

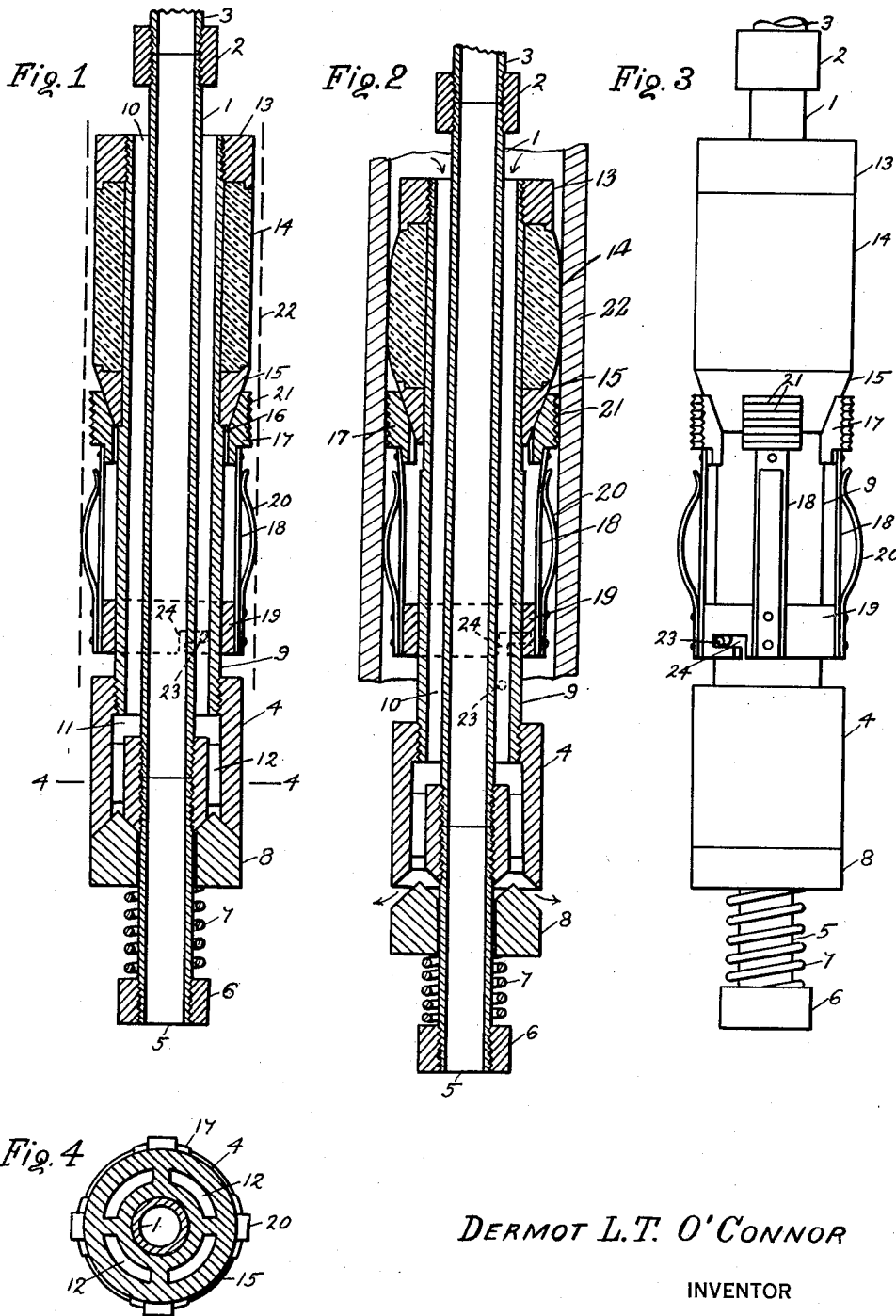
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WELL PACKER

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WELL PACKER

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My invention relates to well packers and has particular reference to devices for sealing the annular clearance between the flow pipe and walls of a well.

5 The packers are usually provided with a rubber sleeve which freely slides in the casing of a well but which can be expanded at the desired depth in the well so as to seal the clearance around the central flow pipe. The fluids, such as petroleum oil, gas or water, can be then extracted
10 through the flow pipe.

Under certain conditions, however, it becomes necessary to raise the pressure in the well under the packer in order to force the fluids up the
15 flow pipe, preventing at the same time the possibility of a back flow through the packer. Or it may be necessary to force liquids under pressure through the packer for flushing the well, permitting the liquids to flow upward through the flow
20 pipe only.

In ordinary packers usually there is no provision made for pumping fluids around the flow pipe and for maintaining working pressure below the packer if the latter is provided with flow
25 channels. Packers having such channels have no provisions for preventing the back flow in case the pressure below the packer rises above the pressure in the upper portion of the well.

My invention has for its object therefore to
30 provide a means for permitting an unobstructed flow of fluids through the packer around the flow pipe, preventing at the same time any possibility of a back flow if the pressure above the packer drops (for instance, if the pump is
35 stopped).

For this purpose I provide a longitudinal channel or passage between the flow pipe and the shell of the packer. I also provide an automatic valve at the lower portion of the packer shell. The
40 valve is opened by the pressure from above thereby automatically admitting fluids pumped into the well through the packer. The valve closes the passage whenever the pressure above the packer drops below the pressure in the well.
45 My invention is more fully described in the accompanying specification and drawing in which—

Fig. 1 is a sectional elevation of my packer with the parts locked in an inoperative position, Fig. 2 is a similar view of my packer in its operative position, with the rubber seal expanded and wedged in the well, and with the automatic valve opened, Fig. 3 is an outside view of my packer, and Fig. 4 is a sectional view taken on
55 the line 4—4, of Fig. 1.

My packer consists of an inner tube 1 attached by a coupling 2 to the end of a flow pipe 3, the tube 1 forming thereby a continuation of the flow pipe. A bushing 4 is mounted on the tube 1 near its lower end. For this purpose the bushing is threaded inside, and the end of the tube 1 is
5 screwed into it from the top. A lower portion 5 of the tube 1 is screwed into the bushing from the bottom. The portion 5 has a bushing 6 retaining a spring 7 pressing against a sliding ring-shaped valve 8. The upper end of the valve has
10 a double convex taper fitting into the corresponding tapered seat at the bottom of the bushing 4. The upper portion of the bushing is threaded inside for the lower end of a packer shell 9. The inside diameter of the shell is
15 larger than the diameter of the tube 1 so that an annular clearance 10 is formed between the two tubes.

The bushing 4 has an inner chamber 11 in
20 communication with the clearance 10, and longitudinal channels 12 connecting the chamber 11 with the valve seat at the lower end of the bushing. The upper end of the shell 9 has a bushing
25 13 retaining a rubber sleeve 14. The lower end of the rubber sleeve rests against a cone-shaped bushing 15 the lower end of which rests against a shoulder 16 on the shell 9. Slips or sliding blocks 17 rest against the tapering side of the
30 bushing 15 being correspondingly tapered on the inside. These slips are supported on the upper ends of flat springs 18 attached to a sliding collar 19. Curved friction springs 20 are also attached to the collar 19. The slips 17 are provided with sharp ridges or wickets 21 on the
35 outside adapted to engage the inner walls of the well 22 when the slips are moved out by sliding up the cone 15. The outside diameters of the bushings are such that the whole device slides
40 freely in the well, only the friction springs 20 engaging the casing 22. The sleeve or collar 19 is prevented from sliding on the shell 9 by a pin 23 supported on the shell and engaged by a curved slot 24 in the collar 19.
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The operation of my hook wall packer is as follows.

The packer is attached to the end of a flow pipe 3 by the coupling 2 and is lowered into the well casing 22. The collar 19 is then fixed in its
50 position by the slot 24 engaging the pin 23. The friction spring 20 becomes partly compressed when forced into the well. When the packer is lowered to the desired depth, the flow pipe 3 is turned to the left (with the slot 24 as shown,
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or to the right if the slot is made in the opposite direction).

The pin 23 is thereby released from the slot 24. With the further downward movement of the pipe 3, the shell 9 will slide downwardly through the sleeve 19, the latter being prevented from moving downwardly by the springs 20 frictionally engaging the walls of the well. The slips 17 will slide over the cone 15, expanding until they come into engagement with the casing 22. The sharp ridges 21 will prevent the slips from sliding along the casing even if a strong downward pressure is applied to the device. With sufficiently great pressure the rubber sleeve 14 becomes compressed and expanded until it is firmly wedged in the casing as shown in Fig. 2 thereby sealing the well. With the well sealed by the packer the fluids from the well can flow only through the flow pipes 5, 1 and 3. If the pressure in the well becomes too low and the flow stops, then gases or liquids under pressure can be pumped into the well through the packer channel 12, the valve 8 being automatically opened when the pressure of the pumped fluids exceeds the pressure in the well below the packer. The valve automatically closes again if the pressure above drops, for instance, if the pump stops working.

Important advantages of my packer are that it can be used under any operating conditions, and its operation can be instantly changed from natural flow from the well through the flow pipe 3 to the forced flow, using gas or water lift, these changes taking place automatically, without any change in the setting of the packer. With the forced lift the pumps may work intermittently, as the valve closes the passages automatically every time the pumps stop working.

The valve, being placed at the lower end of the packer, is self cleaning, and any obstructions in it caused by dirt or foreign particles, can be easily cleaned by forcing air or liquid through it.

My automatic packer can be used for petroleum oil wells with natural flow or forced lift, for pumping air, gases, water, or other fluids; it can also be used with artesian wells in which natural pressure is insufficient to raise water, and where air lift becomes necessary; also for various other industrial application, for instance, in salt mines for pumping water and extracting brine, in sulphur mines for extracting sulphur by hot water, etc.

I claim as my invention:

1. In a well packer, the combination of a flow pipe, a bushing attached to said pipe near its lower end, a shell attached at its lower end to the upper end of said bushing, the outer portion of said shell being adapted to be expanded for sealing said well, said shell being of a larger diameter than said pipe thereby forming a passageway between said pipe and said shell, the lower end of said bushing having a valve seat, said bushing being provided with longitudinal passages in communi-

cation with said passageway and extending to said valve seat, a valve slidably mounted on the lower end of said pipe, and a spring adapted to press on said valve for closing said passages, said valve being adapted to be opened by the pressure of fluids in said well above said packer.

2. In a well packer, the combination of a flow pipe, a bushing attached to said pipe near its lower end, a shell attached at its lower end to the upper end of said bushing, the outer portion of said shell being adapted to be expanded for sealing said well, said shell being of a larger diameter than said pipe thereby forming a passageway between said pipe and said shell, the lower end of said bushing having a valve seat, said bushing being provided with longitudinal passages in communication with said passageway and extending to said valve seat, a valve adapted to close said passages in said valve seat, and a yieldable means to keep said valve closed, said valve being adapted to be opened by the pressure of a fluid in said well above said packer.

3. In a well packer, the combination of a flow pipe, a bushing supported on said pipe near its lower end, a shell attached at its lower end to the upper end of said bushing, the outer portion of said shell being adapted to be expanded for sealing said well, said shell being of a larger diameter than said pipe thereby forming a passageway between said pipe and said shell, said bushing being provided with longitudinal passages in communication with said passageway, a valve adapted to close said passages, a yieldable means for keeping said valve closed, said valve being adapted to be opened by the pressure of a fluid in said well above said packer.

4. In a well packer, the combination of a cylindrical member, a pipe supported in said member and adapted to form a continuation of a flow pipe in said well, the outside portion of said member being adapted to be expanded for sealing said packer in said well, said member being provided with longitudinal passages extending from one end of said packer to the other outside of said pipe, a valve adapted to close said passages, and a yieldable means to keep said valve closed, said valve being adapted to be opened against said closing means by the pressure of a fluid in said well above said packer.

5. In a well packer, the combination of a cylindrical member mounted on the lower portion of a flow pipe, the outer portion of said member being adapted to be expanded by the movement of said pipe for sealing said well, said member being provided with longitudinal passages extending from one end to the other, a valve adapted to close said passages, a yieldable means to keep said valve closed, said valve being adapted to be opened by the pressure of a fluid in said well above said packer independently of the relative position of said flow pipe.

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