No. 880,213. PATENTED FEB. 25, 1908.

C. M. HEETER.

PACKER FOR DEEP WELLS.

APPLICATION FILED JUNE 17, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

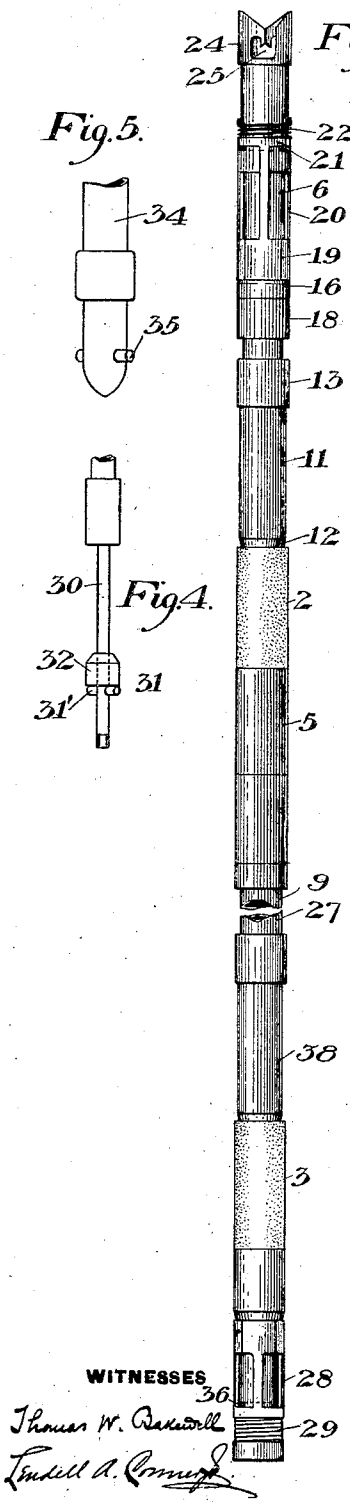


Fig. 5.

Fig. 4.

Fig. 3.

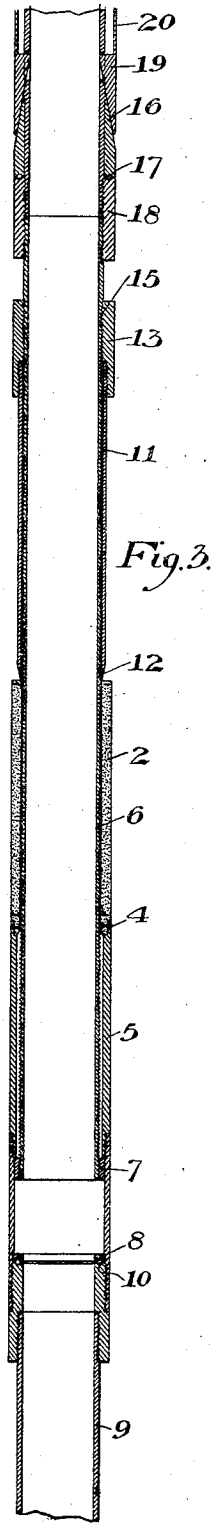
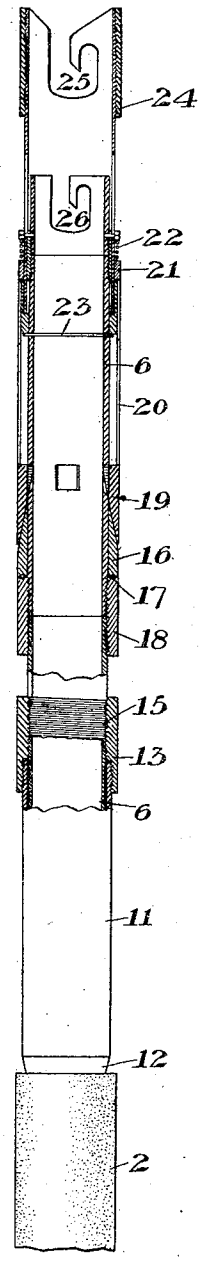


Fig. 2.



WITNESSES

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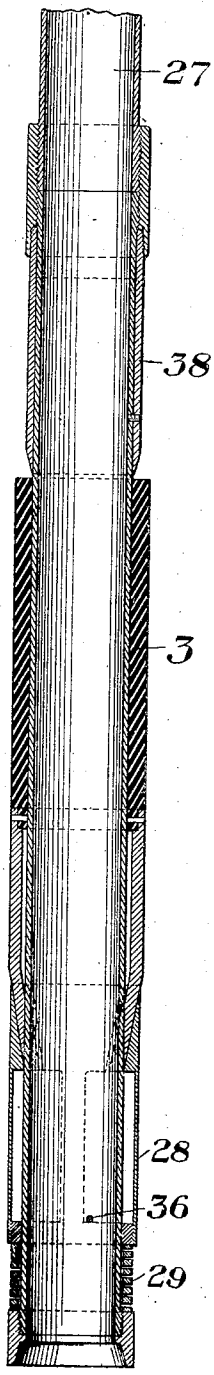
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2 SHEETS—SHEET 2.

Fig. 6.



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PACKER FOR DEEP WELLS.

No. 880,213. Specification of Letters Patent. Patented Feb. 25, 1908.

Application filed June 17, 1904. Serial No. 212,998.

To all whom it may concern:

Be it known that I, CHARLES M. HEETER, of Butler, Allegheny county, Pennsylvania, have invented a new and useful Packer for Deep Wells, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a side elevation of a packer embodying my invention; Fig. 2 is a partial section on a larger scale of the upper part of the packer shown in Fig. 1; Fig. 3 is a similar section of the packer showing in detail the parts for expanding the upper packing ring; Fig. 4 is an elevation of the tool which I employ for letting the packer into the well; and Fig. 5 is a view of the tool which I employ for pulling the packer out of the well. Fig. 6 is an enlarged detail sectional view showing the construction of the lower gravity packer.

In the construction of packers heretofore employed for shutting off seams of water, oil or gas at points above and below the seam by means of two packing rings connected together, arranged to dispense with a line of casing above the packer difficulty has been experienced in causing the two packing rings to hold. When in use such packers soon become defective and begin to leak and the result has been that they have been regarded as too inefficient for continued use, and have been generally abandoned.

My invention provides means by which these difficulties are for the first time overcome, and by which double wall-packers are rendered entirely successful. It also provides for the improvement of certain parts of the packer, applicable either to double packers above described or to packers of other forms and construction whether double or single. I will first describe the invention with reference to the double packer.

In the drawings, 2 is the upper packing ring of rubber or other flexible material, and 3 is the lower packing ring.

The packing ring 2 is secured by pins 4 or otherwise to a sleeve 5 and surrounds a tubular section 6 which constitutes the body of the packer and which is capable of moving telescopically up and down within the sleeve 5. It is limited in its upward motion by a shoulder 7 at its end which engages the lower end of the sleeve 5 when moved upwardly and at the other end engages and is limited by a ring 8 at the end of a section 9 of the packer-casing which preferably constitutes part of a ball-bearing 10, although this ball bearing may be omitted if desired.

Above the rubber ring 2 the body of the packer has an enlarged portion 11 with a conical lower end 12, the portion 11 terminating at the upper end in a shoulder 13, which may be integral therewith. The body 6 of the packer is capable of being screwed and thus moved longitudinally within the sleeve 13 by being provided with a screw-thread 15 which engages a screw-thread on the inside of the sleeve. Above the parts last mentioned is a holding-down device comprising a cone 16 which is preferably set on a ball-bearing 17 on top of a sleeve 18 which is fitted to the packer-body 6, and above this cone are wedges or slips 19 at the ends of flexible arms 20 carried by a ring 21 and adapted to be forced down by a spring 22 which is normally held back from acting by means of a frangible pin or disk 23. The ring 21 which carries the slips is itself connected loosely to a sliding section 24 having a bayonet slot 25 at its upper end for the purpose of drawing the packer from the well as explained below. The upper end of the body 6 of the packer has a similar bayonet slot 26 adapted to be engaged by a tool for lowering the packer into the well and operating the screw-mechanism described below.

3 is the lower rubber packer ring, which is separated from the packing ring 2 by a string of casing 27 of suitable length to span the seams of water, oil, or gas which are to be shut off. This lower packing ring has associated with it slips 28 provided with a spring 29 and a frangible pin or disk 36 as described above with reference to the slips 19, except that the slips 28 operate upwardly on their cone, while the upper slips operate downwardly on their cone. If desired, other means than the springs and frangible disks may be employed for setting the slips or anchoring devices, to afford resistance for setting and holding the packer, or the lower packer may be set on a shoulder.

In using my double packer, the tool 31 shown in Fig. 4 is engaged with the bayonet-slot 26 on top of the packer-body by fitting a pin 31′ of the tool in said slot, and for the purpose of preventing the pin from engaging the slot 25 I provide the tool with a loose guiding-sleeve 32. Having engaged the pin 31′ in the slot 26, I lower the double packer

to the place in the well where the lower packer 3 will be below and the upper packer 2 will be above the seam to be shut off. The tool 31 and its supporting casing or tubing being hollow, a weight is dropped through it upon the frangible pin or disk 23 which holds back the spring 22, and this spring being released thereby the slips 19 spring downwardly, engage their cone and jam against the side of the well, so as to afford a resistance to prevent upward movement of the packer. The weight is then dropped further and is caused to break the pin or disk 36 of the lower packer, the slips of which then are forced upwardly by their spring and jam against the sides of the well. The lower packer is then expanded against the sides of the well by the weight of the casing above which extends from the top of the packer, forcing the packer-body 6 down until its end engages the ball-bearing ring 8, this being the extent of the loose downward motion provided as above described the weight being transmitted through the sections 9 and 27 which add additional weight to assist in forcing the enlarged section 38 into the packing ring 3, the loose motion of the packer body 6 carries the conical end of the section 11 down into the rubber ring 2 and causes it to engage the rubber ring with sufficient friction to hold the section 11 stationary during the screwing operation about to be described. In order to expand the packer 2 against the side of the well, the operator then by means of the tool 31 engaged in the bayonet-slot 26 rotates the body of the packer 6, and causing it to screw within the sleeve 13, draws the sleeve 13 and section 11 downwardly, the sleeve 13 being held from rotation by frictional engagement of the section 11 with the rubber ring 2 which is secured to the sleeve 5. The sleeve 13 is thus moved downwardly until its lower end engages the end of the rubber 2, and thereupon the endwise compression on the rubber ring expands it and presses it out solidly against the wall of the well. The reaction thus exerted upon the body 6 of the packer tends to draw the ring 7 up from the ball-bearing ring 8, but its upward motion is checked by the down-holding action of the anchoring slips 19 which are firmly wedged against the side of the well and thus aid in the final expansion of the packing ring. Both packing rings 2 and 3 are thus held firmly in compression between the oppositely acting anchoring devices above and below, so that it is impossible for them to relax and leak. The holding power of the packing ring 3 is not diminished, but on the contrary is increased by the act of expanding the upper packing ring 2. The device is therefore very efficient in its packing action, and is reliable because the packing rings coact and aid each other, and the operation of one ring does not render the operation of the other uncertain as in the devices used heretofore.

The turning of the packer for the purpose of operating the screws and expanding the packing ring 2 is facilitated by the ball-bearings at the points 10 and 17.

Where it is desired to remove the packer from the well, the operator takes the tool 34, shown in Fig. 5, and having attached it to a string of tubing, lowers it into the well and engages the pin 35 thereon with the bayonet slot 25, and then draws upwardly. This has the effect of raising the sleeve 24 with the slips 19 and freeing the slips from engagement with the cone and with the side of the well, and further upward motion lifts the body of the packer 6 within the limits of the loose motion afforded by the slip-joint at 7, thus relieving somewhat the pressure on the packing ring; and by making the loose motion afforded at that place sufficiently long, the pressure on the packing ring may be relieved altogether. Further upward motion of the tool 34 will then relieve the lower packer 3 and the entire apparatus can be withdrawn from the well.

In addition to the novel features connected with the double packer 2 and 3, there are parts of the invention above described which are novel in themselves and can be used with packers of other form. Thus, for example, a packer with a screw-section adapted to be screwed down within the rubber packing-ring, in combination with the preliminary loose downward motion afforded by the slip-joint, is new; as is also the packer adapted to be expanded by screwing, and having such preliminary loose motion for the purpose of affording the friction by which one of the parts of the screw-device is held while the other is screwed within it, this action being aided by the securing of the rubber at 4 to the sleeve 5. I believe I am also the first to use a double packer or a screw packer in combination with a down-holding anchoring device at its upper end, by which a resistance is afforded, so that the reaction in the operation of screwing will compress the packing ring until it becomes perfectly solid against the side of the well. I am also the first to use a double packer, one packer of which is compressed by gravity and the other by screwing, whether anchoring devices be used or not, and whether the screw-device be constructed as shown in the drawings or otherwise constructed for example constructed in the manner of screw packers heretofore employed. I am also the first to employ a double packer of which a screw-packer forms part. While the double packer is well adapted to be used without casing extending to the top of the well, it can be used with such casing, in which case the upper anchoring device can be omitted, if desired, though it is better to retain it, because the efficiency of

the packer is increased thereby. In such case the casing could be connected with the slips of the upper anchoring device, so that the act of lifting the casing would be free and release the slips.

I believe I am the first to devise a packer having down-holding slips, and a lifting device connected with the slips, so that the act of lifting the packer will first free the slips.

By the term "slips" used in the claims I intend to include not only the wedging slips shown in the drawing, but any suitable anchoring device may be used.

If desired my screwing device may be applied not only to double packers, but to single packers, and especially to what is known as plug-packers which hold fluid or gas at the bottom of a well and have to resist strong upward pressure.

I claim:—

1. A double packer for deep wells having two connected packers, the lower packer being constructed for expansion by the weight of a superimposed casing and the upper one having an expanding device, substantially as described.

2. A double packer for deep wells, having upper and lower connected packers, a down-holding device above the upper packer; and means for releasing the down-holding device substantially as described.

3. A double packer for deep wells having two connected packers, the lower one being constructed for expansion by the weight of a superimposed casing, and the upper one having an expanding screw, substantially as described.

4. A double packer for deep wells having two connected packers, the lower one being a gravity packer and the upper having an expanding screw, and a down-holding device above the upper packer; substantially as described.

5. A double packer for deep wells having two connected packers, one a gravity packer, and the other having an expanding screw, and anchoring devices above the upper packer and below the lower packer; substantially as described.

6. A double packer for deep wells having two connected packers, one a gravity packer and the other having an expanding screw, and down-holding slips above the upper packer; substantially as described.

7. A packer having an expansible ring, an expanding screw, a sliding section affording loose motion, and having an expanding portion adapted to enter the ring and afford a frictional resistance for operating the screw; substantially as described.

8. A packer having an expansible ring, an expanding screw, and means for holding part of the packer by frictional engagement with the ring while the other part is screwed; substantially as described.

9. A packer having an expanding screw, downholding slips and cone, said slips having means for attachment to a lifting device whereby the slips are freed from the cone when the packer is lifted; substantially as described.

10. A packer having an expanding screw, downholding slips and cone, said slips having means for attachment to a lifting device whereby the slips are freed from the cone when the packer is lifted, and the screw having means for engagement with a turning-tool; substantially as described.

11. A packer having an expanding screw, downholding slips and cone, said slips having means for detachable engagement with a lifting device whereby the slips are freed from the cone when the packer is lifted; substantially as described.

12. A packer having an expanding screw, downholding slips and cone, and a part connected with the slips and adapted to be raised by the lifting device and hold the slips from the cone when the packer is lifted, and a second part on the packer adapted to be grasped detachably to operate the screw; substantially as described.

13. A packer having a rotative sliding body-section, and another section having an expansible ring attached to it, said sliding section having loose motion and carrying a threaded section adapted to engage the expansible ring frictionally; substantially as described.

14. A packer having an expansible ring 2, a ring-holding sleeve 5, a body-portion 6 having a slip-joint 7 and provided with an external enlargement and a threaded sleeve engaging the body portion; substantially as described.

15. A double packer, the upper packer being provided with a rotative threaded section and having bearings at its ends; substantially as described.

16. A double packer, the upper packer being provided with a rotative threaded section and having anti-frictional bearings at its ends; substantially as described.

17. A double packer for deep wells, having two connected packers, a down-holding device above the upper packer, means whereby the body of the packer may be lifted, and other means whereby the down-holding device may be lifted; substantially as described.

18. A packer having an expanding screw, and oppositely acting slips above and below the same, between which the compression is exerted by the screw; substantially as described.

19. A double packer, having slips above the upper packer and below the lower packer, said slips wedging respectively in opposite directions; substantially as described.

20. A double packer, having slips above the upper packer and below the lower packer,

said slips wedging respectively in opposite directions, one of said packers having an expanding screw; substantially as described.

21. A packer having an expanding screw, and an anchoring device above the same; substantially as described.

22. A well packer having upper and lower packer elements, the lower element being constructed for expansion by the weight of a superimposed casing, and the upper element being mechanically expanded, substantially as described.

23. A well packer having upper and lower packer elements, normally inactive down-holding means, the upper packer element capable of being slid downwardly to expand the lower packer element when the down-holding means is active, and mechanical means for expanding the upper packer element, substantially as described.

24. A packer having down-holding slips above the packer, and means for effecting a downward increasing pressure on the packer and an upward increasing pressure against the slips, substantially as described.

25. A well packer comprising an upper mechanically expansible packer, a lower packer, anchoring means below the lower packer, the lower packer capable of being set by the weight of the superimposed casing when the anchoring means is set and is supporting the superimposed casing, and means for setting the upper packer after the setting of the lower packer without forcing said upper packer downward, substantially as described.

In testimony whereof, I have hereunto set my hand.

C. M. HEETER.

Witnesses:
THOMAS W. BAKEWELL,
H. M. CORWIN.