

May 22, 1928.

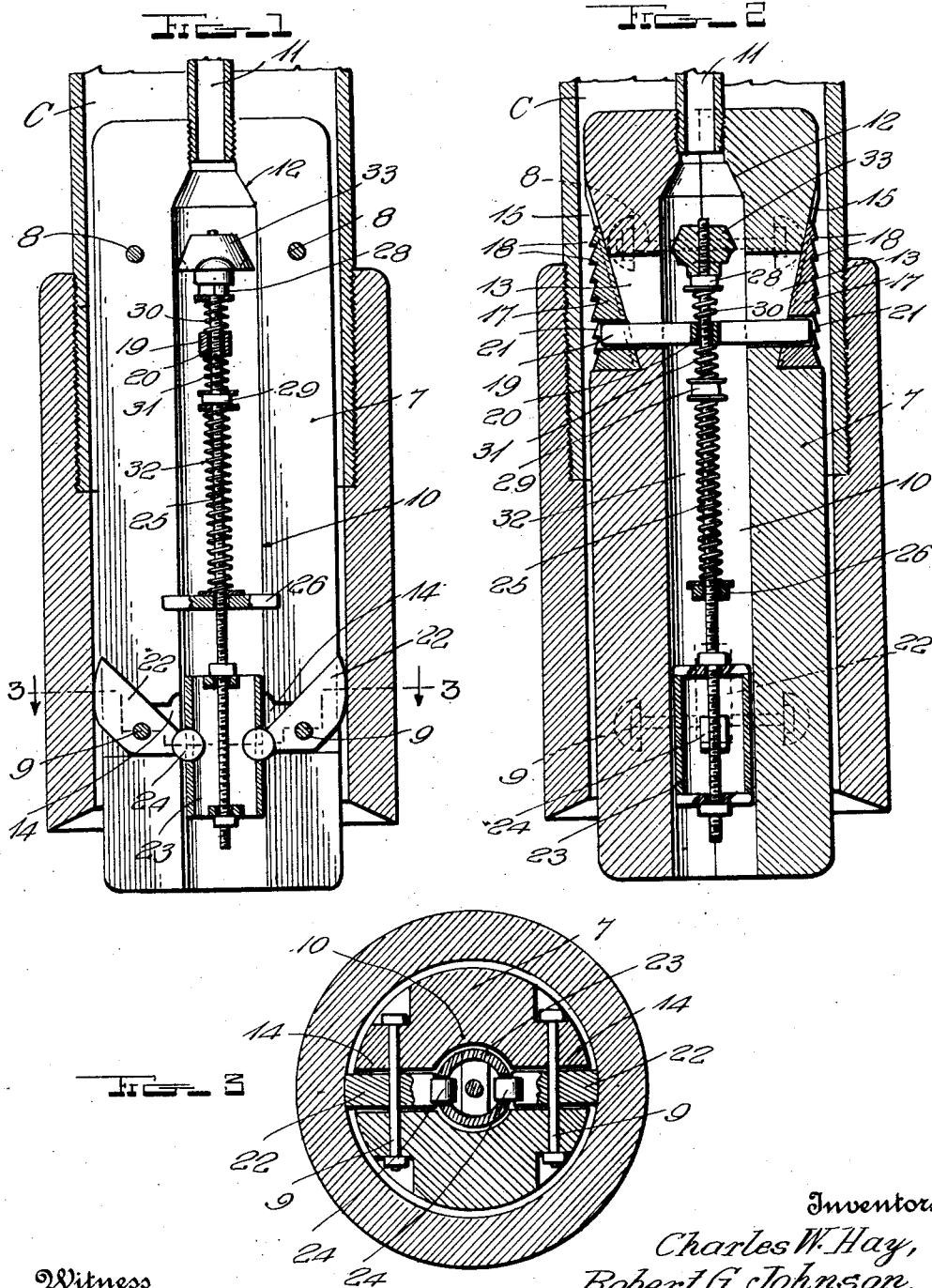
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C. W. HAY ET AL

HEAVING PLUG

Filed May 12, 1927

2 Sheets-Sheet 1



Witness

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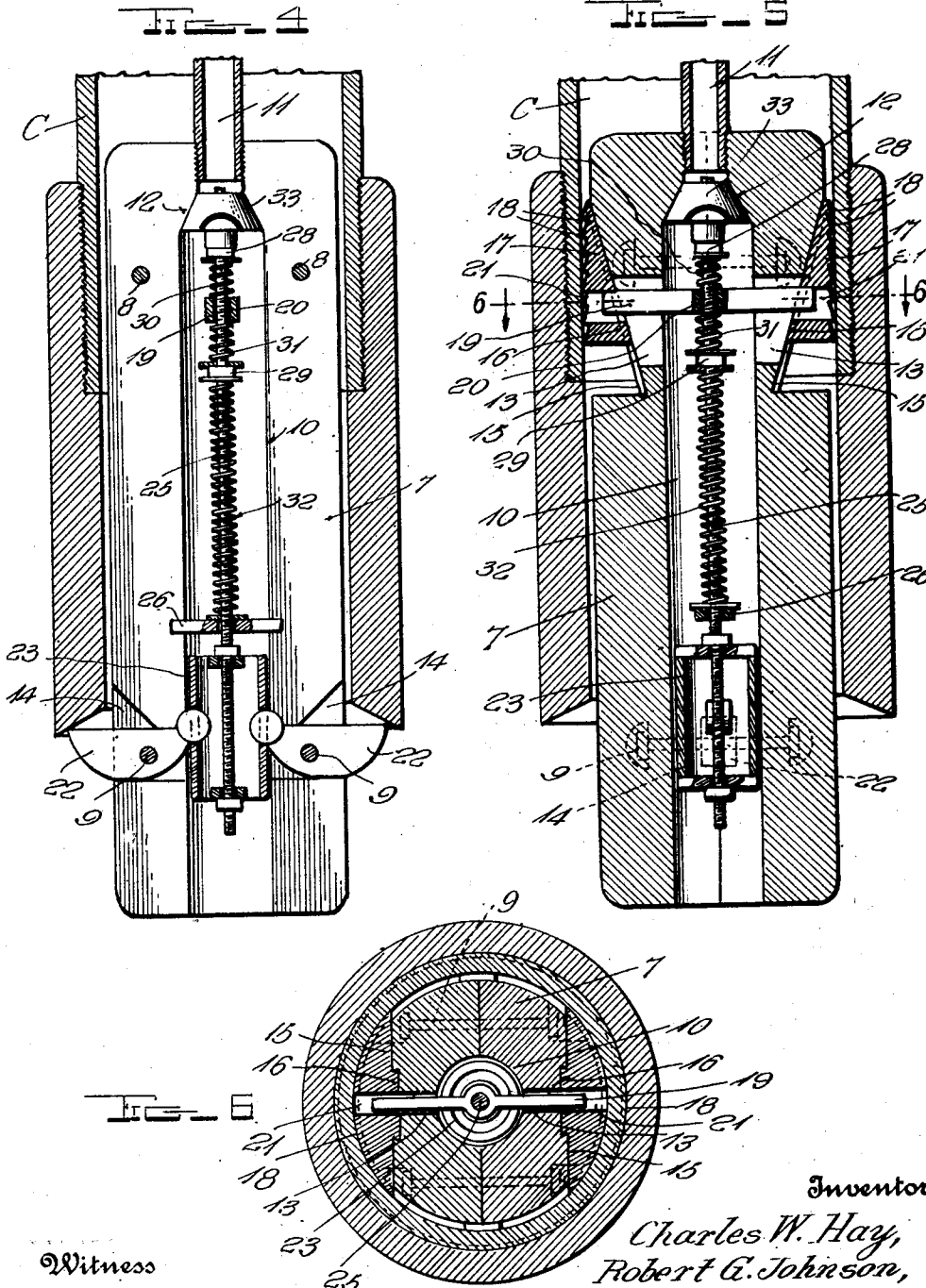
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UNITED STATES PATENT OFFICE.

CHARLES W. HAY AND ROBERT GUY JOHNSON, OF COALINGA, CALIFORNIA.

HEAVING PLUG.

Application filed May 12, 1927. Serial No. 190,929.

The invention relates to plugs for the lower ends of well casings, commonly known as heaving plugs. The use of such plugs is well known, for the purpose of preventing sand, shale and the like from being upwardly forced by gas pressure or otherwise, into the casing, but difficulty has heretofore been encountered in properly holding the heaving plug in the position at which it is initially set.

It is one object of our invention to provide a new and generally improved construction in which novel provision is made for positively holding the plug against further descent when it reaches the lower end of the well casing and for at that time positively holding it against upward shifting.

To permit rapid and easy lowering of the plug in the well casing, it is formed with a longitudinal passage, and another aim of the invention is to provide novel valve means for closing this passage when the plug reaches its destination.

With the foregoing in view, the invention resides in the novel subject matter herein-after described and claimed, the description being supplemented by the accompanying drawings.

Figs. 1 and 2 are vertical sectional views at right angles to each other, illustrating the relation of parts which obtains when the plug is being lowered in the casing.

Fig. 3 is a horizontal sectional view on line 3—3 of Fig. 1.

Figs. 4 and 5 are views similar to Figs. 1 and 2 but illustrating the relation of parts which takes place when the plug has reached the lower end of the well casing.

Fig. 6 is a horizontal sectional view on line 6—6 of Fig. 5.

In the drawings above briefly described, the preferred form of construction has been illustrated and while this construction will be specifically described, it is to be understood that within the scope of the invention as claimed, numerous variations may be made.

The numeral 7 designates a vertically elongated, cylindrical body which is preferably formed of two sections secured together by upper and lower bolts 8 and 9. This body is formed with a central, longitudinal bore 10 preferably having its upper end threaded for engagement with a suitable member 11 forming part of the means

for lowering the plug into the well casing C. Near said upper end of the bore 10, a downwardly facing valve seat 12 is provided. Below this valve seat, opposed slots 13 extend from the bore 10 to the periphery of the body 7 and other slots 14 extend from said bore to said periphery, near the lower end of the body. At the outer end of the slots 13, the body 7 is provided with inwardly declined faces 15 having dove-tail connections 16 with vertically slidable slips 17, said slips having teeth 18 to grip the casing C and support the body 7, when said body has reached the lower end of said casing. A cross arm 19 passes through the slots 13 and is provided at its center with an opening 20 for a purpose to appear, the outer ends of said cross arm being connected with the slips 17, preferably by inserting them in slots 21 in said slips.

Two dogs 22 are pivoted between their ends upon the bolts 9 and are located in the slots 14, which slots are of such shape that the dogs may swing upwardly and inwardly as shown in Fig. 1 to permit downward travel of the body 7 in the casing C, or may swing downwardly and outwardly to the positions shown in Fig. 4 when they clear the lower end of the well casing. In their last named positions, the dogs 22 rest solidly upon the lower ends of the slots 14 and are hence held against further downward movement. These dogs then about the lower end of the casing C and consequently they serve to effectively prevent upward forcing of the body 7 within the casing. Provision is made, whereby the dogs 22 hold the slips 17 retracted as long as said dogs are in the position shown in Fig. 1, and whereby when said dogs clear the lower end of the casing, the slips may come into play to engage said casing. Thus, the slips will hold the body 7 against further descent and the dogs will hold it against ascent from its proper position.

A tubular slide 23 is mounted in the lower portion of the bore 10 and has appropriate pivotal connections 24 with the inner ends of the dogs 22. A vertical rod 25 is suitably secured to this slide and rises therefrom through the opening 20 and through a similar opening in a transverse bar 26 which is fixed across the bore 10. Above and below the cross arm 19, the rod 25 is provided with nuts 28 and 29 respectively, and coil springs 30—31 are interposed between these nuts and

said cross arm, establishing a connection between said cross arm and the rod 25. Another coiled, compression spring 32 surrounds the rod 25 between the bar 26 and the nut 29, this spring being held compressed when the dogs 22 are in the positions shown in Fig. 1. Thus, as soon as these dogs clear the lower end of the casing C, and are consequently free to swing outwardly and downwardly, the spring 32 comes into play to effect such swinging by upward sliding of the rod 25 and the slide 23. This upward movement of the rod also causes the nut 29 and spring 31 to upwardly force upon the cross arm 19, thus upwardly sliding the slips 17 along the faces 15 and causing engagement of their teeth 18 with the casing.

The rod 25 extends somewhat above the nut 28 and carries a valve 33 for co-action with the seat 12. This valve remains open as long as the rod 25 is lowered and hence while the heaving plug is being lowered into the well casing, the liquid in the latter may readily flow upwardly through the bore 10. However, when the dogs 22 are projected, the valve 33 automatically closes. If, at the time the valve 33 contacts with the seat 12, the slips 18 have not moved upwardly to the maximum, the upper spring 30 will compress somewhat and permit further upward movement of said slips and the arm 19. Similarly, if by the time the slips 17 contact with the casing, the valve 33 has not entirely closed, the lower spring 31 will compress somewhat and permit further upward movement of the rod 25 and said valve 33, to effect tight closing of the latter.

From the foregoing, taken in connection with the accompanying drawings, it will be seen that although the invention is rather simple and inexpensive, it will be efficient and unusually desirable, as it is positively held both against dropping out of the well casing or being forced upwardly in the latter. As above stated, variations may be made within the scope of the invention as claimed, although the embodiment herein illustrated may be considered as preferred.

We claim:

1. In a heaving plug, normally retracted, self-projecting means movably mounted on the plug for holding the latter against further descent when lowered to the end of a well casing, and casing engaging means for holding said self-projecting means against projection until said casing engaging means clears the casing.

2. In a heaving plug, casing-controlled means for holding the plug against further descent when lowered to the lower end of a well casing, and casing-controlled means for holding the plug against upward shifting when lowered to said lower end of the casing, each of said means embodying a casing engaging member, the casing engaging mem-

ber of the last-mentioned casing-controlled means holding the casing-engaging member of the first mentioned casing-controlled means against action until said casing-engaging member of the last mentioned casing controlled means clears the lower end of the casing.

3. A heaving plug comprising a body, a projectable casing gripper carried thereby, a dog movably mounted on the body below said gripper and adapted to be held retracted by a well casing until it clears the lower end of said casing, operating connections between the dog and the casing gripper for holding the latter retracted until said dog clears the lower end of the well casing, and spring means for then moving said gripper, said dog and said operating connections to engage the gripper with the casing and to project the dog under said casing, thereby holding the plug against movement in either direction.

4. A structure as specified in claim 3; together with a passage through the body, and valve means controlled by said operating connections for closing said passage when said dog is projected.

5. A structure as specified in claim 3; together with a passage through the body, and valve means controlled by said operating connections for closing said passage when said dog is projected, said operating connections embodying elastic means permitting change of relation between the valve and the casing gripper and hence permitting closing of the valve regardless of the extent to which the gripper is projected.

6. A heaving plug comprising a body having a bore and upper and lower slots from said bore to its periphery, said body being formed with an inwardly declined face at the outer end of its upper slot, a toothed slip engaging said face, an arm passing through said upper slot and connected with said slip, a dog pivoted between its ends in said lower slot, a vertically movable rod in the aforesaid bore pivotally connected with the inner end of said dog and connected also with said arm, whereby upward and inward swinging of said dog will lower and retract said slip, and spring means acting on said rod in a direction tending to outwardly and downwardly swing the dog and raise said slip.

7. A structure as specified in claim 6; together with a valve seat at the upper end of said bore and a valve co-operable with said seat, said rod extending above said arm, having an elastic connection therewith and carrying said valve.

In testimony whereof we have hereunto affixed our signatures.

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