

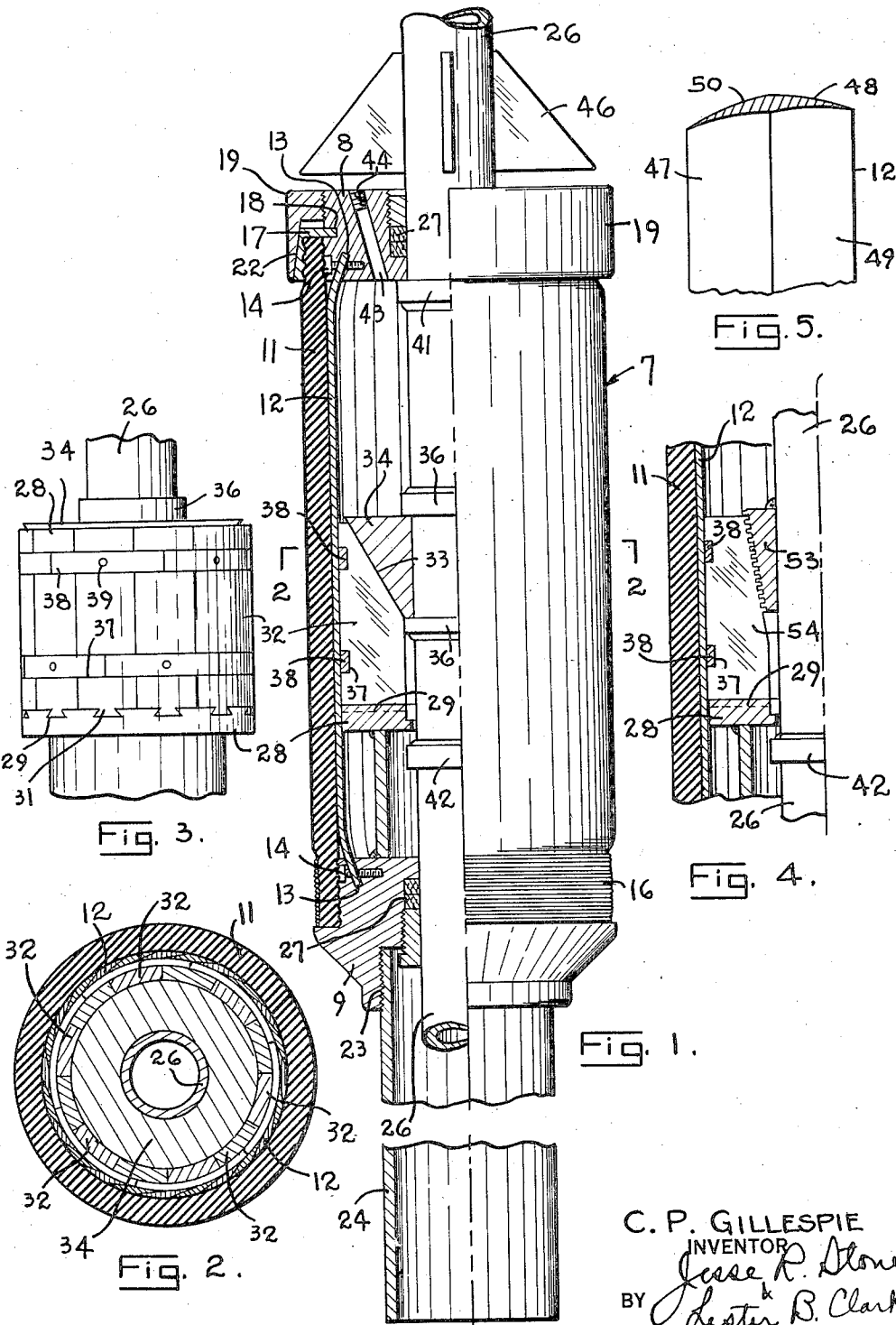
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WELL PACKER

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WELL PACKER

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6 Claims. (Cl. 166—10)

The invention relates to well packers of the type adapted to be expanded to seal between an inner pipe and an outer pipe or the wall of a well bore.

5 It is an object of the invention to provide a packer which may be supported in a well and expanded and contracted by manipulation of an upwardly extending pipe.

10 It is another object of the invention to provide a packer in which a rubber sleeve is interiorly supported by overlapping metal strips which are adapted to continuously reenforce the sleeve as it is expanded.

15 It is an object to provide a well packer adapted to be expanded mechanically and in which most of the parts operate in an oil bath.

20 It is an object to provide a packer having a reenforced rubber sleeve adapted to be expanded by a tapered mandrel engaging within wedge blocks.

It is an object to provide a packer for wells in which the operating pipe may be rotated while the packer remains "set".

25 It is a further object to provide fins or vanes on a device to be used in an open hole, so that increased resistance to rotation may be indicative of caving of the well bore.

30 It is still another object to provide a packer sleeve expander comprising a plurality of radially slidable wedge blocks, and a mandrel to engage within the wedge blocks to expand them.

It is also an object to provide a segmental band around the wedge blocks so that gaps between them will be bridged.

35 It is another object of the invention to provide a novel clamp for securing the ends of resilient tubes, sleeves, hose, etc.

40 It is another object to provide a packer which is adapted to be set and released and wherein the rubber sleeve, spring members, external fluid pressure, the weight of the mud above and the weight of the lower portion of the packer, all tend to contract or collapse the packer when its release is attempted.

45 It is also an object to provide a packer having a yieldable sleeve reenforced by overlapping spring members, and which is expanded by the action of a tapered threaded mandrel being screwed within a plurality of special radially movable wedge blocks.

50 These and other objects of the invention will be apparent to one skilled in the art when the following description is read in connection with the accompanying drawing, wherein:

55 Fig. 1 is a partially sectional view of one form of packer embodying features of the invention.

Fig. 2 is a transverse sectional view taken along the plane 2—2 of Fig. 1.

Fig. 3 is a side view of the expander assembly.

60 Fig. 4 is a partially sectional view showing a

slightly different form of construction of the improved packer.

Fig. 5 is a broken perspective view of a portion of one of the reenforcing strips.

The packer indicated generally at 7 in Fig. 1, 5 comprises an upper head 8 and a lower head 9, these heads being joined by a sleeve 11 of rubber or other suitable material. The sleeve 11 is interiorly reenforced by a plurality of resilient members 12, which may be of spring steel or any 10 material of the necessary properties. The spring members are socketed in the heads 8 and 9 at the points 13 and are secured therein by the cap screws 14.

The rubber sleeve is attached to the two heads 15 and is here shown as being bound by the wire 16 to the head 9 and held by a special clamp to the upper head 8. The special clamp comprises a plurality of segmental pieces 17 adapted to engage the end portion of the sleeve 11 and having 20 tongues which fit in the annular groove 18 of the head or body 8. The clamp ring 19 is threaded to the head 8 at 21 and is tapered at 22 so that, as it is screwed upon the threads 21, the taper engages the segments 19 and moves them radi- 25 ally inwardly to clamp the end of the sleeve securely to the head 8. The type of clamping arrangement employed in the construction of the packer may be varied without altering the operation of the packer.

30 The head 9 is threaded at 23 to receive the pipe 24 which may terminate in any desired fitting, and is usually arranged to engage the bottom of the well bore to form a support for the packer. Both of the heads 8 and 9 are cen- 35 trally apertured to receive the actuating pipe 26 and may be provided with suitable stuffing boxes or seals 27 to close about the pipe. In the Fig. 1 form of the invention the pipe 26 is rotatable within the heads and has a certain longitudinal 40 freedom therein. The pipes 24 and 26 may be attached to a well tester or formation tester not shown and this use is within the contemplation of the invention.

A support ring 28 is fixed to and above the head 45 9 and within the reenforced expansion sleeve forming the packer. The ring is bored to pass the pipe 26 and is of such outside diameter as to fit within the reenforcing members when the packer is collapsed. Radial dovetail slots 29 are 50 formed in the upper face of the ring 28 and are adapted to slidably receive the tenons 31 on the lower end of the wedge blocks 32. These blocks are segments of a ring which is shaped to fit within the reenforced packer sleeve and the as- 55 sembled ring thus formed has an upwardly flaring recess 33 provided therein.

A tapered mandrel 34 is rotatably mounted on the pipe 26 and is held against longitudinal movement therealong by the collars 36. The tapered 60

exterior of this mandrel fits within the recess 33 and it will be seen that a downward movement of the pipe 26 and mandrel 34 will expand the wedge blocks radially, thus forcing the strips 12 and sleeve 11 outwardly to contact a surrounding wall and seal against it.

The expander blocks are provided with peripheral grooves 37 into which are fitted the spring members 38 which are short segments of a ring and are attached to alternate blocks by pins 39 and overlap the intermediate blocks so that as the blocks expand radially along the dovetail slots 29 the widening gap between them will be bridged by these members 38. This construction is best seen in Fig. 3.

Collars 41 and 42 formed on the pipe 26 are adapted to engage the heads 8 and 9, respectively, to limit the movement of the pipe 26 through the packer. An oil hole 43 having a plug 44 is provided through which the interior of the packer may be filled with a lubricant, so that all of the working parts operate in an oil bath.

A plurality of fins or vanes 46, spaced above the top head 8, are provided upon the pipe 26 so that when said pipe 26 is being rotated any caving formation will engage the vanes and increase the resistance to rotation and serve as a warning signal to the operator.

Fig. 5 shows a perspective view of a section of one form of reinforcing strips which may be substituted for strips 12. The inner face 47 and the outer face 48 are concentrically curved to conform to the circular position which they occupy (see Fig. 2). The sides of these strips are beveled as at 49 and 50 so that these surfaces of adjacent strips fit together. The engaging faces 49 and 50 of adjacent strips remain in contact as the blocks 32 move radially and expand the packer, thus maintaining a continuous support for the packing sleeve.

The construction of Fig. 1 is particularly advantageous when it is desired to pack off for only a short period and then release and remove the device. The packer is lowered into the hole on the pipe 26 until the stand pipe 24 engages a support. Further downward movement of the pipe 26 operates the interior expander mechanism and forces the sleeve and strips outwardly. As the pipe 26 moves down the head 8 is free to move down to provide the slack required for the expansion of the sleeve and strips.

To release the packer it is only necessary to lift the pipe 26, thus withdrawing the mandrel 34. The packer structure will then be supported on the collar 41 under the head 8 and the entire weight will tend to straighten the sleeve and strips. Furthermore the pressure on the outside and the reduced pressure on the inside give a differential pressure acting to collapse the device.

Fig. 4 shows a second embodiment of the invention in which a threaded tapered mandrel 53 fixed on the pipe 26 is adapted to be screwed between the wedge blocks 54. This type of construction is especially intended for use in making more permanent installations and for use inside other pipes where only a small expansion is needed.

What is claimed is:

1. A packer for wells including a lower head, a connection to support said head, an upper head spaced from said lower head, an actuating pipe passing through said heads, packing to seal between said heads and an outer pipe, a tapered mandrel carried by said actuating pipe and positioned between said heads, a plurality of wedge

blocks supported on said lower head and adapted to be engaged by said mandrel to be expanded by downward movement thereof, a groove in the periphery of said wedge blocks, spring members within said groove and attached to some of said blocks, said spring members extending to adjacent blocks and adapted to bridge the gap between said blocks as they are expanded, a plurality of spring strips extending longitudinally of said packer and anchored at their ends to said heads, overlapping bevelled edges on said spring strips adapted to maintain contact as they are expanded by said wedge blocks, and a rubber sleeve surrounding said spring strips and attached at either end to said heads.

2. A packer for wells including a pair of spaced heads, a support for one of said heads, an actuating pipe passing through both of said heads, a tapered mandrel carried by said actuating pipe and rotatable thereon, a plurality of wedge blocks positioned between said tapered mandrel and said supported head, means for supporting said blocks on said supported head whereby a downward movement of said actuating pipe and mandrel will expand said blocks, a plurality of spring strips connected at their ends to said heads and surrounding said blocks, and a substantially cylindrical rubber sleeve about said strips, said sleeve being secured to said heads whereby a downward movement of said pipe and mandrel will expand said blocks, strips and sleeve, said strips being overlapped to maintain a continuous support for said sleeve as it is expanded.

3. In a packer for wells, a rubber sleeve, a plurality of axial reinforcing strips underlying said sleeve, and means enclosed by said strips to expand said strips and sleeve, said strips being overlapped whereby a continuous support for said sleeve is maintained as it is expanded.

4. In a packer for wells an actuating pipe, upper and lower heads thereon, a support for said lower head, a packing sleeve extending between and attached to said heads, a plurality of metal reinforcing strips extending longitudinally of said packer within said sleeve, said strips being overlapped and connected at either end to said heads, an operating pipe extending upwardly from said packer, and an expander within said packer, actuated by said operating pipe to expand said reinforcing strips and rubber sleeve to seal against a surrounding wall, said overlapping strips being adapted to maintain a metal backing for said sleeve as the packer is expanded.

5. A packer for wells including a longitudinally extending pipe, a substantially cylindrical packing sleeve associated therewith, a plurality of overlapping reinforcing strips extending longitudinally of the interior of said sleeve, means within said packer and actuated by said pipe to expand said packing sleeve, and means to secure said packing sleeve and strips to said pipe.

6. A rubber tube clamp including a hollow body, a threaded portion thereon, a clamp ring adapted to be screwed onto said threaded portion, an interiorly tapered portion in said ring, a plurality of segments positioned around said body and having tapered surfaces to engage within the tapered portion of said ring, and means to secure said segments against longitudinal movement along said body whereby the clamp ring may be screwed along the body to contract the segments to clamp the end of a tube placed between said body and segments.