Sept. 1, 1936. G. MEYER 2,052,786

WELL PACKER

Filed May 4, 1935

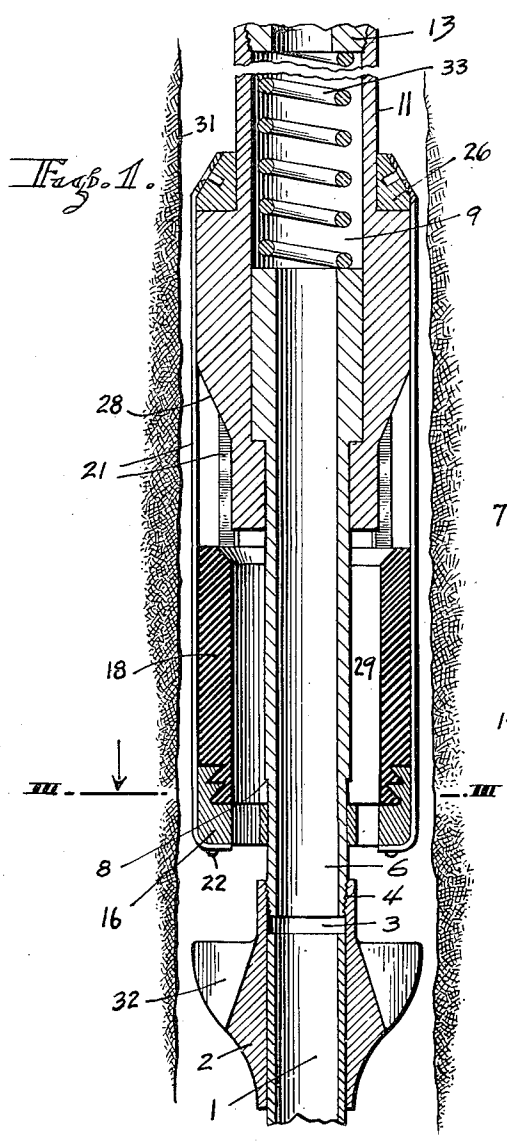


Fig. 1.

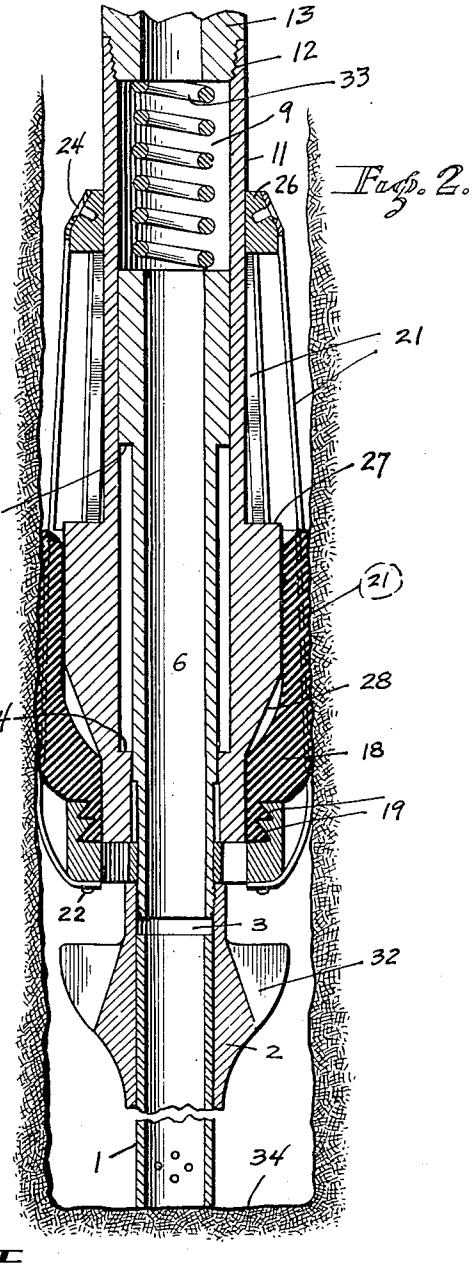


Fig. 2.

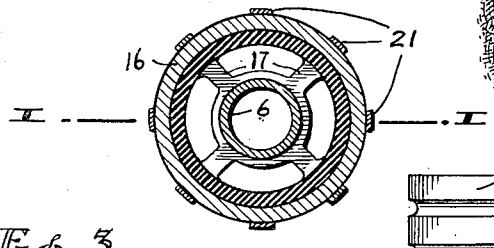


Fig. 3.

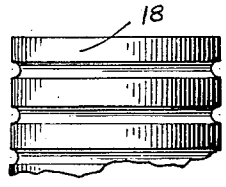


Fig. 4.

INVENTOR

Gerhard Meyer.

Patented Sept. 1, 1936 2,052,786

UNITED STATES PATENT OFFICE

2,052,786

WELL PACKER

Gerhard Meyer, Los Angeles, Calif., assignor to The Technicraft Engineering Corp., Los Angeles, Calif., a corporation of California

Application May 4, 1935, Serial No. 19,834

7 Claims. (Cl. 166—10)

My invention relates to packers for oil wells and the like, and the objects of my invention are:

First, to provide a packer having a bypass channel through its packing element and exteriorly of its mandrel or body member to permit flow of fluids past and around the packing element as the packer is raised or lowered in the well bore, thereby providing a packer which may be readily and easily lowered or withdrawn from a liquid and particularly a mud filled well bore;

Second, to provide a packer wherein the packing element is not directly subjected to the weight of the tubing string, but is expanded radially against the surrounding formation or casing by an internal expanding member and the direct weight of the tubing string is carried by other elements designed for such purpose;

Third, to provide a packer which is particularly suitable for use as a formation packer;

Fourth, to provide a packer which incorporates a novelly arranged packing element and restraining cage therefor;

Fifth, to provide a packer wherein the packing element tends to increase its sealing engagement with the well bore when the pressure above the packing element exceeds the pressure below, but readily releases in response to an upward pull on the tubing string; and

Sixth, to provide on the whole a novelly constructed and arranged packer which is efficient in its action, sturdy of construction, and economical of manufacture.

With the above and other objects in view as may appear hereinafter, attention is directed to the accompanying drawing in which:

Figure 1 is a longitudinal sectional view of my packer taken substantially through I—I of Figure 3 as it appears when being lowered or raised in a well bore, the connections at the ends of the packer being broken away.

Figure 2 is a similar sectonal view of my packer when in its set or sealing position and showing the tubing string and perforated liner fragmentarily.

Figure 3 is a transverse sectional view taken through III—III of Figure 1.

Figure 4 is a fragmentary elevational view of a modified form of my packing element.

Referring to the drawing, the numeral 1 indicates a perforated pipe constituting the lowermost member of my packer assembly shown in Figures 1 and 2.

The upper end of said pipe is threaded, or rigidly secured in any suitable manner, to a guide member 2 provided with a centrally disposed passage 3 which is tapped to receive threads 4 on a tubular support member or mandrel 6.

The wall thickness of member 6 is successively reduced to form annular shoulders 7 and 8. The major head portion of member 6 is made to slide within a centrally disposed bore 9 in a sleeve member 11, threaded at 12 for engagement with a tubing string 13.

The bore 9 in sleeve 11 is reduced to form an annular shoulder 14 adapted to abut shoulder 7 on the support 6 and, when so engaged, said shoulder supports the weight of member 6, guide 2, and perforated pipe 1.

Shoulder 8 on support member 6 serves as a stop to limit the travel of a spider ring 16, provided with radially disposed lugs 17, Figure 3, the inner ends of which slidably contact the peripheral surface of member 6 at its smallest diameter.

Spider ring 16 engages the lower end of a packing sleeve 18, said ring and said sleeve being provided with interlocking complementary configurations on their confronting surfaces, indicated at 19 in the drawing.

The packing sleeve 18 is confined, circumferentially, within a basket of springs 21 of flexible material. The lower ends of said springs are secured, as by screws 22, to the spider ring 16, and the upper ends, as by screws 24, to a ring 26 slidable on the sleeve 11.

Sleeve 11 is provided with an enlarged body portion, said body being flat on the top to form a shoulder 27 for abutment with ring 26.

Said body portion is tapered, as indicated at 28, to form a conical spreader intermediate said sleeve 11. The lower end of sleeve 11 is of a diameter coinciding substantially with that of the opening 29 through packing sleeve 18, and is of a length sufficient to penetrate and stabilize laterally, said packing sleeve, when the sleeve 11 is lowered to dilate the packing sleeve by the entrance of the conical spreader 28.

Operation

When my packer is run in to a well bore 31, the parts assume the relative positions shown in Figure 1. Drilling fluid encountered by the descending implement is displaced through slots 32, cut radially in the guide 2 which serves as a centering means for the assembly above. Said fluid also flows through opening 29 within the packing sleeve 18 and out between the spring members 21.

This fluid passage is normally kept open as the packer is run in, by the weight of the suspended

members 1, 2 and 6, and/or by an expansion spring 33 bearing at one end against the lower end of tubing string 13 and at the opposite end against the top of support member 6.

When the perforated pipe 1 encounters the bottom 34 of the well bore 31, weight of the tubing string compresses spring 33, moves sleeve 11 downwardly, and forces the lower end of said sleeve into the opening 29 in the packing sleeve 18.

At this point said packing sleeve is moved downwardly until lugs 17 on the spider ring 16 are obstructed by the upper end of guide 2.

Further lowering of the tubing string 1 forces the conical spreader 28 into the packing sleeve 18, dilating said sleeve laterally against the surrounding formation wall as indicated in Figure 2.

It will be noted that, when the packer is set, the weight of the tubing string is not applied directly to the deformed packing sleeve 18, but is transmitted, through sleeve 11, and lugs 17 and guide 2, to the perforated pipe 1, resting on the bottom of the well.

The resilient packing material of sleeve 18 is displaced laterally by spreader 28 and adapts itself to inequalities in the surface of the formation wall. Any excess of rubber is free to displace at the top of said sleeve which is unconfined.

When the packer is set, as in Figure 2, the interlocking portions of sleeve 18 and spider ring 16 are prevented from disengagement by the lower end of sleeve 11.

When the packer is to be removed, upward movement of tubing string 13 withdraws spreader 28 from the packing sleeve 18 which is held by frictional engagement with formation and by engagement of lugs 17, of the spider ring 16, with the shoulder 8 on support 6.

While the packer is set, springs 21 are bowed, causing a downward movement of collar 26 to which said springs are attached at the top. Said springs become embedded in the resilient packing, as indicated in dotted lines, Figure 2.

When the tubing string is lifted, shoulder 27 on sleeve 11 encounters ring 26 and straightens the bowed springs 21, causing them to compress the packing sleeve 18 and restore it to original shape, as in Figure 1.

I claim:

1. In a packer: a pair of tubular members connected in a manner to provide a limited degree of relative longitudinal movement; an annulus of resilient material; means responsive to relative movement of said tubular members in one direction for dilating said annulus radially; and an instrumentality responsive to relative movement of said tubular members in the opposite direction for contracting said annulus radially.

2. In a packer: a pair of tubular members connected in a manner to provide a limited degree of relative longitudinal movement; a packing annulus of resilient material; a cage surrounding said packing annulus and including a plurality of flexible retracting elements tending to retain said packing annulus in an inoperative position; and means moveable within said cage and connected with one of said tubular members for entering and expanding said packing annulus radially in opposition to said retracting elements.

3. In a packer; a sleeve of resilient material; a keeper ring encircling one end of said sleeve, said sleeve and keeper ring having complementary interlocking portions; a dilating means adapted to be inserted in said sleeve to expand it radially; and means associated with the dilating means for engaging said sleeve and holding it in its interlocked relation with said ring.

4. In a well packer; a packing sleeve restrained at its lower end and radially dilatable at its upper portion, said sleeve providing a circulating passage through its interior; and a combined dilating and sealing member adapted to be inserted in said packing sleeve to expand the same radially and seal said passage.

5. In a well packer; a packing annulus; a combined dilating and sealing member adapted to be inserted in said annulus to expand the same radially and plug the opening therethrough; and yieldable means tending to retain said packing annulus in an inoperative position whereby the packing annulus is urged to an inoperative position upon withdrawal of said dilating and sealing member.

6. In a well packer; a packing sleeve restrained at its lower end and radially dilatable at its upper portion, said sleeve providing a circulating passage through its interior; a combined dilating and sealing member adapted to be inserted in said packing sleeve to expand the same radially and seal said passage; and means tending to constrict the packing sleeve whereby the packing sleeve is urged to a constricted position upon withdrawal of said dilating member.

7. In a well packer; a packing sleeve providing a circulating passage through its interior; a keeper ring encircling one end of said sleeve, said sleeve and keeper ring having complementary interlocking portions; a dilating means adapted to be inserted in said sleeve to expand it radially; means associated with the dilating means for engaging said sleeve and holding it in its interlocked relation with said ring; and circulating valve means formed by said dilating means and packing sleeve for controlling said passage.

GERHARD MEYER.