

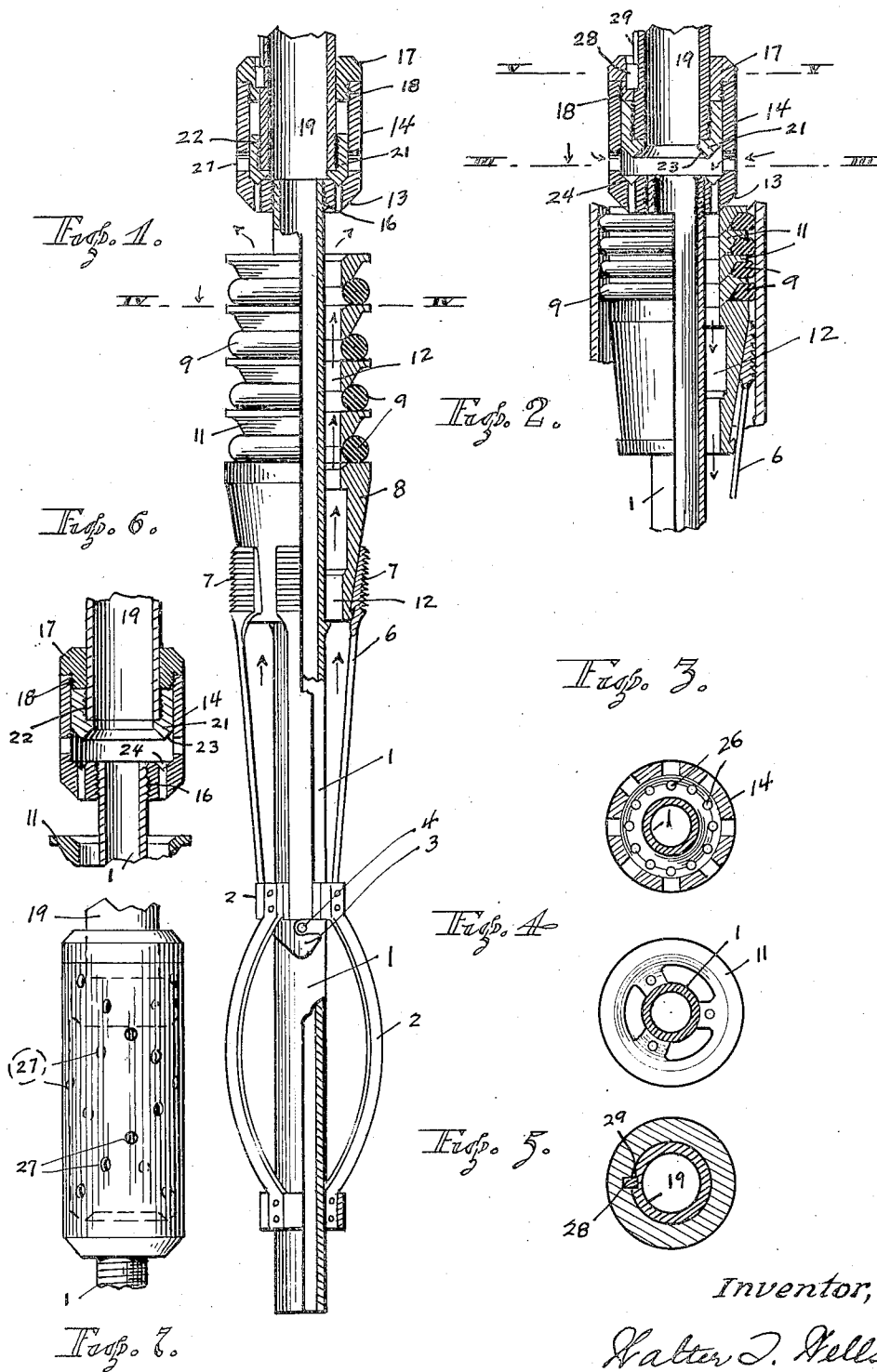
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PACKER

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1,926,017

PACKER

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9 Claims. (Cl. 166—12)

The present invention is an improved packer and is, particularly, an improvement on the device shown and claimed by me in an application for Letters Patent filed on June 1, 1932, Serial No. 614,731.

The object of this invention is to provide in a packer, wherein a central by-pass is opened and closed by compressive force applied to head and foot members one of which is secured to, and the other slidable on a tubing string, a secondary valve controlling a bleeder passage which communicates with said by-pass.

The purpose of said secondary valve and passage is to provide a structure which can be readily lifted, after the packer has once been set. The structure herein described permits the use of a head member of reduced cross-sectional area whereby the lifting force required will be considerably less than is required for conventional types of packer.

In a packer of sixteen inch diameter the member which obstructs passage of fluid, as the packer is moved in the casing, is usually of twelve or thirteen inch diameter, whereas in my improved type this can be reduced to five inches or less.

Another object is the provision of automatic means for breaking the hydraulic lock, by equalizing, suddenly, the pressure above and below the packer to produce an impact, of sufficient force to dislodge and release the packer when it is to be raised.

Another object is the provision of means for controlling the rate of flow of fluid, under pressure from above, to the zone below the packer, and through a by-pass within the packing elements.

In the accompanying drawing, Fig. 1 is an elevation, partly in section, of my improved packer,

Fig. 2 is a fragmentary sectional view of same showing the packer set and the secondary valve open,

Fig. 3 is a section of Fig. 2 on the line III—III,

Fig. 4 is a section of Fig. 1 on the line IV—IV,

Fig. 5 is a section of Fig. 2, on the line V—V,

Fig. 6 is a fragmentary view showing both valves open, and

Fig. 7 is an elevation of an elongated type of slip-head showing a series of helically disposed ports for throttling the capacity of a passage between primary and secondary valves.

Referring to the drawing, the numeral 1 indicates a tubular support member on which is slidable a cage 2 of springs, adapted to frictionally engage the wall of a casing surrounding

the packer. A hook 3 releasably engages a stud 4 protruding from tube 1. Cage 2 carries slip members 6 provided with serrations 7 for engagement with the casing wall when said slips are spread by a cone 8 slidable on tube 1.

At 9 I show packing rings adapted to be deformed between compression rings 11, slidable on tube 1. A by-pass 12 extends through the packer, outside of tube 1 and within the packing elements 9 and rings 11, and said by-pass is closed by a valve-face 13 on a head member 14.

The parts so far described are shown and claimed in my copending application before mentioned. The novel features of this invention pertain to the head structure hereinafter described. In this instance the head member 14 is threaded to the tube 1, at 16, and is of sleeve form. The upper end is closed by a collar 17 threaded thereto at 18. Said collar is slidable on a tubing string 19 from which it is suspended by a collar 21 threaded at 22 to said tubing.

This provides a slip-head structure. The lower end of collar 21 is tapered as shown at 23 to seat in an annular groove 24 in the bottom of which are ports or passages 26 which communicate with the by-pass 12, when the packer is set (as in Fig. 2).

The wall of head 14 is provided with ports 27, normally open, as shown in Fig. 6, while the packer is run in. When the packer is set, by release of stud 4 from hook 3, tube 1 slips down through cage 2 and cone 8 spreads slips 6, and the descending head causes surface 13 to close the by-pass 12 and thereafter compress rings 9 as shown in Fig. 2.

Weight of the tubing string 19 causes collar 21 to seat in groove 24, closing ports 26 and 27.

When the packer is set and valves 13 and 21 set in closed position, fluid in the zone below the packer is released to the atmosphere by opening the dry tubing string at the bottom and the hydrostatic pressure in the formation is allowed to build up as will be indicated by a rise of fluid in the tubing string 19.

This increased pressure (over atmospheric) is less than the hydrostatic pressure in the casing, otherwise the well would flow. This being the case, the operation of this packer, with a valve positioned below it (not shown) and the tubing dry, the opening of said valve, instantaneously puts the entire weight of the fluid column in the casing on top of the packer. This weight, in a great many instances is too great for present day well equipment to lift.

This is the reason for the by-pass area 12.

Therefore, I have provided a secondary valve, the effective cross-sectional area of which is but slightly greater than that of the tubing string and which offers but little resistance to lift.

- 5 Immediately upon opening of the secondary valve 21, hydrostatic pressure from the casing is admitted through ports 26 and 27, communicating with by-pass area 12 of the packer and is transmitted directly to the fluid zone
10 below the packer, thus equalizing the pressure above and below said packer, at the same time opening the larger area of the primary valve 13, governing the by-pass 12, allowing fluid in the casing to displace through the packer and the
15 entire device can be easily lifted through the fluid-filled casing:

At the time that this equalizing occurs the packer is subjected to a momentary shock. The impact of hydraulic pressure as described, is sufficient to dislodge the entire packer.

- 20 In order to impart rotary movement to tube 1, from tubing 19, when stud 3 is to be released to set the packer, and still permit sliding movement of head 14, I provide a key 28, secured to head
25 14, and slidable in a key-way 29 in tubing 19.

I claim:

1. In a packer for suspension on a tubing string wherein flexible packing is adapted to be de-
30 formed by compression between head and foot members provided with means permitting relative movement, and wherein one of said members is adapted to open and close a by-pass through said packer and within said packing, a head member movable on said tubing string, and pro-
35 vided with a fluid passage connecting said by-pass with the space between said packer and a surrounding casing, and means, associated with said tubing string, co-operating with said head, for opening and closing said passage.

- 40 2. In a packer for suspension on a tubing string, wherein flexible packing is adapted to be deformed by compression between head and foot members provided with means permitting relative movement, and wherein one of said mem-
45 bers is adapted to open and close a by-pass through said packer and within said packing, a head member movable on said tubing string, and provided with a fluid passage connecting said
50 by-pass with the space between said packer and a surrounding casing, and means, associated with said tubing string, co-operating with said head, for opening and closing said passage and said by-pass.

- 55 3. In a packer for suspension on a tubing string, wherein flexible packing is adapted to be deformed by compression between head and foot members provided with means permitting rela-
60 tive movement, and wherein one of said members is adapted to open and close a by-pass extending through said packer and within said packing, a head member movable on said tubing string, and provided with a fluid passage connecting said by-pass with the space between said packer and a
65 surrounding casing, means, operable by the movement of said tubing string, for opening and closing said passage and said by-pass, and means for regulating the capacity of said passage.

4. In a hook-wall packer, provided with a by-

pass therethrough within elastic packing, and with means for connection with a tubing string, a sleeve head member, slidable on said tubing string and provided with a primary valve surface, adapted to open and close said by-pass, and also provided with a passage connecting said by-pass with the space between said packer and a surrounding casing, a secondary head member rigidly secured to said tubing string and provided with means for closing said passage, and means, responsive to the movement of said tubing string, for opening and closing said passage independently of said by-pass valve.

5. In a hook-wall packer, provided with a by-pass therethrough and with means for connection to a tubing string, a sleeve-head member, slidable on said tubing string and provided with a primary valve surface adapted to open and close said by-pass and with a passage connecting said by-pass with the space between said packer and a surrounding casing, a secondary head member rigidly connected to said tubing string and provided with means for closing said passage, means responsive to movement of said tubing string for opening and closing said passage independently of said by-pass valve, and throttling means for restricting the capacity of said passage.

6. The combination, with a tubing string and a packer provided with a by-pass therethrough independent of said tubing string, of a closure for said by-pass, movable with respect to said tubing string, and provided with a passage connecting said by-pass with the zone above said packer and between said tubing string and a surrounding wall, and means for opening said passage to bleed said by-pass.

7. In combination, a tubing string, a packer provided with a by-pass therethrough independent of said tubing string, a closure constituting a primary valve controlling said by-pass and provided with a passage therethrough connecting said by-pass with the zone above said packer outside of said tubing string, and means for opening and closing said passage.

8. In combination, a tubing string, a packer provided with a by-pass therethrough independent of said tubing string, a closure member constituting a primary valve controlling flow of fluid through said by-pass and provided with a passage therethrough connecting said by-pass with the zone above said packer outside of said tubing string, means responsive to movement of said tubing string for opening and closing said passage, and means for placing said primary valve under strain whereby it will unseat, automatically, when said by-pass is bled.

9. In combination, a tubing string, a packer provided with a by-pass therethrough independent of said tubing string, a closure constituting a primary valve for closing said by-pass, and provided with a passage extending said by-pass to the zone above said packer outside of said tubing string, a secondary valve means controlling flow through said passage, means for actuating said secondary valve, and throttling means for regulating the rate of flow through said passage.

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