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ADJUSTABLE ANCHOR FOR WELLS

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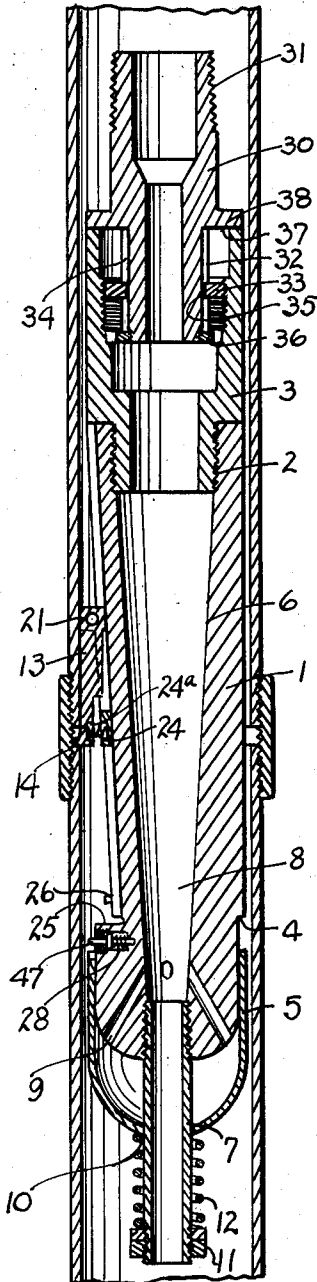


Fig. 1.

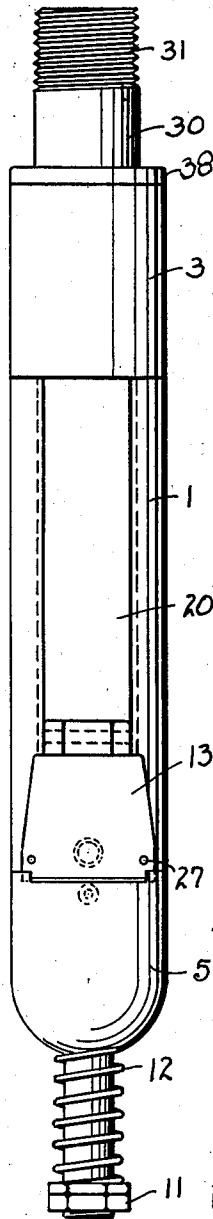


Fig. 2.

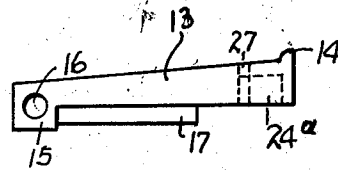


Fig. 4.

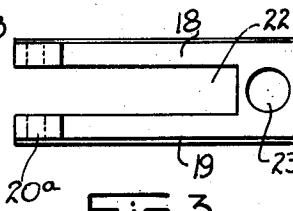


Fig. 3.

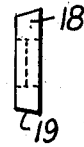


Fig. 5.

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ADJUSTABLE ANCHOR FOR WELLS

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8 Claims. (Cl. 166—1)

My invention relates to supports or anchors for use in wells.

In the operation of tools such as pipe cutters, whipstocks, packers and the like, in wells it frequently is necessary to support devices of that character upon some means anchored in the casing of the well and acting in a general way to support the device which is being used. An expedient some times adopted is to extend a pipe in advance of the tool to rest upon the bottom of the hole and support the tool at the desired height relative to the bottom of the well but this is unsatisfactory in that some times the tool must be supported at some distance from the bottom and the use of long pieces of pipe are expensive and make it difficult to properly handle the tool. This is particularly the case where there is junk or other material in the well, making it uncertain where the bottom of the hole is located.

It is an object of the invention to provide an anchor which may be easily engaged with the casing in the well and be a support for other tools at any desired point throughout the length of the casing.

I desire to form a supporting anchor which may be lowered into the well without danger of its being operated or tripped to engage the casing at the wrong point in its course.

It is also an object to provide a device adapted to engage the casing and be anchored in position therein which may be tripped or set to engage the casing through the force of flushing fluid which is pumped downwardly from the surface.

I also desire to form an anchor which may be adjusted to different levels in the wall after it has been once tripped or set.

I also desire to form a setting tool whereby the device may be lowered to the proper level and anchored to the casing and then allow the withdrawal of the setting tool, leaving the anchor in position in the well.

These and other objects, depending upon the particular construction and arrangement of the parts, will be more clearly understood from the following description.

Referring to the drawing herewith, Fig. 1 is a central longitudinal section through my anchor showing the setting tool thereon and the anchoring dog as engaged with the casing.

Fig. 2 is a side elevational view of the assembled device.

Fig. 3 is a front elevation of a slidable plate upon which the anchoring dog is pivoted.

Fig. 4 is a side view of the anchor dog,

Fig. 5 is an end view of the plate shown in Fig. 3.

The body of my device, shown at 1 in the drawing, is a cylindrical mandrel having its upper end threaded at 2 for engagement with a nipple 3. Its lower end is reduced in diameter a short distance from the lower extremity to form a shoulder 4, which acts to limit the upward movement of a guard member 5.

The interior of the mandrel 1 is formed with a downwardly converging opening 6, the upper end of which merges with the threaded portion 2 and the lower end of which is adapted to discharge liquid from the lower end of said mandrel. The lower end of the opening is threaded to receive a tubular guide member 7, which projects below the mandrel for a short distance and serves as a guide for the guard or latch member 5. The passage 8, which has been described, has a plurality of outwardly inclined passages 9 formed therein to discharge fluid from the lower end of the mandrel to the interior of the said guard member.

The guard member 5 is a cup-shaped device which encloses the lower end of the mandrel and projects below the same, having a central opening 10 therein through which the guide member 7 projects. The lower end of the guide member has nuts 11 thereon, and a helical compression spring 12 is seated on said nuts, bearing at its upper end against the lower extremity of the guard 5. The guard is thus held resiliently upwardly with its upper end bearing against the shoulder 4. It is adapted to be depressed into its lower position, shown in Fig. 1, by the pressure of flushing fluid exerted downwardly through the passages 8 and 9.

The supporting dog which anchors the device in the well comprises a plate 13, which, as shown in Fig. 1, is of sufficient width to form a contact with the casing. Its outer surface is curved to conform to the curvature of the casing and its lower end is formed with an outwardly projecting nose 14 thereon to engage within the joint formed between the ends of section of casing. As will be seen from Figs. 1 and 4, the latching dog is of greater thickness at its lower end and tapers slightly toward the upper end, said upper end having a projection 15 thereon extending rearwardly and formed with an opening 16 to receive a pivot pin. Below the projecting lug 15 is formed a comparatively narrow keylike projection 17, which is adapted to interfit with the supporting plate 18.

The plate 18 is a rectangular plate shown in

Figs. 3 and 5. It has its side faces 19 beveled so that it may fit within a slot 20 in the side of the mandrel and be slidable therein. The beveling of the edges of the supporting plate gives the same a dovetailed fit within the slot, preventing its removal but allowing a longitudinal sliding movement of the plate in said slot. The plate is formed with an opening 20—a at its upper end through which a pivot pin 21 may extend, said pivot pin acting as a connecting means between the dog 13 and said supporting plate. The plate has a longitudinal recess 22 therein to receive the projecting key 17 upon the dog 13. At the lower end of the plate 18 is a cylindrical recess 23 adapted to receive a coil spring 24. Said spring bears at its outer end within a recess indicated at 24—a in the anchoring dog. This spring thus tends to hold the dog resiliently outwardly away from the supporting plate 18 upon which it is mounted.

The plate 18, together with the dog 13 thereon, is slidable within the slot 20, formed on a downwardly inclined face on the mandrel. As will be understood from Fig. 1, the lower wall of the slot 20 forms an inclined plane. When the plate 18, with the dog thereon, is at the lower end of the slot 20 it will bear against a shoulder 25 upon the mandrel. It may be held temporarily in that position by the use of dowel pins 26 on the face of the mandrel and adapted to engage with small openings 27 in the dog 13 and when thus latched in position the guard 5 will engage over the lower end of the dog and hold the same latched over the ends of said dowels 26, preventing upward movement of the said dog.

The guard member 5 may be latched in lower position by means of a pin 47 mounted in the lower side of the mandrel and adapted to be held resiliently outwardly by means of a spring 28. Said spring may be depressed when the guard 5 is moved upwardly, but when the guard is moved into the position shown in Fig. 1 the pin 47 will be forced outwardly into position, preventing the return of the guard member to latching position.

This device may be introduced into the well by means of a setting tool including a tubular setting member 30. Said member is formed with an upper threaded shank 31 by means of which it may be attached to a pipe or drill stem for operation. The lower end of the setting member is reduced in diameter at 32 to engage with a nut 33. The engagement between the two parts 32 and 33 is by way of keys or splines 34 on the setting member, slidable within keyways 35 in the nut. Said nut is held in position on the setting member by a flange 36 at the lower end of said member and is limited in its upward movement by the shoulder 37 formed by a flange 38 on the setting member adapted to contact with the upper end of the nipple 3 previously referred to. The inner face of said nipple is threaded to engage with the nut and said nut may be screwed therein in a lefthand direction. That is, the said nut is formed with a lefthand thread so that it is screwed from position in the nipple by the right hand rotation from above of the setting tool.

When the device is to be set in the well, it is assembled, as shown in Fig. 2, with the setting member 30 connected at the lower end of a pipe or drill stem. The latching device is moved to the lower end of the slot 20 and is latched in position at that point by engaging the openings 27 over the ends of the dowels 26. The latching

pin 47 is depressed to allow the guard member to be moved upwardly by the spring over the lower end of the latching dog, as shown in Fig. 1, thus holding the said latching dog at the lower end of the guideway in an inoperative position.

When the device is being introduced into the hole the contact of the lower end thereof with projections or obstructions in the hole will not tend in any manner to unlatch and disengage the anchoring dogs. When the proper level in the well has been reached where the anchor is to be set, the pumps will be started, forcing fluid downwardly through the device and through the passages 9 in the mandrel to the inner side of the guard 5. Pressure of the liquid will force the said guard downwardly from latching position and will allow the spring 24 to force the dog outwardly away from the mandrel. This will release it from the dowels 26 and will allow the anchoring dog to be moved upwardly along the slotted guideway 20. The device is then raised or lowered until a coupling in the casing has been reached. The dog will then be forced by the spring into the space between the ends of the sections of the casing so that the dog 13 may rest upon the shoulder formed by the ends of the casing sections. The device may then be rested upon said shoulder at the coupling, as shown in Fig. 2, supporting the weight of the tool. This is a firm and substantial support and will sustain a considerable weight.

The support being thus formed upon the casing at one of the joints not only furnishes a substantial base for the anchor which will not tend to expand the casing, but it has the further advantage that the tool supported upon the anchor is spaced upwardly away from the coupling. Thus, a packer could be set better away from the joint, or a whipstock would deflect the cutter through the pipe without engaging the coupling.

It will be seen that when the device is thus supported it will be impossible thereafter to lower the device in the casing. It may be raised to higher levels, engaging the latching dog and other couplings in the casing but it may not be lowered. When the device is thus supported in position the drill stem may be rotated to unscrew the nut 33 from its connection with the nipple 3, and this may be done with a right-hand rotation of the pipe and nipple. When the nut has been unscrewed, the nipple, together with the drill stem and nut, may be withdrawn, leaving the anchor in position. This anchor may thus be set at any desired point in the casing and will serve as a support for different tools when such a support is desired. When it is necessary to withdraw the anchor from the well this may be done by introducing the setting device 30 and screwing the nut 33 back into its connection with the nipple and pulling upwardly on the anchor. As the device is raised the anchoring dog 13 will be moved downwardly in the inclined slot 20 into a position away from the casing and allow no obstruction to the upward movement of the anchoring device.

The device thus constructed will have certain obvious advantages previously mentioned.

What I claim is:

1. An anchor for wells including a mandrel, supporting means thereon adapted to be forced into supporting contact with a well casing, means engaging about said supporting means to retain the same out of engagement with said casing, and means whereby liquid under pressure may

be employed to move said retaining means and release said supporting means.

2. An anchor for wells including a tubular mandrel, a supporting dog slidable thereon into casing-engaging position, and a cap to retain said dog normally in inoperative position, said cap being movable in response to fluid pressure to release said dog.

3. An anchor for wells including a tubular mandrel, a supporting dog slidable thereon into casing-engaging position, and a cap to retain said dog normally in inoperative position, said cap being movable in response to fluid pressure to release said dog, and means to prevent the movement of said cap back to latching position.

4. An anchor for wells including a tubular mandrel, a supporting dog slidable thereon into casing engaging position, a cap, a spring acting to urge said cap into latching position to retain said dog normally in inoperative position, said cap being movable in response to fluid pressure to release said dog.

5. An anchor for wells adapted to be secured to a well casing, including a tubular mandrel, a plate slidable thereon, a dog pivoted on said plate, means to swing said dog outwardly to engage a joint in the casing, said plate and dog being movable to and from casing-engaging position, and means releasable through liquid pressure to hold said dog and plate from casing engaging position.

6. An anchor for wells adapted to be secured to a well casing, including a tubular mandrel, a

plate slidable thereon, a dog pivoted on said plate, means to swing said dog outwardly to engage a joint in the casing, said plate and dog being movable to and from casing-engaging position, and a cap engaging over said mandrel to latch and retain said dog in inoperative position, said mandrel having fluid channels whereby liquid under pressure may be forced into said cap to move it from latching position.

7. An anchor for wells including a mandrel, supporting means thereon to engage within a joint of the well casing, means normally latching said supporting means in inoperative position, means to lower said anchor into the well, said mandrel having a fluid passage therethrough, fluid pressure operated means to release said latching means, and means to then move said supporting means to casing engaging position, said mandrel being supported on said supporting means by relative downward movement of said mandrel.

8. An anchor for wells including a hollow mandrel, a tapered surface thereon, a member slidably mounted on said tapered surface, and pipe engaging means associated with and adapted to support said member whereby said mandrel may be lowered therealong and be wedged in supported position within the casing, said pipe engaging means being released by fluid pressure and adapted to be moved from an inoperative position into contact with the casing when it is desired to set the anchor.

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