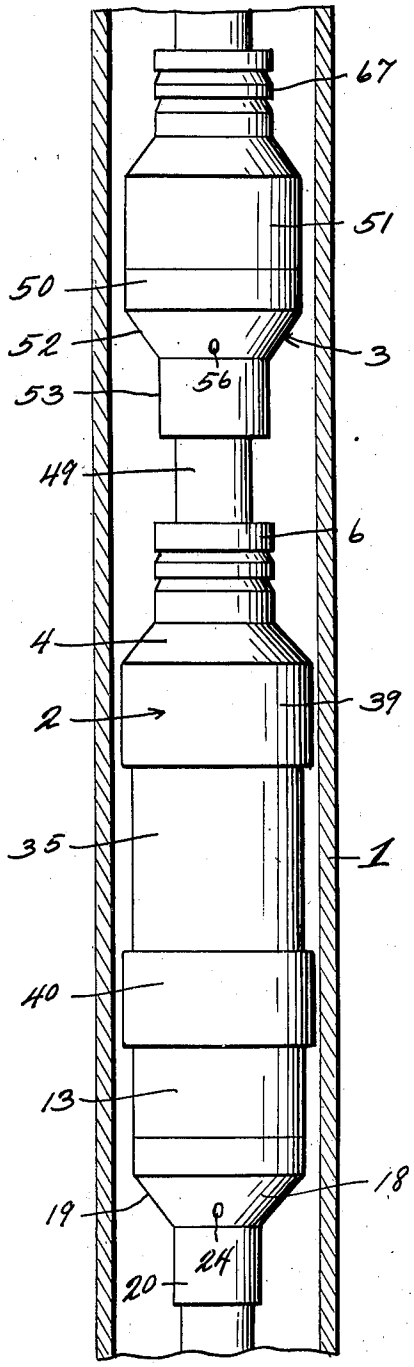
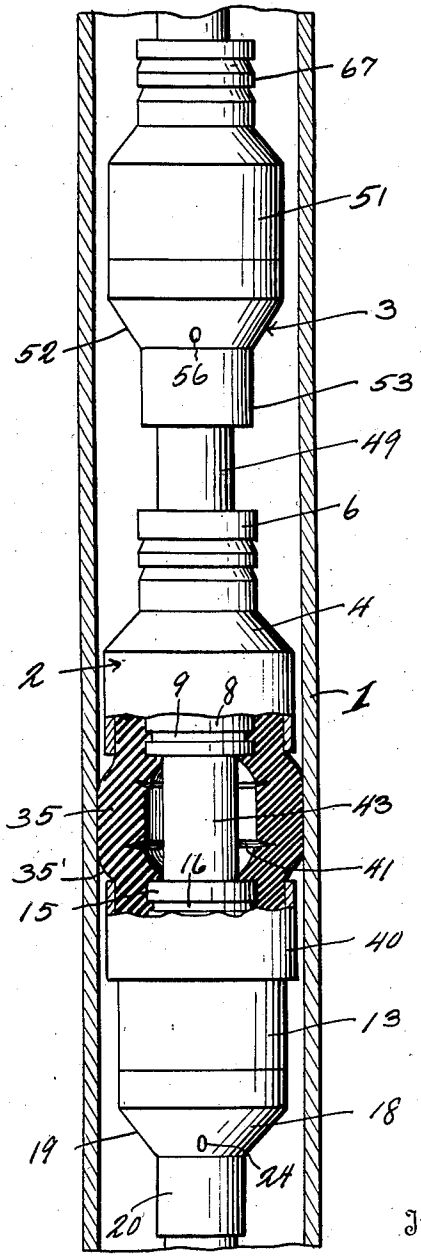


Fig. 2.



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Fig. 4

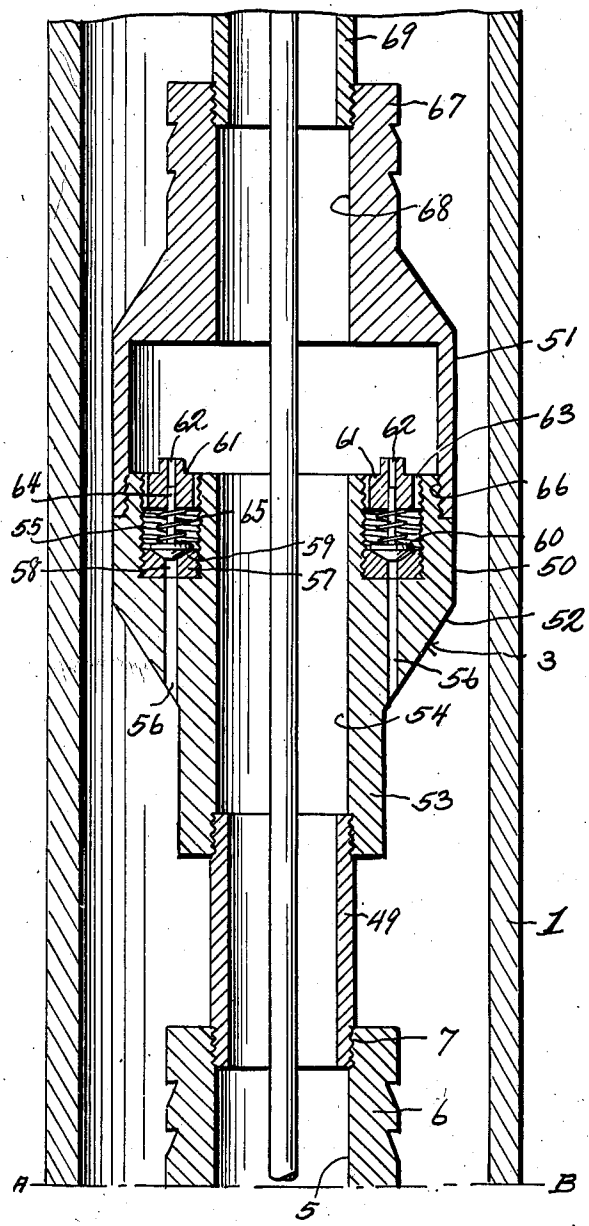
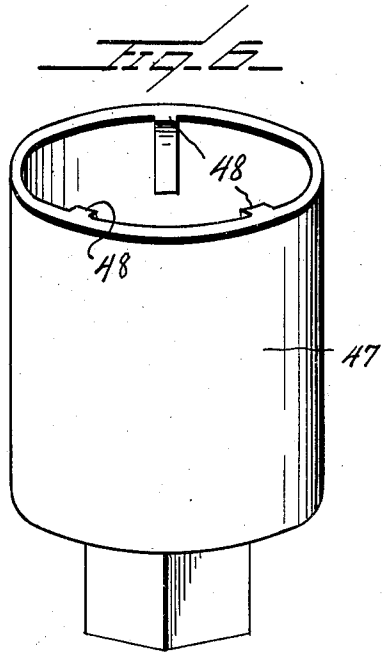


Fig. 6



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Fig. 4

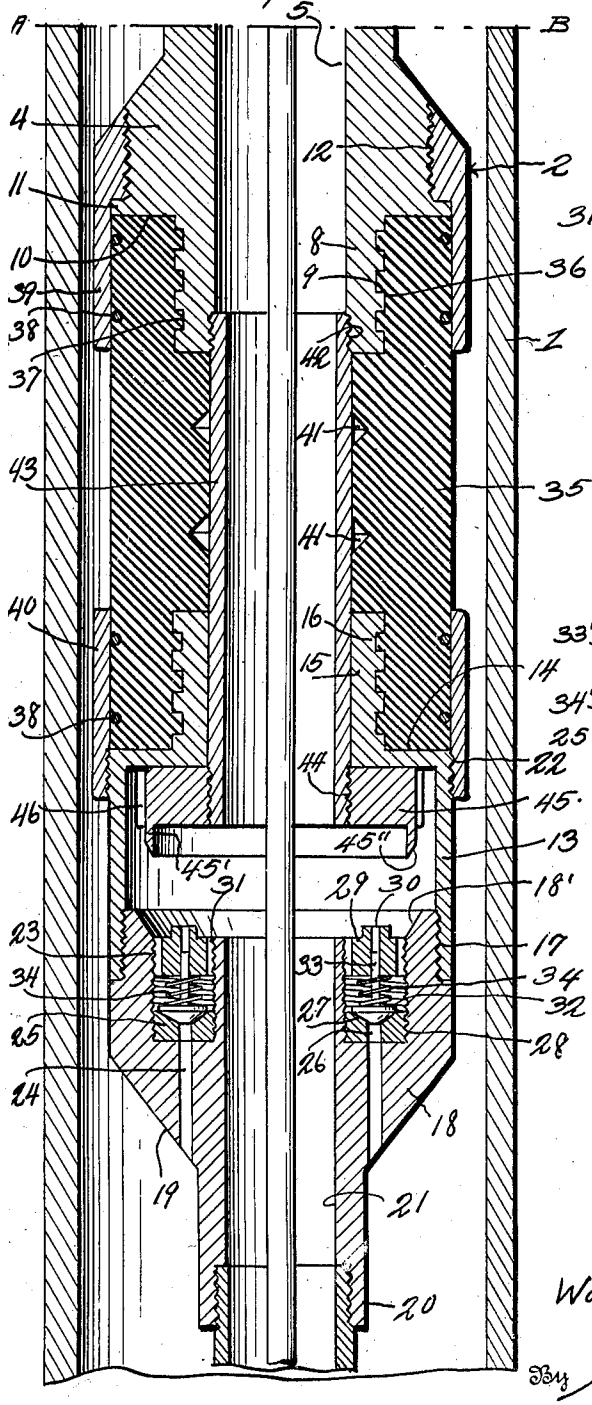


Fig. 7

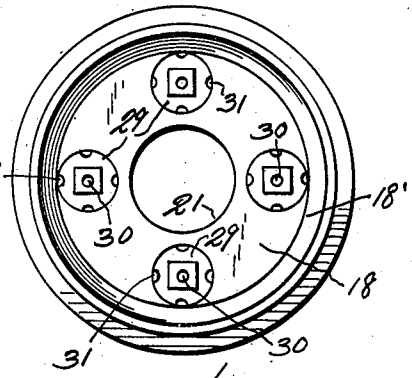
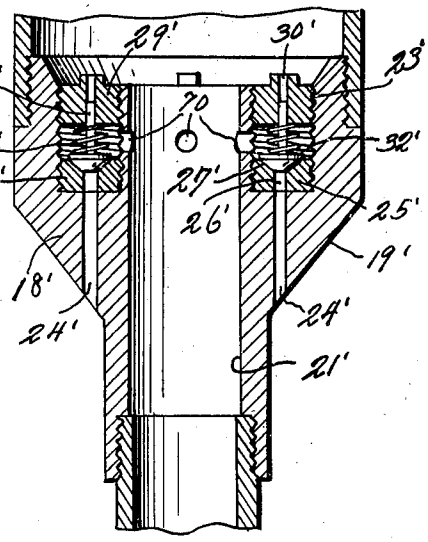


Fig. 5



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Patented Jan. 18, 1944

2,339,319

UNITED STATES PATENT OFFICE

2,339,319

VALVED WELL PACKER

Walter J. Brightwell, Henderson, Tex.

Application March 6, 1941, Serial No. 382,079

1 Claim. (Cl. 103—232)

This invention relates to the class of wells and well drilling and pertains particularly to improvements in casing packers and valves for facilitating the elevation of fluid from a well.

A primary object of the present invention is to provide a packer and valve structure or fluid elevator for use in wells for the purpose of improving the flow and utilizing the natural gas to bring about this result, which is of novel and improved construction whereby the setting of the packer may be easily accomplished and the disassembling of the same may be readily effected for the purpose of replacing or repairing parts thereof.

Another object of the invention is to provide a combination casing packer and valve structure which, when properly placed in a well casing, will operate to lower the cost of producing or lifting fluids through the utilization of the natural gases flowing in the well whereby a greater production may be obtained without the employment of pumping equipment or other such means.

Another and more specific object is to provide a combination casing packer and valve unit in which the rubber packer is secured in the unit in a novel manner so that it may be readily expanded and is maintained at all times against rupture or collapse.

The invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawings, it being understood, however, that the invention is not to be considered as limited by the specific illustration or description but that such illustration and description constitutes a preferred embodiment of the invention.

In the drawings:

Fig. 1 is a view in side elevation of the device embodying the present invention, the same being shown in inoperative position in a well casing.

Fig. 2 is a view partly in elevation and partly in longitudinal section of the device showing the packing rubber expanded.

Fig. 3 is a longitudinal section through the upper portion of the device.

Fig. 4 is a longitudinal section through the lower portion of the device, the line of division between Figs. 3 and 4 being indicated at A—B.

Fig. 5 is a longitudinal section through a modified construction of the lower valve body.

Fig. 6 is a view in perspective of a socket wrench designed to facilitate the assembling of the device.

Fig. 7 is a view in plan of the lower valve body.

Referring now more particularly to the drawings, the numeral 1 generally designates a well casing in which the combination packer and valve unit embodying the present invention is shown. This device consists broadly of two coupled units disposed one above the other and indicated generally by the numerals 2 and 3.

The lower unit here indicated by the numeral 2 comprises an upper body 4 through which is formed longitudinally a bore 5. The upper end of this body 4 is reduced as shown, to form the neck 6 which is interiorly screw-threaded at 7. The lower end of the body is also reduced through a portion of its length forming a nipple 8, the exterior surface of which is provided with encircling channels or recesses 9. At the upper end of the nipple 8, the body 4 provides the outwardly extending flat shoulder 10. Encircling the shoulder is a flange 11 and above this flange the body 4 is screw-threaded as indicated at 12.

In spaced relation with the upper body 4 is a circular box 13 which at its top end has the flat shoulder portion 14 which is integral with the nipple 15, the overall diameter of which is materially less than that of the box as shown. This nipple is of the same diameter as the nipple 8 and is axially alined therewith. Around the outer side of the nipple 15 are formed lock channels or grooves 16 for the purpose hereinafter stated.

The lower end of the box 13 is interiorly threaded, as indicated at 17, and has threadably secured therein the lower valve body 18 which has the downwardly facing tapered shoulder 19 which merges into the lower end neck portion 20. Through the center of the valve body 18, a bore or passage 21 is formed which alines with the nipples 8 and 15.

The box 13 is exteriorly screw-threaded at its upper or shoulder end, as indicated at 22, for the purpose hereinafter stated.

The valve body 18 has formed therein from the upper end thereof the threaded bores or sockets 23, each of which at its lower end communicates with the reduced passage 24 which opens through the shoulder 19. These bores and passages 23 and 24 are parallel with the center bore 21 through the valve body.

Threaded into each bore 23 and seated at the bottom thereof is the valve seat block 25 which has a central passage 26 therethrough and which is formed upon its upper end to provide the tapered valve seat 27. These blocks are provided with notches 28 for the reception of a suitable wrench for threading the block into position in the valve bore. The upper end of each bore has threaded thereinto a guide 29 which is provided with a central passage 30 and in its outer surface

has longitudinally extending gas escape channels 31. Between the guide 29 and the block 25 is located a tapered or cone valve 32 which has a stem 33 which is slidably engaged in the bore 30 of the overlying guide. Interposed between the guide 29 and the valve 32 is an expansion spring 34 which constantly maintains the valve on its seat. Any number of these valves may be mounted in the valve body 18 and it will be readily seen that it is their function to open upwardly to permit gas to pass from the lower part of the well casing into the slide box 13.

The numeral 35 generally designates the rubber packer which is in the form of a cylinder which at its end is counterbored or enlarged, as indicated at 36, to receive the nipples 8 and 15. The inner surface of this counterbored part of each end of the packer is provided with securing ribs 37 which engage in the locking grooves or channels of the adjacent nipples to hold the packer in connection therewith.

The locking connection between the ends of the rubber packer and the encircled nipples is made more positive by encircling each end of the packer with binding wires or rings 38.

Encircling the upper body 4 and having threaded engagement with the threads 12 thereof is a restraining collar 39 which encircles the upper end of the rubber packer and assists the tie wires or rings 38 in holding the adjacent end of the packer against rupture. The lower end of the packer is likewise enclosed in a collar 40 which has threaded connection with the slide box 13 by means of the screw threads 22. The shoulders 11 upon the upper body 4 limit the relative movement between the collar 39 and the body to which it is attached. The inner wall surface of the rubber packer is provided with annular channels 41 which facilitate the expansion or outward breaking of the packer when longitudinal pressure is applied to the ends thereof, so that the packer may be brought into contact with the inner surface of the casing 1, as shown by the dotted lines indicated by the numeral 35' to close the casing above the valve body 18.

The nipple 8 of the body 4 is interiorly screw-threaded as indicated at 42, and there extends from the slide box 13 through the nipple 15 and through the rubber packer 35, the liner tube 43, the upper end of which is suitably screw-threaded for engagement with the threads 42 whereby the upper end of this liner is securely coupled with the body 4. The lower end of the liner is also exteriorly threaded as indicated at 44, and this threaded portion extends beyond the shoulder 14, on which the lower end of the packer 35 engages, and into the slide box and receives the nut 45 which bears against the under side of the shoulder 14, as shown. This nut is provided in its periphery with grooves 46 to facilitate its engagement by a socket wrench of the character shown in Fig. 6, to facilitate turning the nut for the purpose of drawing the slide box and body 4 together to firmly lock the packer between the shoulders 10 and 14. This socket wrench is indicated generally by the numeral 47 and as shown, comprises a cylindrical body which has a diameter sufficient to receive in one end the nut 45 and which has upon its inner surface at the said end the lugs 48 for engagement in the notches 46 of the nut. By this means the nut is readily reached through the slide box to be turned by a suitable implement applied to the socket 47.

The nut 45 is provided with the axially directed flange 45', the outer corner of which is beveled off, as indicated at 45''. In opposed relation with this beveled flange 45'' the inner end of the valve body 18 is provided with the circular inwardly directed sloping or tapering shoulder 18' which forms a seat for the beveled edge 45'' of the flange 45'. Thus when the device is installed in a well casing and the packing rubber is expanded in the usual or customary manner, the nut 45 will be moved toward the valve body 18 and the flange 45' will come into firm contact with the shoulder 18' to form a fluid-type joint between the parts 18 and 45 in the slide box 13. This will prevent the escape of gases which may enter the slide box by way of the passages 24, between the packing rubber and the liner tube 43.

As previously stated, the neck 6 of the body 4 which is connected with the rubber packer is interiorly screw-threaded and by this means the body 4 has coupled therewith through the medium of a coupling nipple 49, the upper unit 3. This upper unit comprises a valve body 50 and a box 51. The valve body 50 is of substantially the same design as the body 18 in that it is provided with a downwardly tapered shoulder 52 which merges with a lower neck portion 53 and surrounding the central passage 54 which is formed axially therethrough are a number of threaded valve bores 55 corresponding to the bores 23. The neck 53 is joined to the neck 6 by the coupling nipple 49.

Each of the bores 55 has leading from its lower end the passage 56 which opens through the shoulder 52. In each bore 55 is fitted a valve seat forming block 57 having a central passage 58 communicating with the passage 56, and on a seat 59 which is formed upon the top of the block positions a conical valve. The upper end of each bore 55 has fitted therein a guide 61 provided with a central passage 62 and longitudinal outer wall channels 63 and the stem 64 of the valve 60 has sliding engagement in the bore 62 of the overlying guide. An expansion spring 65 interposed between the guide and the block 57 engages the valve 50 and maintains the same on its seat.

Around the outer side of the top of the upper valve body 50, screw threads 66 are formed for engagement with the wall of the box 51 into which the top part of the body 50 is introduced. The box 51 has a reduced neck 67 through which a bore 68 is formed which leads into the box 51.

The present packer and valve structure is designed to be inserted in line with the well tubing, a portion of which is shown coupled with the neck 67 and indicated by the numeral 69, so that the device may be disposed at any desired elevation within the well casing. The packer and valve device may be set at any desired depth by means of the well known wall hooks or slips, not shown, or it may be set on the bottom of the well by means of a mud anchor, not shown. Since the means referred to for setting the packer and valve device at any desired depth forms no part of the present invention and since such means are well known to those versed in the art, it is not believed necessary to illustrate the same in conjunction with the illustration of the invention.

When the packer and valve device is located at the proper depth in the well casing, the packer rubber is expanded to contact the casing wall and thus prevent the escape of natural gases past the lower valve body and also prevent the passage downwardly of air under pressure which may be introduced into the casing from the upper end. It will thus be seen that the upwardly

flowing natural gases will pass through the lower valves in the body 18 into the slide box 13 and will then flow into the central conduit of the device through which the fluid passes from the lower part of the well and will function to assist in the upflow of such fluid. If it is desired that such fluid flow be further assisted by compressed gases introduced from the top of the well, such gases will flow through the valve bores in the lower valve body 50 and enter the fluid conducting conduit or line by way of the box 51.

In Fig. 5 there is illustrated a modified construction of the valve bodies 18 and 50. In this construction the body 18' is of exactly the same form as the body 18, as will be readily seen and it has formed therein from the top end the threaded bores 23', each of which at its lower end joins a small passage 24' which opens through the downwardly tapering shoulder 19'. In the lower part of each threaded bore 23' is fitted a valve seat forming block 25 through the center of which is a passage 26' and the top of this block is provided with a tapered valve seat 27'. Threaded into the upper end of each bore is a guide 29' through the center of which is formed a passage 30'. In this construction the guide 29' is not provided with the side channels such as the channels 31 of the guides 29, but the escape of gases flowing upwardly through the passages 24' past the valves is by way of the lateral ports 70 which lead from the bores 23' into the main bore 21' of the valve body 18'.

Upon the seat 27' is disposed a tapered valve 32' which has a stem 33' which extends upwardly into the bore 30' of the guide 29' and this valve is maintained seated under normal conditions by an expansion spring 34'.

With the construction as described, it will be seen that if it is desired to make use only of the natural well gas, the upper unit 3 may be removed and the pipe line connected directly with the body 4, but if introduced fluid pressure is to be employed in conjunction with the natural well pressure, then, of course, the upper unit may be readily connected in the line with the lower unit.

What is claimed is:

In a fluid elevator and packer for a well, a pair of tubular bodies adapted to have relative axial movement for effecting compression and lateral expansion of an interposed packer, one of said bodies including an enlarged portion of circular form and interiorly threaded, a single body having an axial passage and exteriorly threaded for connection with the threads of said enlarged portion, a tube secured at one end in one of said tubular bodies and slidably extended at its other end into the other tubular body and into said enlarged portion, means on the said other end of the tube and within said enlarged portion limiting outward movement of the tube and permitting inward movement thereof, a packer body between the tubular bodies yieldingly maintaining the same separated, and a fluid passageway extending longitudinally through the single body and opening at one end into said enlarged portion and opening at its other end through the outside of the single body.

WALTER J. BRIGHTWELL.