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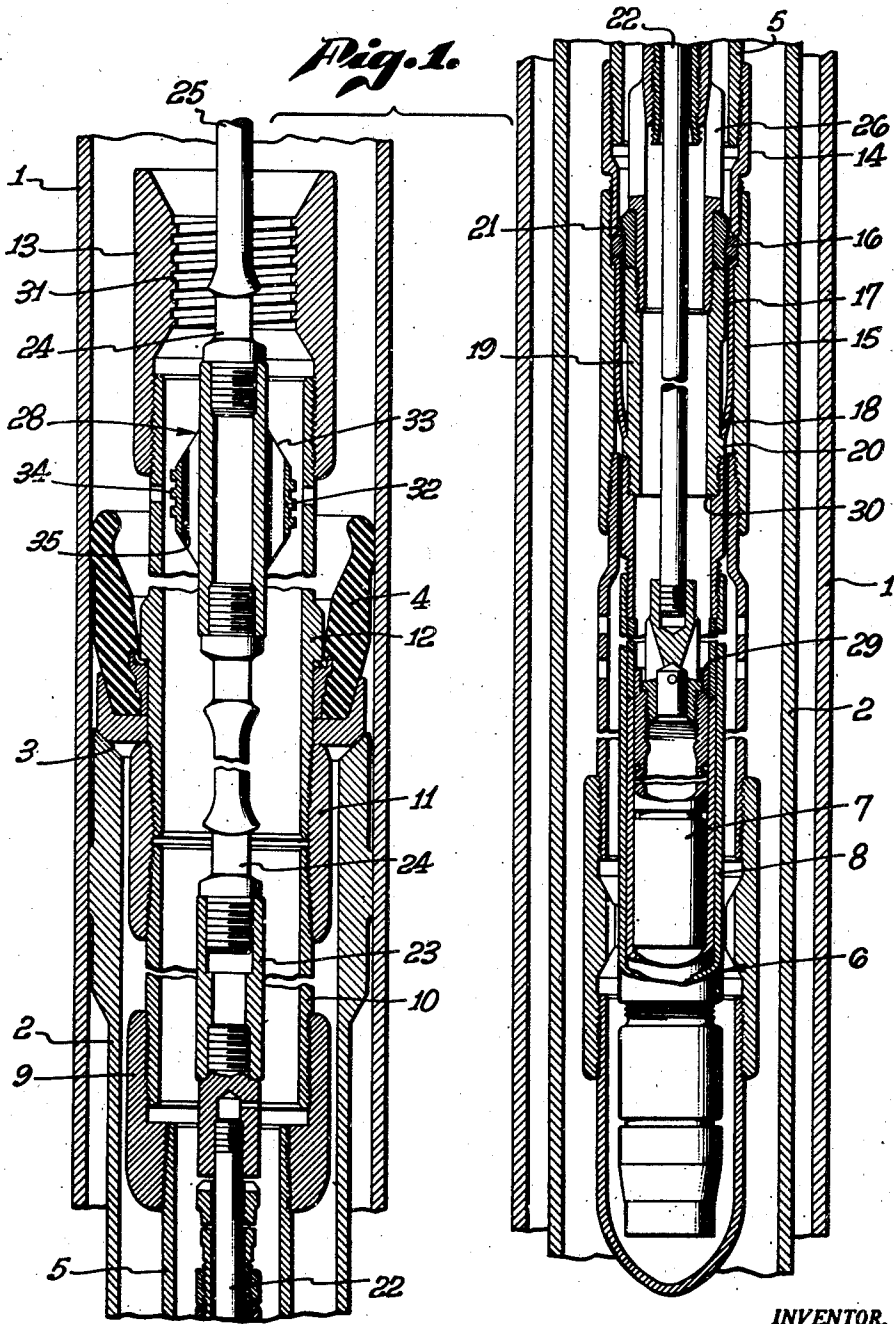
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2,414,254

PULL-OUT DEVICE FOR DEEP WELL PUMPS

Filed July 10, 1945

3 Sheets-Sheet 1



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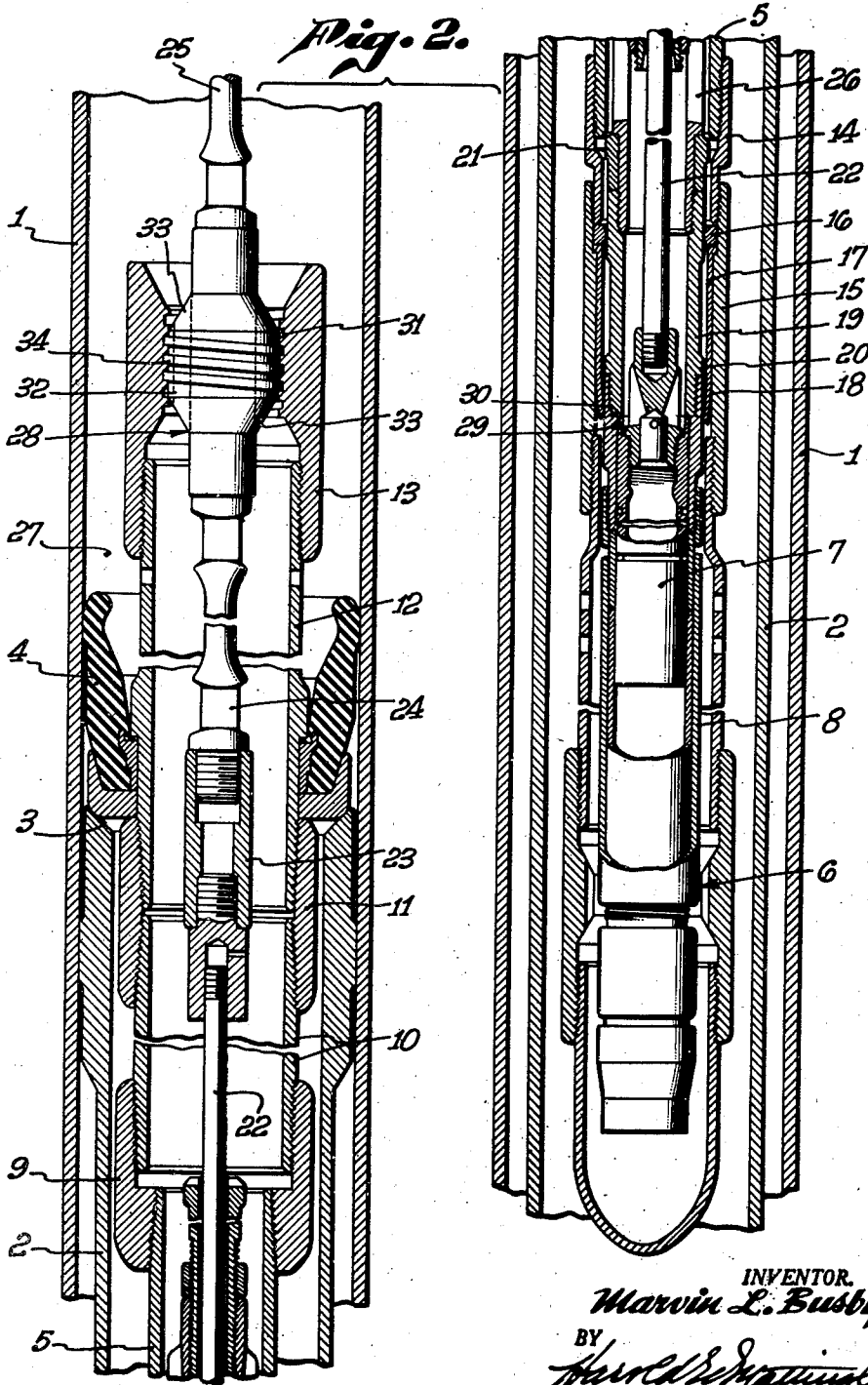
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3 Sheets-Sheet 2



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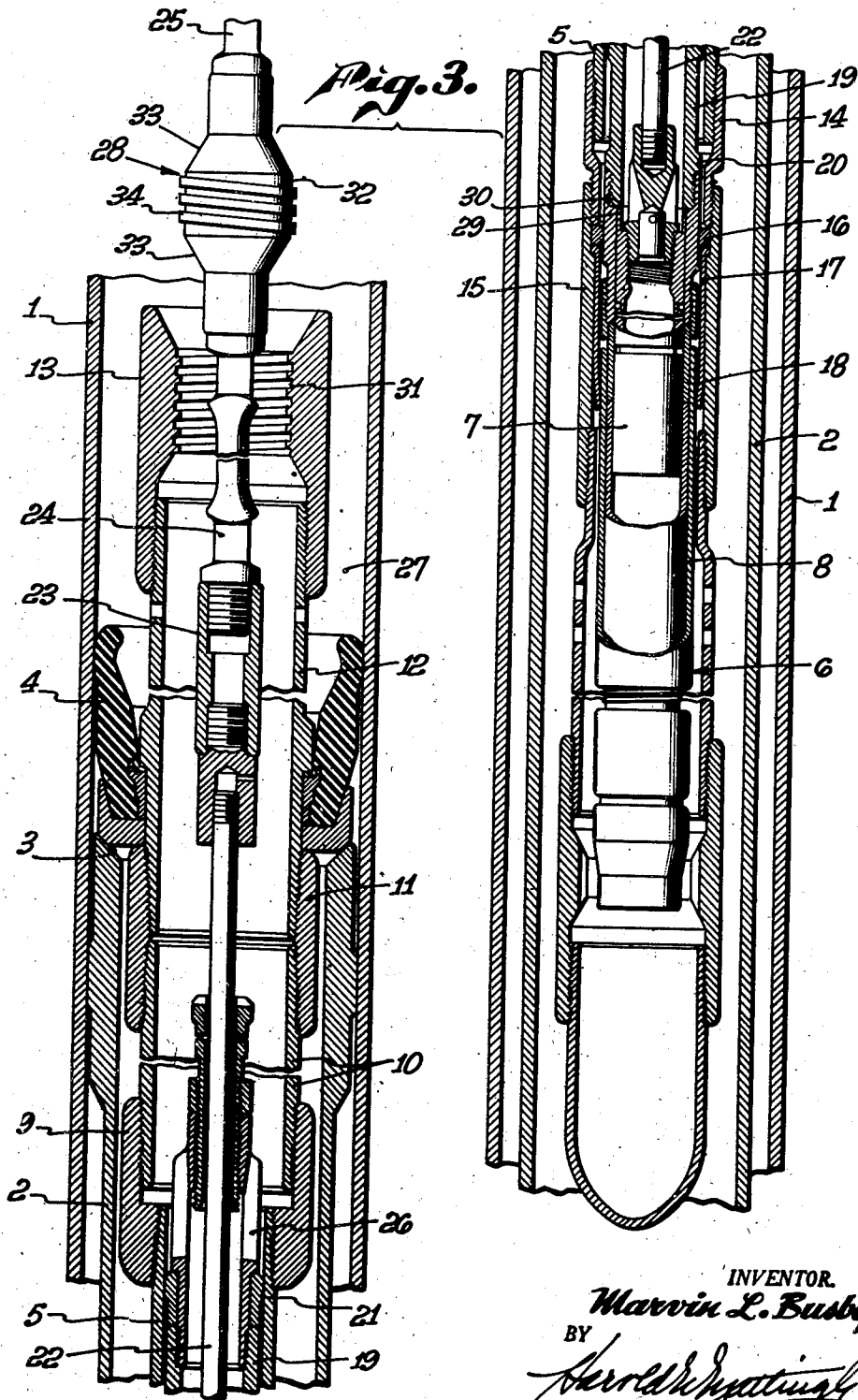
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PULL-OUT DEVICE FOR DEEP WELL PUMPS

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3 Claims. (Cl. 103—181)

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My invention relates to pull-out devices for use with oil well pumps and has particular reference to a pull-out device which is adapted to be included as a permanent part of a casing pump assembly to permit the selective pulling of the pump or both the pump and the tubing within which the pump is located.

In deep well pumps, particularly casing pumps wherein the pump is disposed adjacent the oil bearing formations within a relatively short section of tubing packed off against the interior of the well casing, it has heretofore been the practice to elevate the sucker rod string which supports the pump plunger when it is desired to withdraw the pump and then by a second operation a pulling device is lowered into the well to engage the packed off tubing when it is desired to remove the tubing. Such operation is necessarily laborious and time-consuming due to the fact that it is necessary to raise the entire sucker rod string, disconnecting the sucker rod sections as they are brought to the ground surface and then to reconnect the sucker rod strings and lower them into the well for the second portion of the operation.

It is therefore an object of my invention to provide a pull-out device which may be employed as a permanent part of the pump and tubing assembly and which may be operated selectively to either permit the elevation of the sucker rod string to pull only the pump assembly from the tube or to interengage the sucker rod string with the tubing so that the entire tubing and pump assembly may be elevated to the ground surface in a single operation.

Other objects and advantages of my invention will be apparent from a study of the following specifications, read in connection with the accompanying drawings, wherein

Fig. 1 comprises a vertical sectional view of a portion of the casing of an oil well and the tubing and pump assembly located therein, the position of the parts being shown as they appear during the normal pumping operations;

Fig. 2 is a view similar to Fig. 1 but illustrating the position of the parts when it is desired to withdraw both pump assembly and the tubing from the well; and

Fig. 3 is a view similar to Figs. 1 and 2 but illustrating the position of the parts when it is desired only to draw the pump assembly from the well.

Referring to the drawings, I have illustrated in Fig. 1 a portion of the casing 1 of an oil well extending adjacent the oil producing forma-

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tion and within which is located a perforated liner 2, the upper end of which is formed with a seat 3 upon which is adapted to rest a packer 4 secured to a section of tubing 5 within which a pump assembly 6 is located, the pump assembly comprising a plunger 7 adapted to reciprocate within a pump barrel 8.

The tubing 5 is illustrated as being connected to the packer by means of a coupling 9 threadedly secured to the upper end of the tubing 5 and to which in turn is connected a short length of pipe 10 connected by means of a coupling 11 with a tubular head 12, upon the upper end of which is secured a pull-out shoe 13 comprising the stationary coupling element of my pull-out device.

Secured to the lower end of the tubing 5 is a collar 14, to which in turn is secured a hold-down shoe 15 having associated therewith an annular seat 16 and an elongated sleeve 17, the lower end of which is split to form a plurality of spring fingers 18 projecting into the interior of the chamber formed by the shoe 15.

As a part of the pump barrel assembly there is a sleeve 19 which is provided with a radial enlargement 20 adapted to be disposed immediately below the ends of the spring fingers 18 at a time when a seating ring 21 associated with the pump barrel seats upon the annular seat 16. The assembly of the shoe 15, seat 16, sleeve 17, sleeve 19 and seating ring 21 comprises a releasable lock or hold-down by which the pump barrel is removably held in place within the tube 5.

The plunger 7 of the pump is connected by means of a rod 22 and couplings 23 to the lowermost section 24 of a string of sucker rods 25 which extends up to the ground surface for connection to the power mechanism employed to reciprocate the plunger 7 within the barrel 8 during the normal pumping operations.

By referring particularly to Fig. 1, it will be observed that when the various parts are in the position shown therein, reciprocation of the sucker rod string 25 will cause the plunger 7 to move up and down within the barrel 8 to cause the pump to elevate oil from below the plunger 7 to a position above the plunger where it may escape through a cage 26 into the interior of the tube 5 and thence upwardly through the tube 5 to the upper chamber 27 in the casing 1, and thence upwardly through the casing to the ground surface without the necessity of employing additional tubing extending between the pump barrel and the ground surface.

It will also be noted that interposed in the

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sucker rod string between the section 24 and the upper portion of the sucker rod string 25 is a pull-out coupling 28 comprising the movable element of my pull-out device, the location of the coupling 28 in the sucker rod string when the pump plunger is in its normal pumping positions within the pump barrel being such that the extent of movement of the sucker rod string 25 required for the pumping stroke will always dispose the coupling 28 below the pull-out shoe 13.

However, when it is desired to withdraw either the pump assembly or both the pump assembly and the tubing 5, elevation of the sucker rod string 25 through a greater distance than during the normal pumping stroke will engage the coupling member 28 with the pull-out shoe 13, either just prior to or immediately after the upper end 29 of the pump plunger engages an inwardly directed shoulder 30 on the pump barrel assembly.

As illustrated, the pull-out shoe 13 is provided with a longitudinal bore of such diameter as will permit the pump assembly, i. e., pump plunger and barrel, to pass therethrough, the interior of the bore being provided with threads 31 as indicated in Fig. 1.

The pull-out coupling 28 is formed as an elongated tubular member having an enlarged portion 32 disposed approximately centrally along its length, the ends of the enlarged portion 32 being tapered as indicated at 33 while the greatest diameter of the enlarged portion 32 is provided with threads 34 adapted to interengage the threads 31 on the pull-out shoe when the coupling 28 has been elevated into a position to bring the uppermost threads on the coupling 28 into engagement with the lowermost threads on the pull-out shoe 31. Since the enlarged diameter portion 32 of the shoe 28 reduces the effective open area within the head 12 through which oil may pass, a plurality of longitudinal bores 35 may be formed through the coupling 28 to increase the effective area of the passage past the coupling 28.

Thus when it is desired to pull out both the pump assembly and the tubing 5, all that is required is to elevate the sucker rod string until the threads of the pull-out coupling 28 abut the threads of the pull-out shoe 13, whereupon further elevation of the sucker rod string will lift both the pump and the tubing. If desired, a rotary movement may be imparted to the sucker rod string which would result in the threading of the pull-out coupling into the threads of the pull-out shoe as shown in Fig. 2 and thus the load of the shoe and tubing may be more evenly distributed along the threads of the coupling.

On the other hand, if it is desired only to pull out the pump assembly, a rotary movement imparted to the sucker rod string will cause the pull-out coupling 28 to be threaded entirely through the pull-out shoe 13 to dispose the coupling 28 above the shoe 13, as shown in Fig. 3, and thereafter any additional elevation of the sucker rod string will raise only the pump assembly, leaving the tubing and packer in place within the casing.

It will be apparent therefore that I have provided a pull-out device, one element of which may be interposed in the sucker rod string in such position as will not interfere with the normal reciprocation of the sucker rod string in the normal pumping operations but which may be selectively moved into a position of engagement with

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the pull-out shoe when it is desired to raise both the pump and the tubing or may be moved to a position above the shoe when it is desired to only pull the pump assembly.

While I have illustrated the interengageable elements between the pull-out shoe and the coupling as interengageable threads, it will be apparent to those skilled in this art that other forms of interengageable mechanisms may be used, the only essential being that the coupling member should have some portion projecting a sufficient distance radially as not to be permitted to pass through the shoe in a straight axial motion but must be manipulated through the same tortuous passageway formed in the pull-out shoe, at least a portion of the passageway extending in a substantially horizontal direction requiring a rotary motion to be given to the coupling in order to allow the projecting portions of the coupling to pass therethrough.

While I have shown and described the preferred embodiment of my invention, I do not desire to be limited to any of the details of description shown and described herein, except as defined in the appended claims.

I claim:

1. In a pull-out device for use with deep well pumping equipment including a tubing and a pump assembly removably secured in the tubing having a reciprocable pump plunger connected to the ground surface through a string of sucker rods: the combination of a tubular shoe on the tubing through which shoe and tubing the sucker rod string passes up from the pump assembly and disposed above the pump assembly and above the uppermost position of the pump plunger when the plunger is at the upper end of its working stroke, said shoe having an internal diameter sufficient to permit the passage of the pump assembly therethrough; a coupling member interposed in the sucker rod string to be normally disposed below said shoe when said plunger is at the uppermost position of its working stroke; and interengageable means on said shoe and coupling for selectively interengaging the shoe and coupling or for permitting the passage of the coupling through the shoe, whereby the pump assembly only can be removed from the well or both the pump assembly and the tubing may be removed from the well.

2. In a pull-out device for use with deep well pumping equipment including a tubing and a pump assembly removably secured in the tubing having a reciprocable pump plunger connected to the ground surface through a string of sucker rods: the combination of a shoe on said tubing through which shoe and tubing the sucker rod string passes up from the pump assembly and having a longitudinal bore of a diameter sufficient to permit the passage of the pump therethrough, said shoe being disposed on said tubing above the pump assembly and above the uppermost position of the plunger at the upper end of its working stroke; a coupling member disposed in said sucker rod string adjacent the plunger and below the shoe when the pump plunger is at the uppermost position of its working stroke; means on said coupling member projecting radially therefrom such a distance as will prevent the axial passage of the coupling through the shoe, and a tortuous passageway on the inner surface of said shoe through which said projecting means may pass, at least a portion of said passageway extending in a direction requiring relative rotary movement between said coupling

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and said shoe to pass the projecting means through the passageway, whereby the coupling may be selectively manipulated relative to the shoe to either pass through the shoe when the pump assembly only is to be removed from the well or to engage the shoe and remove both the pump assembly and tubing from the well.

3. In a pull-out device for use with deep well pumping equipment including a tubing and a pump assembly removably secured in the tubing having a reciprocable pump plunger connected to the ground surface through a string of sucker rods: the combination of a shoe on said tubing through which shoe and tubing the sucker rod string passes up from the pump assembly and having an internally threaded longitudinal bore of a diameter sufficient to permit the passage of

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the pump therethrough, said shoe being disposed on its tubing above the pump assembly and above the uppermost position of the plunger at the upper end of its working stroke; and a coupling member disposed in said sucker rod string adjacent the plunger and below said shoe when the plunger is at the uppermost position of its working stroke, said coupling member having external threads conforming with the threads on said shoe, whereby said coupling member may be threaded through said shoe when only the pump assembly is to be removed from the well or said coupling member may be engaged with the shoe when both the pump assembly and tubing are to be removed from the well.

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