

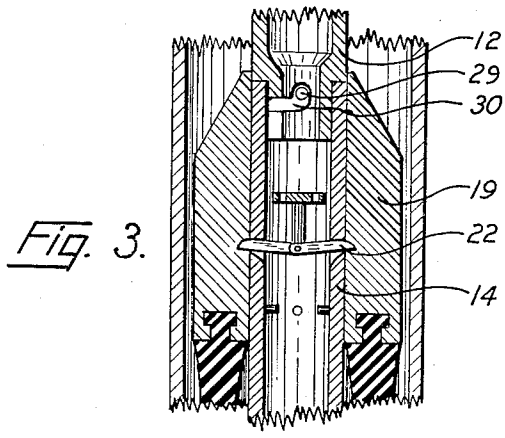
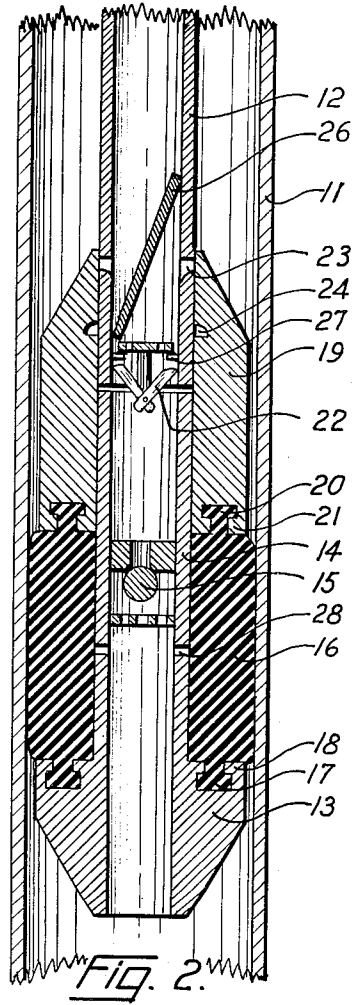
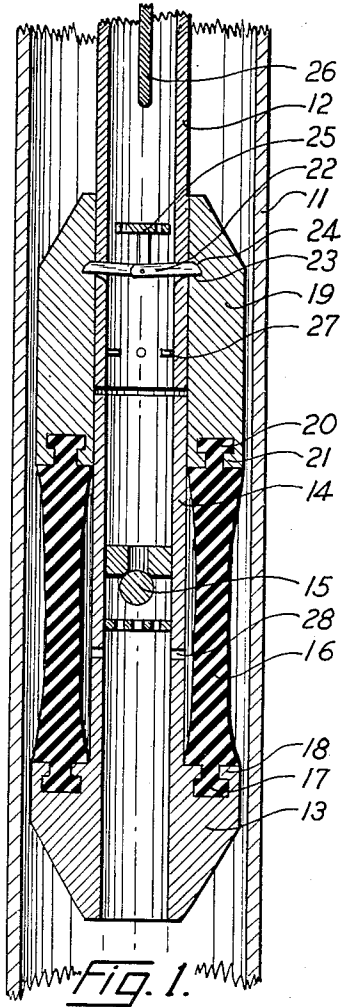
Nov. 29, 1938.

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2,138,156

PACKER

Filed Nov. 16, 1936



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# UNITED STATES PATENT OFFICE

2,138,156

PACKER

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Application November 16, 1936, Serial No. 111,049

6 Claims. (Cl. 166—13)

This invention relates to apparatus adapted for use in oil wells or the like and more particularly to packers or means for retaining elements in fixed and sealed relation in an oil well.

It is often desirable, as in the cementing of an oil well, to fix a valve or other structure to a casing therein. An example of known means for this purpose is shown in the patent to Baker, No. 1,035,674, granted August 13, 1912.

In the prior art constructions of which I am aware metal parts, such as slips, have been necessary in order to hold the packer against movement in at least one direction.

It is an object of the present invention to devise a packer and a securing means which may secure a valve or other structure to a casing without the use of any metal parts.

It is a further object of the invention to devise means for securing some element in a casing by means which may be readily drilled out in case it is desired to remove that element from the casing.

It is still another object of the invention to devise a novel method of setting a packer in an oil well casing or the like.

Another object of the invention is to devise simple means for securing and sealing an element, such as a valve, to the casing in which the packer or sealing means itself acts as the motivating force for effecting the sealing and securing action.

Other objects and advantages reside in certain novel features of the arrangement and method as will be apparent from the following description taken in connection with the accompanying drawing, in which:

Fig. 1 is a vertical cross-sectional view of the casing of an oil well with a valve assembly and a packer being lowered into position, the figure illustrating the position of the parts before the packer has been set;

Fig. 2 is a vertical cross-sectional view of the same apparatus as that shown in Fig. 1 but illustrating the position of the parts after the packer has been set; and

Fig. 3 is a vertical cross-sectional view of a modified form of latching and securing means which may be used in place of the latching and securing means of Figs. 1 and 2.

Referring to the drawing in detail and first to the embodiment of the invention shown in Figs. 1 and 2, it will be seen that a casing of an oil well is there illustrated at 11. Located within the casing at a point where it is desired to maintain a seal is the valve and packer assembly

which constitutes the present invention. This assembly may be mounted upon the lower end of a drill stem or tubing 12, the assembly being secured thereto by latching means which will presently be described.

The assembly includes a lower packer retaining ring 13 which has a tubular extension 14 integral therewith. This element may be made of "Bakelite" or other material which has considerable strength but which may be easily drilled up in case it is desired to remove the apparatus from the casing. The tubular extension 14 may be provided with a valve, as illustrated at 15. This valve may be constructed entirely of cement or other material which may be readily drilled out. In a similar construction now being manufactured the valve seat is made of cement, the ball of hard rubber and the retaining spider for the ball of cement or fibrous material. It is obviously within the scope of the invention to use various materials other than these just mentioned, however, and it may be advisable to use soft metals, such as aluminum or aluminum alloys, for various parts of the apparatus.

For securing the element 13 and the valve 15 to the casing a packer 16 is employed, the packer serving the double function of sealing the element 13 to the casing and of securing it thereto.

The lower end of the packer 16 is rigidly secured to the body portion 13 by being molded in the annular opening 17 beneath the shoulder 18 of the body portion 13. The upper end of the packer 16 is similarly secured to a collar 19 slidably mounted upon the tubular extension 14, the annular opening in the collar 19 being designated at 20 and the shoulder at 21.

The packer 16 may be made of flexible rubber. It may be of such consistency that it can be stretched. When stretched it will occupy the position and take a shape approximately like that illustrated in Fig. 1. To hold the packer in this shape suitable latching means is provided for interlocking the collar 19, the mandrel or tubing 12 and the tubular extension 14. This locking means is shown at 22 as consisting of a simple toggle latch, the pins of which extend through openings 23 in the tubing 12 and cooperate with a groove 24 in the collar 19. The toggle 22 has an operating table or anvil 25 mounted on its axle which when struck by a weight such as that illustrated at 26 will collapse the toggle and unlatch the collar 19 from the tubing 12. For catching the toggle and the anvil suitable pins

may be placed in the tubing 12 as illustrated at 27.

The operation of the apparatus will be apparent from a study of Figs. 1 and 2. In preparing the apparatus before lowering it into the well, the packer 16 will be stretched by some suitable power means available at the well and the toggle placed in position to hold the parts in the position shown in Fig. 1 with the packer distended. It is to be noted that the lower end of the tubing 12 abuts against the upper end of the tubular extension 14 on the main body portion 13 of the assembly and that the parts are held in this position by the collar 19. When the apparatus is lowered to the proper position in the well, the weight 26 is dropped and this unlatches the collar 19 as described above. When this happens the elasticity of the rubber packer 16 causes the collar 19 to move downwardly and the packer takes the position shown in Fig. 2. At the high temperatures and pressures normally existent in an oil well ordinary rubber is extremely sticky. Upon the packer taking the position shown in Fig. 2, therefore, it will adhere to the casing 11. The adhesion to the casing may be enhanced to some extent if the tubing 14 is provided with small openings such as are shown at 28 although these may not be necessary in all cases.

If, now, with the assembly in position as shown in Fig. 2, it is desired to remove the tubing 12 from the well, it will be apparent that all metal parts, such as the toggle 22 and the weight 26, are also removed, leaving only parts which may be made of "Bakelite", cement or rubber which can be easily drilled out should this subsequently be desired.

One advantage in the use of the present assembly is in the cementing of oil wells. In normal use of the assembly the tubing 12 will remain in the position shown in Fig. 2 during the cementing operation. The cement will be forced downwardly through the tubing and through the valve 15. After the cement is in place beneath the assembly the tube 12 may be immediately removed. The valve 15 will close and no cement will flow upwardly through the assembly. Likewise the packer 16 will hold the assembly against movement in an upward direction.

In a cementing operation the pressure at the valve may be extremely high and this will aid in setting the packer firmly. This may be increased to some extent if the rubber in the packer 16 buckles slightly between the shoulder 18 and the inner surface of the casing 11, but since this may not always take place it has not been shown in the drawing. In any event, the packer will be firmly bound to the casing.

In the arrangement of Figs. 1 and 2, as soon as the toggle 22 is released, the tubing 12 is wholly disconnected from the assembly. It will normally remain in place due to the weight of the tubing 12 and this weight will usually be sufficient to enable the cementing operation to be carried on. In some cases it may be desirable, however, to provide separate means for latching or securing the tubing directly to the tubular extension 14 of the main body portion 13 of the assembly independently of the toggle latching mechanism. Such an arrangement is shown in Fig. 3.

In Fig. 3 the valve assembly may be similar to that shown in Figs. 1 and 2 and the corresponding parts have been similarly designated. It is

to be noted, however, that the toggle 22 instead of latching the collar 19 to the tubing 12 latches it to the tubular extension 14. The tubing 12 is connected to the tubular extension 14 by means of pins 29 operating in the bayonet slots 30. A weight 26 like that illustrated in Figs. 1 and 2 may be dropped through the tubing 12 in the arrangement of Fig. 3 and operate the toggle as before. The cementing operation may then be carried on with the tubing 12 secured to the tubular extension 14 and after the cementing operation is completed the tubing 12 may be removed from the well by disconnecting the bayonet joint. Instead of a bayonet joint, the tubing 12 may be secured to the extension 14 by means of screw-threads or other connectors.

If it is desired to remove the toggle mechanism 22 from the well after the cementing operation is completed, this can be done by connecting it by means of a flexible connector, such as a chain, to the lower end of the tubing 12, but this has not been shown in the drawing.

It is to be noted that in both embodiments of the invention illustrated the packer is set merely by dropping a weight in the tubing, the resiliency of the material of which the packer is made itself acting as the motive force for setting the packer. This constitutes a simple and effective way of securing any element to the casing in a well. In addition it constitutes simple means for securing a valve or other element to the casing by means which may be readily removed from the casing subsequently.

If it is desired, the entire assembly, that is, the body portion 13 with its tubular extension 14, the collar 19, the packer 16 and the valve 15 in the tubular extension 14, may all be made of non-metallic, easily drillable, material. The packer may be made of soft rubber and the other members of the assembly of hard rubber, "Bakelite", cement or concrete.

While only two embodiments of the invention have been shown and described herein, it is obvious that various changes may be made both in the structure and in the method of operating the same without departing from the spirit of the invention or the scope of the annexed claims.

I claim:

1. Apparatus for securing and sealing an element in a casing or the like which includes a packer, means for holding the packer in stretched position and substantially out of contact with the casing and latching means cooperating with said holding means and operable to release the same at will to enable the packer to contact the casing.

2. Apparatus for securing and sealing an element in a casing or the like which includes a rubber packer, means for holding the packer in stretched position and means for releasing said holding means to enable the packer to contact the casing.

3. A packer adapted for use in oil wells or the like and comprising a body of elastic yieldable material, means for deforming the body into such shape that the same can be readily lowered into place in the well and means for releasing said deforming means to enable the body to change its shape under the influence of its own elasticity to contact the wall of the well.

4. A valve assembly adapted to be secured and sealed to the casing of an oil well or the like and comprising a main valve body, a collar slidably mounted on a portion of said body, an elastic

packer surrounding a portion of said body with one end secured thereto and the other end secured to said collar and means for latching the collar to said body to hold the packer in distorted position, the arrangement being such that upon the release of the latching means the packer may expand as the result of its elasticity and contact and stick to the casing.

5  
10  
15  
20  
5. A valve assembly adapted to be secured and sealed to the casing of an oil well or the like and comprising a main valve body, a collar slidably mounted on a portion of said body, an elastic packer surrounding a portion of said body with one end secured thereto and the other end secured to said collar and means for latching the collar to said body to hold the packer in distorted position, the arrangement being such that upon the release of the latching means the packer may expand as the result of its elasticity and contact and stick to the casing, said valve, valve

body and collar being made of hard non-metallic, readily drillable, material and said packer being made of soft rubber.

6. A structure adapted to be suspended on the lower end of a drill stem or tubing and lowered into the casing of a well to be secured to the casing, said structure including a main body having a portion abutting against the lower end of said drill stem, a collar slidably mounted on said portion of said body, an elastic packer having one end secured to said body and the other end secured to said collar and latching means for securing the collar to the drill stem, the arrangement being such that upon the release of said latching means the packer expands into contact with the casing and sticks thereto and at the same time the drill stem is disconnected from the structure so that it may be removed from the well.

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