

Feb. 13, 1934.

J. H. HOWARD

1,947,262

SETTING TOOL

Filed March 24, 1933

2 Sheets-Sheet 1

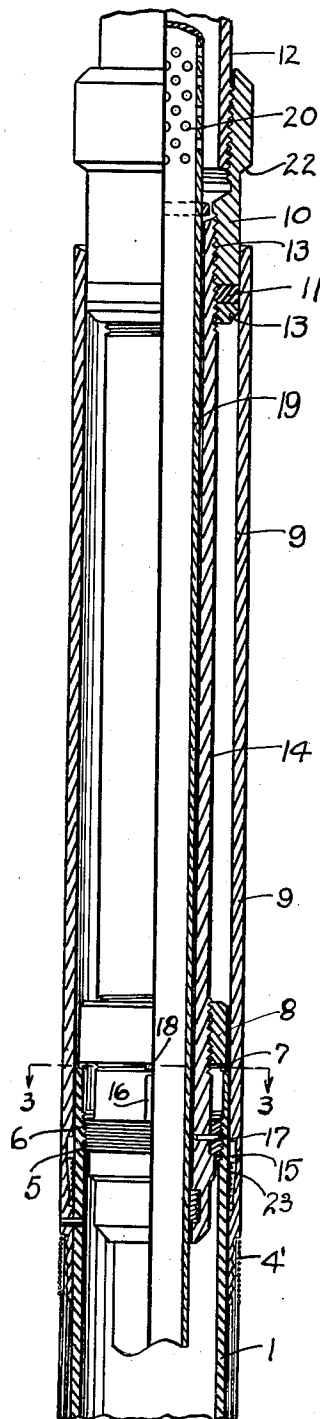


Fig. 1.

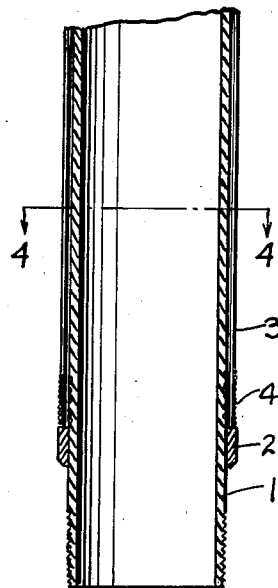


Fig. 2.

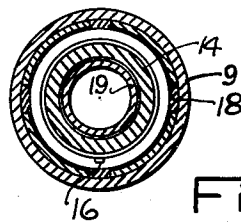


Fig. 3.

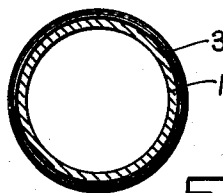


Fig. 4.

JAMES H. HOWARD.

INVENTOR.

BY

Jesse R. Stone
&
Lester B. Clark

ATTORNEYS

Feb. 13, 1934.

J. H. HOWARD

1,947,262

SETTING TOOL

Filed March 24, 1933

2 Sheets-Sheet 2

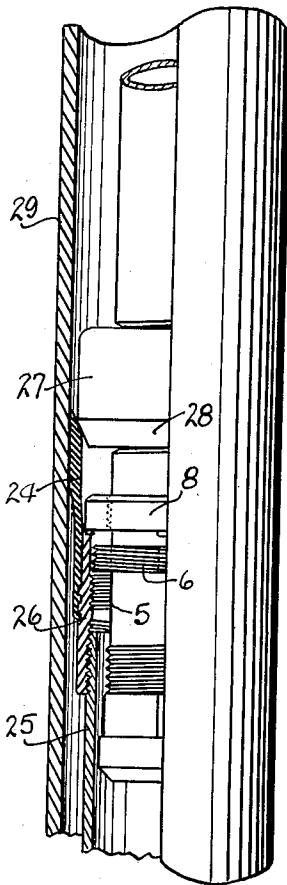


Fig. 5.

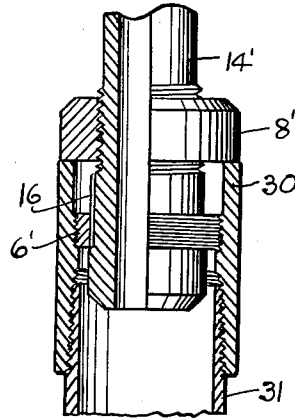


Fig. 6.

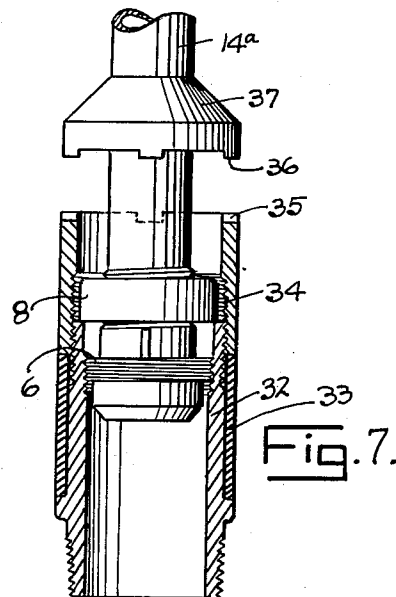


Fig. 7.

INVENTOR.
JAMES H. HOWARD.
BY *Jesse R. Stone*
Leslie B. Clark
ATTORNEYS

UNITED STATES PATENT OFFICE

1,947,262

SETTING TOOL

James H. Howard, Houston, Tex., assignor to
J. H. McEvoy & Company, a corporation

Application March 24, 1933. Serial No. 662,560

10 Claims. (Cl. 166—10)

My invention relates to setting tools for introducing pipe into wells and setting it in position therein.

It is an object of my invention to provide a setting tool which may be employed principally in setting screen, but which may also be employed to set liner or packers or sections of pipe in the well whenever occasion arises.

It is an object to provide a setting device which may be easily and positively released when it is necessary to disconnect from the pipe which is introduced into the well.

It is another object to provide a setting tool which may form a seal with the pipe which is introduced and prevent passage of fluid between the said tool and the pipe.

Another object is to provide a setting tool through which a wash pipe may extend in case such pipe is necessary in the washing of the screen.

I desire to provide a setting tool having means thereon to connect with the pipe which is introduced into the well and in which the thrust thereon due to the inserting of the pipe downwardly will be sustained by strong and rigid connections which may be readily released.

I also desire to provide in connection with a tool of this character, means whereby a packer may be set when desired.

In the drawings herewith Fig. 1 is a central, longitudinal section through the lower end of a setting tool embodying my invention, the same being shown within the upper end of a packer.

Fig. 2 is a continuation of Fig. 1 showing the lower end of the packer in collapsed position.

Fig. 3 is a transverse section on the plane 3—3 of Fig. 1.

Fig. 4 is a central, transverse section on the plane 4—4 of Fig. 2.

Fig. 5 is a side view, partly in section and partly in elevation, showing my tool as adapted for setting a packer or seal different from that shown in Fig. 1.

Fig. 6 is a broken side view partly in central, vertical section and illustrating my tool adapted for setting an ordinary pipe or liner in the well.

Fig. 7 is a side view, partly in vertical section illustrating a still different embodiment of the invention as employed in setting a still different form of seal or packer.

In the Fig. 1 embodiment of the invention I have shown the same as employed in setting an ordinary canvas packer, it being understood that this packer may be employed at the upper end of

a screen which is delivered into the well along with the packer.

The packer is shown as being mounted upon a pipe section 1 which may be a part of the liner or extension thereof, which I call a packer barrel. It has a ring 2 secured to the outer surface thereof by welding or otherwise, to furnish support for the wrappings of canvas 3 which make up the packer. Said canvas is secured at its upper end to the compression member 9. The barrel is extended upwardly a short distance above the packer and is threaded on its inner surface at 5 to engage with a retaining sleeve 6. The upper end of the barrel is further provided with notches 7 therein to engage with teeth on the lower end of the thrust sleeve 8.

On the outer surface of the packer barrel is the packer compression sleeve 9, the lower end of which furnishes a point of attachment for the upper end 4' of the packer. This sleeve extends some distance above the packer and acts to make a seal connection with the coupling 10 at its upper end by means of a packing ring 11 on said coupling.

The setting tool is adapted to engage the upper end of the packer barrel. The tool is secured at its upper end to the tubing 12 by means of the special coupling 10 previously referred to. Said coupling is reduced in internal diameter at its lower end and threaded at 13 to engage with the mandrel 14. The said coupling fits closely within the packer compression sleeve 9 and forms a seal therewith through the packing ring 11 previously noted, said ring being held in position by a nut 13 on said mandrel below the coupling.

The lower end of the mandrel is formed to engage releasably with the packer barrel. This is done principally by the retaining sleeve 6 previously noted. Said sleeve is fitted over the outer periphery of the mandrel resting upon a small shoulder 15 on the mandrel. It is held non-rotatably thereon by means of a key 16 on the mandrel engaging within a key-way on the interior of the ring. There is also a small pin of friable material 17 extending radially through the retaining sleeve into the body of the mandrel. This holds the retaining sleeve on the mandrel while said sleeve is being screwed in its seat in the upper end of the packer barrel as shown in Fig. 1. It will be seen that the mandrel cannot be pulled upwardly out of the packer when the retaining sleeve is screwed in position because of the engagement of the shoulder 15 on the mandrel therewith.

The downward thrust of the mandrel against the packer barrel is not taken up by said retaining sleeve but I provide the thrust sleeve 8 previously noted for this purpose. Said thrust sleeve is a ring-shaped member threaded on its inner surface to engage with the thickened lower end of the mandrel. The lower side of the sleeve is provided with teeth 18 to engage within the recesses 7 in the upper end of the packer barrel. Thus when the mandrel is in position as shown in Fig. 1 the thrust sleeve 8 will engage the barrel and hold the parts nonrotatably together.

In using this device for introducing the strainer and packer into the well, the parts are assembled as shown in Figs. 1 and 2, and in case it is desired to wash the screen on the outside a wash pipe 19 may be extended downwardly through the mandrel, the upper end thereof being perforated as shown at 20. When the pipe has been placed in proper position in the well, and it is desired to release and set the packer, the tubing and mandrel are rotated in a right-hand direction. It is here to be noted that the retaining sleeve 6 is screwed to the interior of the packer barrel with a left-hand thread while the thrust sleeve 8 is secured to the mandrel by a right-hand thread. Thus rotation of the mandrel in a right-hand direction will tend to screw the mandrel downwardly through the thrust sleeve, but will rotate the retaining sleeve 6 to screw it upwardly in the packer barrel. When this movement takes place the pin 17 will be sheared off releasing the retaining sleeve to be moved upwardly on the mandrel.

The retaining sleeve is shorter than the thrust sleeve and will screw upwardly and be released from its connection with the packer barrel just shortly before the thrust sleeve is released from the mandrel and when the two parts are both disconnected from the mandrel the mandrel may be forced downwardly in the packer and compression sleeve so that the shoulder 22 upon the coupling 10 will engage the upper end of the compression sleeve and allow it to be forced downwardly on the packer barrel to compress the packer longitudinally and expand it laterally against the wall of the casing or the well. The packer compression sleeve will be prevented from moving backwardly after it has been depressed by the slips 23 fitting within a recess on the interior of the compression sleeve in the usual manner.

When the packer has thus been set, the setting tool may be entirely withdrawn from the well if desired, or it may be elevated slightly and employed as a flow tube to conduct the fluid from the well.

In Fig. 5 I have shown my setting tool as adapted to expand a packer or seal 24. In this case the said seal 24 may be of soft metal or other compressible composition and is secured to the upper end of the pipe 25 by means of engagement with the collar 26 on said pipe. Said sealing sleeve extends above the inner pipe 25 which may be a liner or screen and the setting tool is introduced downwardly into the upper end of the said pipe. Its engagement with the coupling or collar 26 is the same as the engagement of the setting tool with the packer barrel in the previously described device.

The retaining sleeve 6 is shown in Fig. 5 as being screwed upwardly out of its threaded connection at 5 and the thrust sleeve 8 is shown in engagement with the upper end of the coupling.

Above the sleeves 6 and 8 on the mandrel, I have shown an expanding bushing 27, the lower end of which is beveled at 28 and thus adapted to engage and expand the packing sleeve 24.

By the use of this device it will be seen that the pipe 25 may be introduced into position in the well and the packing sleeve then expanded by forcing the mandrel downwardly to bring the expanding bushing 27 into the upper end of the lead seal 24 and force it outwardly into sealing engagement with the casing 29.

In Fig. 6 the thrust sleeve 8' is adapted to rest frictionally on the upper end of the coupling 30 on the pipe 31. The lower end of the mandrel is connected with said coupling 30 by means of the retaining sleeve 6'. When this device is inserted into the well, the parts will be assembled as shown in Fig. 6 and the pipe introduced into the well and lowered to the proper position, and the setting tool is then released by rotating the mandrel to screw the retaining sleeve 6' upwardly out of its seat, after which the mandrel may be withdrawn.

In Fig. 7 is shown a still different embodiment in which the mandrel is connected with the upper end 32 of a special coupling which may be connected on to the liner or screen or other pipe. On the outer surface of the coupling member 32 is a packer 33 of flexible compressible composition which may be rubber or even lead if desired. Above the packer is a nipple 34 screwed upon the upper end of the coupling and having its lower end bearing against the packer sleeve. The upper end of the nipple 34 is formed with notches 35 to engage with teeth 36 upon a flange 37 on the mandrel 14a.

When this device is employed it is connected with the pipe to be set in the well in the manner shown in Fig. 7 and when the pipe is in proper position to expand the packer 33 the mandrel is rotated in a right-hand direction to release the retaining sleeve 6 and the thrust sleeve 8 so that the mandrel may be lowered to engage the teeth 36 with the teeth 35 in the nipple. The nipple may then be rotated to screw it downwardly against the packer sleeve and expand it. After the packer has thus been set in position the mandrel may be withdrawn upwardly from the well.

The advantages of my construction lie in the fact that my device may be readily and positively released and is exceedingly simple in construction. No special construction of packer barrel or compression sleeve need be made and the engagement between the setting tool and the device to be set is a simple threaded one easily released.

Furthermore, in setting the packer there are no special expanding dogs necessary to be used, the shoulder on the collar or coupling 10 being entirely sufficient. However, when the expanding or compression sleeve is to be screwed downwardly, a special flange such as shown at 37 in Fig. 7 may be employed. The device is, therefore, not only simple in construction and reliable in action, but is economical to manufacture.

As a further advantage, it is used to form a seal between the mandrel and the upper pipe 9 so that the flow of fluid between the mandrel and the pipe may be prevented.

While I have shown several embodiments of the invention, it is to be understood that various other changes and modifications may be made coming within the scope of the invention.

Having described my invention, what I claim is:
1. In combination with a tubular member to

be set in a well, and having an interior threaded seat adjacent the upper end of said member, a setting tool comprising a tubing, a mandrel, a coupling connecting said tubing to said mandrel, a retaining sleeve non-rotatably mounted on said mandrel and threaded within said seat, and thrust means on said mandrel engaging the upper end of said member.

2. In combination with a tubular member to be set in a well, and having an interior threaded seat adjacent the upper end of said member, a setting tool comprising a tubing, a mandrel, a coupling connecting said tubing to said mandrel, a retaining sleeve nonrotatably mounted on said mandrel and threaded within said seat, and thrust means on said mandrel comprising a sleeve threaded to said mandrel, and teeth thereon engaging the upper end of said member.

3. In combination with a tubular member to be set in a well, and having an interior threaded seat adjacent the upper end of said member, a setting tool comprising a tubing, a mandrel, a coupling connecting said tubing to said mandrel, a retaining sleeve nonrotatably mounted on said mandrel and threaded within said seat said sleeve being connected with a left hand thread to be screwed loose from said member by a right hand rotation of said mandrel, and thrust means on said mandrel engaging the upper end of said member.

4. A tubular member to be set in a well, a threaded seat on the upper end of said member, in combination with a setting tool including a mandrel, an operating tube supporting said mandrel, a retaining sleeve keyed slidably on said mandrel and threaded within said seat, and a thrust collar on said mandrel engaging said member to take the upward thrust therefrom when said retaining sleeve is engaged in said seat.

5. A tubular member to be set in a well, a threaded seat on the upper end of said member, in combination with a setting tool including a mandrel, an operating tube supporting said mandrel, a retaining sleeve keyed slidably on said mandrel and threaded within said seat, and a thrust collar on said mandrel engaging said member to take the upward thrust therefrom when said retaining sleeve is engaged in said seat, and means to limit the downward movement of said sleeve on said mandrel.

6. A tubular member to be set in a well, a threaded seat on the upper end of said member, in combination with a setting tool including a man-

drel, an operating tube supporting said mandrel, a retaining sleeve keyed slidably on said mandrel and threaded within said seat, means on said mandrel forming a seal with the interior of said member, and a thrust collar on said mandrel engaging said member to take the upward thrust therefrom when said retaining sleeve is engaged in said seat.

7. A packer support, a packer thereon, a threaded seat on the upper end of said support, a mandrel, a retaining sleeve engaged slidably on said mandrel and adapted to engage within said seat, a thrust sleeve threaded on said mandrel and having a nonrotatable engagement with the upper end of said member, means to limit the downward movement of said retaining sleeve on said mandrel, both said sleeves being movable upwardly to released position when said mandrel is rotated in a right hand direction.

8. In combination with a tubular member to be set in a well, a mandrel, means by which said mandrel may be operated, retaining means on said mandrel engaging said member and adapted to be screwed upwardly from engagement with said member by rotation of said mandrel, and a thrust member on said mandrel nonrotatably engaged with the member while said mandrel is rotated to release said retaining means.

9. In combination with a tubular member to be set in a well, a mandrel, means by which said mandrel may be operated, retaining means on said mandrel engaging said member and adapted to be screwed upwardly from engagement with said member by rotation of said mandrel, and a thrust member on said mandrel nonrotatably engaged with the member while said mandrel is rotated to release said retaining means, said thrust member being released from said mandrel by a further rotation of said mandrel.

10. In combination with a tubular member to be set in a well, a mandrel, means by which said mandrel may be operated, retaining means on said mandrel engaging said member and adapted to be screwed upwardly from engagement with said member by rotation of said mandrel, and a thrust member on said mandrel nonrotatably engaged with the member while said mandrel is rotated, both said retaining means and said thrust member being released to disconnect said mandrel and said member by a right hand rotation of said mandrel.

JAMES H. HOWARD.

55

60

65

70

75

180

185

140

145

150