May 31, 1932. P. H. MACK 1,860,467

PRESSURE FLOOD PACKER

Filed July 6, 1929 2 Sheets-Sheet 1

Fig. 1.

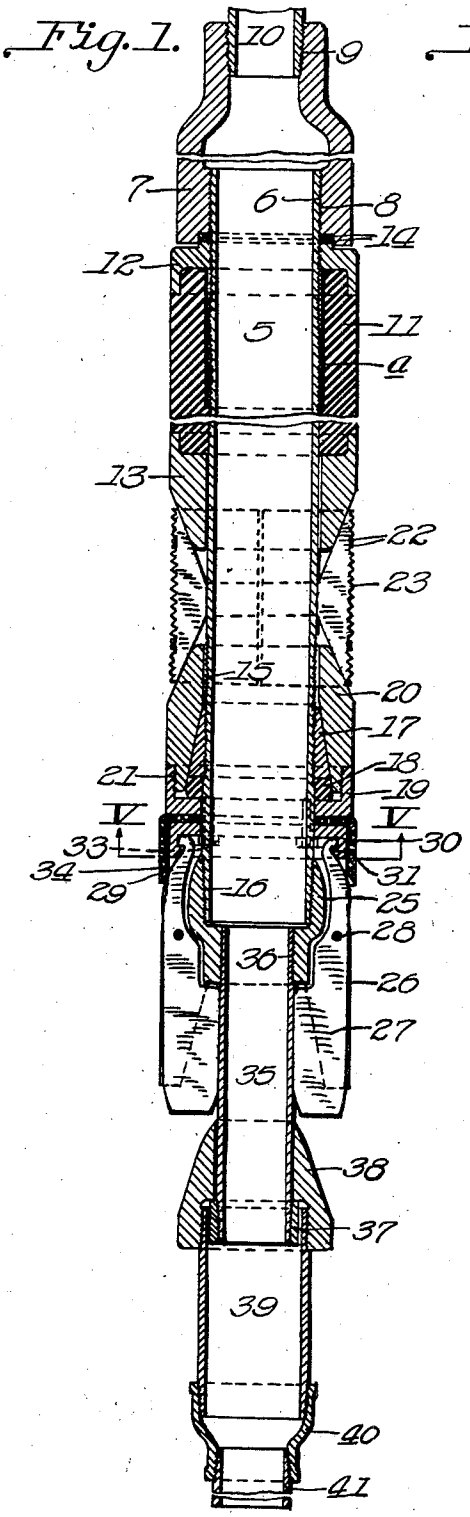


Fig. 2.

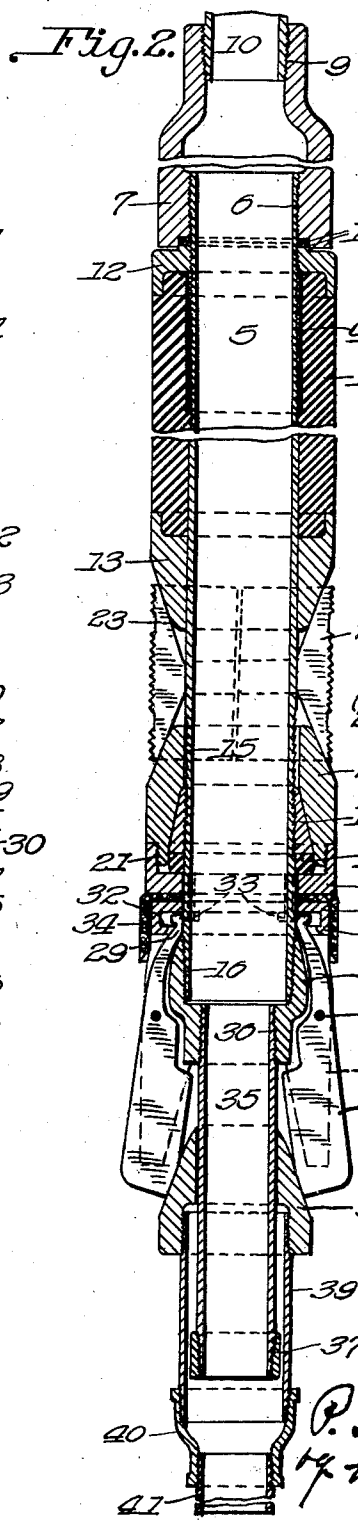


Fig. 5.

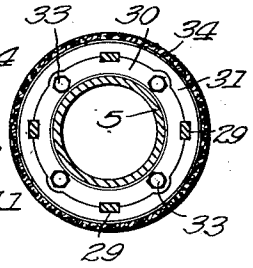
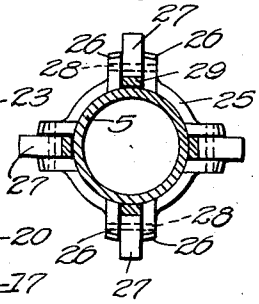


Fig. 6.



INVENTOR

P. H. Mack.

by W. F. Dodick

Attorney.

May 31, 1932. P. H. MACK 1,860,467

PRESSURE FLOOD PACKER

Filed July 6, 1929 2 Sheets-Sheet 2

Fig. 3.

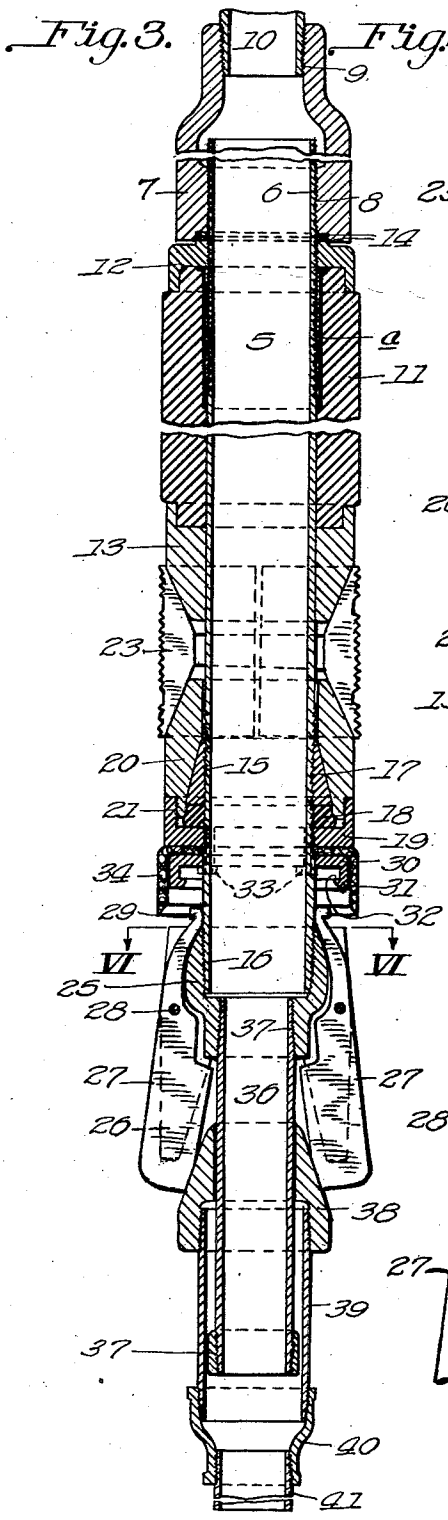
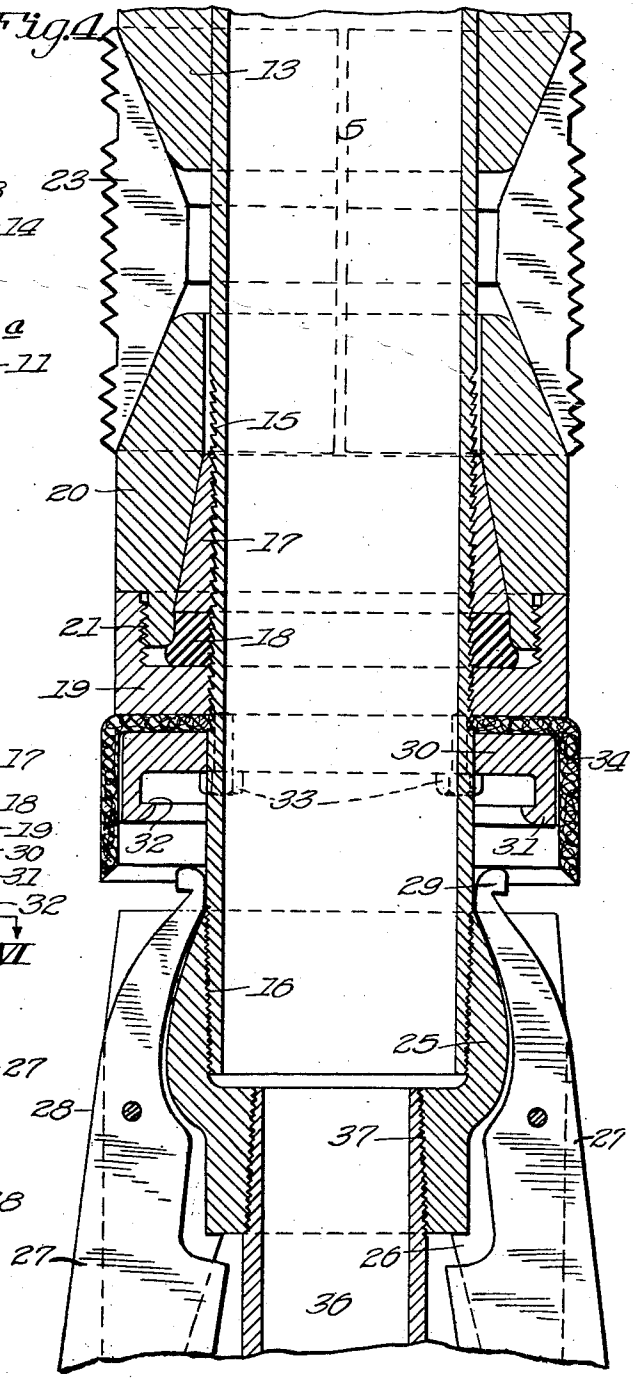


Fig. 4.



INVENTOR

P. H. Mack

by W. F. Doolittle

Attorney.

Patented May 31, 1932 1,860,467

UNITED STATES PATENT OFFICE

PATRICK H. MACK, OF BRADFORD, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO OIL WELL SUPPLY COMPANY, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF NEW JERSEY

PRESSURE FLOOD PACKER

Application filed July 6, 1929. Serial No. 376,396.

This invention relates to improvements in packers, and more particularly to packers designed for use in wells in which fluids under pressure, as water, air or gas, or introduced to the oil bearing sands for the purpose of flooding said sands, said packers being known as high pressure flood packers.

Packers of the character stated, as heretofore constructed, have been the source of considerable trouble when employed in flooded wells, due to the movement or slippage of the packer structure after the high pressure has been removed from the bottom of the packer, thereby destroying or lessening the packing efficiency of the structure.

In practice, pressure pumps are employed for forcing high pressure fluids of from five hundred to fifteen hundred pounds per square inch down through tubing into the oil bearing sand and beneath the packer or packers; and, as it is the custom to treat a number of adjacently located wells in this manner at the same time, the pressure is intermittently introduced, thus subjecting the set packer to a considerable variation in pressure.

Among the objects of the present invention are, to provide in a packer structure simple and efficient means for preventing a movement of the packer after a release or reduction of pressure beneath the packer; to provide means automatically operable by the high introduced pressure fluid for effecting an expansion and a locking of gripping means such as slips for preventing movement of the packer; to provide new and improved means for preventing a rotative movement of the packer prior to the act of setting the packer; and to provide a packer structure of the character specified that may be made at comparatively low cost and which is efficient in operation and may be readily placed in operative position in a well.

In the accompanying drawings, which illustrate an application of my invention:

Fig. 1 is a vertical sectional view of a packer embodying my invention, showing the parts in position when lowering the packer into the well;

Fig. 2, a view similar to Fig. 1, showing the position of the parts after the packer has been positioned in the well, with the dogs engaged in the hole to prevent turning of the packer;

Fig. 3, a like view showing the position of the parts after the packer has been set in the well and acted on by the introduced fluid pressure;

Fig. 4, an enlarged detail vertical sectional view of a portion of the packer structure, showing the position of the parts as in Fig. 3;

Fig. 5, a horizontal sectional view taken on line V—V of Fig. 1; and

Fig. 6, a similar view taken on line VI—VI of Fig. 3.

Referring to the drawings, 5 designates a tubular body member of the packer structure; said body is externally threaded at its upper end, as at 6, to engage an elongated head or top portion 7, the latter being provided with internal threads 8 at its lower end to engage the upper threaded portion 6 and at its opposite end with a threaded portion 9 adapted to be coupled with a section of tubing indicated by the numeral 10.

The threaded portion 6 of the body 5 extends downwardly for a considerable length and the head 7, in the operation of setting the packer, is adapted to be screwed down on the said upper threaded portion.

As is usual in packer structure, an elongated packing element 11, preferably formed of rubber, is mounted on the body and, as shown, the packing element 11 is disposed between a movable counterbored collar 12 surrounding the body and a cone-shaped annular slip expanding member 13, said member 13 being counterbored as collar 12 to receive an end of the packing element. Interposed between the collar 12 and the lower end of the head 7, I provide metallic bearing rings or brass washers 14 to reduce friction when head 7 is turned on member 12 in the operation of setting the packer. *a* is a protective sleeve to prevent element 11 coming into contact with the threaded portion of the body.

The tubular body member 5 is further formed towards its lower end with an external serrated portion 15, and at its lower end with a threaded part 16. 17 designates ratchet devices such as internally serrated

wedge members having the serrated portions thereof arranged for co-operation with the serrated portions 15 of the body, said serrations being of such character as to permit a movement of the means 17 relatively to the body in one direction only. The wedge means 17, as illustrated and as preferred, is supported on a resilient ring member 18 mounted on the body and held in operating position thereon by means of an annular retaining ring member 19.

Adapted for co-operation with the members 17 is a floating cone-shaped slip expanding member 20, said member 20 being connected with the retaining member 19, as shown at 21, and interposed between the upper end of the said cone-shaped member 20 and the lower portion of the tapered expanding member 13 I provide gripping means such as slip members 23. 22 designates wires employed for retaining the movable slips in position during the operation of lowering the packer into operative position in the well. The pressure exerted on the slips by the expanding members 13 and 20 in forcing the slips into engaging position will break the wires.

Secured to the lower threaded end 16 of the hollow body 5 is a coupling member 25, said coupling member being provided with pairs of vertically extending elongated lugs or projections 26 to receive therebetween a plurality of dogs 27 pivotally mounted on pivot pins 28. Said dogs 27 have at their upper ends co-operating locking means 29 adapted to co-operate with an annular member 30 having a depending annular flange 31 formed with a ledge 32 to engage a locking means on the dogs. This annular member 30 is secured to the retaining ring member 19 by means of cap screws 33.

Interposed between the said retaining ring 19 and the annular member 30 is a cup leather 34, made of rubber or other suitable material. The function of this cup leather 34 is to direct fluid pressure under and against the unitary movable parts 30, 19, 17, 18 and 20, so as to effect an upward movement of said parts in the operation of further expanding and locking the slips 23 in expanded position.

Extending downwardly from the dog supporting coupling 25, I provide a tubular sleeve 35, said sleeve being externally threaded at its upper end, as at 36, adapted to be entered in the internally threaded portion of the dog supporting member. 37 designates a collar mounted on the lower threaded end portion of the sleeve 35, and 38 a slidable cone member mounted on the sleeve 35. Said member 38 at its lower end has secured thereto a second tubular sleeve 39, the latter having secured to its lower end a pipe reducer member 40 designed to connect a section 41 of an anchor pipe thereto.

The anchor pipe extends to the bottom of the well, and it will be evident that after the anchor pipe strikes the bottom a continued lowering of the packer structure will bring the lower ends of the pivoted dogs or the pivotally mounted wall engaging members 27 into contact with the member 38, thus spreading members 27 and forcing them outwardly into engagement with the wall of the well to prevent a rotative movement of the packer structure with the exception of its head or top portion 7.

In lowering the packer structure into the well, the parts are assembled in the position shown by Fig. 1. As heretofore stated, when the lower portion of the anchor pipe strikes the bottom of the well, a continued lowering of the packer forces the engaging members out into engagement with the wall of the hole or well and releases the locking portions of the dogs from the member 30 and permits relative movement between the body member 5 and the annular member 30. The position of the parts of the packer structure after this action is clearly shown by Fig. 2.

After the packer has been positioned against rotative action as aforesaid, the packer is set by turning the tubing to the right; this action screws the top or head of the packer downwardly on the threaded portion of the tubular body member 5, moving the slip expanding member 13 downwardly to expand the slips 23 by the combined action of said member 13 and member 20. After this expansion is effected, a further turning of the head will force the packing element 11 into close contact with the wall of the well, thus setting the packer.

After the introduction of the fluid under high pressure into the oil sand and beneath the packer, this fluid will raise the assembled parts or elements 30, 19, 17 and 20 from the position shown by Fig. 1 to the position shown by Figs. 3 and 4, and this action will further expand the slips 23 and lock them in expanded position, due to the action of the serrated means 17 cooperating with the serrations 15 of the tubular body. By mounting the means 17 on a resilient member 18, as a rubber ring, it will be understood that said means 17 has a movement independent of its co-operating slip expanding member 20. This is due to the resilient action of the rubber which, upon upward movement of the said parts, has been deformed into the shape shown by Fig. 4.

It will be apparent that as the expanding member 20 has been moved upwardly and slightly away from the means 17, the rubber will force said means 17 upwardly and that the co-operating serrated portions on the body and said means will lock the expanding member 20, and in turn the slips 23, in their complete expanded position.

I claim:

1. In a well packer, a body member formed with a serrated portion, slips, means for expanding the slips, and fluid actuated means associated with the expanding means for further expanding and locking the slips in expanded position including a resilient member and wedging means mounted thereon, said wedging means having serrated portions for co-operation with the serrated portion of the body.

2. In a well packer, a body member formed with a serrated portion, slips, means for expanding the slips, and fluid actuated means associated with the expanding means for further expanding and locking the slips in expanded position including a resilient member wedging means mounted thereon, said wedging means having serrated portions for co-operation with the serrated portion of the body, spaced-apart annular members, and a cup leather interposed between the annular members, said annular members supported from the slip expanding means.

3. In a well packer, a body member, packing means for sealing the body member in a well, gripping means capable of being expanded into engagement with surrounding walls of the well for securing the body member in position, and means for expanding the gripping means including expanding members movable inwardly toward each other from opposite sides of the gripping means, fluid actuated means for moving one of said expanding members inwardly and means for retaining the same in inward position after being moved to such position.

4. In a well packer, a body member, packing means for sealing the body member in a well, gripping means capable of being expanded into engagement with surrounding walls of the well for securing the body member in position, and means for expanding the gripping means including an expanding member operable by hydraulic pressure.

5. In a well packer, a body member, packing means for sealing the body member in a well, gripping means capable of being expanded into engagement with surrounding walls of the well for securing the body member in position, and means for expanding the gripping means including expanding members movable toward each other from opposite sides of the gripping means, one of said expanding members being operable by hydraulic pressure, and a ratchet device for checking return movement of said last mentioned expanding member.

6. In a well packer, a body member, packing means for sealing the body member in a well, gripping means capable of being expanded into engagement with surrounding walls of the well for securing the body member in position, and means for expanding the gripping means including an expanding member operable by hydraulic pressure, and a ratchet device for checking return movement of said expanding member.

7. In a well packer, a body member, a packing element associated therewith, gripping means capable of being expanded into engagement with surrounding walls for securing the body member in position, fluid actuated means for expanding the gripping means, and dogs pivotally supported on the body for engaging surrounding walls to prevent rotation of said body, said fluid actuated expanding means and said dogs having co-operating interengaging portions.

8. In a well packer, a body member, a packing element associated therewith, gripping means capable of being expanded into engagement with surrounding walls for securing the body member in position, fluid actuated means for expanding the gripping means, dogs pivoted on the body for engaging surrounding walls to prevent rotation of said body, said dogs having locking engagement with said expanding means when in retracted position and operable to release said expanding means when swung to expanded position, and means for expanding the dogs.

9. In a well packer, a body member, packing means for sealing the body member in a well, gripping means capable of being expanded into engagement with surrounding walls of the well for securing the body member in position, and means actuated by fluid pressure in the well beneath the packer for expanding the gripping means.

10. In a well packer, a body member, packing means for sealing the body member in a well, gripping means capable of being expanded into engagement with surrounding walls of the well for securing the body member in position, and means for expanding the gripping means including an actuating member reciprocable longitudinally of the well and exposed to hydraulic pressure in the well.

In testimony whereof I affix my signature.

PATRICK H. MACK.