

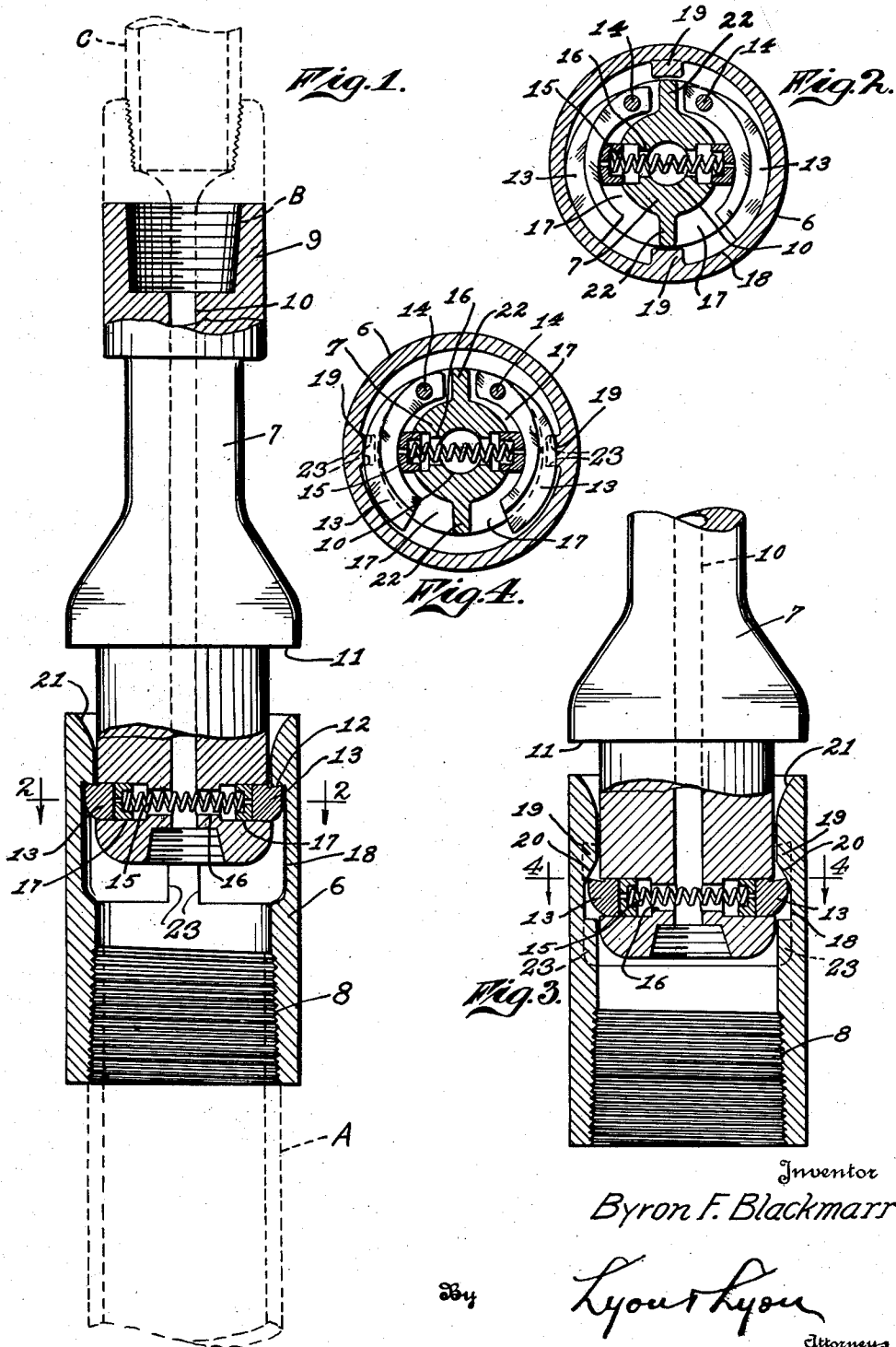
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LINER SETTER AND PULLER

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LINER SETTER AND PULLER

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This invention relates to devices of the type employed, for example, as a liner setter and adaptor or, as it is frequently termed hook-on and hook-off adaptor, as a safety joint for fishing tools, or as a bearing puller.

In the art relating to the drilling of oil wells, it is generally necessary to place a smaller string of casing inside of a larger string. For example, this is done in setting a perforated string or liner, as it is termed. Since it is unnecessary to extend the smaller casing to the top of the well, it is the usual practice to set the liner by lowering the same into position with a string of drill pipe. A means must be provided for releasably coupling the drill stem to the liner so that the liner can be lowered into and raised from the well. This invention is well adapted to thus releasably couple a string of casing to the drill stem in the manner mentioned.

It is an object of the present invention to provide a device of this character of comparatively simple construction and one that is reliable in its operation.

A very important object is to prevent accidental disengagement of the coupling members.

Another object is to insure that relative rotation between the coupling members, while lowering the casing into or raising it from the well, will not cause the coupling members to become disengaged.

Other objects and advantages will appear in the subjoined detailed description.

The accompanying drawings illustrate the invention:

Fig. 1 is a longitudinal view, mainly in mid section, of a liner setter and puller constructed in accordance with the provisions of this invention, fragments of a drill pipe or stem and of a liner or string of casing being indicated in broken lines as connected with the coupling.

Fig. 2 is a horizontal section on the line indicated by 2—2, Fig. 1.

Fig. 3 is a view similar to Fig. 1, with a portion of the mandrel broken away, and with the parts in different positions than in Fig. 1.

Fig. 4 is a horizontal section on the line indicated by 4—4 of Fig. 3.

Referring to the drawing, the liner setter and puller comprises a liner adaptor 6 and a mandrel 7 releasably connected with the adaptor. The adaptor is internally threaded at its lower end at 8 so as to adapt it for screwing on to the upper end of a member A that is to be pulled, such, for example, as a liner.

The upper end of the mandrel 7 is provided with a threaded box 9 so as to adapt it for receiving a threaded pin B on the lower end of a string of drill pipe, indicated at C which is employed in the operation of lowering the liner A into and raising said liner from a well. The mandrel 7 is provided with an axial bore 10 extending from end to end thereof so as to enable mud to be circulated through said mandrel, if that should be advisable or necessary.

The mandrel is provided with an external annular shoulder 11 and the adaptor is provided with an internal annular approximately horizontal shoulder 12. The distance from the shoulder 12 to the adjacent end of the adaptor is less than the distance from the shoulder 11 to a dog or dogs 13, which are adapted to project from the mandrel beneath the shoulder 12. Thus, when the dogs 13 are projected beneath the shoulders 12, relative axial movement within prescribed limits may take place between the adaptor and the mandrel without disengaging the dogs from the mandrel, provided the mandrel and adaptor are not turned to predetermined positions relative to each other.

The dogs 13 are crescent shaped and are pivoted at their adjacent ends by pins 14 to the mandrel. The dogs 13 are yieldingly held outwardly in their latching positions by a spring 15 which is accommodated in a spring chamber 16 that extends transversally through the mandrel, the opposite ends of said spring engaging the inner faces of the dogs 13.

The dogs 13 are partly accommodated at all times and are adapted to be wholly retracted within a circumferentially extending groove or recess 17 in the mandrel 7, said dogs being

in the unlatching positions when thus retracted.

To produce the shoulders 12, which, as shown, preferably extend slightly aslant inwardly and downwardly to obviate any tendency to the dogs becoming disengaged from the shoulders, the adaptor is provided with an enlarged bore portion 18. In order to retract the dogs 13 against the pressure of the spring 15, there are provided inward projections or lugs 19 on the inner face of the adaptor 6 within the bore portion 18. The projections 19 are positioned midway of the length of the bore portion 18 and are thus spaced from the shoulder 12 and the lower end of the bore 18, thus making it necessary, for effecting retraction of the dogs 13, that the mandrel and adaptor be relatively positioned to bring the dogs midway of the bore portion 18. The projections 19 terminate downwardly in outwardly and downwardly slanting cam faces 20, which function, when the mandrel is pulled upwardly, to gradually force the dogs 13 inwardly into the recesses 17 in the mandrel, in which position the dogs are unlatched, thereby enabling the dogs to pass the projections 19 so that the mandrel can be withdrawn from the well. The adaptor has an upwardly and outwardly tapered portion 21 which, when the mandrel is lowered into the well, functions to force the dogs inwardly so as to pass the projections 19, after which the dogs 13 are urged outwardly by the spring 15 so as to engage beneath the shoulder 12.

The mandrel, is preferably, provided in the recess 17 with oppositely positioned webs 22 which join the end walls of the recess 17 for strengthening purposes, said webs being positioned between the opposing dogs 13.

The foregoing will make clear the construction and operation of the invention and, briefly stated, the operation is as follows:

Assuming, for example, that the parts are in the positions illustrated in Fig. 1 and that the parts are being lowered into the well and assuming that the outer face of the adaptor is engaged by the wall of the hole in its descent, there may be a tendency for the adaptor to be turned by reason of its contact with the wall of the hole. The adaptor will freely turn, without any liability of the dogs 13 being disengaged therefrom. This will be true whether the shoulder 12 be engaged by the dogs 13 or the mandrel be forced downwardly in the adaptor until the dogs are positioned beneath the level of the projections 19, as would occur, for example, when the liner A strikes the bottom of the well.

It is preferable that the adaptor be provided with inwardly projecting vertically extending shoulders 23 below the level of the cam faces 20. The advantage of this construction is that, in the operation of setting the liner, if said liner should stick fast, the mandrel will descend in the bore of the adapt-

or 6 until the dogs 13 are positioned at the level of the shoulders 23. The operator will then cause the drill pipe to be rotated, thus turning the mandrel, causing engagement of the dogs with the shoulders 23 and, consequently, causing the adaptor to turn with the mandrel. It will be readily understood that the liner may thus be readily rotated in either direction, if it should tend to stick, without any liability of accidentally disconnecting the mandrel and adaptor.

Now, assuming that the liner has been set in position in the well, and that the shoulder 11 is resting on the end of the adaptor and that it is desired to disengage the mandrel from the adaptor, the drill pipe, to which the mandrel is secured, will be turned by the driller to cause the dogs 13 to be in vertical alignment with the cam faces 20, whereupon the driller will cause the drill pipe to be pulled upwardly, thereby causing the cam faces 20 to force the dogs 13 inwardly so as to retract said dogs and permit them to pass the projections 19.

To hook onto the adaptor, the driller will lower the drill pipe with the mandrel attached thereto and upon engagement of the dogs 13 with the tapered face 21, said dogs will be retracted so as to pass the projections 19, whereupon said dogs will snap outwardly into position beneath the shoulder 12. The driller now causes the drill pipe to be raised, thus pulling the adaptor out of the well together with the liner A secured to said adaptor.

I claim:

1. A liner setter and puller comprising a tubular member provided with an enlarged bore portion defining a shoulder, a mandrel adapted to enter the bore of the tubular member, a dog movably mounted in the mandrel, a means yieldingly holding the dog outwardly so as to engage said shoulder, and an inward projection in the enlarged bore portion of the tubular member adapted to be brought into engagement with the dog by relative movement between the tubular member and mandrel for retracting said dog.

2. A liner setter and puller comprising a tubular member provided with an enlarged bore portion defining a shoulder, a mandrel adapted to enter the bore of the tubular member, a dog movably mounted in the mandrel and adapted to engage said shoulder when said mandrel is in one position, a means to yieldingly hold the dog outwardly, and a projection in the enlarged bore portion spaced from the shoulder and from the opposite end of the enlarged bore portion and adapted to engage and retract the dog when the mandrel is moved to bring the dog to mid position in the enlarged bore portion.

3. A liner setter and puller comprising a tubular member provided with an enlarged bore portion defining a shoulder, a mandrel

adapted to enter the bore of the tubular member, a dog movably mounted in the mandrel and adapted to engage said shoulder when said mandrel is in one position, a means to
 5 yieldingly hold the dog outwardly, and a projection in the enlarged bore portion spaced from the shoulder and from the opposite end of the enlarged bore portion and
 10 adapted to engage and retract the dog when the mandrel is moved to bring the dog to mid position in the enlarged bore portion, the projection terminating in a direction away from the shoulder in an outwardly inclined cam face.

15 4. A liner setter and puller comprising a tubular member provided with an enlarged bore portion defining a shoulder, a mandrel adapted to enter the bore of the tubular member, a dog movably mounted in the
 20 mandrel, a means yieldingly holding the dog outwardly so as to engage said shoulder, and an inward projection in the enlarged bore portion of the tubular member adapted to be brought into engagement with the dog by
 25 relative longitudinal movement between the tubular member and mandrel for retracting said dog.

5 5. A liner setter and puller comprising a tubular member provided with an enlarged bore portion defining a shoulder, a mandrel adapted to enter the bore of the tubular member, a dog movably mounted in the
 30 mandrel and adapted to engage said shoulder when said mandrel is in one position, a means to yieldingly hold the dog outwardly, and a projection in the enlarged bore portion spaced from the shoulder and from the opposite end of the enlarged bore portion and
 40 adapted to engage and retract the dog when the mandrel is moved longitudinally to bring the dog to mid position in the enlarged bore portion.

6. A liner setter and puller comprising a tubular member provided with an enlarged bore portion defining a shoulder, a mandrel adapted to enter the bore of the tubular member, a dog movably mounted in the mandrel and adapted to engage said shoulder when
 45 said mandrel is in one position, a means to yieldingly hold the dog outwardly, and a projection in the enlarged bore portion spaced from the shoulder and from the opposite end of the enlarged bore portion and adapted to
 50 engage and retract the dog when the mandrel is moved longitudinally to bring the dog to mid position in the enlarged bore portion, the projection terminating in a direction away from the shoulder in an outwardly inclined cam face.

55 7. A liner setter and puller comprising a tubular member provided with an internal approximately horizontal shoulder and provided with a projection positioned to one side of said shoulder and extending below
 60 the level of said shoulder, said projection terminating downwardly in an outwardly and downwardly slanting cam face, a mandrel adapted to enter the bore of the tubular member, a dog movably mounted in the mandrel, and a means yieldingly holding the dog outwardly to engage the shoulder when the
 70 mandrel is turned to one position, the cam face engaging the dog when the mandrel is lowered and turned to a different position and then raised.

8. A liner setter and puller comprising a tubular member provided with an internal approximately horizontal shoulder and provided with a projection positioned to one side of said shoulder and extending below the level of said shoulder, said projection terminating downwardly in an outwardly and downwardly slanting cam face, a mandrel adapted to enter the bore of the tubular member, a dog movably mounted in the mandrel, and a means yieldingly holding the dog outwardly to engage the shoulder when the
 75 mandrel is turned to one position, the cam face engaging the dog when the mandrel is lowered and turned to a different position and then raised.

8. A liner setter and puller comprising a tubular member provided with an internal approximately horizontal shoulder and provided with a projection positioned to one side of said shoulder and extending below the level of said shoulder, said projection terminating downwardly in an outwardly and downwardly slanting cam face, a mandrel adapted to enter the bore of the tubular member, a dog movably mounted in the mandrel, and a means yieldingly holding the dog outwardly to engage the shoulder when the
 80 mandrel is turned to one position, the cam face engaging the dog when the mandrel is lowered and turned to a different position and then raised, the adaptor being provided with an inwardly projecting vertically extending shoulder engageable by the dog when the mandrel is lowered into a third position and turned in one direction.

9. A liner setter and puller comprising a tubular member provided with an internal approximately horizontal shoulder and provided with a projection positioned to one side of said shoulder and extending below the level of said shoulder, said projection terminating downwardly in an outwardly and downwardly slanting cam face, a mandrel adapted to enter the bore of the tubular member, a crescent shaped dog pivoted at one end in the mandrel to swing horizontally, and a spring in the mandrel yieldingly thrusting the dog outward so that said dog will engage beneath the shoulder when the mandrel is turned to one position, the cam face engaging the dog when the mandrel is lowered and turned in a different position and then raised.

Signed at Bakersfield, Calif., this 25 day of February 1929.

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