July 22, 1952 L. A. LEFFLER 2,604,170

PLUG PACKER

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Fig. 1.

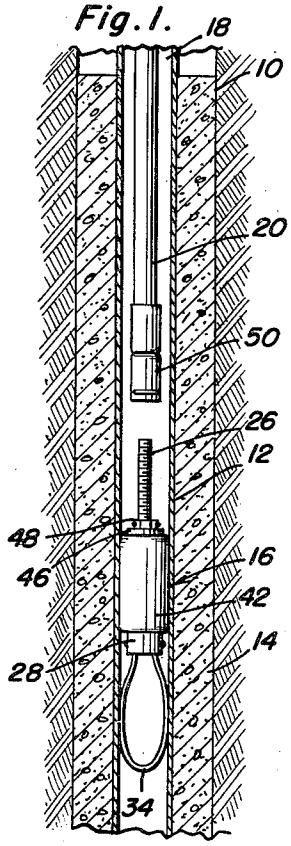


Fig. 2.

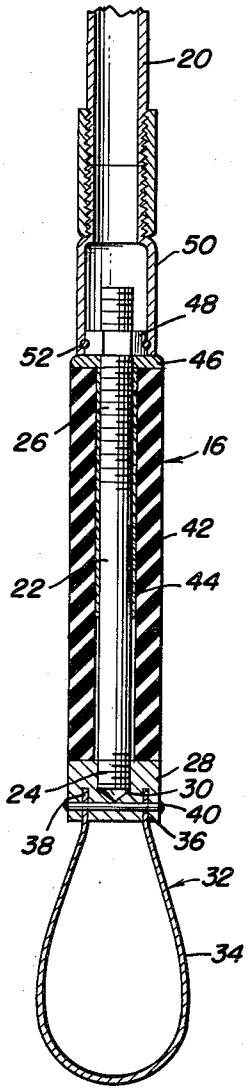


Fig. 3.

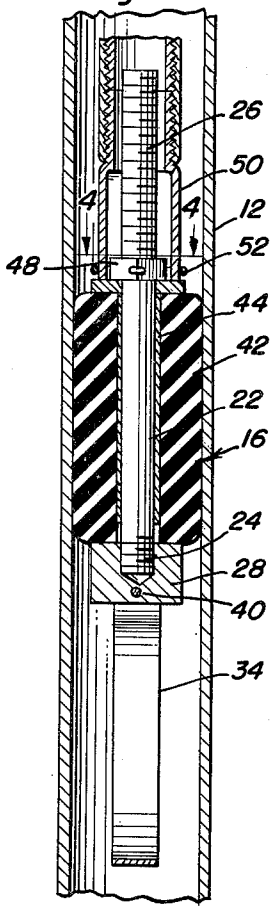


Fig. 5.

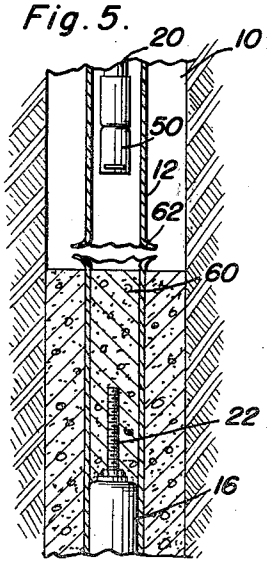
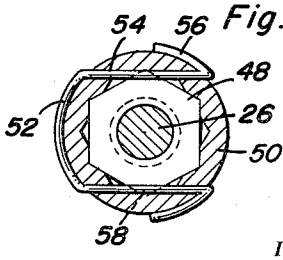


Fig. 4.



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PLUG PACKER

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7 Claims. (Cl. 166—13)

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This invention appertains to a well plug for sealing or plugging off a lower section of a well bore and more particularly is directed to a method and means for plugging a well hole in such a manner as to permit recovery of the well casing or tubing.

The primary object of this invention is to dependably seal off a well casing in a manner to prevent leakage and to resist pressure thrusts from above or below the plug.

Another important object of this invention is to seal off a well hole and enable the well casing above the sealed zone to be removed for re-use.

This invention comprehends the positioning of an expandable plug or sealing member in a pipe casing by using a pipe string to lower it into the bore of the pipe casing and the locking of the plug in the casing at the lower end thereof by rotating the pipe string to expand the plug into locking engagement with the walls of the casing.

This invention further includes the removal of the pipe casing above the locked plug by pouring cement onto the plug and rupturing or fracturing the walls of the casing above the set cement to enable the portion of the casing thus removed to be pulled from the well hole.

These and ancillary objects and structural features of merit are attained by this invention the preferred embodiment of which is set forth in the following description and illustrated in the accompanying drawing, wherein:

Figure 1 is a vertical sectional view of a well hole and casing showing the plug in set or locked position in the casing;

Figure 2 is a vertical sectional view of the plug;

Figure 3 is an enlarged vertical sectional view of the plug in set position in the casing;

Figure 4 is a cross sectional view taken on line 4—4 of Figure 3, and

Figure 5 is a fragmentary vertical sectional view of the well hole and plug after the upper portion of the casing has been removed.

In the accompanying drawing, the numeral 10 designates a well hole within which a well casing or tubing 12 is positioned, the lower portion thereof being lined by cement 14. It is the primary purpose of this invention to seal off the lower portion of the casing 12 to permit removal of the portion of the casing above the seal. Thus, a plug 16 is provided and is adapted to be lowered into the bore 18 of the casing by suitable lowering means, such as a pipe string 20.

The plug 16 includes an elongated body portion or rod 22, which is formed with an externally threaded lower end 24 and an exteriorly

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threaded upper end 26, the upper end being extensively threaded. An enlarged member or cap 28 is formed with a threaded axially disposed socket 30 receiving the end 24 of the rod, the member 28 thus being secured to the lower end of the rod.

Anchoring means 32 is carried by the cap 28 and is provided to initially brake the descent of the plug and to retain the same in the desired lowered position. The means 32 includes an elongated strap 34 formed of thin steel or similar material of a resilient nature and provided with apertured ends 36 and 38. The ends are positioned in openings formed in the cap 28 and secured therein by a transverse pin or rivet 40 extending through the cap, so that the strap is centrally flexed and extends downwardly and outwardly from the cap to engage the walls of the casing 12.

A deformable resilient sleeve 42 is concentrically disposed on the rod and is spaced from the threaded end 26 by a tube 44 so that the threads on the end 26 do not come in contact with the sleeve. A collar or washer 46 is slidably positioned on the rod and engages the upper end of the sleeve with the lower end of the sleeve seated on the cap 28.

A rotatable multi-sided member or nut 48 is threadingly engaged on the upper end 26 of the rod and is spaced from the sleeve by the washer 46. A socket member 50, complementary to the nut 48, is carried by the lower end of the pipe string 20 and is adapted, upon rotation of the pipe string, to rotate the nut.

Means is provided for connecting the socket member 50 to the nut 48 so that the plug can be lowered into the casing by the pipe string 20 and includes a U-shaped pin 52 which has its legs disposed in parallel openings 54 in the socket member. The terminals 56 of the legs are bent back upon the socket member to lock the pin therein. It is to be noted that the legs are positioned parallel in the bore of the socket member and grooves or slots 58 are formed in the opposing sides of the nut to seat the legs. In use, the socket would be positioned on the nut, before the pipe string or plug would be lowered into the casing, and the pin is inserted, as seen in Figure 4, to lock the socket member on the nut and thereby connect the plug to the pipe string.

After the plug 16 is lowered into the casing 12 to the desired depth the pipe string 20 is rotated to force the anchoring means 32 into decided engagement of the side walls of the casing. Continued rotation of the pipe string will result in

a downward movement of the nut 48 on the rod and effect a coincidental compression of the sleeve 42, which, as seen in Figure 3, will be translated into an expansion of the sleeve laterally of the bore of the casing. The sleeve will thus be locked in fluid tight engagement with the walls of the casing.

The pipe string is then pulled upwardly and the pin 52 is sheared so that the socket 50 and the pipe string are dislocated from the plug 16, which is locked in the casing bore. Cement is then introduced into the pipe string and forced onto the top of the plug, so that when it is set a concrete top 60 is formed over the plug. Suitable explosives, such as nitro-jelly are then employed and lowered in the casing, above the concrete 60, and detonated to rupture or fracture the casing 12, as at 62 in Figure 5. The upper portion of the casing can then be withdrawn from the well hole for re-use.

Having described the invention, what is claimed as new is:

1. Means for plugging oil well casings comprising an elongated body member having an enlarged lower end, an anchoring member carried by said end and adapted to frictionally engage the walls of a casing, a deformable resilient sleeve concentrically mounted on the body member and seated on the enlarged lower end thereof, a nut and washer rotatably mounted on the upper end of the body member and engageable with the sleeve, said washer being interposed between said nut and said sleeve, and means supporting said body member suspended in the casing and engageable with said nut for rotating the same to compress the sleeve and expand it into fluid tight engagement of the walls of the casing, said nut having parallel notches in opposite sides thereof, said support means including a socket surrounding said nut and having spaced openings in alignment with said notches, a pin extending through said openings and seating in said notches and securing said socket to said nut.

2. The combination of claim 1, wherein said lower end of the body member is rotatably mounted thereon.

3. The combination of claim 1, wherein said anchoring member includes a steel strap having its ends secured to the lower end of the body member and extending outwardly therefrom and in alignment therewith.

4. The combination of claim 1, wherein the upper end of said body member is externally threaded and a tube is interposed between the body member and the sleeve.

5. The combination of claim 1, wherein said last means includes a pipe string connected to said socket.

6. The combination of claim 1 wherein said pin is U-shaped and adapted to shear when said socket is rotated in one direction.

7. Means for plugging oil well casings comprising an elongated body member having an enlarged lower end, an anchoring member carried by said end and adapted to frictionally engage the walls of a casing, a deformable resilient sleeve concentrically mounted on the body member and seated on the enlarged lower end thereof, a nut and washer rotatably mounted on the upper end of the body member and engageable with the sleeve, said washer being interposed between said nut and said sleeve, and means supporting said body member suspended in the casing and engageable with said nut for rotating the same to compress the sleeve and expand it into fluid tight engagement of the walls of the casing, said nut having spaced notches therein, said support means including a socket surrounding said nut, a shear pin extending through said socket and seating in said notches to secure the socket to the body member.

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