P. H. MACK.

OIL WELL PACKER.

APPLICATION FILED JUNE 21, 1911.

1,009,328.

Patented Nov. 21, 1911.

2 SHEETS—SHEET 1.

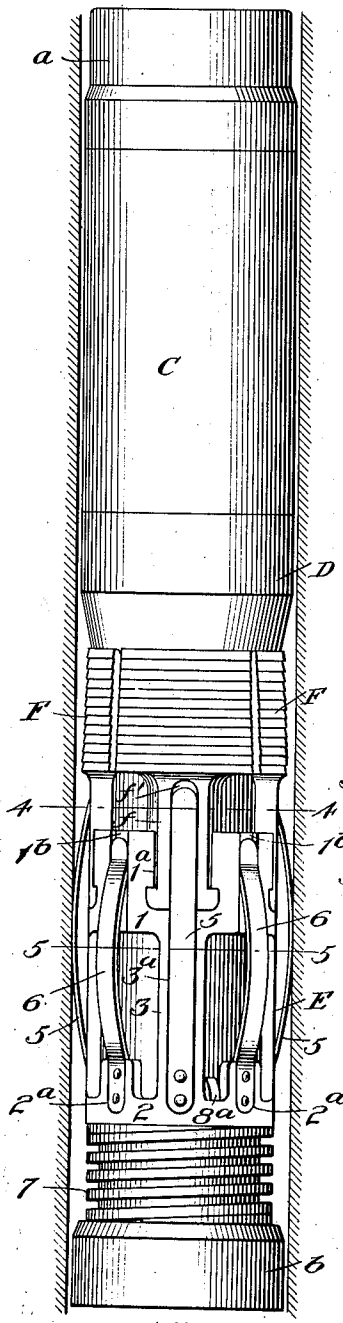

Fig. 1.

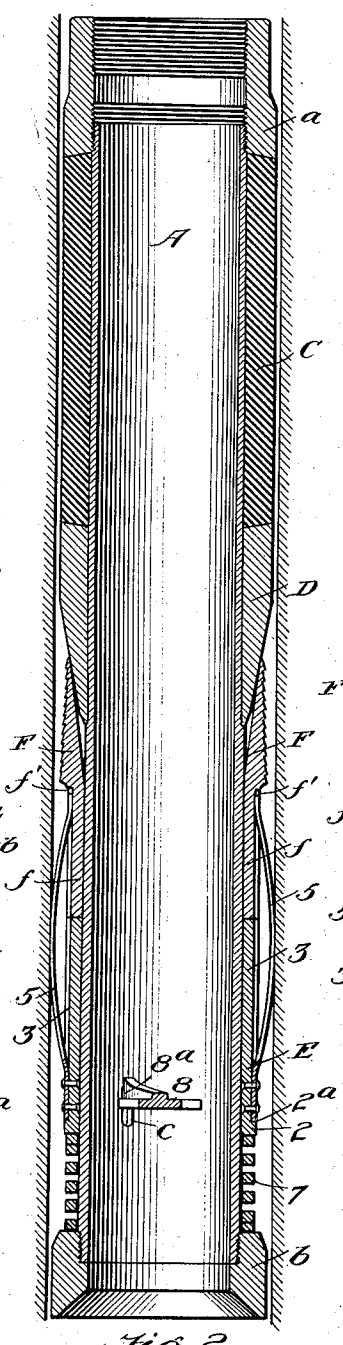

Fig. 2.

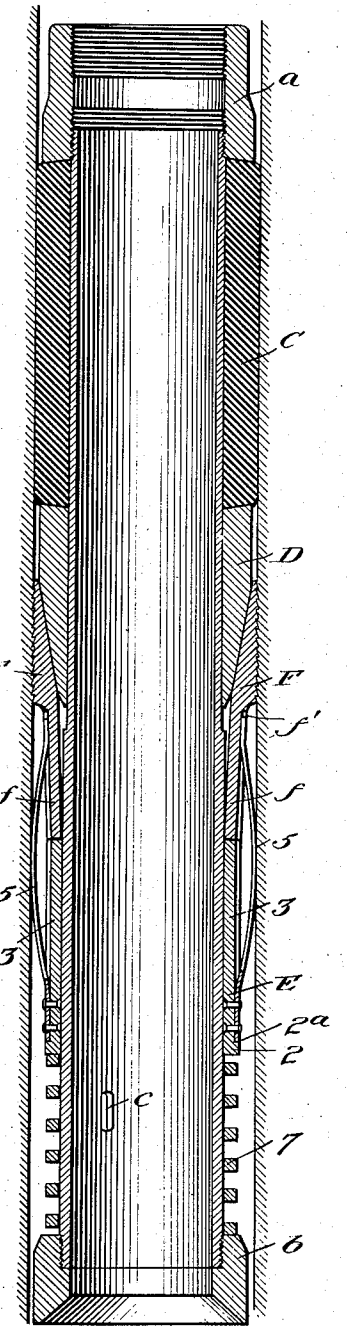

Fig. 3.

Witnesses

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2 SHEETS—SHEET 2.

Fig. 6.

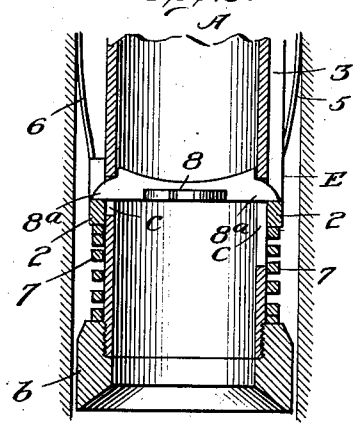


Fig. 4.

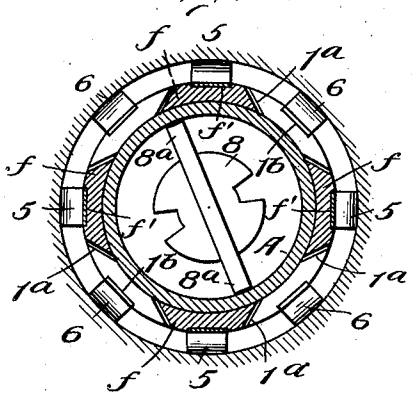


Fig. 7.

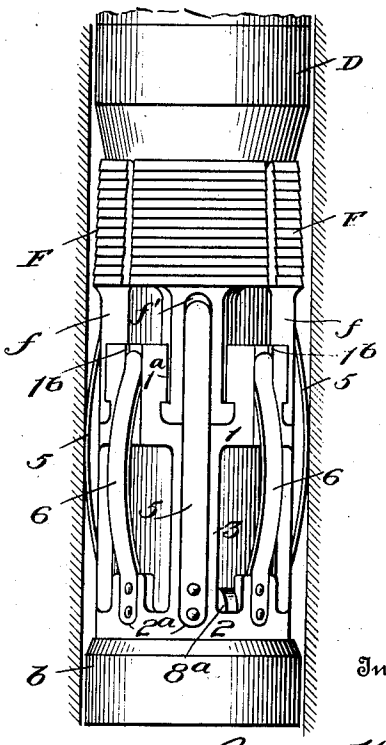
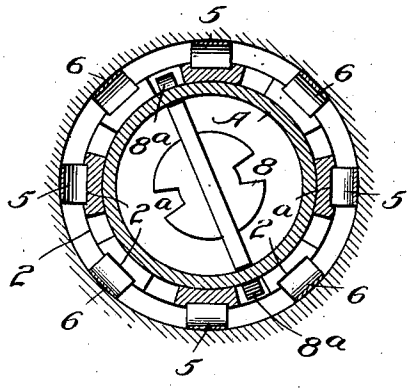


Fig. 5.



Witnesses

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UNITED STATES PATENT OFFICE.

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OIL-WELL PACKER.

1,009,328. Specification of Letters Patent. **Patented Nov. 21, 1911.**

Application filed June 21, 1911. Serial No. 634,558.

To all whom it may concern:

Be it known that I, PATRICK H. MACK, a citizen of the United States, residing at Bradford, in the county of McKean and State of Pennsylvania, have invented certain new and useful Improvements in Oil-Well Packers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates generally to that class of devices commonly termed oil well packers used in conjunction with well tubing or casing for shutting off water from the lower levels of oil or Artesian wells.

It relates more especially to that class of packers wherein there is combined with the packer proper, which is usually a rubber cylinder so connected with the casing or tubing as to be compressed and expanded by the weight of the tubing or casing, an anchor or support for the packer, said anchor comprising slips, a conical sleeve or like means for expanding the slips, and means for maintaining the slips and expanding means out of engagement while lowering the packer into the desired position in the well or casing.

The disadvantages, and difficulties in the use of the packer, incident to the present construction of this class of well packers, resides in the inability to insure a sufficient collapse or retraction of the slips, when released by the expanding devices, to insure the avoidance of any obstructions in the well or casing which obstructions will interfere with the withdrawal of the packer from the well, or, as frequently happens, buckles the slips and folds them over thus impairing the further usefulness of the devices.

The object of the present invention is the provision of means which will insure a proper and effective collapse or retraction of the slips and obviate the difficulties and losses hereinbefore noted.

To this end the main feature of my invention embraces the combination of a slip-cage, slips loosely connected with the cage, means for expanding the slips, means for causing the collapse of the slips when the expanding means is withdrawn, said means operating on the slips above their loose or hinged connection with the slip-cage, and means for locking the cage and slips out of engagement with the expanding means.

A second feature of my invention embraces the combination of a slip-cage, slips loosely connected therewith, means for expanding the slips, springs acting on the slips above their loose or movable connection with the slip-cage, means for yieldingly supporting the slip-cage, and means for locking the slip-cage and slips out of operative engagement with the slip expanding means.

There are other, minor, features of invention involving particular combinations and elemental features of construction ancillary to the main features of invention, all of which will hereinafter more fully appear.

In the drawings chosen for the purpose of illustrating my invention, the scope whereof is pointed out in the claims, Figure 1 is a view in elevation of an oil well packer embodying my invention, the parts being shown in the positions they occupy when the devices are in condition to be lowered into the well, Fig. 2 is a central vertical section of the devices shown in Fig. 1, Fig. 3 is a central vertical section of the devices shown in Fig. 1 the parts being in the relative positions they occupy when the packer is expanded in the well or casing, Fig. 4 is a transverse section of the packer taken in the plane of the line 4—4, Fig. 1, Fig. 5 is a transverse section of the packer taken in the plane of the line 5—5, Fig. 1, Fig. 6 is a vertical central section of the lower portion of the packer taken in a plane at right angles to Fig. 2, Fig. 7 is a view in elevation of the slip-cage and slips, showing an instance in which the coiled spring shown in Fig. 1, and which yieldingly supports the cage, has been omitted.

Like symbols refer to like parts wherever they occur.

I will now proceed to describe my invention more fully so that others skilled in the art to which it appertains may apply the same.

In the drawings, A indicates the section of casing or tubing which carries the packer and *a* a collar or coupling thereon which rests on the packer proper and by transmitting to the packer the load of the tubing or

casing causes the compression and lateral expansion of the packer by means of which the packing of the well is effected.

C indicates the packer proper which is preferably in the form of a cylinder of rubber. Immediately below the packer C and in contact with the lower end thereof is a conical sleeve D movable on the tubing or casing A and with its tapered portion projecting downward between slips which it serves under certain conditions to expand.

Beneath the conical sleeve D, or expander for the slips, is a slip-cage E, which carries the slips F by loose connections, which while they allow of the slips tilting freely to and from the conical or taper sleeve D, cause the slips to move vertically with the cage E. This slip cage E is movable on the tube A and is preferably in the form of two rings 1 and 2, connected by vertical bars 3.

The upper ring 1 to which the slips F are loosely attached is provided with shouldered open slots 1^a for the reception of the reins *f* of the shouldered slips, the construction being such that the slip may have a tilting movement on the ring 1 to and from the conical sleeve D, but will move vertically with the cage E. The ring member 1 has also a series of depressed seats 1^b for the reception of the free ends of the auxiliary friction springs 6. The lower ring 2 of the slip-cage is provided with a series of depressions or seats 2^a in which the friction springs 5 and 6 are secured at one end, and the vertical bars 3 which connect the rings 1 and 2 of the cage are also recessed to form depressed seats 3^a for the friction springs.

F indicates the slips which, if desired, may be serrated as indicated on Fig. 1 of the drawings. These slips have dependent reins *f* shouldered at their lower end, or otherwise formed, whereby the slips may be loosely and tiltingly connected with and carried by the slip-cage. The general form of the slip reins *f* corresponds with the open slots 1^a of ring 1 in which they are to be inserted. On the outer surfaces of slips F and reins *f* are depressed seats *f'* for the friction springs 5. These depressed spring seats on the slip-cage and slips serve a very useful purpose in that they not only permit the friction springs 5 and 6 to close in to the diameter of the cage and slips where the diameter of the well or casing so requires, but they also prevent the springs from being forced off the slips and subjected to torsional strains when turning the packer and casing in the well.

The friction springs, which are preferably of semi-elliptic or bow form, are attached at one end to the lower ring of the slip-cage with their free ends bearing on either the cage or a slip, and have as their principal function the support of the cage in the well or casing until such time as the slips F become operative to anchor the conical sleeve D in the well or casing. Certain of these springs (6) have only said function, while others of said springs, namely, springs 5, have the additional function of exerting a constant yielding inward pressure on the movable or tilting slips F at points above the loose connection of the slips with ring 1 of the slip-cage, whereby the retraction or collapse of said slips is insured under all conditions of service, and the slips are thus protected against injury in drawing the packer from the well. The main friction springs 5 are generally sufficient to support the slip-cage in the desired position in the well until the slips F become operative, but in case of heavy packers a series of the supplemental or auxiliary friction springs 6 may be deemed desirable.

7 indicates a coiled spring which surrounds the section of casing or tube A to which the packer is attached, and said spring is interposed between the slip-cage E and a collar or coupling *b* on the tubing or casing A, and 8 indicates a lock member whereby the cage E may be locked down against the force of said spring 7 when it is desired to maintain the slips E out of engagement with the conical sleeve D or expanding element, and in an inoperative relation thereto, as when the packer is being inserted in the well. The lock 8, in the present instance, is shown as a disk in the interior of the tubing A having radially projecting arms 8^a which extend through slots *c* in the walls of tubing or casing A over the lower ring 2 of slip cage F, and the method of removing the lock and releasing the cage is the well known one of fracturing the disk 8 by means of a weight dropped into tubing or casing A. The primary function of spring 7 is, when released from the lock, to lift the slips into operative engagement with the conical sleeve D or slip expander, but in combination with the friction springs 5, and the slips loosely hinged or pivoted on the slip-cage or ring 1 as herein shown and described it has an additional function. The friction springs are confined by the casing or walls of the well, as the case may be, and act directly on the slips F, the upward pressure of spring 7 acting directly on the cage is measurably resisted by springs 5, and the direction of force is deflected so that an increased inward force is exerted on the slips F to insure their collapse and prevent injury to the slips in withdrawing the packer from the well.

In Fig. 7 of the drawings I have shown an instance in which the spring 7 has been omitted. While this construction is effective for my purposes for the reason that the friction springs 5 will support the cage E in the proper position in the well until such

time as the descent of the conical sleeve D brings the slips F into operative relation to said sleeve D or expander, yet I do not recommend the omission of spring 7 from the combination as there is necessarily a proportionate loss of power to control the slips when withdrawing the packer from a well.

The devices being constructed and combined substantially as hereinbefore pointed out, will operate as follows: The slip-cage E and slips F being locked down into the inoperative position by disk lock 8, 8ª, as shown in Figs. 1, 2 and 7 of the drawing, the friction springs 5 will yieldingly force the slips F inward, causing them to tilt or rock on their movable connection with the slip-cage. In this condition the packer is introduced into the well and lowered to the desired position, the friction springs 5 (and 6) engaging the walls of the well or casing, as the case may be, and being compressed thereby. When the packer reaches the desired position the lock 8, 8ª is broken by dropping a weight in tube or casing A to which the packer is attached, and this releases the cage E and slips F. If a spring (7) be present in the combination the cage will be forced up thereby until the slips F assume the initial operative position with relation to conical sleeve D, after which the descent of the conical sleeve D under the weight of the packer and tubing or casing will further expand the slips F and anchor the cage, conical sleeve and slips to the well walls, and the load of the tubing will compress and laterally expand the rubber packer cylinder C. If the coiled spring 7 has been omitted from the combination the slip-cage and slips F will, when the lock is broken and the cage released, be held in the desired position in the well by the friction springs 5 (and 6) until the descent of the tubing or casing A has carried the conical sleeve D down into operative relation to the slips, after which the continued downward movement of the tubing or casing will force the conical sleeve D between the slips F until the conical sleeve, slips and cage are anchored in the well, whereupon the load of the tubing or casing A bearing on rubber packing C will compress and expand the packing as hereinbefore set forth.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In an oil well packer, the combination of a slip-cage, slips loosely connected with the slip-cage, means for expanding the slips, means for causing the collapse of the slips when the expanding means is withdrawn, said means acting on the slips above their loose connection with the slip-cage, and means for locking the cage and slips out of operative engagement with the slip-expanding means.

2. In an oil well packer, the combination of a yieldingly supported slip-cage, slips loosely connected with the slip-cage, means for expanding the slips, means for causing the collapse of the slips when the expanding means is withdrawn said means acting on the slips above their loose connection with the slip cage, and means for locking the slip cage and slips out of operative engagement with the slip expanding means.

3. In an oil well packer, the combination of a slip-cage, slips loosely connected with the slip-cage, springs attached to the slip-cage and having their free ends in contact with the slips above the loose connection of the slips with the slip-cage, means for expanding the slips, and means for locking the slip-cage and slips out of operative engagement with the slip expanding means.

4. In an oil well packer, the combination of a slip-cage, slips loosely connected with the slip-cage, springs attached to the slip-cage and which bear on the slips above the loose or hinged connections of the slips with the slip-cage, means for expanding the slips, a spring for yieldingly supporting the slip-cage, and means for locking the slip-cage and slips out of operative engagement with the slip-expanding means.

In testimony whereof I affix my signature, in the presence of two subscribing witnesses.

PATRICK H. MACK.

Witnesses:
M. D. BALLAUF,
ARTHUR L. BRYANT.