April 25, 1939. R. N. BEAN 2,155,380

PACKER LOCK

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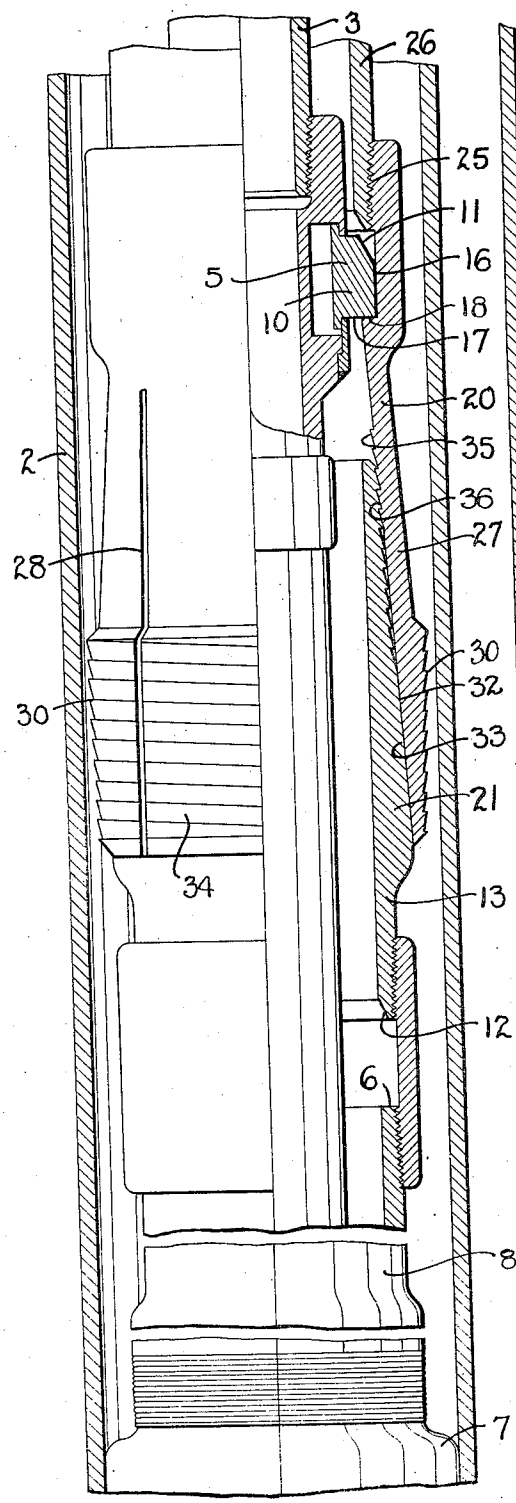


Fig. 1.

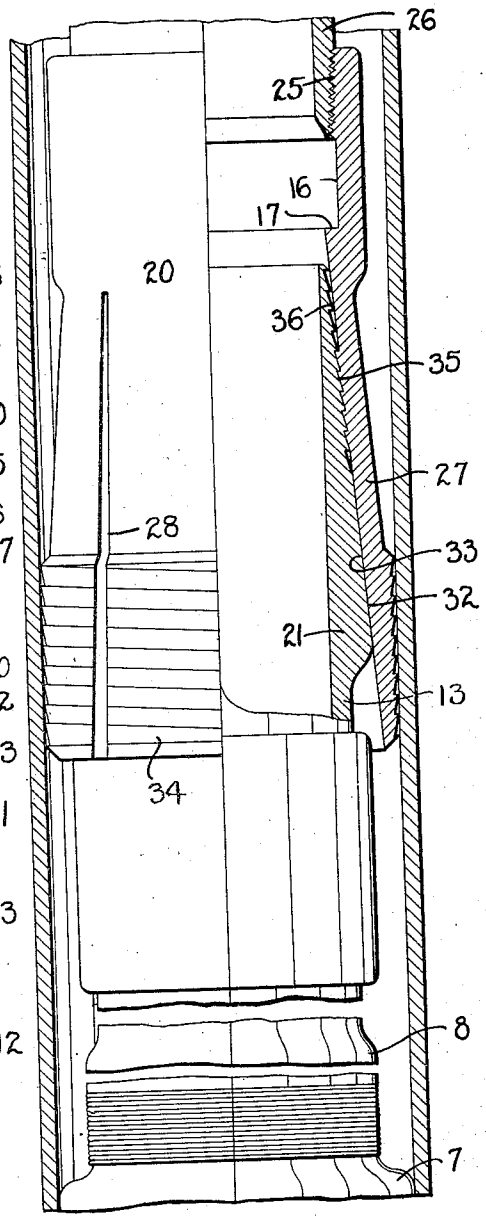


Fig. 2.

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PACKER LOCK

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9 Claims. (Cl. 166—12)

The invention relates to a packer lock which can be incorporated in the string of pipe in the form of a coupling so as to remain in an inoperative position when the packer and string of pipe is lowered into the well bore and to thereafter telescope in order to provide a locking arrangement to serve as a hold-down for the packer or other equipment in the well.

In the setting of strainers in wells and the arrangement of well bottom equipment, particularly where high pressures are encountered, it is desirable to hold down the equipment in the well to lock it into position so that it will not be displaced.

It is one of the objects of the invention to provide a hold-down apparatus for packers and well equipment which may be run into the well in an inoperative position and to thereafter be set so as to lock it in position.

Another object of the invention is to provide a hold-down apparatus for well equipment which can be set in position and released by rotation thereof.

Another object of the invention is to provide a hold-down device which may be thereafter connected to a fishing tool in order to release it from its locked position.

Another object of the invention is to provide a hold-down device for wells which will have ratchet threads both on the inside and the outside in order to effect release of the device.

Another object of the invention is to provide a hold-down device which may be set with the same setting tool that is used to set the well packer.

Other and further objects of the invention will be readily apparent when the following description is considered in connection with the accompanying drawing wherein:

Fig. 1 is a vertical sectional view of the apparatus being lowered into the well bore and illustrating the packer as having been set and with the setting tool in a position to set the hold-down slip.

Fig. 2 is a view similar to Fig. 1 but showing the hold-down in locked position.

In the equipping of wells it is the usual practice to provide in the well a pipe or casing 2 which may be of any desired size or length and which extends down to the vicinity of the producing formation. Below the lower end of this casing the hole is opened and it is usual to lower a well bore assembly into the well which usually comprises a set shoe, a strainer, liner and one or more packers. This arrangement is assembled together and lowered into the well by means of a setting or letting in string 3. This string is in the form of sections of pipe, the lower end of which is usually coupled to the setting shoe or the base of the strainer in order to lower the assembly into the well. The well is washed by circulating liquid downwardly through the string of pipe 3 and outwardly through the bottom well or said shoe until the well has been cleaned and is ready to be completed.

If a valve at the lower end of the assembly is to be closed this pipe 3 is usually manipulated for that purpose and then released from the strainer. Upward movement of this string of pipe 3 is then negotiated in order to bring the setting tool portion 5 thereof up to the elevation of the shoulder 6 above the packer 7. It is to be understood that one or more packers may be provided and that the drawing herein is merely illustrative because the hook-up for every well may be somewhat different, depending upon the conditions encountered. Above the packer 7 is a length of blank pipe 8 which may be in the form of an extension of the strainer which is below the packer. The upper end of this pipe 8 carries the shoulder 6 which is arranged to receive the segments 10 of the setting tool and as seen in Fig. 1 this setting tool has been raised from below the packer 7 up to the elevation of the shoulder 6 and then at least some of the weight of the string of pipe 3 is applied so as to force the segments 10 against the shoulder 6 in order to effect expansion of the packer 7 by telescoping the pipe 8 downwardly relative to the packer supporting portion. Various types of packers may be embodied and for the particular construction and arrangement of the packers, setting tool and well bottom assembly reference is made to the copending application of Leslie A. Layne, Serial No. 122,948, filed January 29, 1937, for a Packer and setting tool.

As described in the above mentioned application, after the packer has been set an upward pull on the pipe 3 will cause the segments 10 of the setting tool 5 to move inwardly so that the beveled surface 11 thereon will abut against the inclined surface 12 in the well bottom assembly.

In the present device, however, further upward movement of the string 3 will cause the segments to move inwardly so that the tool can then be moved upwardly inside of the hold down coupling 13. In this manner the setting tool 5 may be moved to the elevation shown in Fig. 1 where it will enter the recess 16 so that the lower edge 17 thereof will abut against the shoul-

der 18 in the upper end of the locking coupling 13. If pressure is again applied to the string 3 then a downward pressure will be exerted upon the head 20 of the locking or hold down coupling 13.

It will be particularly noted that the coupling 13 is made up of the head 20 and the base 21 which parts constitute the hold down device or apparatus. These two parts are telescopically arranged in such a manner that a pressure applied by the setting tool 5 will effect relative movement of the parts from the position shown in Fig. 1 to the position shown in Fig. 2 where they serve to hold the packer down against an upward force from below.

The head 20 is peculiarly formed in that it is threaded internally at 25 at its upper end in order to receive a section of pipe 26. Directly below these threads it is formed with a recess 16 and the skirt 27 is at the lower end of the head. This skirt is formed by providing a plurality of slits 28 in the body portion so as to make it resilient. The outside of this skirt is formed with a ratchet thread 30 which is arranged to engage the inside surface of the casing 2 and to bind into the surface in order to obtain a firm clamp thereon as seen in Fig. 2.

In order to expand this skirt the base 21 is in the form of an upwardly tapered mandrel which has an inclined face 32 thereon. This face is arranged to receive the inside face 33 of the skirt 27 so that the several fingers 34 which form the skirt will be expanded so as to contact the inside of the casing. It seems obvious that when pressure is applied to the setting tool 5 that the head 20 will be caused to telescope over the base portion 21 so as to expand and lock the device in position.

In order to hold the device in locked position the inside of the skirt 27 is formed with a ratchet thread 35 and the periphery of the mandrel or base 21 is also formed with a ratchet thread as at 36. The threads 35 and 36 cooperate together and will hold the head and the base in any relatively telescoped position.

It should be particularly noted that the ratchet threads 30, as well as the ratchet threads 35 and 36, can be so arranged that they will have either a right-hand or left-hand pitch so that the device can be released from its locked position by relative rotation of the head with respect to the base.

In operation it is merely necessary to release the setting string 3 from the base of the well bottom assembly to raise it so that the setting tool will engage and set the packer and then the next step is to again raise the setting tool and engage the locking or hold-down device so that it may be set in a manner to take the position shown in Fig. 2. The setting string may remain hung in this position and production had through this setting string 3, or if desired, the setting string may be removed and the usual string of tubing lowered into position.

It is to be distinctly understood that this hold-down arrangement broadly contemplates a device which can be set with the same setting tool which is used to set the packer and which may be released in any desired manner but which can be readily manipulated to hold down the entire well bottom assembly.

What is claimed is:

1. In a well bottom assembly for use with a packer, a setting string therefor, a setting tool on said string, a hold-down above said packer, said hold-down comprising a coupling having a head and a base, a skirt on said head, means on said packer to receive said setting tool, and additional means on said head to thereafter receive said setting tool to telescope said skirt over said base.

2. The combination for use with a packer, a hold-down, a shoulder on each said packer and said hold-down, and a setting tool to successively engage said shoulders to first set said packer and to then set said hold-down.

3. A pipe coupling including upper and lower portions, said lower portion having an upwardly and inwardly tapered mandrel, said upper portion having a skirt overlying said mandrel, and means including a string of pipe to apply pressure to said upper portion to telescope said skirt to expanded position over said mandrel.

4. A hold-down device for well packers comprising a tapered base, a flaring skirt thereabove to engage the casing, means to move said skirt along said base to hold-down position, and ratchet threads on said skirt and base to support the load of the packer and to thereafter lock said skirt in hold-down position.

5. The combination for use with a packer to be set, a packer lock to be set after the packer, a single setting tool for both said packer and said lock, and means on said tool to engage and set said packer and to release therefrom and to thereafter engage and set said packer lock.

6. A hold-down for well bottom assemblies comprising a coupling made up of a pair of telescoping members, inter-engaging parts thereon to normally prevent movement in one direction and support the load of the assembly, contacting tapered faces to expand one of said members upon relative movement, and means to apply a downward force to move one of said members.

7. A hold-down head comprising a body, a recess therein, an expansible skirt on said body, said recess being adapted to receive a setting tool to apply pressure in setting said skirt.

8. A hold-down head comprising a body, a recess therein, an expansible skirt on said body, said recess being adapted to receive a setting tool to set said skirt, and a base to expand said skirt.

9. A hold-down head comprising a body, a recess therein, an expansible skirt on said body, said recess being adapted to receive a setting tool, a base to expand said skirt, and latching means between said skirt and base to hold said skirt in expanded position.

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