

April 16, 1940.

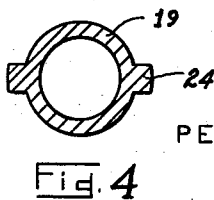
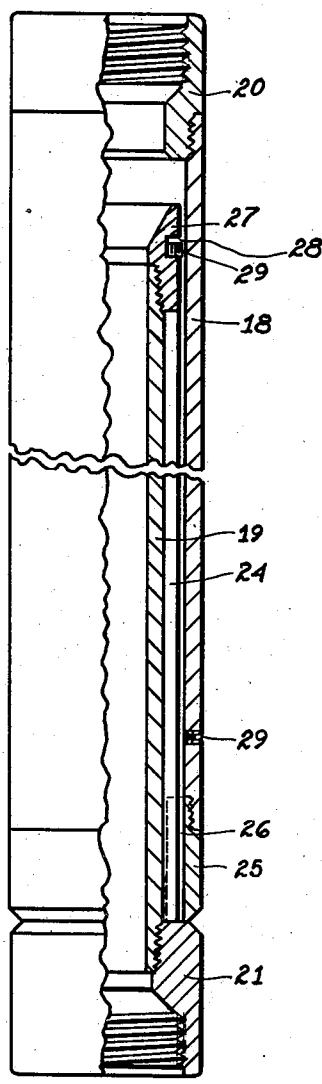
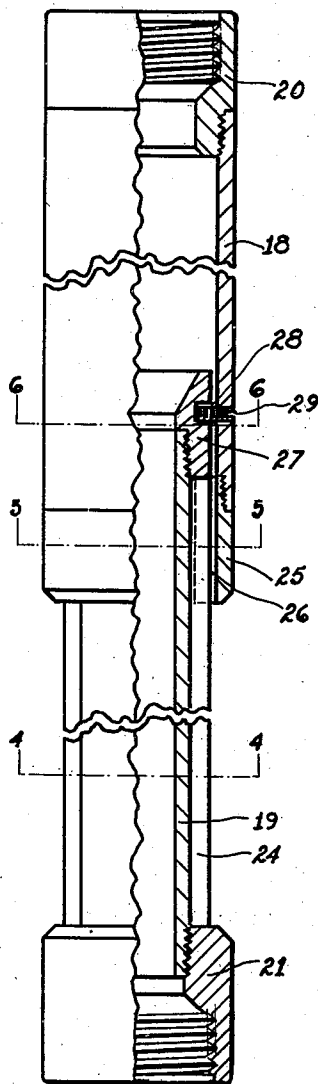
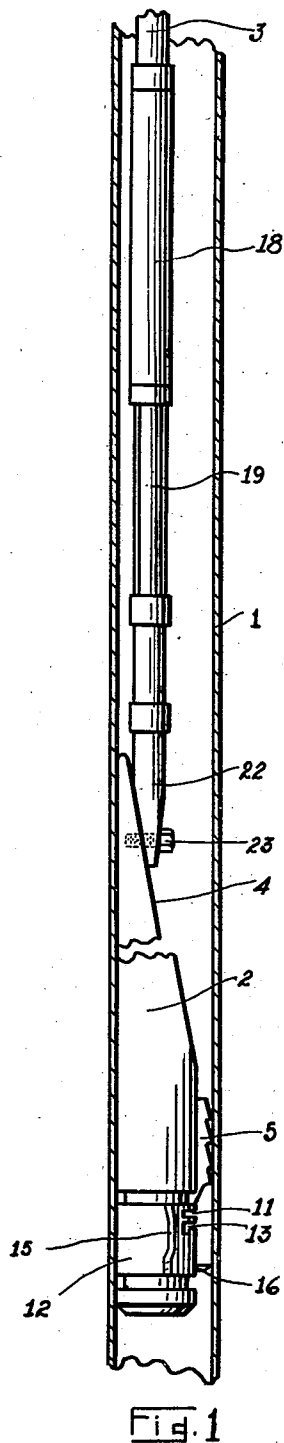
P. F. MATLOCK

2,197,344

SETTING TOOL

Filed Feb. 25, 1939

3 Sheets-Sheet 1



PERCY F. MATLOCK INVENTOR.

BY *J. Vincent Martin*
Ralph K. Braving
ATTORNEYS.

April 16, 1940.

P. F. MATLOCK

2,197,344

SETTING TOOL

Filed Feb. 25, 1939

3 Sheets-Sheet 2

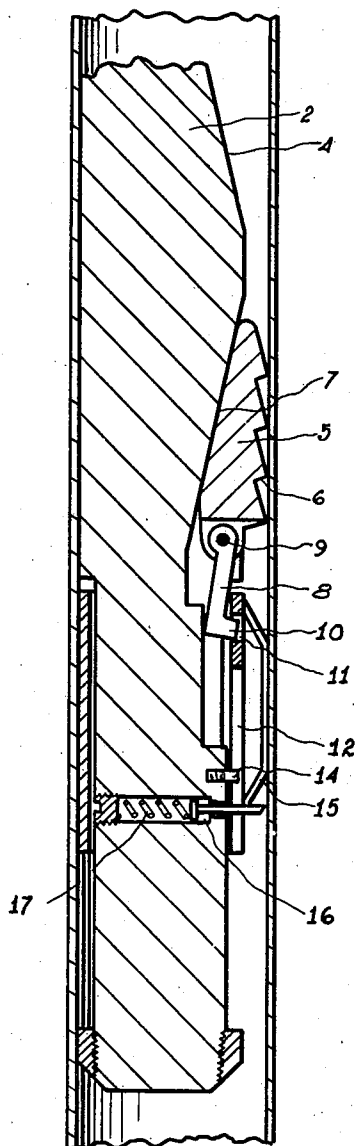


Fig. 7

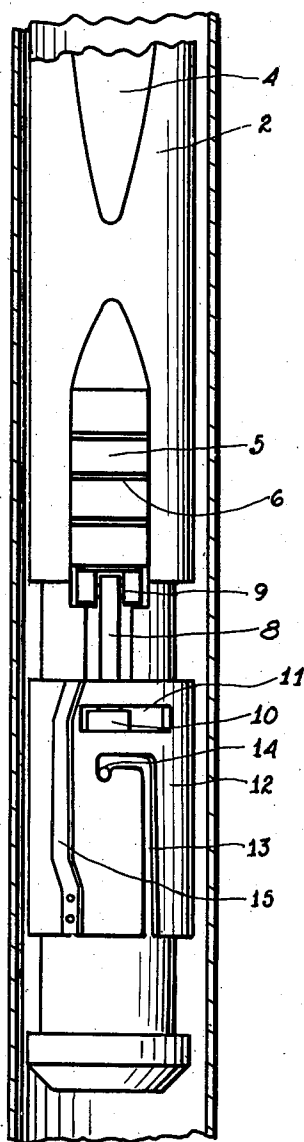


Fig. 8

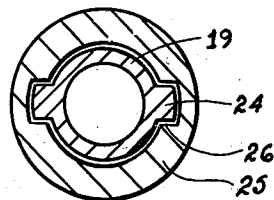


Fig. 5

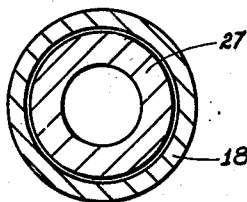


Fig. 6

PERCY F. MATLOCK INVENTOR.

BY *J. Vincent Martin*
Ralph H. Browning
ATTORNEYS.

April 16, 1940.

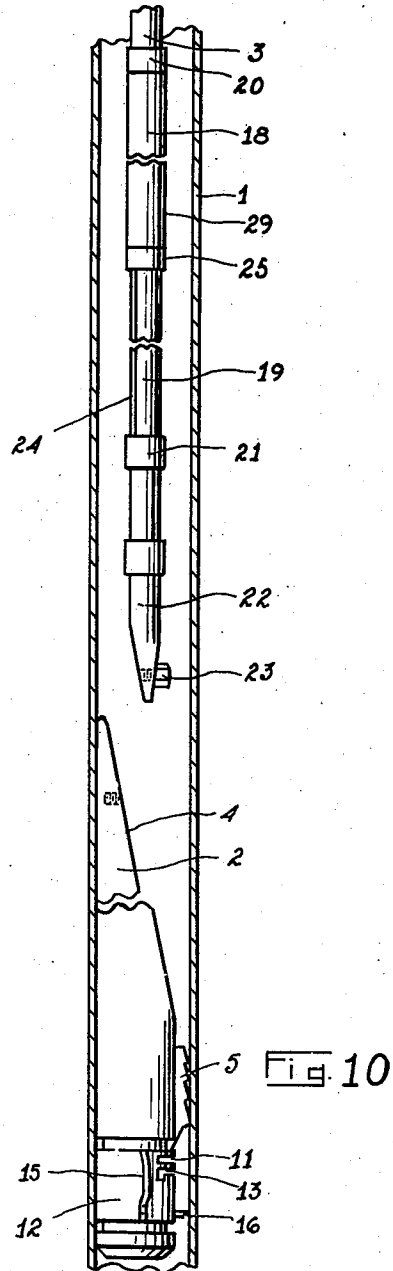
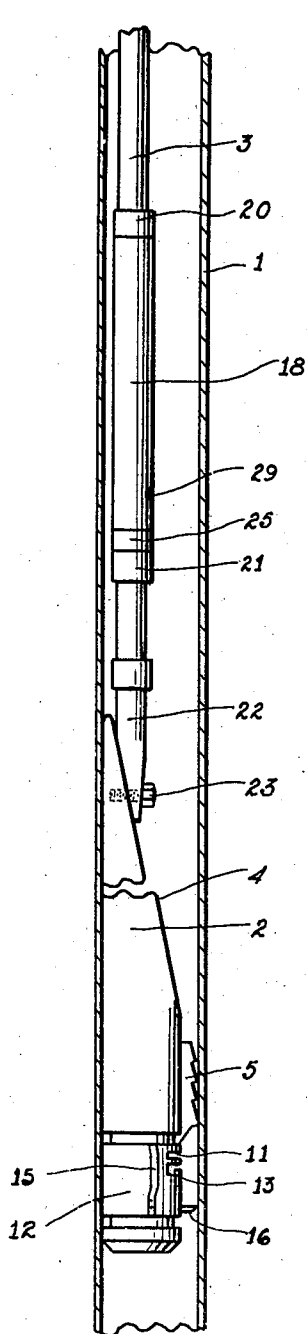
P. F. MATLOCK

2,197,344

SETTING TOOL

Filed Feb. 25, 1939

3 Sheets-Sheet 3



PERCY F. MATLOCK INVENTOR.

BY *J. Vincent Martin*
Ralph H. Browning
ATTORNEYS.

Patented Apr. 16, 1940

2,197,344

UNITED STATES PATENT OFFICE

2,197,344

SETTING TOOL

Percy F. Matlock, Houston, Tex.

Application February 25, 1939, Serial No. 258,473

6 Claims. (Cl. 255-1)

This invention relates to setting tools particularly adapted for setting or positioning various devices within a well.

The general object of this invention is to provide a setting tool for positioning an object within a well, which tool will make it possible for an operator to avoid sticking or premature anchorage and release of a member being lowered into a well.

The device herein described is illustrated in connection with the setting of a whipstock in a well but it is to be understood that it is capable of use in connection with other types of tools, as well as in connection with whipstocks.

In lowering a whipstock or other tool into a well, it not infrequently occurs that an anchoring device carried by the tool may be prematurely released and moved to anchoring position or the tool may encounter some obstruction within the well and its downward progress suddenly halted. With the present type of setting tool, a sudden stoppage of the device being lowered into the well causes the entire weight of a long string of pipe by which the tool is being lowered into the well to be placed on the connection between the pipe and the device being so lowered. This strain may cause damage in many and various ways, and, in the case of a frangible connection, such as frequently used in such locations, would most certainly result in breaking the connection between the string of pipe and the tool being lowered.

It is an object of this invention to provide a device which will prevent such occurrences.

In the case of certain tools, such as whipstocks, it is very difficult, due to their construction and purpose, to fish them out of the hole once the connections by which they are lowered has been broken. Inasmuch as this connection is ordinarily adapted to be broken by the weight of the pipe on which the whipstock is lowered, an occurrence such as above referred to will almost invariably result in breaking the connection between the pipe and the whipstock, leaving the whipstock anchored in the wrong place in the well and possibly causing the complete loss of the well due to inability to fish the whipstock out.

It is, therefore, an object of this invention to provide a means of preventing the breaking of the connection between the string of pipe and a whipstock being lowered thereby.

Also, in the case of whipstocks and certain other tools, it is desirable that the tool be capable of rotation by rotating the pipe before the tool is anchored. It is also necessary that the connection between the pipe and the tool being set be

such that the anchoring device on that tool may be firmly set and driven into anchoring position before the connection between the pipe and the tool being set is broken.

It is an object of this invention to provide a device whereby this may be accomplished.

Other objects and advantages of this invention will become apparent from the following description taken in connection with the accompanying drawings, wherein like numerals indicate corresponding parts throughout.

In the drawings:

Fig. 1 is a vertical cross section through a well casing showing a tool constructed in accordance with this invention in use for lowering a whipstock into the casing, the whipstock in this instance having just been anchored in the casing.

Fig. 2 is a view partly in side elevation and partly in vertical cross section showing a setting tool constructed in accordance with this invention the parts being in the position which they occupy during the lowering of the device into a well.

Fig. 3 is a view similar to Fig. 2 but showing the position taken by the device after the tool has been set and subjected to a portion of the weight of the string of pipe thereabove.

Fig. 4 is a horizontal cross section taken along the line 4-4 of Fig. 2.

Fig. 5 is a horizontal cross section taken along the line 5-5 of Fig. 2.

Fig. 6 is a horizontal cross section taken along the line 6-6 of Fig. 2.

Fig. 7 is an enlarged vertical cross section through the whipstock shown in Fig. 1, illustrating the details of the anchoring mechanism thereof.

Fig. 8 is a side elevation of the same whipstock taken at right angles to Fig. 7.

Fig. 9 is a view similar to Fig. 1 but showing the parts after some weight has been placed on the setting tool and before all of the weight of the pipe has been placed thereon.

Fig. 10 is a view similar to Figs. 1 and 9 but showing the parts in the position they occupy after the connection between the setting tool and the whipstock has been broken.

In Fig. 1 the numeral 1 designates the casing in to which the whipstock 2 has been lowered by means of a string of pipe 3. The whipstock which is shown in this instance as the tool being set, has a long body with a tapered face 4 adapted to deflect a milling tool later to be lowered in to the casing so that such milling tool will mill a hole in the wall of the casing and provide

assage through which a drill may be later lowered to change the direction of the drilled hole.

The whipstock here illustrated is adapted to be anchored at any point desired within the casing. For the purpose of anchoring the whipstock, a slip 5 is provided having teeth 6 thereon adapted to engage the inner surface of the casing, and having an inclined rear surface 7 adapted to ride up on a tapered portion of the whipstock body, and thus be wedged against the casing when the whipstock body moves downwardly with respect to the slip. During the movement of the whipstock into the casing, the slip 5 is held downwardly in a lower position with respect to the whipstock body by means of a link 8 connected by a pivot 9 to the slip and having an outwardly projecting angular part 10 fitting in a slot 11 in a sleeve 12 on the body. This sleeve 12 as a J-slot 13 formed therein and adapted to receive a pin 14 carried by the whipstock body so that when in the position shown in Fig. 8 the sleeve and the slip 5 will be held down in a lower position with respect to the whipstock body. The sleeve 12 is provided with springs 15 which are adapted at all times to press against the inner wall of the casing. When in the position shown in Fig. 8, the sleeve 12 overlies the end of a pin 16 mounted in a transverse opening in the body of the whipstock and spring pressed outwardly by a spring 17. When the whipstock body is rotated in the sleeve 12 to move the pin 14 into such position that the sleeve may move upwardly on the whipstock body, the pin 16 is moved into register with the J-slot 13 and permitted to press outwardly against the casing. In the event the casing is of the welded type having no joints herein, this pin simply rests against the inner wall of the casing and upon downward movement of the whipstock body, the slip 5 will be forced to anchoring position against the inner wall of the casing. If, however, the casing be of the type having couplings therein, and it be desired to set the whipstock so that the milling tool later to be employed will not have to cut through a coupling, the whipstock may be drawn upwardly with the pin 16 scraping along the casing until the pin 16 enters the space between two sections of casing within a coupling. The increased pull due to this pin, will notify the operator that a coupling has been located and he may then either set the whipstock in that position or move it upwardly a predetermined amount to make sure that when he does set it, it will be in such a position that the milling tool will not have to cut through a coupling.

The setting tool, to which this invention principally relates, is secured to the lower end of the tubing 3, and consists of a pair of telescoping parts, the outer and upper of which is designated by the numeral 18 and the lower by the numeral 19. The part 18 has a fitting 20 on its upper end adapted to be screwed onto the lower end of the pipe, and the part 19 has a similar fitting 21 on its lower end adapted to receive a part 22 which in turn is secured to the tapered face of the body of the whipstock by means of a shear bolt 23. The outer surface of the member 19 is formed with splines 24 extending from end to end thereof, and the member 18 is provided with a fitting 25 on its lower end which has internal slots 26 adapted to receive the splines 24. On the upper end of the member 19 is a fourth fitting 27, which is of a diameter too large to pass through the fitting 25 and which will, therefore,

prevent disengagement of the parts 18 and 19 from each other.

The fitting 27 is provided with a lateral opening 28 in one of its side walls, the same being adapted to receive a shear pin 29. The shear pin 29 is threaded through the fitting 18 and with the opening 28 serves to hold the telescoping or lost motion connection in its extended position, as shown in Figs. 1 and 2. The shear pin 29 is of somewhat less strength than the bolt 23 so that when weight is placed upon the upper end of the setting tool, the pin 29 will shear and permit the parts 18 and 19 to telescope before the bolt 23 will shear. The parts 18 and 19 are made relatively long so that a considerable amount of lost motion will be permitted before the telescoping connection will be completely collapsed and the weight of the pipe placed upon the bolt 23. Therefore, even though a part or all of the weight of the pipe be placed on the setting tool, as would be the case where the whipstock is accidentally and prematurely anchored, or where it encounters some unexpected obstruction in the casing, the setting tool would not be disconnected from the whipstock but on the contrary, the operator would be signaled to the effect that the whipstock has stopped. This signal would be given by the temporary lightening of the load on the hoisting apparatus and then by the sudden dropping thereof when the pin 29 is severed.

In operation, the device will be lowered into a well with a tool such as the whipstock 2 on its lower end and with the parts in the position they are shown in Figs. 1 and 2. In the event the whipstock should become prematurely anchored or should encounter an obstruction, a portion of the weight of the pipe will be taken by the setting tool until the pin 29 is sheared. This would signal the operator and would convey to him the knowledge that the whipstock had been stopped in its downward travel, but the whipstock will not have been disconnected from the pipe by which it is lowered into the well. If the operator upon manipulating the pipe discovers that the slip has been prematurely set to anchor the whipstock or that for some other reason it is impossible to go on into the well with the whipstock, he still has a connection with the whipstock which will make it possible for him to pull the whipstock out of the well. There will thereby be avoided the danger of the whipstock becoming stuck in the well at the wrong point and the connection with the whipstock broken at the same time that it is set so that it cannot thereafter be removed without great difficulty.

In connection with the whipstock illustrated, and many other tools employed in wells, it is necessary in order to move the parts to the position where they can be anchored to rotate the pipe. It is also necessary in some cases to rotate the whipstock in order to properly orient it before it is set. Because of the splines 24 and the corresponding parts on the member 18, it is possible to rotate the whipstock or other tool either before or after the pin 29 has been sheared.

After the anchoring device, consisting of the slip 5, has been released and moved to anchoring position, it is desirable that it be firmly set in order that when the milling tool is operated against the surface 4 the whipstock will not thereby be rotated into the wrong position in the well. In order to accomplish this additional anchorage, the operator will allow sufficient weight on the setting tool to shear the pin 29.

After that he may move the pipe upwardly and downwardly allowing the part 25 to strike upon the part 21 and thus deliver repeated blows to the whipstock to more firmly anchor it. After it has been thus firmly anchored, sufficient force is exerted on the setting tool to shear the bolt 23, whereupon the pipe and setting tool may be removed from the hole.

In view of the foregoing, it will be seen that one embodiment of this invention has been disclosed whereby all of the objects and advantages set forth in connection therewith may be accomplished.

Having described my invention, I claim:

1. In combination with a device to be set in a well, a lowering string for lowering said device into position in a well, and means for connecting said lowering string to said device, said means including a lost motion connection, means of predetermined strength for normally holding said lost motion connection in extended position, and means of greater strength than said last mentioned means for joining said lost motion connection to said device, whereby in the event downward movement of said device into a well is suddenly halted, said means for holding the lost motion means extended may be overcome and said lost motion connection contracted to prevent the weight and inertia of said lowering string from being exerted on the means for securing the lost motion connection to the device, and whereby said device may then be removed from a well.

2. In combination with a device to be set in a well, a string of pipe for lowering said device into a well, a lost motion connection adjacent the lower end of said pipe and between the major portion of said pipe and the device, frangible means for securing said lost motion connection to the device, and frangible means of less strength than the first frangible means for

normally holding said lost motion connection extended.

3. In combination with a device to be set in a well, a string of pipe for lowering said device into a well providing a lost motion connection, a telescoping section at the lower end of said pipe, a frangible member for normally holding said telescoping section extended, and a second frangible member stronger than the first for securing the lower end of said telescoping section to said device, whereby in the event downward progress of said device into a well is suddenly halted, the inertia of said pipe will be exerted upon said first frangible member and sever the same and then taken up by said lost motion connection without causing the severance of said second frangible member and the consequent disconnection of the string of pipe from the device.

4. A setting tool comprising a pair of upper and lower telescoping members, the upper of which is provided with means for connection to a string of pipe and the lower of which is provided at its lower end with frangible means for connection to a device to be set in a well, and a frangible connection, of less strength than the said frangible means, between the said upper and lower telescoping members and normally retaining said members in extended position but permitting said members to telescope and contract upon breakage of said frangible connection of less strength.

5. A setting tool as in claim 4, the lower end of the lower member being provided with a jar fitting to receive impact of the upper member when said members are telescoped.

6. A setting tool as in claim 4, and means to prevent separation of the members by upward movement of the upper member.

PERCY F. MATLOCK.