

April 28, 1959

C. C. BROWN

2,884,069

LINER PACKER FOR WELLS

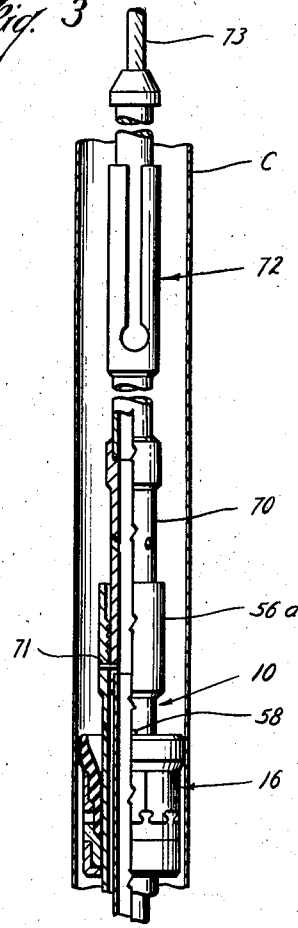
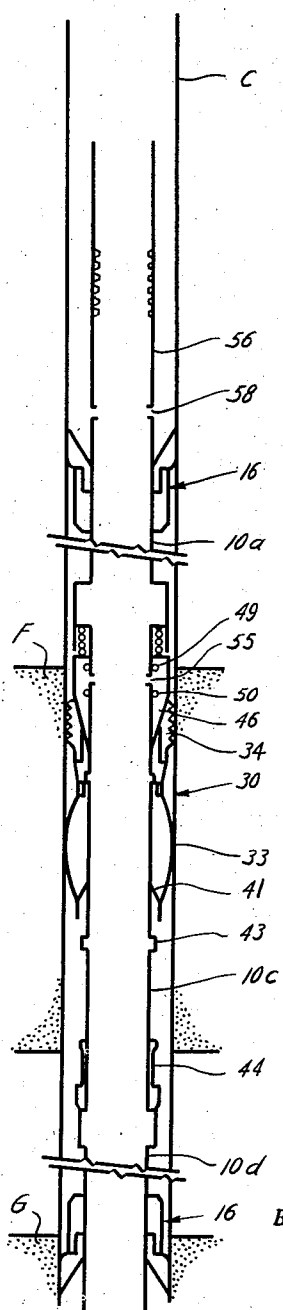
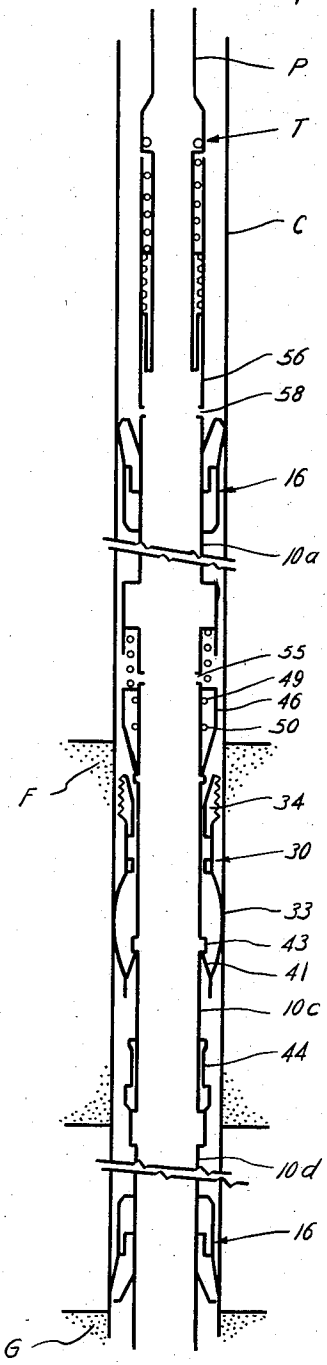
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Fig. 1

Fig. 2

Fig. 3



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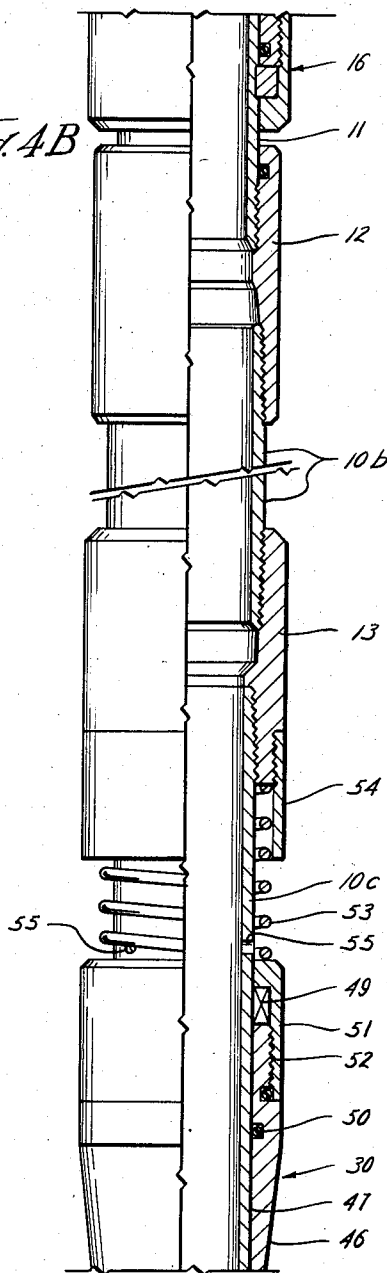
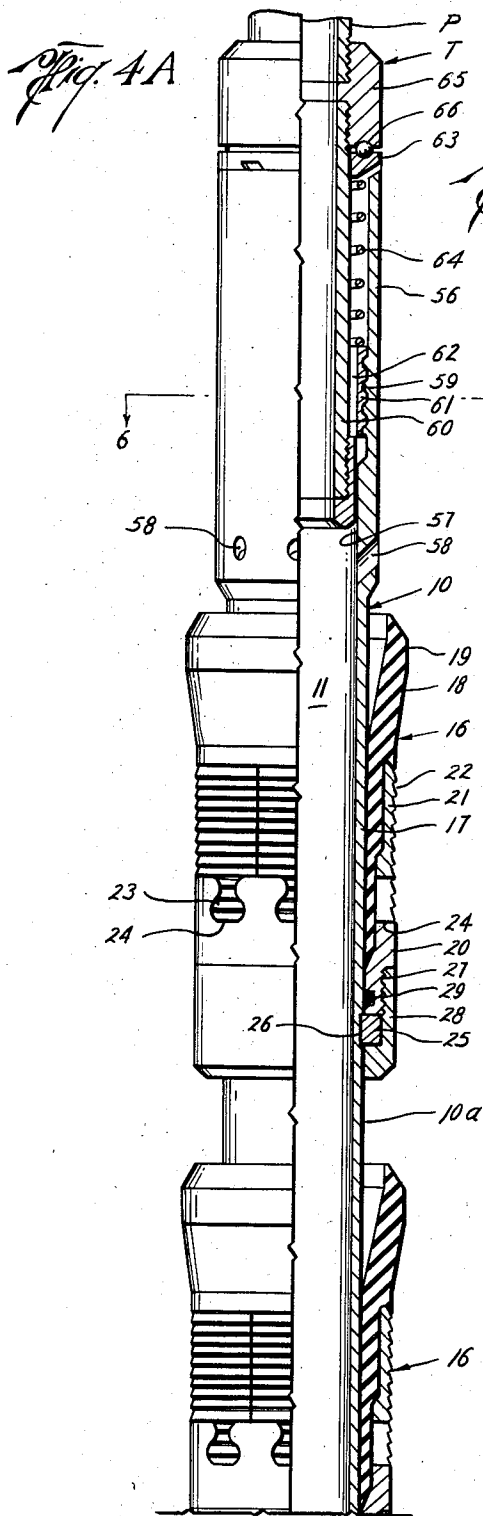
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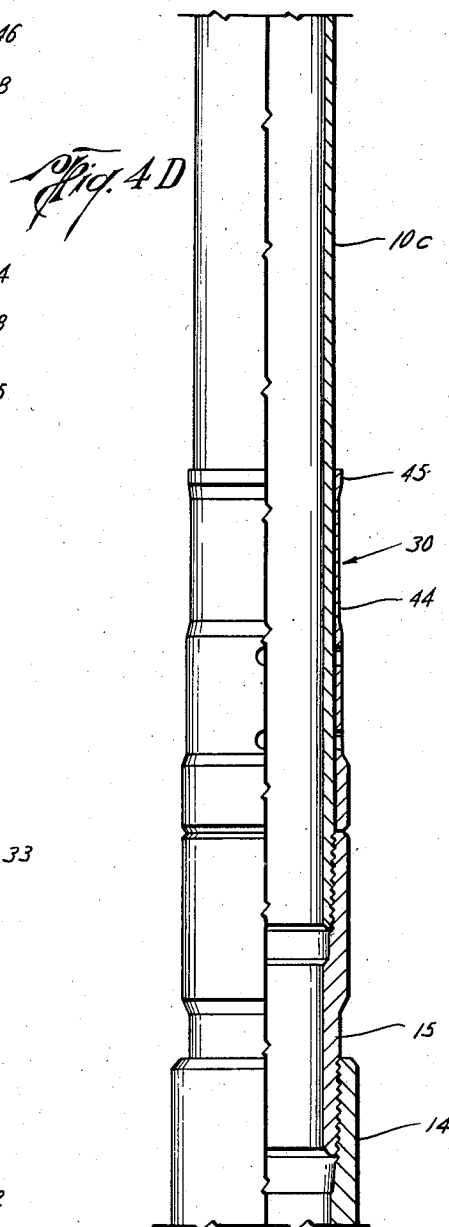
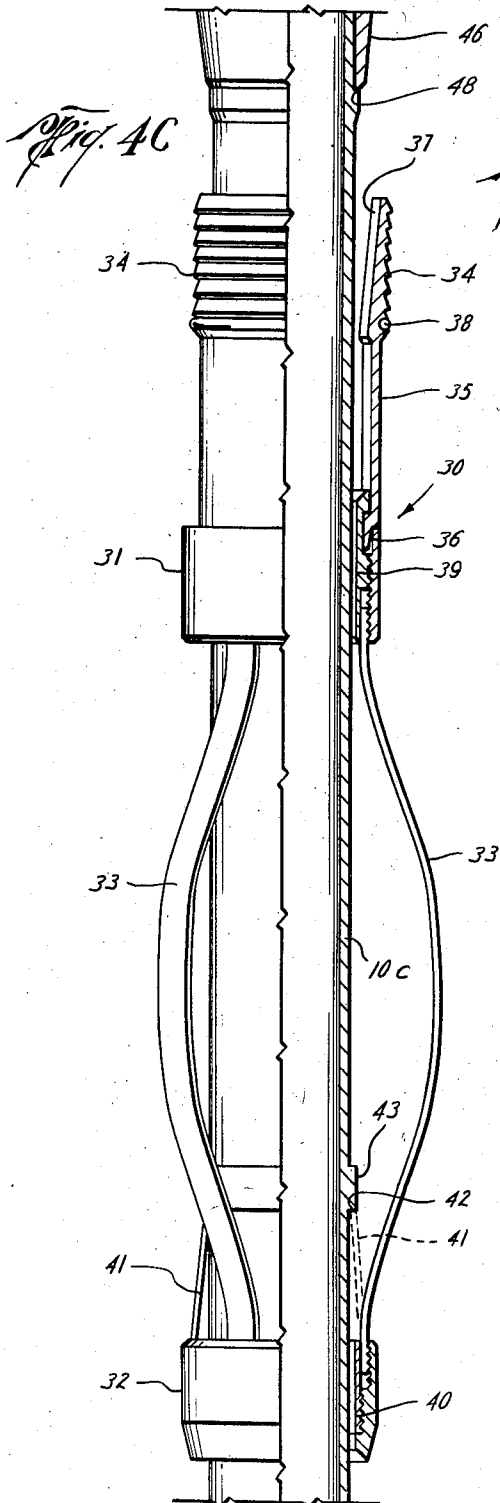
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4 Sheets-Sheet 3



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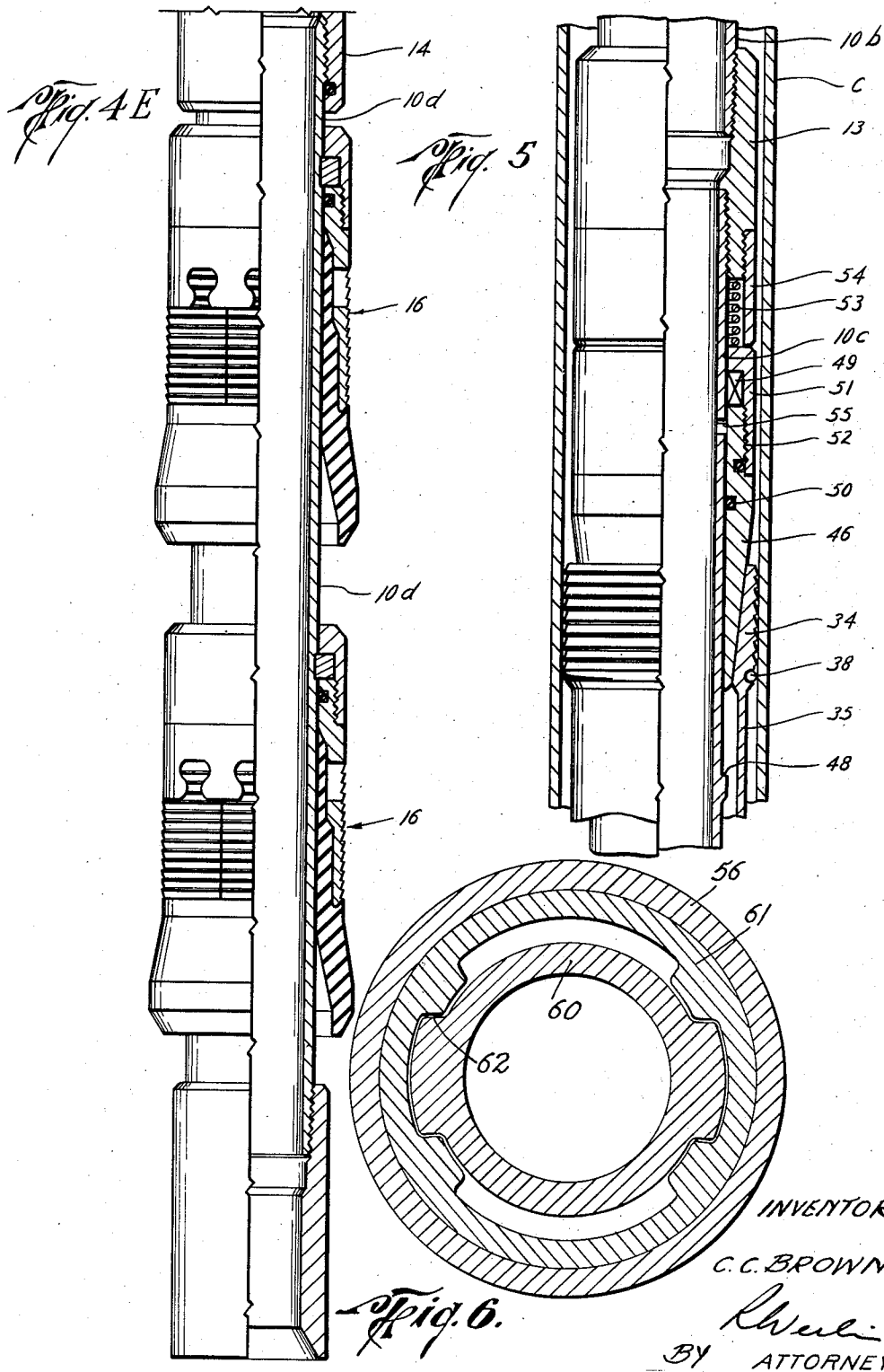
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LINER PACKER FOR WELLS

Filed Jan. 10, 1955

4 Sheets-Sheet 4



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1

2,884,069

LINER PACKER FOR WELLS

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Application January 10, 1955, Serial No. 480,793

8 Claims. (Cl. 166—119)

This invention relates to well packers.

In many oil and gas fields the oil and gas containing formations are frequently of tight character and of relatively low permeability so that it has been the practice, particularly in recent years, to employ various treating methods for opening up flow passages through the formations in order that the fluids may drain more easily into the well bore. Such treating methods include the well-known acid treating, sand fracture, so-called "Hydro-frac" methods, and the like.

Such earth formations frequently comprise a series of potentially productive layers interspersed by impervious or non-productive sections. Common practice has been to perforate several of the potentially productive layers and to then subject these perforated layers to one or more of the treating methods noted above. However, because of the widely varying permeability of the various layers, when the treating fluid is attempted to be forced into the formations the bulk of such fluid will naturally enter the layer or layers of greatest permeability and those which really require the treatment to the greatest extent will receive little or none of the treating fluid. Hence, various means have been employed to attempt to direct selectively the treating fluid into selected ones of the layers. This has required various types of packing arrangements for sealing-off some of the layers to permit access only to the layers selected for treatment. But this necessarily has also involved restrictions in the passageways through the packers through which the fluid is introduced to the exposed formation and these restrictions have made it difficult, because of large pressure drops, to apply effective volumes of treating fluids at sufficiently high pressures to the formation layers to be treated to accomplish effective results.

The present invention is designed to provide a packer by which earth strata or layers may be selectively treated and which provides a treating fluid passage of large area and relatively small pressure drop to thereby render the treating procedure fully effective for the purposes intended.

Generally speaking, and in accordance with one embodiment of this invention, the packer structure comprises an elongate tubular body carrying longitudinally spaced cup shaped, oppositely facing sealing elements for sealing between the body and the well wall, the sealing elements being spaced apart at any predetermined distance required to span or straddle a zone which it is desired to exclude from the treating. An anchor structure of any suitable construction is mounted on the body between the seals to anchor the packer structure to the well wall, the anchor structure preferably being of the type which is operable by relative longitudinal movement of the body.

By-pass ports are provided in the body at appropriate points to equalize the pressures across the tool so that the tool may be run without difficulty into and out of a well containing fluids.

In accordance with the illustrative embodiment of this invention, the by-pass ports are arranged to form with

2

adjacent portions of the anchor structure a valve means, the ports being normally in open position while the packer structure is being run into a well and closed by the longitudinal movement of the body relative to the anchor structure which is employed to set the anchor structure. The packer structure is adapted to be run into the well either on a tubing string or on a wire line by the employment of an appropriate type of generally conventional setting tool for manipulating the packer.

- 10 When the packer structure has been run into the well to the selected point, manipulation of the packer body from the surface through the setting tool serves to anchor the packer structure securely to the well casing. The movements for effecting setting of the anchor structure simultaneously actuate the valve means to close the by-pass ports. The setting tool is then disconnected from the packer body and withdrawn from the well together with the tubing string or wire line on which it was run. The packer structure will then remain firmly anchored in the well and will provide a relatively large diameter, substantially unobstructed bore through which large volumes of fluid may be delivered with minimum pressure drop for treating the earth strata below the lower seal.
- 15
- 20

An important object is to provide a packer structure of the class described employing an anchor assembly operated by longitudinal movement of the packer body to set and release the packer structure, and having a sleeve-type valve which is opened and closed by the movements employed to set and release the packer.

- 25
- 30 A further object is to provide a packer structure including a tubular body having a relatively large diameter unobstructed bore for the passage of fluid therethrough with minimum pressure drop.

Other and more specific objects and advantages of this invention will become more readily apparent from the following detailed description when read in conjunction with the accompanying drawing which illustrates a useful embodiment in accordance with this invention.

In the drawing:

- 40 Figs. 1 and 2 are generally diagrammatic views showing the packer structure in accordance with this invention positioned in a well bore, Fig. 1 showing the structure with its parts in the "running-in" position; and Fig. 2 showing the packer structure with the parts in the set position in the well bore;
- 45

Fig. 3 is a fragmentary view of the upper part of the packer structure, showing a modified form of setting tool employed for running the tool on a wire line.

- 50 Figs. 4A, 4B, 4C, 4D and 4E, together, constitute a longitudinal partially sectional view of the packer structure in accordance with this invention, the parts being shown in the positions occupied when the structure is being run into a well, as illustrated diagrammatically in Fig. 1;

Fig. 5 is a fragmentary view in longitudinal partial section of the packer structure, showing the valve and anchor parts in the set position in a well casing, and

- 55
- 60 Fig. 6 is a cross-sectional view taken along line 6—6 of Fig. 4A.

Referring to Figs. 4A to 4E, inclusive, the packer structure includes an elongate tubular support or body, designated generally by the numeral 10, extending entirely through the packer structure and having a continuous bore 11 of substantially uniform diameter which is unobstructed throughout its length.

- 65
- 70 Body 10 is made up of a plurality of elongate tubular sections connected together in end-to-end relation by suitable screw couplings. These body sections, in descending order along the structure, are designated by the numerals 10a, 10b, 10c, and 10d and, for purposes of this description, are termed, respectively, the upper seal-carrying section, spacer section, anchor-carrying sec-

3

tion, and lower seal-carrying section. Upper seal-carrying section 10a is threadedly connected to the upper end of spacer section 10b by means of a screw coupling 12. The lower end of spacer section 10b is threadedly connected to the upper end of anchor-carrying section 10c by means of a screw coupling 13, and the lower end of anchor-carrying section 10c is threadedly connected to the upper end of lower seal-carrying section 10d by means of a screw coupling 14 and an intervening bushing 15.

Upper seal-carrying section 10a and lower seal-carrying section 10d, each, has mounted thereon one or more cup-type resilient seal units designated generally by the numerals 16. The seal units are substantially identical in construction, except that those on upper seal-carrying section 10a open upwardly while those on lower seal-carrying section 10d face downwardly. A description of one of these seal units will suffice for all.

Seal units 16 are preferably of the general type illustrated and described in my co-pending application Serial No. 403,328, filed January 11, 1954, although other known forms of seals may be employed for the packer of the present invention.

The sealing element of each seal unit 16 is constructed of flexible resilient material, such as natural or synthetic rubber or other well-known resilient composition material commonly employed in sealing elements of well packers. The sealing element comprises a generally tubular body portion 17 merging at one end into an externally enlarged, outwardly flared cup-shaped seal portion 18. The external diameter of seal portion 18, in its normal pre-formed unstressed condition, is made somewhat larger than that of body portion 17 and its maximum unstressed diameter, as at point 19, is made approximately equal to the diameter of the well casing C (Fig. 1) in which the packer is to be run so that the seal portions will be in continuous frictional contact with the inner wall of the casing at all times for purposes to be described hereinafter.

The inner end of the sealing element is secured, as by vulcanizing or in any other suitable and well-known manner, to a metal end ring 20. Mounted on the exterior surface of body portion 17 is a plurality of segmental slips 21 having teeth 22 on their external faces. Slips 21 are effectively secured directly to the exterior surface of body portion 17 in any well-known manner, as by vulcanizing the metal slips directly to the rubber or other composition material of which the sealing element is constructed. The slips will be so positioned on the exterior of body portion 17, that in the normal unstressed and unexpanded condition of the sealing element, teeth 22 will lie inside a circle which defines the maximum external diameter of seal portion 18. With such an arrangement, it will be seen that when the sealing element is in normal unstressed condition, slips 22 will be out of engagement with the well wall, such as the wall of casing C, so that the packer structure may slide freely through the well casing, except for the frictional engagement of portion 19 with the well wall.

The number of slips 21 which will be employed will preferably be such as to form a continuous ring of slips about body portion 17 when the latter is in its normal unstressed condition. Each slip is provided with a dovetail or generally T-shaped tongue 23, which is secured in a correspondingly shaped slot 24 in the adjacent end of ring 20, whereby slips 21 will be radially movable with respect to the end ring. By mounting the segmental slips 21 directly on and securing them to the exterior of the sealing element, it will be evident that the slips will be radially advanced and retracted coincident with the expansion and contraction of the sealing element.

The sealing element is secured to body section 10a or 10d as the case may be, in any suitable manner. As illustrated, the sealing element is installed on body 10a

4

with end ring 20 abutting a split lock ring 25 which is seated in an annular groove 26 provided in the exterior of the body section. The outer end portion of end-ring 20 is provided with external threads 27 by which the end-ring is adapted to screw into a keeper collar 28 which encloses lock ring 25 and the threaded end of end-ring 20. A seal ring 29, such as a conventional O-ring, is installed in the inner peripheral surface of end-ring 20 to provide a fluid-tight seal between the exterior of the body section and the end-ring.

Anchor-carrying section 10c supports an anchor assembly, designated generally by the numeral 30, and appearing in Figs. 4B to 4D. This anchor assembly is of the general type which is designed to be set and released entirely by longitudinal movement of the supporting body relative to the anchoring elements. Anchors of this general type are well known and an example of such anchors is disclosed in U.S. Patent No. 764,769, issued July 12, 1904, to Robinson et al.

As illustrated, the anchor assembly is made up of a number of parts and includes a slip cage slidably mounted on body section 10c and comprising upper and lower collars 31 and 32, respectively, which are longitudinally spaced apart and connected together into a unitary slip cage structure by a number of circumferentially spaced outwardly bent friction springs 33, which have their opposite ends appropriately secured to the collars, the springs being shaped to make resilient frictional contact with the wall of the well into which the tool is run. Upper collar 31 carries a number of toothed slips 34 arranged about the exterior of section 10c above upper collar 31, the slips being supported on arms 35 which are suitably hinged mounted at 36 in the upper collar to permit radial movement of the slips relative to the exterior of section 10c. The inner faces 37 of the slips are tapered upwardly and outwardly. A garter spring 38 surrounds the slips and resiliently urges them radially inwardly toward section 10c. Collars 31 and 32 have respective bores 39 and 40 of such diameter as to provide an appreciable amount of clearance between the exterior of section 10c and the inner walls of the collars.

Lower collar 32 carries a plurality of circumferentially arranged, upward projecting detents 41, resiliently biased to cause their upper ends to press inwardly toward the exterior of section 10c and to engage beneath a downwardly facing shoulder 42 defined by an annular enlargement 43 formed on the exterior of section 10c at a point intermediate the upper and lower collars.

Slidably mounted on section 10c below the slip cage is a releasing sleeve 44 having an annular external cam shoulder 45 at its upper end which is adapted to pass through the clearance space between section 10c and lower collar 32 for purposes to be described more fully hereinafter. The upper end of bushing 15 forms a stop to limit downward movement of the releasing sleeve on section 10c.

Slidably mounted on section 10c above the slip cage is a downwardly tapering conical slip-expander or mandrel 46 having a bore 47. An upwardly facing external shoulder 48 is formed on section 10c above the slip cage and is adapted to engage the lower end of mandrel 46 to limit its downward movement on section 10c. Longitudinally spaced seals are formed between the exterior of section 10c and the bore wall of the mandrel by means of upper and lower annular packings 49 and 50, respectively. Upper packing 49 is confined within a gland sleeve 51 which is internally threaded to screw down over external threads 52 provided at the upper end of mandrel 46. Mandrel 46 is resiliently urged downwardly on section 10c against shoulder 48 by means of a coil spring 53 which surrounds section 10c above the mandrel and is held in compression between the upper end of the mandrel and the lower end of coupling 13. A retaining sleeve 54 is screwed to the lower end of coupling 13 and encloses the upper end of spring 53.

5

The spacing between shoulders 42 and 48 is such that when shoulder 42 is engaged by detents 41, shoulder 48 will be elevated above the upper ends of slips 34.

A plurality of angularly spaced, radial ports 55 are provided through the wall of section 10c at a point spaced above shoulder 48. The position of ports 55 is such that they may be moved by longitudinal movement of section 10c between a position above upper packing 49 and a position between upper and lower packings 49 and 50. Mandrel 46 thus functions as sleeve valve for controlling ports 55 in response to relative movement between section 10c and the mandrel.

Spacer section 10b may be of any desired length depending upon the spacing desired between the upper and lower seal-carrying sections for spanning earth strata to be excluded from the treating operations. It will be understood that in some cases, no spacer sections will be needed where the length of anchor-carrying section 10c is sufficient to provide the desired spacing between the seal-carrying sections.

The upper end of upper seal-carrying section 10a is provided with a tubular extension 56 having a bore 57 and a plurality of radial ports 58 through the wall thereof at a level just above the upper end of the uppermost seal unit 16. The extension is employed for attachment to the packer structure of a suitable form of running-in and setting tool. In the embodiment illustrated in Figs. 1, 2 and 4A, extension 56 is designed for use when running the packer on a string of pipe or tubing P.

In this embodiment bore 57 of extension 56 is provided with an internal thread section 59 at a point somewhat above the ports 58. A setting tool, designated generally by the letter T, includes a tubular stem 60 adapted to be inserted into bore 57. Stem 60 is made sufficiently smaller in diameter than bore 57 to provide appreciable clearance space therebetween and carries a sleeve nut 61 which is engageable with threads 59. Nut 61 is splined at 62 to stem 60 for longitudinal movement thereon while being held against rotation relative to stem 60. A bearing ring 63 is rotatably mounted on the upper end of stem 60 and is adapted to rest on the upper end of extension 56 when stem 60 is fully inserted into bore 57. A coil spring 64 is mounted about stem 60 in the space between the stem and the wall of bore 57 and is held in compression between sleeve nut 61 and bearing ring 63. A collar 65 threadedly connects the upper end of stem 60 to the lower end of tubing P. The lower end of collar 65 and the upper end of bearing ring 63 form cooperating races between which are mounted ball bearings 66 and thereby provides an easily rotatable connection between tubing P and extension 56.

Fig. 3 illustrates, more or less diagrammatically, a modified form of setting tool adapted for running the packer structure on a wire line. In this embodiment, the setting tool includes a tubular stem 70 which is inserted into extension 56a of upper seal section 10a, and is releasably secured to the extension by means of a shear pin 71. A set of wire line jars 72, of any suitable and well known construction, is interposed between the upper end of stem 70 and a cable or wire line 73 by which the device is lowered into the well and operated therein as will be described more fully hereinafter.

Operation of the packer employing the setting tool embodiment illustrated in Fig. 4A is as follows: With the parts of the structure assembled as shown in Fig. 1 and Figs. 4A to 4B, the device will be run into a well. Friction of bow springs 33 on the wall of well casing C will maintain detents 41 in engagement beneath shoulder 42, thereby elevating shoulder 48 above the slips. Shoulder 48 will prevent mandrel 46 from sliding down body 10 into engagement with the slips. Spring 53 will press mandrel 46 down against shoulder 48 and thus act to hold ports 55 open for the passage of fluid there-through to equalize the fluid pressures across the packer structure and permit substantially unobstructed descent

6

of the structure into the well. Any well fluids will bypass through ports 55 and 58.

When the desired setting point is reached, as for example, straddling formation F (Fig. 1) with the lower seal-carrying section above formation G which is to be treated, an upward pull will be applied to tubing P whereby to pull body 10 upwardly relative to the slip cage which will be held stationary by the frictional engagement of bow springs 33 with the casing wall. The upward movement of the body will draw shoulder 42 upwardly away from detents 41 and at the same time will draw cam shoulder 45 of releasing sleeve 44 through the clearance space between body section 10c and lower collar 32. Cam shoulder 45 will pass between the free ends of detents 41 spreading them apart sufficiently to permit enlargement 43 to move downwardly through the thus spread-apart detents when body 10 is lowered relative to the slip cage (Fig. 2). With detents 41 thus spread apart and released from shoulder 42, body 10 is lowered thereby lowering mandrel 46 relative to the slip cage which will be held stationary by engagement of bow springs 33 with the wall of casing 6. Mandrel 46 will enter the space between body section 10c and the tapered inner faces 37 of slips 34 and will wedge the latter outwardly into engagement with the casing wall. As the anchor slips become set further downward movement of mandrel 46 will be stopped but body section 10c will continue to move downwardly an additional distance determined by the space between the lower end of retainer collar 54 and the upper end of the mandrel which will serve as a limit stop to limit the downward movement of body section 10c relative to the mandrel. This latter movement of section 10c will carry ports 55 downwardly to a position between seals 49 and 50, thus effectively closing the ports and preventing communication between the bore of body 10 and the annular space between the packer structure and the casing wall. It will thus be seen that anchoring of the packer structure to the well wall and closing of the by-pass ports are effected simultaneously and by a sequence of vertical movements of body 10 relative to the anchor structure.

With the by-pass ports thus closed and the packer structure securely anchored to the casing wall, tubing P will be rotated from the surface in a direction to cause sleeve nut 61 to unscrew from threads 59 the spline connection of sleeve nut 61 to stem 60 permitting the sleeve nut to ride upwardly on the stem against the pressure of spring 64 until sleeve nut 61 is fully unscrewed. Thereupon the tubing string and the setting tool will be released from their connection to the packer structure and may be withdrawn from the well. When this operation has been completed, it will be seen that bore 11 will be substantially unobstructed throughout its length and is relatively large in diameter in relation to the overall diameter of the packer structure.

Treating fluid may now be pumped into casing C and large volumes may now be transmitted through the bore of body 10 into formation G with minimum drop in pressure.

It will be understood that when pump pressure is applied to the treating fluid, with by-pass ports 55 closed as described, the pressure in the fluid will be exerted against both the upper and lower sealing elements and will act against the interior of the seal portions 18 to expand the latter into tight-sealing engagement with the casing wall, thus effectively preventing the leakage of treating fluid past both the upper and lower seals into intervening earth formations, such as formation F. The expansion of the sealing elements will at the same time expand slip segments 21 into gripping engagement with the wall of casing C, thereby additionally anchoring the packer structure in place against movement due to pressure differentials across the packer and providing mechanical support for the flexible sealing elements. Since ports 55 are closed, there can be no escape of fluid past

the sealing elements and the greater the pressure differentials, the tighter the seals and the more secure the anchoring of the packer to the casing wall.

As noted, packer structures in accordance with this invention will have unobstructed bores of relatively large diameter for the transmission of large volumes of treating fluids with minimum loss of pressure to the earth formations to be treated. For example, a packer constructed as herein described to be run in a 5½ inch casing will have an external diameter of 5½ inches and a bore diameter of 2⅞ inches. A packer to be run in 7 inch casing will have a bore diameter of 4 inches. Such relatively large bore diameters are provided as a consequence of the self-supporting, self-sealing construction described which enables the packer to remain in place in the casing without requiring the presence in the packer bore of supporting or operating elements as required in more conventional constructions.

To withdraw the structure from the well or to move it to a different elevation in the well, it is only necessary to run the tubing string and setting tool back into the well and re-engage the setting tool in extension 56. Thereupon by merely applying an upward pull on body 10, shoulder 48 will be lifted into engagement with the lower end of mandrel 46 and continued upward pull on the body will pull the mandrel out of the slips, thereby releasing slips 34 and at the same time re-opening bypass ports 55 to thereby equalize the fluid pressures across the seals. The entire packer structure may then be withdrawn from the well or moved to another elevation where the structure may be re-anchored by repeating the sequence of operations previously described.

To run the packer structure hereinbefore described on a wire line, a setting tool of the type illustrated in Fig. 3 and described above, will be employed. With this form of setting tool, when the packer structure has reached the point in the well where it is to be set, the same sequence of upward and downward movements of body 10 will be conducted to anchor the packer to the well wall. When that has been accomplished, heavy downward jarring blows may be struck by means of the jars 72 on shear pins 71 in order to break them. When the shear pins are broken, the setting tool and jars may be withdrawn and the well treated as previously described. To retrieve the packer structure in this case, any type of fishing tool, such as a conventional spear or over-shot, may be run into the well in order to grasp extension 56a and pull the structure out of the well, since elevating body 10 by pull thereon will release the anchor slips and open the by-pass ports.

It will be understood that various alterations and modifications may be made in the details of the illustrative embodiments within the scope of the appended claims, but without departing from the spirit of the invention.

What I claim and desire to secure by Letters Patent is:

1. A well packer, comprising, an elongate tubular body insertible in a well, said body having a substantially unobstructed bore throughout its length, outwardly flaring oppositely-facing flexible resilient cup seals mounted at longitudinally spaced points on the exterior of said body and extending into contact with the wall of the well, an anchor assembly slidable on the exterior of the body intermediate said seals and operable by relative longitudinal movements of the body for releasably anchoring the body to the wall of the well, fluid by-pass ports in the body intermediate the cup seals, said anchor assembly including a slidable slip cage carrying radially movable anchor slips and means frictionally engaging the well wall, and a tubular slip expanding mandrel slidably mounted on the exterior of the body adjacent said ports, said slip cage carrying means releasably engageable with the body for holding the slips out of engagement with the mandrel and releasable by relative

longitudinal movement of the body to release the slips for engagement with the mandrel, said mandrel forming a sleeve valve and being movable to port-closing and -opening positions respectively by the longitudinal anchoring and -releasing movements of said body.

2. A well packer as defined by claim 1 wherein said cup seals have segmental slip elements secured directly to the exterior thereof for expansion and contraction with the cup seals.

3. A well packer, comprising, an elongate tubular body insertible in a well, said body having a substantially unobstructed bore throughout its length, outwardly flaring oppositely-facing flexible resilient cup seals mounted at longitudinally spaced points on the exterior of said body and extending into contact with the wall of the well, a slip cage slidable on the body intermediate the cup seals and carrying radially movable anchor slips and means for frictionally engaging the well wall, a tubular mandrel member mounted on the exterior of the body for reciprocal longitudinal movement therewith relative to the slip cage whereby to move the mandrel member into and out of expandible engagement with the anchor slips, means releasably connecting the slip cage to the body for holding the slips out of engagement with the mandrel and operable by longitudinal movements of the body to release the slip cage, said mandrel member being slidable on said body between upper and lower limit stops mounted on the body, longitudinally spaced annular seal packings mounted in the bore of the mandrel member and extending into slidable sealing engagement with the exterior of the body, fluid by-pass ports in the body positioned between said limit stops whereby to be movable from an open position above the seal packings to a closed position between said seal packings by downward movement of the body relative to the mandrel member when the latter is in expandible engagement with the anchor slips.

4. A liner packer for wells, comprising, an elongate tubular body insertible in a well, said body having a substantially unobstructed bore throughout its length, annular sealing elements fixedly mounted at longitudinally spaced points on the exterior of the body, said sealing elements being of the hollow flexible resilient type which are expandible by internal fluid pressure to seal with the wall of the well, an anchor assembly including slips and expander means therefor slidably mounted on the exterior of the body intermediate said sealing elements said slips carrying wall-engaging friction elements and means releasably engageable with the body for holding the slips out of engagement with said expander means and releasable by relative longitudinal movements of the body to release the slips for engagement with the expander means for releasably anchoring the body to the wall of the well, fluid by-pass ports in the body intermediate said sealing elements, sleeve means forming a part of said expander means and slidably mounted on the exterior of the body adjacent said ports, said sleeve means being movable to port-closing and -opening positions respectively by the longitudinal anchoring-setting and -releasing movements of said body, and means for releasably connecting the upper end of said body to a running-in string.

5. A liner packer for wells according to claim 4 wherein said releasable connecting means comprises a tubular member insertible into the upper end of said body, an external threaded sleeve nut slidably and non-rotatably mounted on said member and releasably engageable with cooperating threads in the bore of said body in response to rotation of said tubular member.

6. A liner packer for wells according to claim 4 wherein said releasable connection means comprises a tubular member insertible into the upper end of said body, and breakable shear pins connecting said member to the body.

7. A liner packer according to claim 4 wherein each

of said sealing elements has mounted on the exterior thereof a plurality of circumferentially arranged slip elements expandible into gripping-engagement with the well wall by the expansion of said sealing elements.

8. A well packer, comprising, an elongate tubular body insertible in a well, said body having a substantially unobstructed bore throughout its length, annular sealing elements mounted at longitudinally spaced points on the exterior of the body, said sealing elements being of the hollow flexible resilient type which are expandible by internal fluid pressure to seal with the wall of the well, an anchor assembly including slip members and expander means therefor slidably mounted on the exterior of the body intermediate said sealing elements, said slip members carrying wall-engaging friction elements, said slip members carrying means releasably engageable with the body for holding the slip members out of engagement with said expander means and releasable by relative longitudinal movement of the body to release the slip members for engagement with said expander means

for releasably anchoring the body to the wall of the well, fluid by-pass ports in the body intermediate the sealing elements, and sleeve valve means forming a part of said expander means and slidably mounted on the exterior of the body adjacent said ports, said sleeve valve means being movable to port-closing and -opening positions respectively by the longitudinal anchor-setting and -releasing movements of the body.

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