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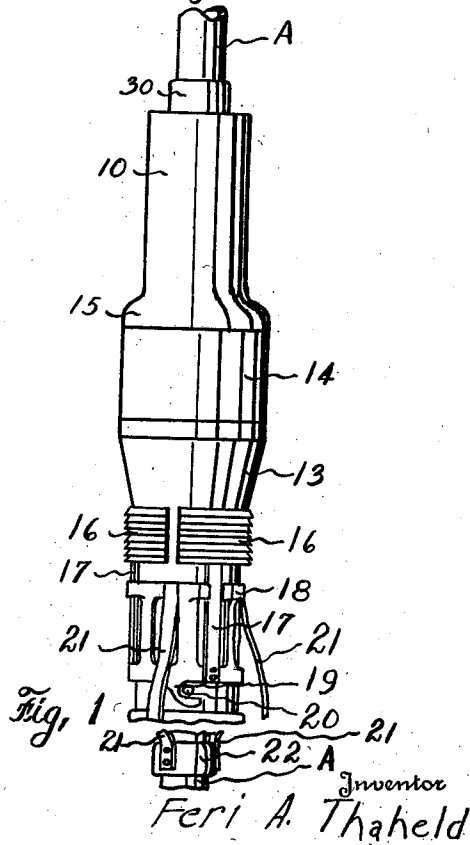
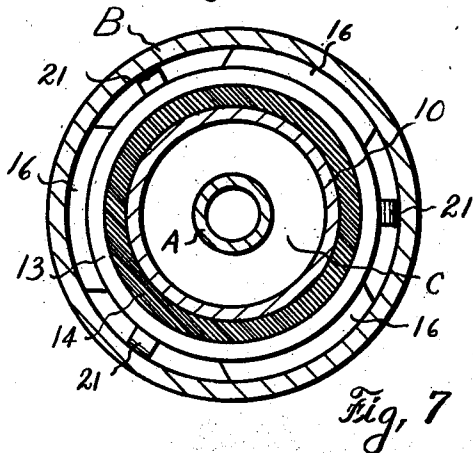
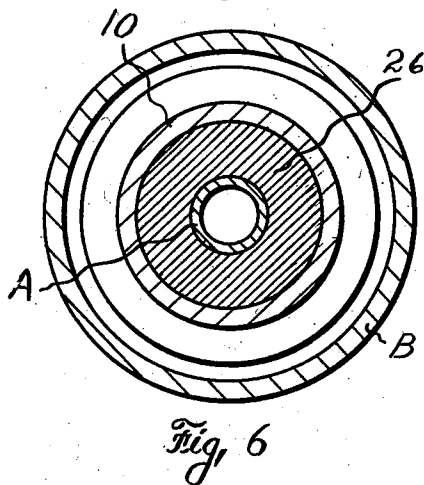
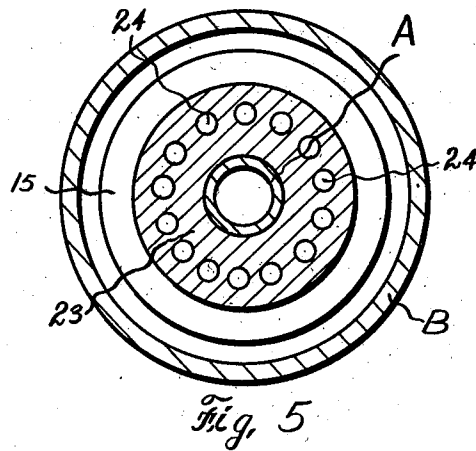
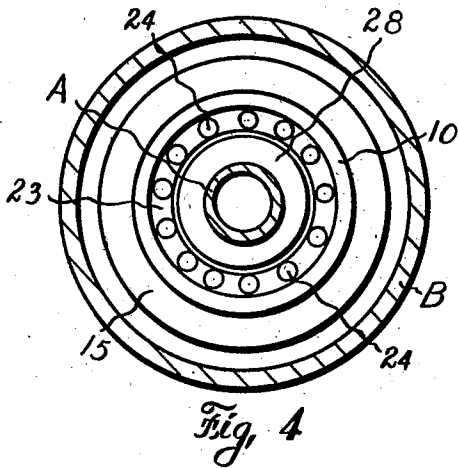
F. A. THAHELD

2,144,420

WELL PACKER

Filed March 21 1936

2 Sheets-Sheet 1



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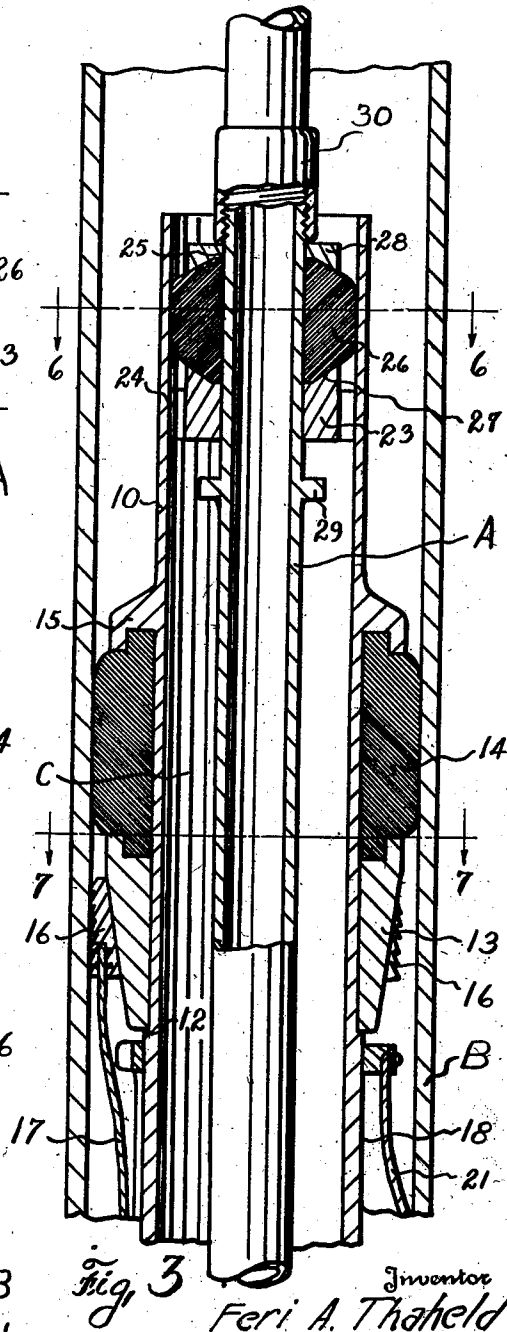
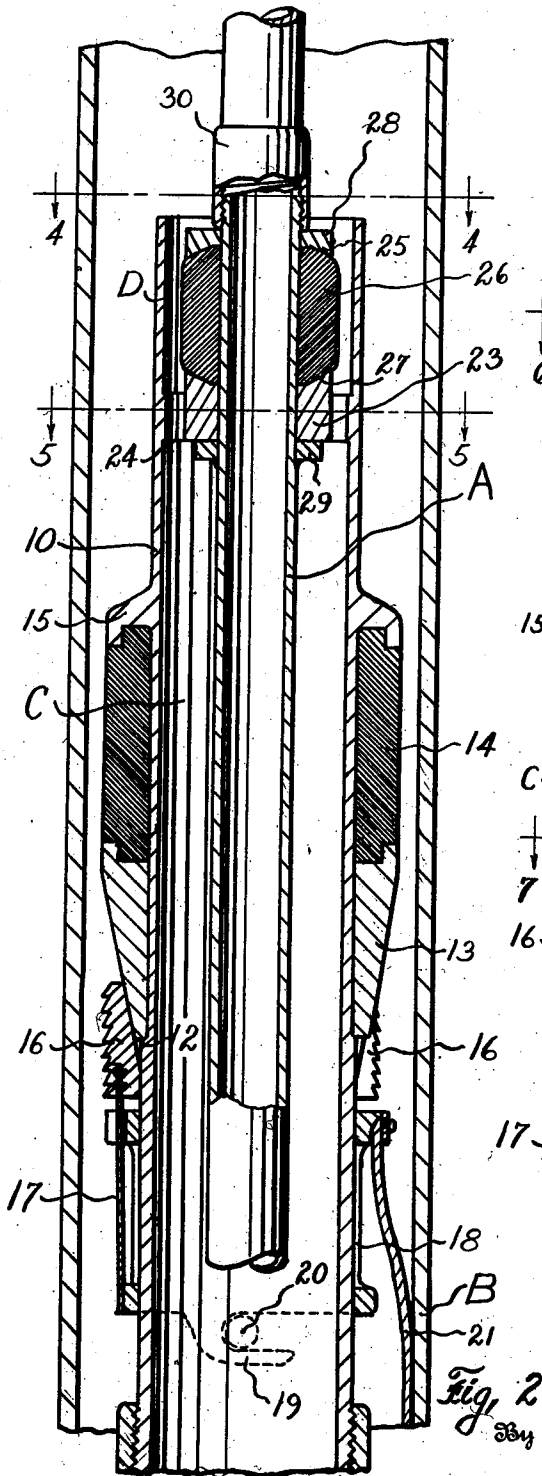
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WELL PACKER

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,144,420

WELL PACKER.

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Application March 21, 1936, Serial No. 70,069

4 Claims. (Cl. 166—12)

This invention relates to new and useful im-
provements in well packers.

The invention particularly relates to that type
of well packer which seals or packs off the space
5 between the casing and the tubing and usually
is provided with a valve for controlling the fluid
through the packer. This valve is ordinarily
mounted at the upper end of the packer and acts
as a by-pass when the packer is lowered into the
10 well casing. Also, after the packer is set, this
valve controls the flow of fluid therethrough.
The valve is usually formed with a beveled seat-
ing surface adapted to engage a complementary
ground seat. It has been found that sand, grit,
15 and other extraneous matter present in the fluid
flowing past the valve accumulate on the ground
seat or on the seating surface of the valve, there-
by preventing proper seating of the valve and
preventing a fluid tight seal; also paraffin adheres
20 to the valve and seat and interferes with the
proper operation of the valve. Further, the
abrasive materials in the fluid score the metallic
surfaces of the valve and seat and thus cause
improper seating with resultant leakage thereby.

One object of the invention is to provide an
improved packer wherein the usual metallic valve
and seat for controlling the flow of fluid through
the packer is eliminated, thus overcoming the
disadvantages and objections above set forth.

An important object of the invention is to pro-
vide an improved packer which is so constructed
that an increased amount of fluid may flow there-
through as the same is being lowered into the
well casing, said packer having packing means
35 for sealing the passageway thereof, whereby said
packing means controls the flow of fluid through
the packer.

Another object of the invention is to provide an
improved packer having a primary packing mem-
ber for packing off the casing and a secondary
packing member carried by the packer and dis-
posed so that when distorted, it will seal off the
passage through the packer to control the flow
of fluid therethrough.

A further object of the invention is to provide a
packer carrying two elastic packing elements,
which are arranged to be set successively, one of
said packing elements being capable of retraction
without releasing the seal formed by the
50 other element, whereby the first named packing
element will control the flow of fluid through the
packer body while the other element maintains
a seal to pack off between said body and the well
casing.

55 A still further object of the invention is to pro-

vide a packer having an elastic packing element
for controlling the flow of fluid through the packer
body, said element being constructed with an
amplified contacting surface, whereby the flow
of fluid is more effectively cut off, and also where-
5 by the amplified sealing area precludes foreign
and extraneous matter from interfering with the
operation of said packing element.

A construction designed to carry out the inven-
tion will be hereinafter described, together with 10
other features of the invention.

The invention will be more readily understood
from a reading of the following specification and
by reference to the accompanying drawings, in
which an example of the invention is shown, and 15
wherein:

Figure 1 is an elevation of a packer, constructed
in accordance with the invention.

Figure 2 is an enlarged transverse, vertical sec-
tional view of the same, and showing the packing 20
elements in retracted, or unset position.

Figure 3 is a view, similar to Figure 2, showing
the packing elements in an expanded or set
position.

Figure 4 is a horizontal, cross-sectional view, 25
taken on the line 4—4 of Figure 2.

Figure 5 is a similar view, taken on the line
5—5 of Figure 2.

Figure 6 is a similar view, taken on the line
6—6 of Figure 3, and 30

Figure 7 is a similar view, taken on the line
7—7 of Figure 3.

In the drawings, the numeral 10 designates
an elongated tubular mandrel or shell 10, which
forms the main portion of the device. The 35
upper end of this mandrel is open, as is its
lower end, which lower end is provided with a
suitable collar 11. The mandrel is provided
with an annular offset or shoulder 12, this shoul-
der being located nearer its lower end. A cone 40
or slip head 13 is slidable on the mandrel and
is normally supported on the offset or shoulder
12. With this arrangement, it will be obvious
that the mandrel 10 may move downwardly with
relation to the cone, but upon upward movement 45
of said mandrel the cone will be moved there-
with due to the shoulder engaging the underside
or bottom of said cone.

An annular elastic packing element 14, which
is constructed of rubber, or other suitable ma- 50
terial, surrounds the mandrel 10 and has its
lower end suitably supported within the upper
end of the cone 13. The upper end of the elastic
packing member is engaged by an annular
flanged cap 15 which is preferably made integral 55

with the mandrel 10. By observing Figure 2, it will be obvious that the packing element 14 is confined on the mandrel between the integral cap 15 and the cone 13.

5 A plurality of slips 16, of any suitable construction, are mounted to slide vertically on the inclined surface of the cone 13. These slips are carried by links 17 which have their lower ends secured to the lower end of a cage 18 which is
10 slidable on the mandrel 10. The slips are held in a normally retracted, or lowered position by a hook 19 which is carried by the lower end of the cage. This hook normally engages a gudgeon 20 on the mandrel. When the hook is engaging
15 the gudgeon, it is obvious that the cage 18 is immovable endwise with relation to the mandrel, whereby the slips are held in their lowermost position on the cone 13. A plurality of bowed friction springs 21 have their upper ends se-
20 cured to the upper end of the cage 18 while their lower ends are secured to a collar 22 (see Figure 1) which is slidable on the well tubing A which passes through the mandrel. These fric-
25 tion springs normally engage the inner periphery of the well casing B.

All of the above described parts are of the usual construction and are, therefore, subject to variation. Their operation is obvious. When the mandrel 10 is lowered into the well casing B,
30 the friction springs 21 will ride the inner peripheral wall of said casing and will serve to center the mandrel therein. When the point at which the packer is to be set is reached, the mandrel 10 is rotated to disengage the hook 19 from the
35 gudgeon 20. This permits the mandrel 10 to move downwardly through the cage 18 which is held stationary by the friction springs 21. This causes the slips 16 to ride upwardly on the cone 13 into their expanded position to grip the casing
40 wall. As soon as this occurs the cone 13 is locked in a stationary position, and further downward movement of the mandrel 10 will cause the cap 15 which is made integral there-
45 with, to exert a pressure against the packing member 14, whereby said member is expanded into packing relation with the casing wall.

The mandrel or shell 10 has a greater diameter than the diameter of the well tubing A, whereby an annular passage C is provided between these
50 parts. For controlling the flow of well fluid through this annular space C, the mandrel 10 is provided with a transverse spider or partition 23 which is located near its upper end. This spider is provided with longitudinal ports 24,
55 whereby the fluid may pass upwardly there-through and into the annular space D there-above. The spider, of course, has an axial opening 25 through which the well tubing A extends. For controlling the flow of fluid through the
60 space D above the ports and outwardly from the upper end of the mandrel 10, a second packing element 26 is provided. This packing element is made of any suitable elastic material and sur-
65 rounds the well tubing A. The lower end of the member is supported within an annular beveled seat 27 which is provided at the central portion of the spider 23 around the well tubing. The
70 upper end of the packing element is engaged by an annular ring 28 which is suitably secured to the well tubing A. The underside of this ring is provided with an annular bevel so as to retain the upper end of the packing element therein. A recovery ring 29 is welded, or otherwise se-
75 cured, on the outer surface of the well tubing A, and this ring is located so as to engage the under

side of the spider 23 when the packing element 26 is in its retracted or unexpanded position. It is noted that although the ring 28 may be welded, or otherwise secured on the well tubing so as to engage the upper end of the packing
5 element, it would be possible to confine this ring between the packing element and the lower end of the coupling collar 30 which is screwed onto the upper end of the section of well tubing.

The operation of the device is obvious. The
10 mandrel and its associate parts are assembled on the section of the well tubing A, which section is connected in the usual tubing string. The device is then lowered into the well and when the point at which said packer is to be set is
15 reached, the hook 19 is disengaged from the gudgeon 20 to permit the slips 16 to be set. Upon setting of the slips 16, the weight of the tubing string A, as well as the weight of the mandrel
20 10, will cause said mandrel to continue its down-ward movement. Since the cone 13 is held in a stationary position, continued downward move-
25 ment of the mandrel 10 causes the primary packing element 14 to be distorted with longitudinal compression and radial expansion into engage-
ment with the casing wall. Thus, it will be seen that the packing element 14 packs off the space
between the casing and the mandrel 10.

After the packing element 14 has been distorted into its packing position, it will be ob-
30 vious that further downward movement of the mandrel 10 is arrested. After this occurs, the weight of the tubing string A is then placed on the ring 28 which engages the upper end of the packing element 26. The lower end of this pack-
35 ing element is supported on the transverse spider 23 which is an integral part of the mandrel 10, whereby the lower end of said packing element is held stationary. As the tubing string A moves
40 downwardly through the spider, the weight of said string is placed upon the packing element 26 through the ring 28. This causes the pack-
ing element 26 to move to its expanded position as is shown in Figure 3, whereby the annular
45 space D between the well tubing and the mandrel 10 above the spider 23 is packed off or closed. Therefore the flow of fluid through the mandrel is cut off.

When it is desired to release the packing ele-
50 ment 26 it is only necessary to raise the well tubing A, whereby the weight of the string is taken off of said element. It is obvious that as soon as this element is relieved of the weight it will return to its normal position to open the
55 annular space D through the mandrel to permit the flow of fluid therethrough. If it is desired to remove the entire device from the well casing it is only necessary to continue the upward move-
60 ment of the well string after the packing member 26 has been released. In such case, the recovery ring 29 on the tubing A will engage the under-
side of the spider 23. Thus, upward movement of the tubing will lift the mandrel 10 with rela-
65 tion to the slips and cone 13. This will relieve the weight on the packing member 14 and permit it to return to its normal unexpanded position. Continued upward movement of the mandrel will
70 cause the offset or shoulder 12 to engage beneath the cone 13 and raise the same, whereby the slips 16 are retracted. The device may then be re-
moved from the well.

It is pointed out that the packing element 26 within the upper end of the mandrel 10 takes the place of the usual metallic valve which is provided to control the flow through the mandrel. The

seat surface of this metallic valve, as well as the seat which it engages, must be ground to give a tight seal. Due to this fact, it is obvious that dirt, grit, and other extraneous matter will accumulate on the ground seat. Therefore, when the valve is closed this extraneous matter will prevent a tight seal and will permit leakage. Also in some wells, paraffin will accumulate on the seat or on the valve and will interfere with the proper operation thereof. By providing the packing element 26, it will be obvious that these disadvantages are overcome. The surface which the packing element 26 engages is enlarged to a great extent and therefore, any accumulation on the side walls of the mandrel 10 will not interfere with a good seal. Thus, a very efficient packing off of the mandrel is had and all the disadvantages of a metallic valve are overcome. Due to the construction it is possible to release the packing element 26 without releasing the primary packing element 14. This permits a control of the flow of fluid through the mandrel. The device is readily lowered to any desired point in the well casing B and may be readily set at any point therein. The insertion and removal of said device within the casing is readily accomplished.

What I claim and desire to secure by Letters Patent, is:

1. A well packer carried by tubing adapted to be lowered in a well casing including, a mandrel spaced from the well tubing and casing forming an outer passageway between the mandrel and casing and an inner passageway between the mandrel and tubing, an outer packing element, means whereby said packing element may be set to close the outer passageway, an inner packing element, a spider carried by said mandrel and supporting said inner packing element, said inner packing element adapted to be actuated to close the inner passageway when the first mentioned means has been actuated and the well tubing is thereafter lowered.

2. A well packer including, a tubular mandrel adapted to be lowered into a well casing and having the well tubing extending therethrough, means for anchoring the mandrel in the well casing, external packing means on the mandrel adapted to be expanded into engagement with the casing, an internal elastic packing member supported annularly at its lower end by said mandrel and extending within the mandrel and normally retracted from the inner wall of said mandrel, and means on the well tubing for engaging the upper end of said member annularly, whereby when the mandrel is locked and externally packed off in position within the well casing the weight of the tubing will longitudinally compress and radially expand said internal

packing member to pack off the space between the well tubing and the mandrel to prevent the flow of fluid through said mandrel.

3. A well packer including, a tubular mandrel adapted to be lowered into a well casing and having the well tubing extending therethrough, means for anchoring the mandrel in the well casing, external packing means on the mandrel adapted to be expanded into engagement with the casing, a transverse supporting member within the upper end portion of the mandrel, said member having a longitudinal fluid flow passageway therethrough, an internal elastic packing element supported at its lower end on said member and surrounding the well tubing, said internal packing element being normally retracted from the inner wall of the mandrel whereby fluid may flow past said element, and means carried by the well tubing and engaging the upper end of said internal packing element, whereby, when the mandrel is held stationary and externally packed off in the well casing, the downward movement of the well tubing will effect the longitudinal compression and radial expansion of said internal packing element to cut off the flow of fluid through the mandrel.

4. A well packer including, a tubular mandrel adapted to be lowered into a well casing and having the well tubing extending therethrough, means for anchoring the mandrel in the well casing, external packing means on the mandrel adapted to be expanded into engagement with the casing, a transverse supporting member within the upper end portion of the mandrel, said member having an annular series of longitudinal fluid flow passageways therethrough and a central annular seat surrounding the well tubing which is slidable longitudinally therethrough, an internal elastic packing element supported at its lower end on said annular seat of said supporting member and surrounding the well tubing, said internal packing element being normally retracted from the inner wall of the mandrel whereby fluid may flow past said element, a collar carried by the well tubing and engaging the upper end of said internal packing element, whereby, when the mandrel is held stationary and packed off in the well casing, the downward movement of the well tubing will effect the longitudinal compression and radial expansion of said internal packing element to cut off the flow of fluid through the mandrel, and means on the well tubing below said transverse supporting member of the mandrel whereby to engage said supporting member when the well tubing is raised and thereby effect the withdrawal of the mandrel from the well casing.

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