Feb. 24, 1948. C. R. EDWARDS 2,436,506

FISHING TOOL

Original Filed May 13, 1940

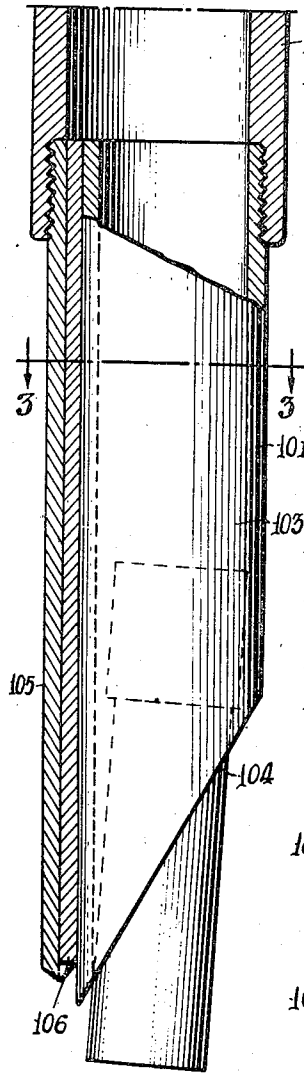


Fig. 1.

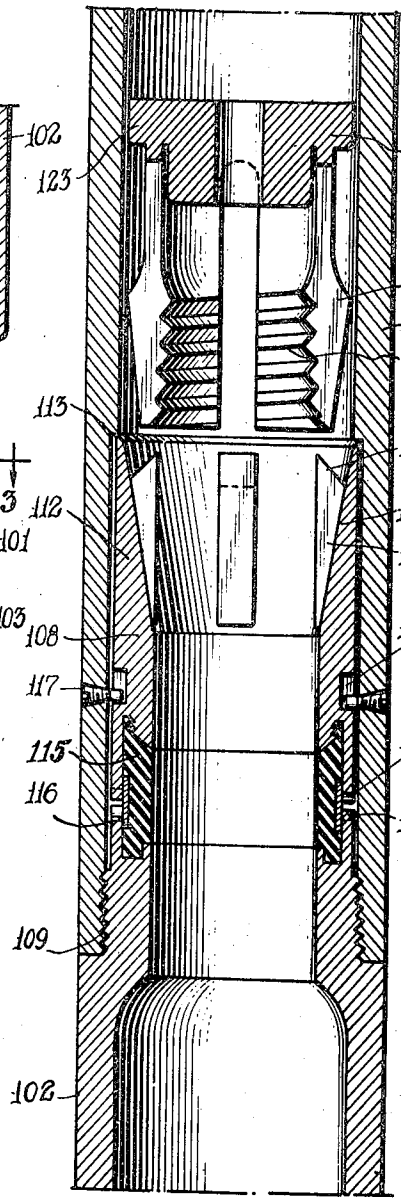


Fig. 2.

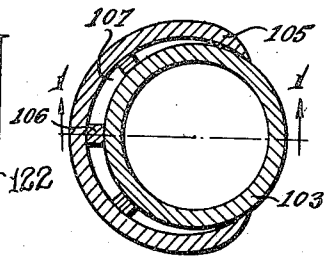


Fig. 3.

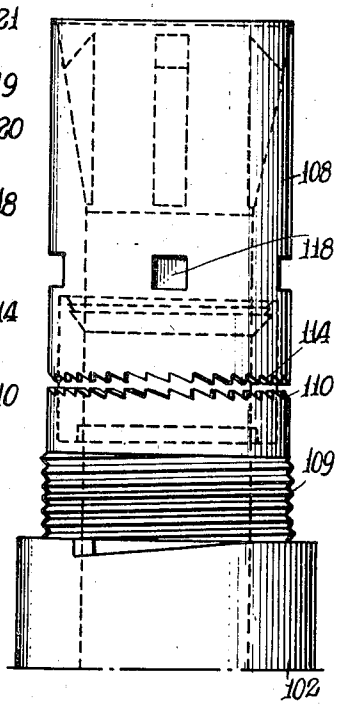


Fig. 4.

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FISHING TOOL

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11 Claims. (Cl. 294—86)

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This invention relates to new and useful improvements in means for recovering elements from well bores.

It has been found that the lodging or sticking of the pipe in the well bores usually occurs during the drilling operation and although the present means may be employed for recovering or removing tubing, casing, or other objects or elements from the bore, said means will be described in connection with removing a portion of drill pipe which has become lodged in the bore due to a cave-in of the formation.

The former practice has been to attempt to remove the lodged or stuck portion of the drill pipe, which is commonly referred to as the "fish," by washing down over the stuck pipe but frequently the wash shoe becomes stuck, thus adding material to the well bore which must be removed. In the present invention, I have provided means to disconnect the wash shoe so that the remainder of the tool may be withdrawn. If the wash shoe remains stuck, then other means can be used to free the pipe since the bore of the pipe lodged in the well is open. For example, circulation breakers or inside cutters may be used.

It is therefore, one object of this invention to provide an improved means for recovering and removing pipe, tubing, casing and other objects which may have become lodged, or which may have fallen downwardly, within a well bore.

A particular object of the invention is to provide improved means, whereby a washing step may be performed to wash the pipe coupling above the lodged portion of the pipe free of any material and debris surrounding the same, whereby a high velocity stream of fluid may be directed around the lodged portion of the pipe to wash the pipe free from its lodged position.

A very important object of the invention is to provide in one tool the combination of a wash shoe, safety joint and overshot.

A construction designed to carry out the invention will be hereinafter described, together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings, in which an example of the invention is shown, and wherein:

Fig. 1 is a vertical view, partly in section and partly in elevation, showing a wash shoe constructed in accordance with the invention,

Fig. 2 is an enlarged, vertical, sectional view of the overshot with the safety joint employed with said wash shoe,

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Fig. 3 is a horizontal cross-sectional view taken on the line 3—3 of Fig. 1,

Fig. 4 is an elevation view, showing the safety joint used with the wash shoe.

In the use of the wash shoe of my invention, the lodged pipe sometimes may be washed free of the holding material down to the next safety joint so that it is free to be unlocked, released and removed. Inserted in this wash string of pipe, above the wash shoe, there has been provided a new and useful combination overshot and special safety joint. The purpose of the overshot is to grapple the upper end of the washed-over pipe so as to release the lower washed-over safety joint and to unlock and release this lower joint and remove the released pipe, together with the wash shoe.

The purpose of the safety joint, in combination with the overshot, is to be able to release the wash pipe at the overshot in case the wash pipe itself becomes stuck, as rather frequently is the case. This special safety joint has an inside diameter larger than the outside diameter of the pipe being washed, and is also provided with a lock so that it may remove the wash pipe with the washed-over pipe when the wash pipe is free. At times, as indicated above, the wash pipe itself will become stuck. In such an event, the special safety joint in the wash pipe is released and the overshot is withdrawn from the well. This leaves, not only the original stuck pipe in the well, but also the wash shoe and the wash pipe up to the safety joint. The stuck wash pipe can now be used as a casing for the well, and is of assistance in removing the first string of stuck pipe from the well, as will now be indicated.

In the drawings, there is shown a combination that includes a wash shoe 101 which is connected to the lower end of a pipe 102. Said shoe has an inner, tubular, hollow member 103 which has its lower end 104 cut at an angle upwardly. Surrounding a portion of the tubular member 103, is a substantially semi-circular member 105 which is spaced from the outer circumference of the inner member by spacer blocks 106. Thus there is provided one or more peripherally located, axially extending fluid passageways 107 between the outer circumference of the inner member and the inner circumference of the outer member, and when fluid is pumped downwardly, the smaller inner member 103 will fairly closely surround the pipe to be washed and only a small portion of the fluid will pass through the inner member. However, a very large portion of the fluid will be pumped through the passageways

107, particularly as the wash shoe passes the collars and other enlarged portions of the object being washed. Thus the restricted passageways will eject fluid at a high velocity in the form of a jet or jets at the lower end of the shoe in a very much stronger stream, due to the restriction, thus increasing the efficiency of the washing tool.

As stated hereinbefore, oftentimes a wash pipe, or a wash pipe and shoe of any form, or a wash shoe, becomes stuck, and in order to release the wash shoe there is provided in the pipe an example of a safety joint 108, shown in Figs. 2 and 4. The upper end of the pipe 102 may be internally reduced in diameter near its upper end so as to increase the fluid pressure, and thus direct the fluid into and through the tube being washed over. The upper end of the pipe 102 may be externally screw-threaded at 109, and is provided with a plurality of teeth 110. A section of pipe 111 is connected to the screw-threads 109 to form a releasing means for the joint. Slidable, but non-rotatable within the pipe 111, is a sleeve 112, and it is pointed out that the bore of the pipe 111 is reduced to form a shoulder 113. The sleeve 112 abuts the shoulder 113 so as to limit vertical travel of the sleeve 112 and thereby confine said sleeve between the shoulder 113 and the upper end of the pipe 102. The lower end of the sleeve 112 is provided with teeth 114 similar to, and adapted to coact with the teeth 110 on the pipe 102. An elastic or rubber ring 115, is embedded in the sleeve 112 and the upper end of the pipe 102 so as to resiliently hold these members apart. Lying against the inner surface of the teeth 110 and 114, is the outer surface of a metal ring 116, the inner surface of said ring being embedded within the rubber ring 115. Thus, when the teeth 110 and 114 are brought together, said metal ring will prevent the teeth 110 and 114 from pinching or tearing the rubber ring 115. Set screws 117, in the pipe 111, have their inner ends lying in keyways 118 provided in the outer surface of the sleeve 112 so as to prevent relative rotation of the pipe 111 and the sleeve 112. The upper end 119, of the sleeve 112, is flared and provided with a plurality of inwardly extending keys 120. The upper ends 121 of said keys extend upwardly and are cut or inclined downwardly towards the bore of the sleeve 112 so as to form a peak or inclined surface. A gripping member 122 is slidable within the pipe 111 above the upper end of the pipe 102. Said member is provided with a circular ring 123, and has depending from said ring a plurality of slips 124. The inner surfaces of said slips are cut to form a gripping surface 125 which is formed as indicated in Fig. 2, but is made with a threading machine, the object of which is to have a second means and method of releasing the slips 124; for example, in case a slip broke from the member 122 and thereby prevented releasing by bringing the keys 120 directly up against the lower end of the slips 124. In the event the pipe is free, the gripping surface 125 will, with considerable friction, slidably engage the pipe or travel downwardly when the pipe 111 is moved upwardly, and the slips will move downwardly into the flared portion 119, and, with the pipe, rotate so that said slips will slide in between the keys 120. Thus the flared and tapered portion 119 will urge the slips 124 inwardly and thereby firmly grip the pipe tighter and allow the same to be removed, or to release a safety joint or a screw joint and remove a section of fish. When the gripping sleeve 122 is in its pulling

position, the sleeve 112 will be moved downwardly, thus engaging the teeth 114 and 110 and preventing the threads 109 from being disengaged. In the event the pipe is still stuck and it cannot be removed, the pipe 111 is moved downwardly so as to allow the gripping member 122 to move above the tapered portion 119 and the pipe 111 is slightly rotated and then pulled upwardly so that the points 121 of the keys 120 will strike the lower end of the slips 124, and continued upward movement of the pipe 111 will cause the slips to slide down the outwardly inclined upper surface of the keys 120 toward the taper 119, thus spreading the slips and releasing their grip on the pipe. If the wash shoe has become stuck, it is only necessary to rotate the pipe 111, preferably to the left, so that the threads 109 may be disengaged and the pipe 111 pulled out of the well. If the wash pipe is stuck, the safety joint in the wash-over string may be released. The section of the fish may be recovered by first slightly lowering the pipe 111 and rotating the same in a reverse direction to partly unscrew the safety joint in the wash-over string, then pulling upwardly on the pipe 111 until the fish is released at a safety joint therein. This permits recovery of a section of the fish and leaves the stuck wash-over section 102 in the bore to be later fished out.

The method of operating the wash combination includes the steps of assembling the combination of wash shoe, wash pipe, safety joint, pack-off seal and overshot or any substitute. The combination is lowered into the well bore until a point just above the fish has been reached by the shoe, at which time it may be desirable to start the circulation of fluid. The location of the fish may be accomplished either by rotating first in one direction or in the opposite direction. If the long side of the bevel 104 strikes the top of the fish or starts to enter the opening in the top of the fish, it may be necessary to lift the combination upwardly so as to slightly rotate the same and to permit the long side of the bevel to pass down by the outside of the fish. The circulation of the fluid progressing the combination can be lowered until the circulation is slowed up, as when the upper end of the fish almost plugs up the reduced bore of the shoe 101. This is an indication that the shoe of the combination is beginning to be telescoped over the upper end of the fish. The combination may now be lowered slowly, giving the circulation sufficient time to remove the debris from around the fish. At times it will be found expedient to either rotate the combination very slowly or to rock the combination back and forth in a rotative direction. At other times the combination will have to be lifted up during this rocking or rotative motion of the combination so as to permit the circulation to enlarge the earth bore. After the combination has been lowered down to the next collar or tool joint on the fish, care should be taken to note that the circulation has now again been slowed up. If such is not the case, then this is evidence that the shoe is not telescoping the fish and there will be very great danger of damaging both the wash shoe and the fish and of sticking the combination. The next step will be to continue to wash down to the lower end of the fish or at least down to a safety joint that can be released so as to recover at least a part of the fish. The recovery steps will now be described, which may include the following: thoroughly washing all debris from the bore preparatory to lowering

the combination until the top of the fish has entered into the restricted upper end of the wash pipe 102. A large part of the circulation may be directed into and, if possible, through the fish, or at least down to a circulation breaker, so as to maintain full circulation up around the outside of the wash combination. This is done to prevent sticking the combination in the bore while grappling the fish to remove all or part of said fish.

The grappling step will now be described; the grapple (the example shown being the overshot, Figs. 2 and 3) may now be lowered by raising the pipe 111 and engaged over the fish so as to secure a firm pulling and preferably a good rotative hold on the fish. An attempt is now made to pull the fish. If the fish can not be pulled, then the pipe 111 and grapple are rotated to release a portion of the fish at a safety joint and this released portion of the fish is pulled from the well bore. If the wash shoe has not reached a safety joint in the fish, then a step in this method may be to break circulation in the stage above a circulation breaker in the fish. It will often be found that circulation can be reestablished in stages so as to facilitate removal of the fish even in sections.

It is also desirable that the combination include a pack-off sealing means. It is preferable to provide a pack-off seal that can be sealed and released by the operator from the top of the bore and without releasing the grapple. A suitable seal 115 is illustrated in Fig. 2. However, any suitable type of seal may be used. The pack-off seal permits re-establishing of the circulation down around the fish and down through the wash combination so as to help prevent the combination from becoming stuck.

This application is a division of my copending application, Serial No. 334,947, filed May 13, 1940, for Methods of and means for recovering elements from well bores, now matured into Patent No. 2,394,759, issued February 12, 1946.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:

1. A fishing tool including a housing, and a wash shoe connected to the lower end of said housing, a sleeve slidably mounted in said housing, said sleeve having its lower end normally spaced above the upper end of said wash shoe by a resilient annular member, the lower end of said sleeve being provided with teeth adapted to engage similar teeth on the upper end of said wash shoe, and a metal ring surrounding a part of the exterior surface of said resilient member, said metal ring being located adjacent such pair of teeth.

2. In a fishing tool a pipe grapple including an outer housing, a sleeve slidably mounted in said housing, a pipe connected to said housing, a resilient annular pack-off member between said pipe and said sleeve and compressible by the downward movement of the sleeve relative to said housing to pack-off the fish and a gripping member slidably mounted in said housing above said sleeve, said sleeve being provided with flared keys adapted to be received in key ways in said gripping member, or to engage the lower end of said gripping member and force same outwardly upon downward movement of said gripping member.

3. In a fishing tool, a wash shoe comprising an inner tubular member, a substantially semicircular member partially surrounding said tubular member and means spacing said semicircular member from said tubular member, thus permitting circulation between said two members.

4. In a fishing tool, a wash shoe comprising an inner tubular member, a substantially semicircular member partially surrounding said tubular member and means spacing said semicircular member from said tubular member, thus permitting circulation between said two members, the lower end of said tubular member extending diagonally with respect to the axis thereof.

5. In a fishing tool, a wash shoe comprising an inner tubular member, a substantially semicircular member partially surrounding said tubular member and means spacing said semicircular member from said tubular member, thus permitting circulation between said two members, said means being spacer blocks to form fluid passageways that eject fluid therein under high pressure in the form of jets.

6. A fishing tool adapted to be used in wells, said tool including a tubular housing, a tubular wash shoe connected to said housing, the inner dimension of said wash shoe being less than the inner diameter of said housing, said wash shoe having axially extending passage means projecting downwardly from the upper end of the wash shoe and extending through the lower end thereof, the upper end of said passage means being located within the interior of said housing and communicating therewith so as to direct a stream of fluid down along a stuck pipe to thus remove detritus that may be sticking to said pipe, gripping means in said tool adapted to engage said pipe so that it may be withdrawn when it has been sufficiently freed of detritus, and a safety joint associated with said housing and wash shoe operable to release said wash shoe from said housing when said wash shoe becomes stuck in the well bore.

7. A fishing tool adapted to be used in a well bore, said tool including a pipe, a tubular wash shoe connected to said pipe, the inner dimension of said wash shoe being less than the inner diameter of said pipe, said wash shoe having axially extending passage means projecting downwardly from the upper end of the wash shoe and extending through the lower end thereof, the upper end of said passage means being located within the interior of said pipe and communicating therewith so as to direct a jet of fluid down along one side of a stuck pipe to loosen and remove detritus that is tending to hold said stuck pipe against movement, said tool also including a gripping member adapted to engage said stuck pipe so that it may be withdrawn when it is sufficiently freed of detritus.

8. A releasable overshot comprising a housing, a gripping member and a pack-off member positioned therein, a wash pipe connected to said housing, said wash pipe including a plurality of fluid passages, and a safety joint associated with said housing and wash pipe operable to release said wash pipe from said housing when said wash pipe becomes stuck in a well bore.

9. A fishing tool including a housing, a wash shoe connected to the lower end of said housing, a sleeve slidably mounted in said housing, a gripping member slidably mounted in said housing adapted to engage a portion of said sleeve, a resilient annular member normally spacing the lower end of said sleeve above the upper end of said wash shoe.

and interlocking means on the lower end of said sleeve and the upper end of said wash shoe; whereby when a fish is engaged by said gripping member and said housing is moved upwardly said sleeve is moved downwardly relative to said housing to cause engagement of said interlocking means.

10. A fishing tool including a housing, a wash shoe connected to the lower end of said housing, a sleeve slidably mounted in said housing, a gripping member slidably mounted in said housing adapted to engage a portion of said sleeve, a resilient annular pack-off sealing member normally spacing the lower end of said sleeve above the upper end of said wash shoe, and interlocking means comprising teeth on the lower end of said sleeve and the upper end of said wash shoe; whereby when a fish is engaged by said gripping member and said housing is moved upwardly, said sleeve is moved downwardly relative to said housing to cause engagement of said interlocking means.

11. In a fishing tool adapted to be used in a well bore, a pipe, and a tubular wash shoe connected to said pipe, the inner dimension of said wash shoe being less than the inner diameter of said pipe, said wash shoe having axially extending passage means projecting downwardly from the upper end of the wash shoe and extending through the lower end thereof, the upper end of said passage means being located within the interior of said pipe and communicating therewith so as to receive washing fluid flowing within said pipe, whereby to direct a jet down along one side of an object in a well bore to remove material that may be tending to hold said object against movement.

CHARLES R. EDWARDS.

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