

Nov. 8, 1938.

J. H. NICKS

2,136,015

OIL WELL TOOL

Original Filed Aug. 26, 1935

2 Sheets-Sheet 1

Fig. 1.

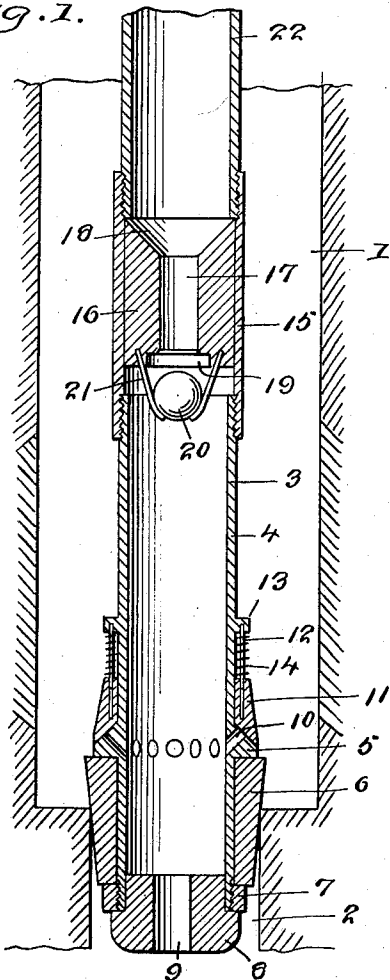


Fig. 2.

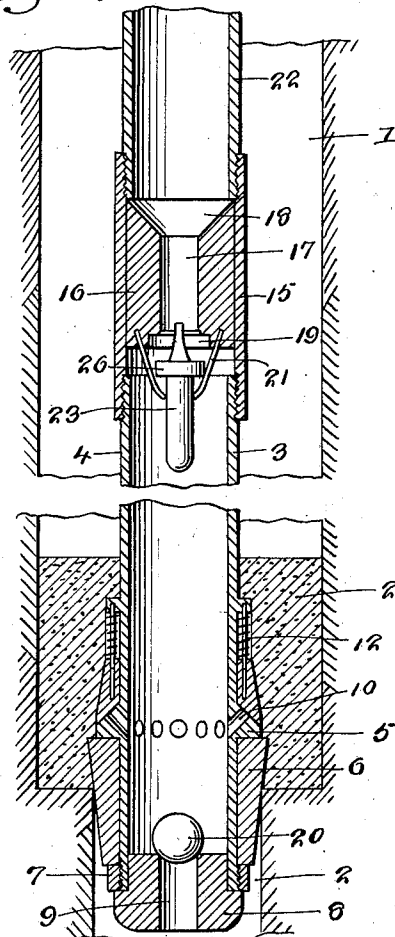


Fig. 5.

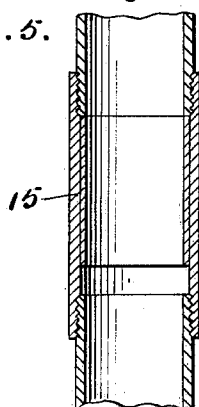


Fig. 3.

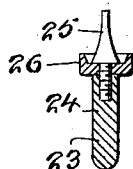
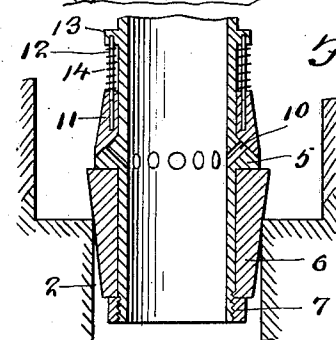


Fig. 4.



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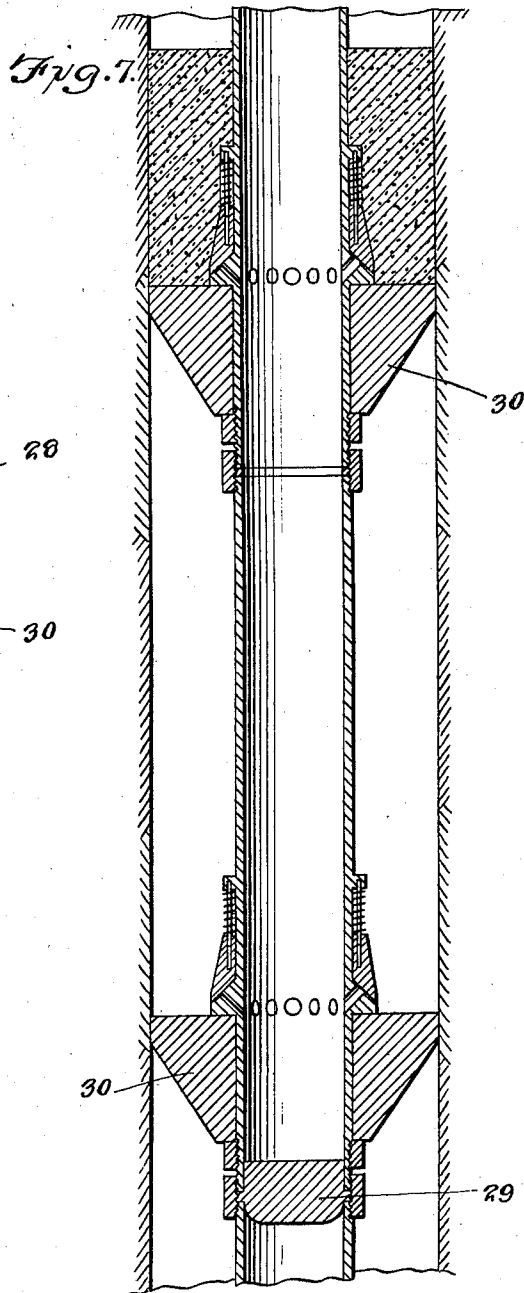
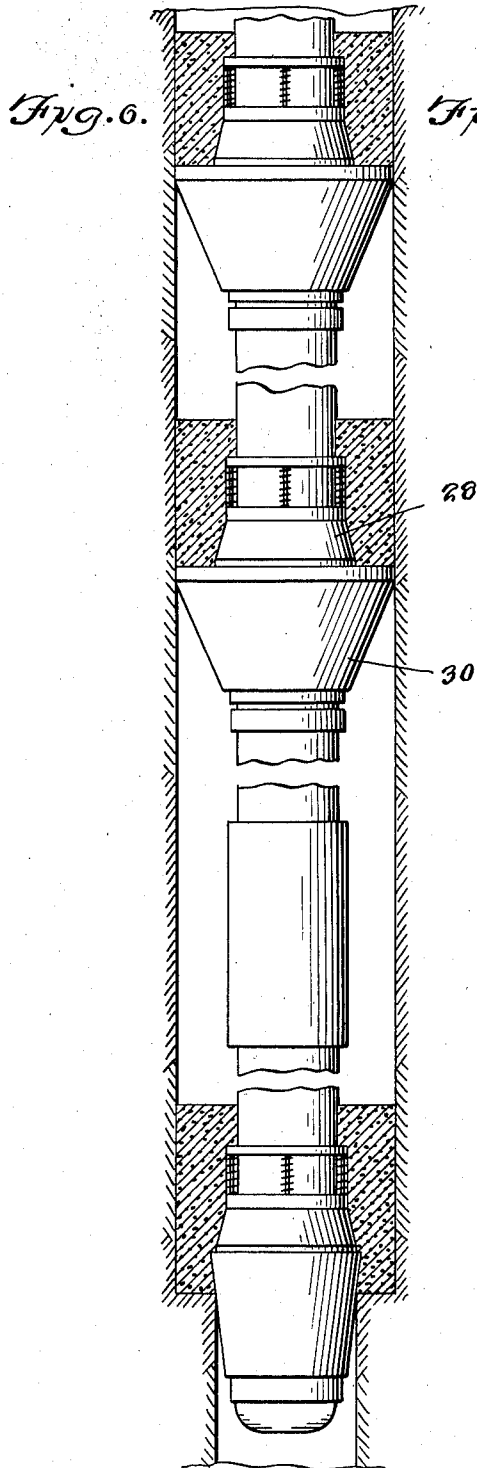
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2,136,015

OIL WELL TOOL

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Application August 26, 1935, Serial No. 37,966
Renewed April 8, 1938

7 Claims. (Cl. 166—1)

This invention relates to a tool or apparatus for the making of seals in oil wells wherein it is desired to separate certain parts of a well from other parts to prevent mixing of undesirable substances with desirable substances, and has for the primary object the provision of a device of this character which is easy and inexpensive to operate and which will permit one or more seals to be constructed and during the construction of such seals, the device will act as a check to prevent the escape of liquids and gases from the well.

With these and other objects in view, this invention consists in certain novel features of construction, combination and arrangement of parts to be hereinafter more fully described and claimed.

For a complete understanding of my invention, reference is to be had to the following description and accompanying drawings, in which—

Figure 1 is a fragmentary vertical sectional view showing a tool positioned in a well for the purpose of closing the rat hole of a well from the upper portion of the well and also acting to check or prevent the flow of liquid or gases from the rat hole upwardly through the well tubing.

Figure 2 is a view similar to Figure 1, showing the forming of a seal in the well to close the upper portion of the well to the rat hole with the ball check valve releasing medium acting as a check to prevent escape of gases and liquid from the rat hole by way of the well tubing.

Figure 3 is a fragmentary sectional view showing a ball valve unseating element which is capable of acting as a check valve after the release of the ball valve.

Figure 4 is a fragmentary vertical sectional view showing the tool after the formation of a seal in the well and cleared of the lower valve seat and ball valve.

Figure 5 is a fragmentary vertical sectional view showing the tool cleared of the upper valve seat after the formation of the seal in the well.

Figure 6 is a fragmentary vertical sectional view showing a well having a series of seals formed therein by a slight modification of the tool from that shown in Figure 1.

Figure 7 is a fragmentary vertical sectional view showing one seal after being formed in the well and the tool arranged for the formation of a second seal at a lower elevation in the well from the first seal.

Referring in detail to the drawings, the nu-

meral 1 indicates a drill well having at its lower end the usual rat hole 2 from which desirable gases and liquids are to be obtained and to close the rat hole from the upper portion of the well a tool 3 has been provided which consists of a cylindrical body 4 having formed thereon and adjacent one end a shoulder 5 forming an abutment to be engaged by a substantially conical-shaped packing 6. The packing 6 is located on the body 4 between the shoulder 5 and one end of said body, the latter-named end of the body being screw threaded to receive a threaded collar 7 cooperating with the shoulder 5 in retaining the packing on the body. Located in the last-named end of the body is a valve seat 8 having a passage 9 therethrough. The packing 6 is of any desired material which will yield slightly under pressure and when subjected to liquid will expand and acts to center the device in a well by contacting the walls of the latter. The valve seat 8 is constructed of a suitable destructible material. The shoulder 5 has formed therein a series of ports 10 having communication with the interior of the body and opening outwardly through the upper beveled face of the shoulder. The beveled face of the shoulder 5 forms a seat for a valve element 11 slidably mounted on the body 4. The valve element 11 has a beveled face to cooperate with the beveled face of the shoulder 5 in closing the ports 10. The valve element 11 is slidably mounted on guide rods 12 suitably secured to a flange 13 formed on the body 4. Coil springs 14 are mounted on the guide rods between the flange 13 and the valve element 11 and act to urge the valve element in engagement with the shoulder 5 for closing the ports 10 but which will permit the valve element to move away from the shoulder to open the ports by an internal force or a force within the body 4.

Detachably secured to the end of the body 4 opposite to the valve seat 8 is a sleeve 15 having mounted therein a valve seat 16 of destructible material. The valve seat 16 has a passage 17 therethrough, one end terminating in a flare 18 and the opposite end terminating in a seat 19 to be engaged by a ball check valve 20 supported by resilient fingers 21 carried by the valve seat 16. The ball valve acts to check an upward flow of liquid or gas through the passage 17 when supported by the fingers 21. However, during the use of this tool the check valve 21 is dislodged from the fingers 21 to engage with the seat 8, this being accomplished by the lowering through the well tubing 22 an element 55

23. The well tubing 22 is detachably connected to the sleeve 15. The element 23 for dislodging the ball valve 20 consists of an elongated body 24 to which a pointed head 25 is threaded. Interposed between one end of the body 24 and the head 25 is a cup 26. The diameter of the passage 17 of the valve seat 16 is not large enough to permit passing of the ball valve 20 therethrough but is of a size large enough to permit the element 23 to pass therethrough to strike the ball and dislodge the same from the fingers. The element 23 on dislodging the ball valve from the fingers 21 becomes suspended by said fingers and should there be a pressure in the body the cup will engage the seat 19 and cut off the pressure to the well tubing 22.

In operation, after drilling a well, as shown in Figure 1, with a rat hole 2, the sleeve 15 with the body 4 connected thereto is secured to the well tubing and the latter is lowered into the well until the packing 6 wedges against the walls of the rat hole, thereby effectively forming a temporary seal between the body 4 and the walls of the rat hole and centering the device in the well. Due to the shape of the packing 6 it will act as a guide for directing the body 4 into the rat hole when said body is lowered into the well. The element 23 is then released at the upper end of the well tubing 22 for gravitation downwardly therethrough and through the passage 17 of the valve seat 16 to dislodge the ball valve 20. The ball valve then gravitates onto the seat 8, closing the body against the escape of any materials in the body. The element 23 remains in the fingers 21 so that should there be any pressure from the rat hole the passage 17 will be closed by said element 23 and thereby prevent the pressure, which may be in the form of oil or gas, from passing up through the well tubing 22.

Cement or similar material is then poured downwardly through the well tubing 22, through the passage 17 into the body 4 where said material passes outwardly of the body by way of the ports 10, forcing the valve element 11 upwardly and evenly filling in the space between the body of the device and the walls of the well. The material fills in evenly between the body 4 and the walls of the well to a desired height to form a permanent seal 27, completely closing the upper portion of the well to the rat hole and thereby prevent desirable substances in the rat hole from being contaminated by undesirable substances which may be in the upper portion of the well.

After the formation and seating of the seal 27, the valve seat 16 and valve seat 8 are crushed and removed by any suitable tool, opening the flow of the gas, liquid or other substance from the rat hole to the well tubing. Figure 4 illustrates the body after the removal of the valve seat 8 and the ball valve while Figure 5 shows the sleeve 15 after the removal of the valve seat 16 and its companion parts.

While I have described the forming of a seal between the upper portion of a well and the rat hole, it is to be understood that through a slight modification my invention may be employed for forming any number of seals in spaced relation in the well, as shown in Figures 6 and 7 of the drawings. The tool 3 may have connected thereto a plurality of tools 28 constructed similarly to the tool 3 except for the valve seat 16 and the ball valve 20 and the seat 8. The tools 28 each will have therein a destructible closure plug 29 for closing the body of each tool to the body of the tool thereunder. When employing the mod-

ified form of my invention to form the series of spaced seals, the uppermost seal is formed first in the well, as shown in Figure 7, and after forming of this seal, the plug 29 of this tool is destroyed so that further pouring of cement or like material will gravitate to the next tool and form the second seal until the last or lowermost seal is to be formed by the tool 3. The same method or step is employed in forming the final seal of the well as heretofore described in connection with the preferred form of the invention.

It will be noted that the packing 30 employed on the tools or units 28 is slightly larger than the packing 6 on the tool 3. The reason for making the packings 30 larger is so that they will contact with the walls of the upper portion of the well, this part of the well being of a diameter greater than the diameter of the rat hole.

During the initial lowering of the tool in the well, the valve element 11 will prevent the ports 10 from being clogged from substances in the well. However, should the ports become clogged they can be opened by liquid or air pressure subjected to the well tubing 22 and after the ball valve 20 has been released from the fingers 21 and engaged with the valve seat 8. With the ball valve in engagement with the valve seat 8, it will be seen that air or liquid pressure subjected to the interior of the body 4 will pass out of the ports 10 and free them of any matter which may be clogging said ports.

Having described the invention, I claim:

1. A device of the character set forth comprising a hollow body, means for connecting said body to a well tubing for forming a continuation of the latter and for lowering into a well, means forming a seal between said body and walls of a rat hole and carried by the body, a temporary closure for the body to prevent seal forming material passed into the body by way of the well tubing from passing from said body, said body having ports to permit the seal forming material to pass from the body and form a seal between the exterior of the body and walls of the well, a valve element slidably mounted on the exterior of the body to close the ports to substances exteriorly of the body, guides secured to the body for slidably supporting the valve element and spring means urging the valve to close the ports and adapted to yield by forces within the body acting on the valve by way of said ports and supported by said guides.

2. A device of the character set forth comprising a tubular body, means for connecting said body to a well tubing for forming a continuation of the latter and for lowering into a well with said well tubing, means forming a seal between said body and walls of a rat hole of said well and carried by the body, a destructible valve seat at one end of the body, a valve means for permitting seal forming material to pass through the body and form a seal between the body and walls of the well, a ball check valve seat carried by the first-named means, a ball valve located between the valve seats and adapted to engage the first-named seat during the placing in and passing of the seal forming material from the body, means for temporarily supporting the ball valve adjacent to the second-named seat to act as a check valve for preventing the pressure in the body passing to the well tubing during the lowering of the well tubing, and means for dislodging the ball valve from its temporary position.

3. A device of the character set forth comprising a tubular body, means for connecting said

body to a well tubing for forming a continuation of the latter and for lowering into a well with said well tubing, means forming a seal between said body and walls of a rat hole of said well and carried by the body, a destructible valve seat at one end of the body, a valve means for permitting seal forming material to pass through the body and form a seal between the body and walls of the well, a ball check valve seat carried by the first-named means, a ball valve located between the valve seats and adapted to engage the first-named seat during the placing in and passing of the seal forming material from the body, resilient fingers carried by the second-named seat for temporarily supporting the ball valve adjacent said second-named seat so that the ball valve may cooperate therewith in preventing pressures in the body from passing to the well tubing during the lowering of the body into the well, and means for dislodging the ball valve from said fingers.

4. A device of the character set forth comprising a tubular body, means for connecting said body to a well tubing for forming a continuation of the latter and for lowering into a well with said well tubing, means forming a seal between said body and walls of a rat hole of said well and carried by the body, a destructible valve seat at one end of the body, a valve means for permitting seal forming material to pass through the body and form a seal between the body and walls of the well, a ball check valve seat carried by the first-named means, a ball valve located between the valve seats and adapted to engage the first-named seat during the placing in and passing of the seal forming material from the body, resilient fingers carried by the second-named seat for temporarily supporting the ball valve adjacent said second-named seat so that the ball valve may cooperate therewith in preventing pressures in the body from passing to the well tubing during the lowering of the body into the well, and means for dislodging the ball valve from the fingers and adapted to form a valve for cooperating with the second seat in checking pressure from the body to the well tubing.

5. A device of the character set forth comprising a tubular body, means for connecting said body to a well tubing for forming a continuation of the latter and for lowering into a well with said well tubing, means forming a seal between said body and walls of a rat hole of said well and carried by the body, a destructible valve seat at one end of the body, a valve means for permitting seal forming material to pass through the body and form a seal between the body and walls of the well, a ball check valve seat carried by the first-named means, a ball valve located between the valve seats and adapted to engage the first-named seat during the placing in and

passing of the seal forming material from the body, resilient fingers carried by the second-named seat for temporarily supporting the ball-valve adjacent said second-named seat so that the ball valve may cooperate therewith in preventing pressures in the body from passing to the well tubing during the lowering of the body into the well, and a dislodging element to pass through the well tubing by gravitation and dislodge the ball valve from the fingers and to be retained by the latter, said element including a valve portion for cooperation with the second-named seat in checking pressures from the body to the well tubing.

6. A device of the character set forth comprising a tubular body, means for connecting said body to a well tubing for forming a continuation of the latter and for lowering into a well with said well tubing, means forming a seal between said body and walls of a rat hole of said well and carried by the body, a destructible valve seat at one end of the body, a valve means for permitting seal forming material to pass through the body and form a seal between the body and walls of the well, a ball check valve seat carried by the first-named means, a ball valve located between the valve seats and adapted to engage the first-named seat during the placing in and passing of the seal forming material from the body, resilient fingers carried by the second-named seat for temporarily supporting the ball valve adjacent said second-named seat so that the ball valve may cooperate therewith in preventing pressures in the body from passing to the well tubing during the lowering of the body into the well, and a dislodging element to pass through the well tubing by gravitation and dislodge the ball valve from the fingers and to be retained by the latter, said element including a valve portion for cooperation with the second-named seat in checking pressures from the body to the well tubing, said second-named valve seat, ball valve and dislodging element being made of destructible material.

7. An oil well tool comprising a body to be lowered into a well and adapted to have cementing material placed therein, an inverted conical shaped plug mounted on said body and of solid yieldable material and of a size to contact and snugly fit walls of a well or walls of a rat-hole of said well to block off portions of the well from each other and to center the body in the well, and means for permitting the cementing material to pass from the body with an even distribution of said material entirely about the body and above and adjacent to the upper end of the plug to contact the plug, walls of the well or walls of the rat-hole and said body to form a seal to prevent the passing of liquid and gas from one portion of the well to another.

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