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G. R. LINVILLE

2,207,019

COMBINATION PACKER

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Fig. 1.

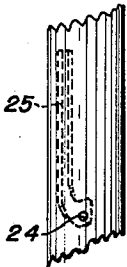


Fig. 3.

Fig. 2.

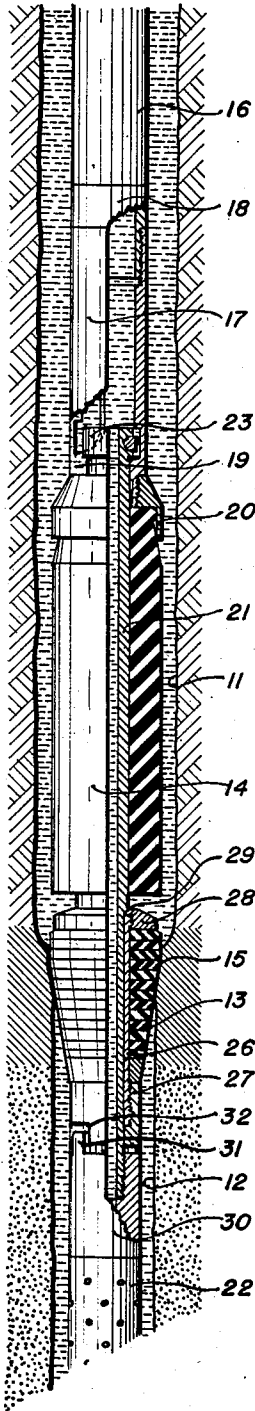
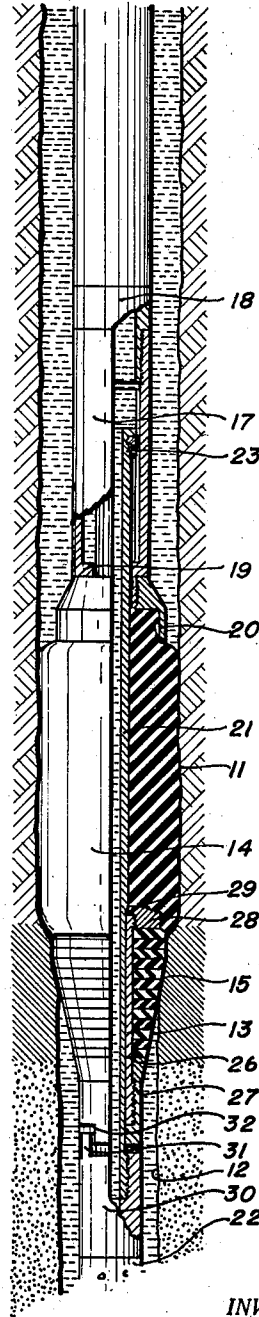


Fig. 4.



INVENTOR.

George R. Linville

BY *Carl Babcock*
ATTORNEY

UNITED STATES PATENT OFFICE

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COMBINATION PACKER

George R. Linville, Los Angeles, Calif., assignor
to Halliburton Oil Well Cementing Company,
Duncan, Okla.

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4 Claims. (Cl. 166—10)

This invention relates to packers for oil wells and more particularly to the combination of a rat hole packer with a wall packer adapted for use in the open hole of an oil well.

In the drilling of oil wells, and particularly in the making of formation tests in oil wells in accordance with the teachings of the U. S. patent to Simmons, No. 1,930,987, it is often desirable or necessary to effect a seal between a pipe and the wall of the well, and various types of packers have been designed for this purpose. If the bore of the well is specially prepared a rat hole packer may be employed, as taught in the patent to Simmons mentioned above. If the well is not specially prepared and is of a fairly uniform diameter so that no shoulder is provided for the seating of a rat hole packer, a wall packer is commonly used to effect this seal.

In accordance with the principles of the present invention, it is proposed to provide an arrangement in which a rat hole packer and a wall packer may be simultaneously seated in the uncased portion of an oil well so as to insure the making of an effective seal between the wall of the bore of the well and drill pipe or tubing lowered therein.

Accordingly, it is one object of the present invention to devise apparatus adapted to effect a double seal between a pipe or a conduit in a well and the wall of the well.

It is a further object of the invention to devise novel means for setting and releasing both a wall packer and a cone packer in an oil well.

It is still a further object of the invention to devise a novel arrangement for sealing in an oil well in which a wall packer is so constructed that it may expand or flow around the upper portion of a rat hole packer and make an effective seal at that point.

It is still another object of the invention to devise a novel combination of wall packer, rat hole packer and anchor pipe in which each of these devices may be individually lifted in succession, thereby enabling the assembly to be removed from engagement with the wall of the well.

Other objects and advantages reside in certain novel arrangement and construction of parts as will be more apparent from the following description taken in connection with the accompanying drawing, in which:

Figure 1 is a vertical cross-sectional view of an oil well showing a combination packer constructed in accordance with the principles of the invention being lowered therein;

Figure 2 is a vertical cross-sectional view of an oil well with the combination packer of Figure 1 therein, the packers being shown in the relationship which they occupy when seated;

Figure 3 is a fragmentary view of the body por-

tion of the assembly of Figure 1 illustrating the position of the pin and slot connection while the apparatus is being lowered into the well; and

Figure 4 is a view similar to Figure 3 and illustrating the position of the pin and slot when the packers are seated within the well.

Referring to the drawing in detail, it will be seen that an oil well is there illustrated as having a main bore hole 11 and a rat hole 12. The combination packer constructed in accordance with the present invention includes a rat hole packer 13 and a wall packer 14, the rat hole packer being adapted to seat upon a shoulder 15 in the bore of the well and the wall packer 14 being adapted to seal the lower portion of the main bore 11 immediately above the shoulder 15.

The combination packer assembly may be lowered into the well by means of tubing or drill pipe 16, the lower end of which is connected to a sleeve member 17 as by means of the threaded connecting member 18. The sleeve member 17 is provided with an inwardly extending flange or shoulder 19 near its lower end. Beneath this shoulder the sleeve member is threaded to provide means for making connection to the upper shoe 20 of the wall packer 14. The shoe 20 is provided with a depending cylindrical portion the lower end of which is inwardly flanged, as illustrated, to fit tightly around an outwardly flanged portion at the upper end of the packer 14. By this arrangement it is not necessary to vulcanize the shoe to the packer.

The wall packer 14 extends downwardly from the shoe 20 and consists merely of a vulcanized rubber cylinder. There is no shoe on the lower end of the wall packer 14.

Supported within the sleeve 17 is a mandrel 21 which extends downwardly within the wall packer 14 and the rat hole packer 13 to be connected at its lower end to a section of perforated anchor pipe 22. The mandrel is provided with an outwardly extended flanged portion 23 at its upper end so as to provide an abutment cooperating with the shoulder 19 on the sleeve body 17 when the drill pipe 16 is lifted upwardly. Tension may thus be transmitted from the drill pipe to the anchor pipe through the mandrel. The flanged portion 23 is provided with one or more radially extending pins 24 which are adapted to cooperate with J-slots 25 in the sleeve body 17 for controlling relative movement between this sleeve body and the mandrel. When the pin 24 is in the position shown in Figures 1 and 3, there can be very limited longitudinal movement between the body 17 and the mandrel. When, however, the sleeve body 17 is rotated slightly in a lefthand direction as viewed from the top by means of the drill pipe 16, there can be considerable longitudinal movement between these members within the limits of the longitudinal portion of the slot

25. The parts may then take the relative position shown in Figures 2 and 4.

The rat hole packer 13 includes a number of flexible disks, such as fabric or belting, clamped upon a sleeve 26 by means of nuts 27 and 28. This assembly, including the sleeve 26, may be moved slightly longitudinally upon the mandrel 21 between a shoulder 29 on the mandrel and the connecting collar 30 which connects the lower end of the mandrel to the perforated anchor pipe 22. The upper portion of the collar may be provided with a number of tongues 31 adapted to cooperate with recesses 32 on the lower portion of the sleeve 26 so as to prevent the rat hole packer assembly from rotating with respect to the mandrel.

It will be seen that the wall packer 14, which may be made of comparatively soft rubber, is so arranged with respect to the rat hole packer that it may be pressed down and flow around the upper shoe 28 of the rat hole packer when the assembly is seated in the well to effect a sealing operation between the conduit consisting of the pipe 16, the sleeve body 17, the mandrel 21 and the pipe 22. It will also be apparent that the wall packer 14 may be easily assembled with the upper shoe 20, the assembly consisting merely of placing the shoe upon the upper portion of the packer before the mandrel is passed there-through.

In using the apparatus to effect a seal, it is lowered into the well with the parts in the relative positions shown in Figure 1. The rat hole packer may be spudded into the rat hole by raising and lowering the drill pipe 16, the wall packer remaining in the position shown in Figure 1 at this time, while the stresses to the rat hole packer are transmitted through the pins 24. After the rat hole packer is spudded in the drill pipe may be rotated slightly, as described above, to bring the pins 24 into the proper position in the slots 25 to enable the sleeve body 17 to be moved downwardly with respect to the mandrel, thus causing the wall packer to expand or bulge out into engagement with the wall of the well and at the same time flow over and around the shoe 28 and the upper portion of the rat hole packer as described above. It is to accomplish this that the wall packer has been specially designed of comparatively soft rubber. After the seal has thus been effected, the testing operations may be carried on if the assembly is used in connection with a formation tester or other operations performed, depending upon the purpose in effecting a seal within a well.

A particular advantage of the present arrangement results from the ease with which the assembly may be removed from the well. It may be that there will be a great difference in pressure between the mud above the wall packer and the interior of the drill pipe 16, particularly where the assembly is used with a formation tester. This difference in pressure may be the cause to some extent of the wall packer flowing around the rat hole packer, as described above, and thus aid in effecting a proper seal. With ordinary packer constructions, however, this difference in pressure renders it difficult to remove the apparatus from the well, since any lifting action on the packer must be against this pressure.

It is often very difficult to remove a packer assembly from a well for the further reason that the rat hole has partially collapsed and formed bridges around the anchor pipe. If, in order to remove a combined wall packer, rat hole packer

and anchor, all of these parts have to be lifted at the same time, a tremendous strain must be taken in the drill pipe, not only because these parts are apt to stick, but also because of the pressure difference mentioned above. With the present arrangement, however, the wall packer, the rat hole packer and the anchor may be lifted separately and individually. Upon first taking a strain in the drill pipe 16 the wall packer 14 is lifted, the sleeve body 17 merely moving upwardly with respect to the mandrel. After this packer is released the strain is transmitted to the mandrel which first lifts the anchor pipe and then as the collar 30 contacts the lower shoe 27 of the rat hole packer, this packer is released from engagement with the shoulder 15 of the bore hole.

It will thus be seen that a very effective but simple arrangement has been provided for seating and releasing both a wall packer and a cone packer in an oil well formation.

While only one embodiment of the invention has been shown and described herein, it is obvious that various changes may be made in the arrangement and construction of parts without departing from the spirit of the invention or the scope of the annexed claims.

I claim:

1. A packer assembly for use in oil wells or the like including a sleeve body adapted to be connected to drill pipe or tubing, a mandrel mounted for longitudinal movement with respect to said body, a rubber wall packer connected only at its upper end to said body and mounted for longitudinal movement on said mandrel, and a cone packer mounted on said mandrel beneath said wall packer, the arrangement being such that as the packers are seated the wall packer flows around the top of the cone packer and after the packers are seated, they may be released independently by raising said sleeve body.

2. A packer assembly for use in oil wells or the like including a sleeve body adapted to be connected to drill pipe or tubing, a mandrel mounted for longitudinal movement with respect to said body, a wall packer connected to said body and mounted for longitudinal movement on said mandrel, and a cone packer mounted on said mandrel beneath said wall packer, said cone packer including a sleeve mounted for limited vertical play on said mandrel.

3. A packer assembly for use in oil wells or the like including a sleeve body adapted to be connected to drill pipe or tubing, a mandrel mounted for longitudinal movement with respect to said body, a wall packer connected to said body and mounted for longitudinal movement on said mandrel, and a cone packer mounted on said mandrel beneath said wall packer, said cone packer having an upper shoe and said wall packer being made of rubber and so disposed as to be capable of flowing down over said shoe when the packers are seated.

4. A packer assembly for use in oil wells or the like including a sleeve body adapted to be connected to drill pipe or tubing, a mandrel mounted for longitudinal movement with respect to said body, a wall packer connected to said body and mounted for longitudinal movement on said mandrel, and a cone packer mounted on said mandrel beneath said wall packer, said body and said mandrel being connected through a pin and slot arrangement whereby relative longitudinal movement may be prevented during certain phases of the operation of the assembly.

GEORGE R. LINVILLE.