

Nov. 3, 1936.

B. E. PARRISH

2,059,901

WELL PACKER

Filed May 20, 1935

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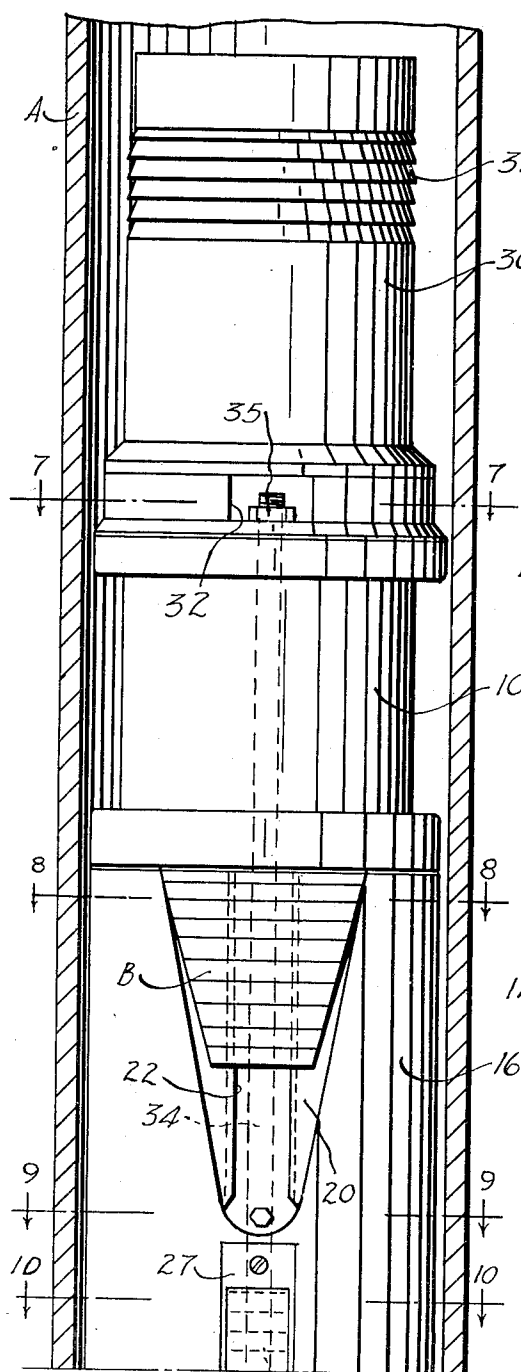


Fig. 1

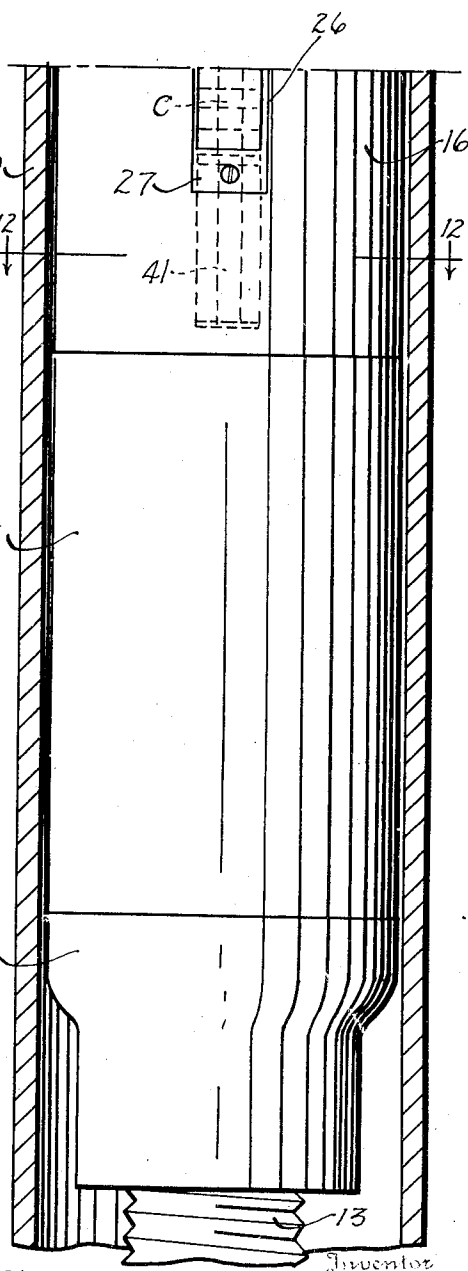


Fig. 2

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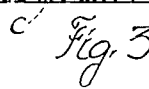
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5 Sheets-Sheet 2



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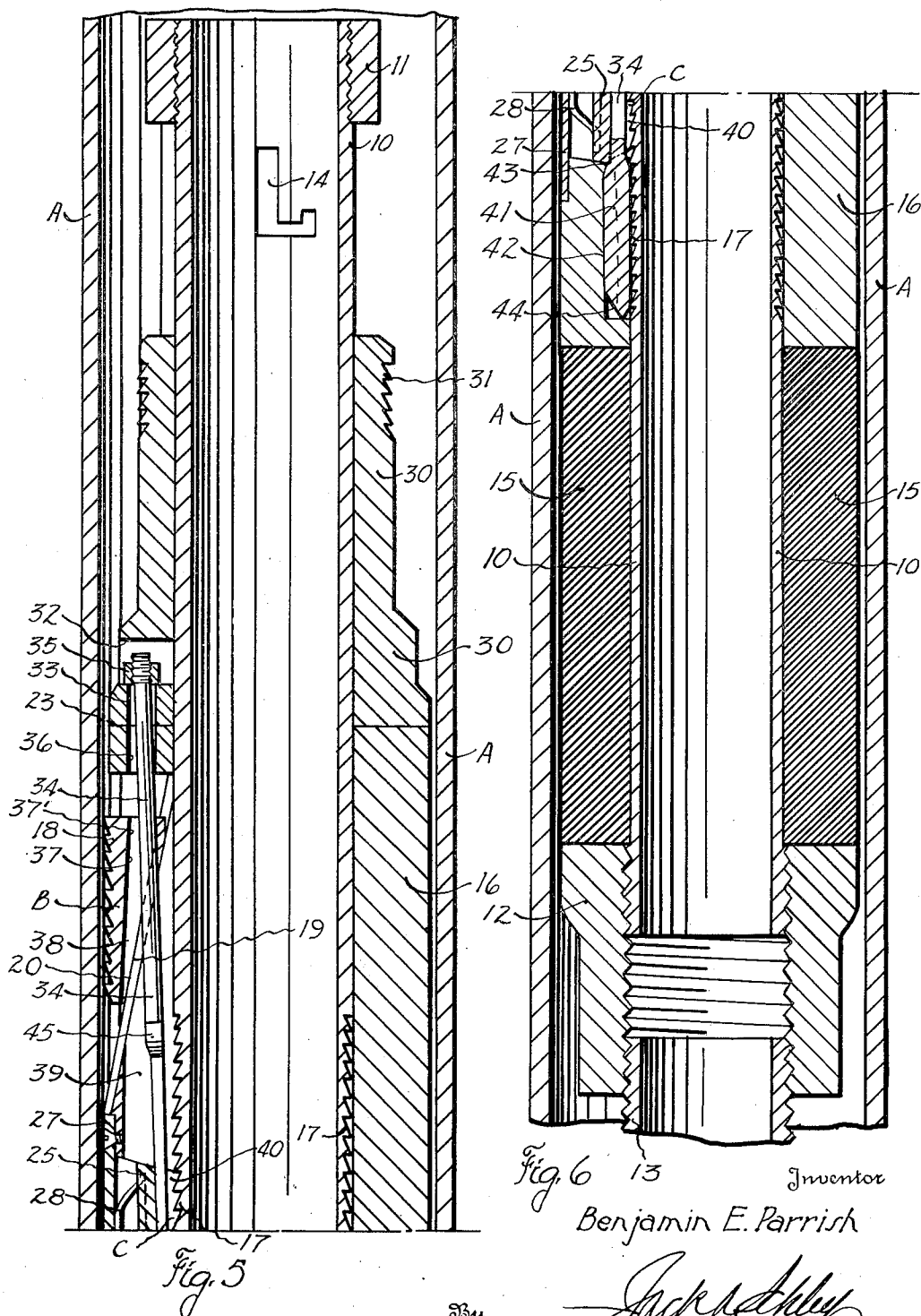
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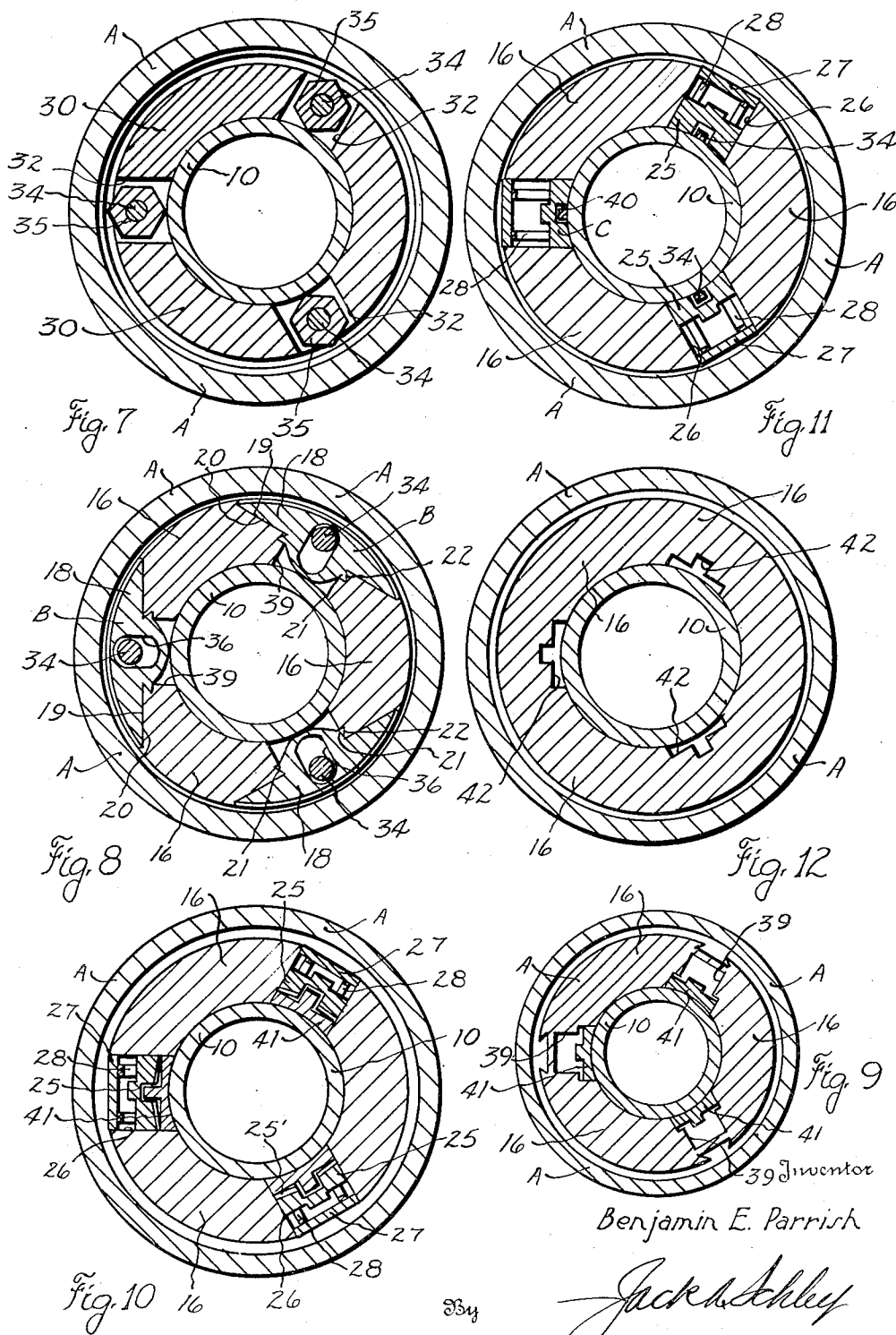
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WELL PACKER

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5 Sheets-Sheet 5

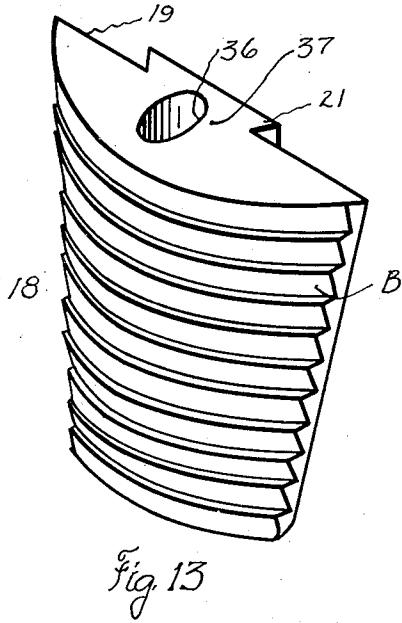
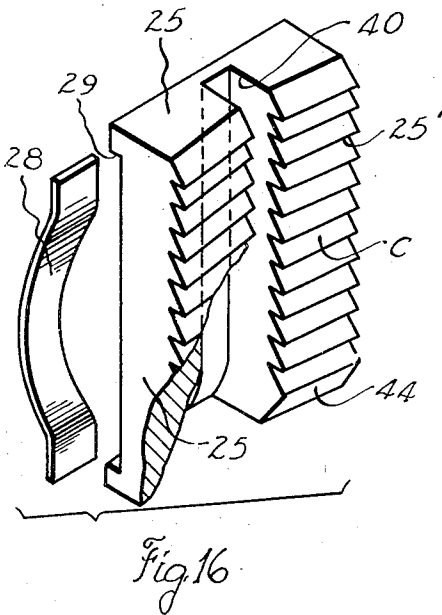
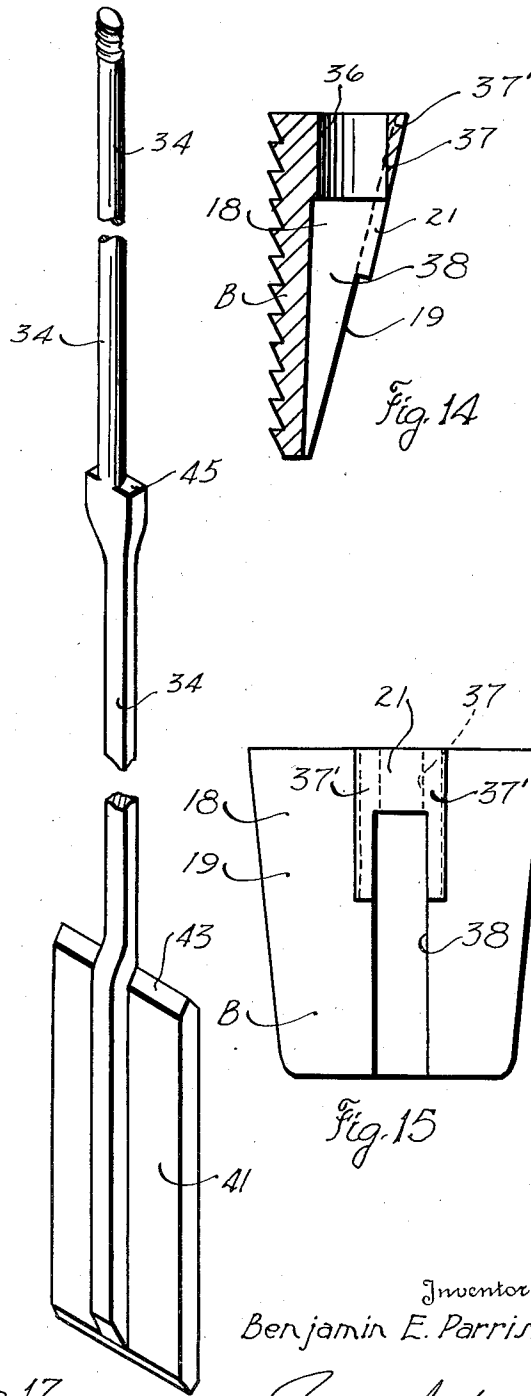
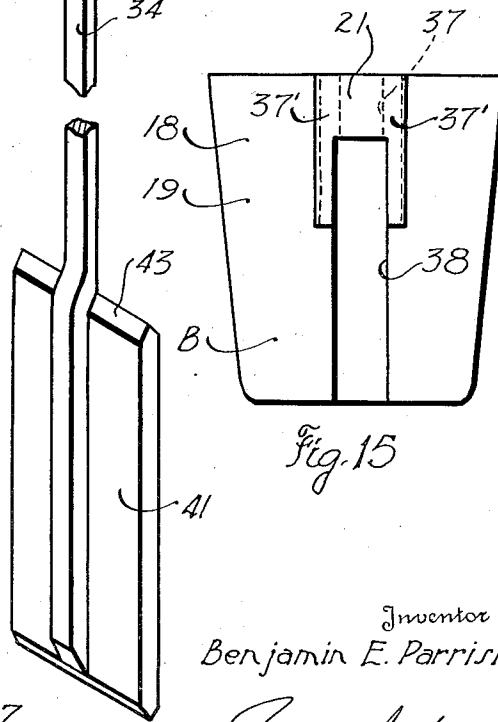


Fig. 17

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UNITED STATES PATENT OFFICE

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WELL PACKER

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10 Claims. (Cl. 166—12)

This invention relates to new and useful improvements in well packers.

One object of the invention is to provide an improved packer which may be anchored at any point within a well casing and which may be utilized for supporting a working barrel, or for any other purpose.

An important object of the invention is to provide an improved packer for packing off a well casing which may be anchored at any point within the casing, and having releasing means for readily removing said packer at any desired time; the packer being capable of supporting a pump whereby the use of tubing, together with its cost and disadvantages, is eliminated.

Another object of the invention is to provide an improved packer including two sets of slips, one to prevent upward movement, the other to prevent downward movement, and means for releasing both sets of slips simultaneously from gripping position to permit removal of the packer from the casing.

A further object of the invention is to provide improved releasing means for a packer which is so arranged that upon actuation of said means, the packing is retracted from the wall of the well casing, whereby upon removal of the packer from said casing, no swabbing effect is caused by the packing element remaining in engagement with said member.

A construction designed to carry out the invention will be hereinafter described, together with 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 wherein:

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

Figure 2 is a continuation of Figure 1 showing the lower half of said unit,

Figure 3 is a vertical, sectional view of the parts shown in Figure 1, taken at right angles thereto, and showing the device in a released position,

Figure 4 is a vertical sectional view which is a continuation of Figure 3, and showing the same parts shown in Figure 2,

Figures 5 and 6 are views, similar to Figures 3 and 4 and showing the device in an anchored position,

Figure 7 is a horizontal, cross-sectional view, taken on the line 7—7 of Figure 1,

Figure 8 is a horizontal, cross-sectional view, taken on the line 8—8 of Figure 1,

Figure 9 is a horizontal, cross-sectional view, taken on the line 9—9 of Figure 1,

Figure 10 is a horizontal, cross-sectional view, taken on the line 10—10 of Figure 1,

Figure 11 is a horizontal, cross-sectional view, taken on the line 11—11 of Figure 5, and showing the inner slips in an engaged position,

Figure 12 is a horizontal, cross-sectional view, taken on the line 12—12 of Figure 1,

Figure 13 is an isometric view of one of the outer slips,

Figure 14 is a vertical, sectional view of the same,

Figure 15 is a rear elevation thereof,

Figure 16 is an isometric view of one of the inner slips and its spring, and

Figure 17 is an isometric view of the releasing plunger for the slips.

In the drawings, the numeral 10 designates a tubular mandrel which forms the main body of the unit. A collar 11 is threaded on the upper end of the mandrel while a working barrel collar 12 is screwed onto the lower end of said mandrel and receives the upper end of a working barrel 13. The pump plunger (not shown) reciprocates in said barrel for pumping the fluid. A J-slot 14 is provided in the mandrel near the upper end thereof for receiving a suitable tool (not shown) whereby the mandrel may be lowered in the well casing A, as will be explained.

An elongated, flexible packing member 15, made of rubber, or other suitable material, surrounds the mandrel and has its lower end resting on the upper face of the working barrel collar 12. A slip supporting sleeve 16 is slidably mounted on the mandrel 10 and has its lower end resting on the upper end of the packing member, whereby the latter is confined between said sleeve and the collar 12. The supporting sleeve carries two sets of slips, an upper or outer set B, and a lower or inner set C. The outer slips B are arranged to engage the inner wall of the casing A to prevent upper movement of the sleeve and the inner slips C are arranged to engage complementary teeth 17 formed on the face of the mandrel 10, whereby the sleeve and mandrel are locked together. When the slips B and C are in their engaged positions, the mandrel and sleeve comprise a single unit locked with the well casing.

As clearly shown in Figures 3, 5 and 8, the upper set B comprises three slips 18 spaced equally around the upper end of the sleeve. Each slip has its outer face curved to conform to the

radius of the casing wall. Its rear face 19 is inclined and is arranged to slide vertically on a complementary inclined face 20 which is formed in the upper end of said sleeve. A dovetail 21 on the rear face of each slip engages in slots 22 on the face 20 to prevent outward displacement of said slips. Thus, it is obvious that the slips are freely slidable on the faces 20 of the sleeve. The inclination of each face is such that when the slips are in their uppermost position, they are retracted and disengaged from the wall of the casing A. A shoulder 23 is formed on the upper end of the sleeve above each inclined face, and the upper end of each slip abuts this shoulder when in a retracted position (Figure 3). Since the slips 18 are free to move vertically on the inclined faces 20, it is obvious that as the sleeve moves downwardly within the casing the frictional engagement of the casing wall with said slips will tend to slide the same upwardly on the faces to a retracted position, whereby said slips will not interfere with the downward movement of the sleeve within the casing A.

The lower or inner set of slips C comprises three slips 25 which are disposed within the sleeve 16, one directly beneath each outer slip 18. Each slip 25 is substantially rectangular in shape and is mounted in a rectangular opening 26 which is formed in the sleeve. As clearly shown in Figure 10, each opening 26 extends completely through the sleeve. Each slip is mounted in the opening with its teeth 25' inwardly, whereby said teeth may engage the teeth 17 on the mandrel 10. This inner face of each slip 25 is on the same radius as the wall of the mandrel 10. A plate 27 closes each rectangular opening 26 after the slip 25 has been inserted and a pair of flat springs 28 are confined between the rear face of each slip and plate.

Shoulders 29 (Figure 16) are formed at the upper and lower ends of the rear face of each slip 25, whereby the ends of the springs 28 may engage thereunder. The springs exert their tension to constantly force the slips 25 inwardly, whereby their teeth 25' engage the teeth 17 on the mandrel. It is pointed out that the inclination of the teeth of both the mandrel and slips 25 is such (Figures 3 and 5) that when said teeth are engaged, the mandrel 10 may move upwardly within the sleeve but downward movement of the mandrel within said sleeve is prevented. Thus, it is obvious that when the mandrel is lowered into the well casing, the slips 25 being engaged with the teeth 17 on said mandrel, will cause the sleeve to travel downwardly therewith. As has been explained, downward movement of the sleeve within the casing tends to hold the upper slips 18 in their retracted position.

As soon as the downward movements stop, however, the upper slips 18 immediately drop down the inclined faces 20 into engagement with the wall of the casing. An upward pull on the mandrel will then raise the collar 12 at its lower end, the inclination of the teeth 17 and teeth 25' of the slips permitting this upward movement of the mandrel with the sleeve 16. Since the sleeve 16 is locked against any upward movement in the casing A by the upper slips 18, upward movement of the mandrel and lower collar 12 will distort the packing member 15 between said collar and the lower end of the sleeve. This distortion causes the packing member to engage the wall of the casing. The mandrel is raised until further upward movement is prevented by the distorted packing member. Then, the tool (not

shown) which has been used to lower the unit into the well is removed from the slot 14 and it is obvious that the unit is securely locked against movement in the well. Upward movement is prevented by the outer slips 18, and downward movement is prevented by the frictional engagement of the packing with the casing wall. The packing member cannot be released because the inner slips 25 prevent any downward movement by the mandrel. The pump plunger may then be entered into the working barrel 13 and pumping continued in the usual way.

It is pointed out that with this unit a working barrel of larger diameter may be employed because the mandrel 10 may be of a larger size than the tubing which would be used in a well casing of the same size. This permits increased production at less lifting costs because the well casing is utilized for the flow of fluid being pumped. The elimination of the tubing not only saves the original cost of such tubing but does away with all disadvantages thereof, such as paraffin accumulating therein, and cracks and leaks developing in said tubing.

For releasing the two sets of slips B and C to permit removal of the unit from the well casing, a head 30 is slidably mounted on the mandrel between the upper end of the sleeve and the collar 11. The upper end of said head is provided with annular teeth 31. Radial slots 32 are formed in the head near the lower end thereof. Three slots are provided and each slot is positioned in vertical alignment with one of the slips 18 and 23. A vertical opening 33 extends from the bottom of the head to each slot and the upper end of a releasing rod 34 projects through this opening into the slot and receives a nut 35 whereby the rod is attached to and movable with the head.

Each rod extends downwardly through an opening 36 in the shoulder 23 and through an opening 37 in a collar 37' formed at the upper end of the dovetail 21 on the rear face of the slip 18. Each slip is provided with a vertical groove 38 and the sleeve 16 is provided with a vertical slot 39 which extends from each opening 26 wherein the inner slips 25 are mounted, to each shoulder 23 on said sleeve. Thus, each released rod 34 extending downwardly through the opening 37 in each slip continues downwardly through the groove 38 in said slip and through the slot 39 in the sleeve.

Each rod then extends through a groove 40 formed centrally in the gripping face of each inner slip 25 (Figure 16). The lower end of each rod carries a blade-like releasing member 41, which, when the head 32, which carries the rods is in a lowered position and resting on the upper end of the sleeve (Figures 5 and 6), is positioned within a vertical recess 42 formed on the inner face of the sleeve 16 below and communicating with the opening 26 wherein one of the slips 25 is mounted. It is pointed out that one release rod and blade is provided for one slip of each set B and C. In other words, one rod controls one slip 18 and one slip 25.

Obviously, the weight of the head 30 will at all times cause the same to rest on the sleeve 16, thereby holding the release rods and members 41 in a lowered position, as shown in Figures 5 and 6. With the members 41 in this position, in the recesses 42, the teeth 25 of the slips 25 engage the teeth 17 on the mandrel 10, because the springs 28 behind said slips force the latter into said engagement. Thus, when the device is lowered

into the casing and the packing set at a desired point, as has been explained, the unit is securely locked in the well casing A.

When it is desired to remove said unit from the casing, a suitable tool (not shown) is entered into said casing and engaged with the teeth 31 on the head 30. An upward pull on said head will pull the release rods 34 upwardly and cause the releasing blade, like members 41, to move upwardly from the recesses 42 between the slips 25 and teeth 17 on the mandrel. The upper edge of each member 41 may be beveled at 43 while the lower end of each slip 25 may be beveled at 44, whereby entrance of said member between the slip and mandrel is facilitated.

It is obvious that as said rods and members move upwardly they depress the slips 25 under tension of the springs 28, thereby disengaging said slips from gripping relation with the mandrel. Immediately the mandrel falls downwardly within the sleeve until the collar 11 at its upper end engages the upper end of the head 30. This downward movement is sufficient to release the packing member 15 from the wall of the casing.

As the releasing members 41 are moving between the slips 25 and mandrel, a shoulder 45 on each rod engages the underside of the collar 37' at the upper end of the dovetail on each slip 18, whereby as the rods move upwardly to release the inner slips 25, the outer slips 18 are raised to a retracted position. Continued upward pull on the head will raise the unit from the well. The raising operation is made easier due to the fact that the mandrel and working barrel are open throughout their length and any oil standing in the well can freely flow therethrough. The sudden drop of the mandrel 13 immediately upon release of the inner slips causes the packing member to return to its original shape, thereby disengaging it from the wall of the casing. Thus, no swabbing effect is had when the unit is withdrawn from the well.

It will be seen that the unit may be locked at any desired point in the well casing and eliminates the use of well tubing, thus permitting the well to be pumped without the use of said tubing. The unit is particularly advantageous, in that it may be positioned at the standing fluid level in the well casing, whereby only the fluid not naturally rising to the top of said well is pumped. This results in a saving in operation costs. Since the working barrel may be made larger and also since the casing instead of the usual tubing is utilized for the fluid passage, a greater amount of fluid can be lifted at reduced costs. By eliminating the tubing, the resultant disadvantages of said tubing, as well as the expense thereof, are eliminated.

It is pointed out that although the device is shown and described with a working barrel 13, it would be possible to mount a check valve in the collar 12 and utilize the valve as a plug for closing the well. The structure of said valve would be preferably as shown by my former Patent, 1,631,152.

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

1. A well packer comprising, a mandrel, slips arranged to slide vertically on said mandrel into gripping relation with the well casing, gripping means comprising a longitudinally movable element and a cooperating spring pressed laterally movable element arranged to connect the mandrel with said slips, an elastic packing member

on the mandrel arranged to be expanded into frictional engagement with the well casing and held so by said gripping means, and means for simultaneously releasing said slips and the gripping means to permit removal of the packer from said casing.

2. A well packer comprising, a mandrel, slips arranged to slide vertically on said mandrel into gripping relation with the well casing, gripping means comprising a longitudinally movable element and a cooperating spring pressed laterally movable element arranged to connect the mandrel with said slips, an elastic packing member on the mandrel arranged to be expanded into frictional engagement with the well casing and held so by said gripping means, and a single means for simultaneously releasing both the slips and the gripping means to permit removal of the packer from said casing.

3. A well packer comprising, a mandrel, a sleeve slidable on the mandrel, slips arranged to slide vertically on said sleeve into gripping relation with the well casing to prevent upward movement of said sleeve in the casing, means comprising a longitudinally movable element and a cooperating spring pressed laterally movable element for connecting the sleeve with the mandrel to prevent downward movement of the mandrel through the sleeve, an elastic packing element carried by the mandrel arranged to be expanded into frictional engagement with the casing and held in expanded position by the gripping means, and means for releasing the slips and gripping means to permit removal of the packer from the casing.

4. A well packer comprising, a mandrel, a sleeve slidable on the mandrel, slips arranged to slide vertically on said sleeve into gripping relation with the well casing to prevent upward movement of said sleeve in the casing, means for connecting the sleeve with the mandrel to prevent downward movement of the mandrel through the sleeve, an elastic packing element carried by the mandrel arranged to be expanded into frictional engagement with the casing and held in expanded position by the gripping means, and a single longitudinally movable means for simultaneously releasing the slips and gripping means to permit removal of the packer from said casing.

5. A well packer comprising, a mandrel, a sleeve slidable on the mandrel, slips arranged to slide vertically on said sleeve into gripping relation with the well casing to prevent upward movement of said sleeve in the casing, means for connecting the sleeve with the mandrel to prevent downward movement of the mandrel through the sleeve, a collar at the lower end of the mandrel, a packing element surrounding the mandrel between the collar and the lower end of the sleeve and arranged to be expanded into frictional engagement with the casing wall and held so by the gripping means connecting the sleeve with the mandrel, and means for releasing the slips and gripping means to permit removal of the packer from the casing.

6. A well packer comprising, a mandrel, a sleeve slidable on the mandrel, slips arranged to slide vertically on said sleeve into gripping relation with the well casing to prevent upward movement of said sleeve in the casing, means for connecting the sleeve with the mandrel to prevent downward movement of the mandrel through the sleeve, a collar at the lower end of the mandrel, a packing element surrounding the

mandrel between the collar and the lower end of the sleeve and arranged to be expanded into frictional engagement with the casing wall and held so by the gripping means connecting the sleeve with the mandrel, and a single means for releasing the gripping means to retract the packer from engagement with the casing and simultaneously disengaging the slips to permit removal of the packer from the casing.

7. A well packer comprising, a mandrel, a sleeve slidable on the mandrel, slips arranged to slide vertically on said sleeve into gripping relation with the well casing to prevent upward movement of said sleeve in the casing, means for connecting the sleeve with the mandrel to prevent downward movement of the mandrel through the sleeve, an elastic packing element carried by the mandrel arranged to be expanded into frictional engagement with the casing and held in expanded position by the gripping means, a vertically movable rod extending downwardly through each slip and through the sleeve and gripping means, and means on the rod for releasing said gripping means and disengaging said slips when said rod is raised to permit removal of the packer from the well.

8. A well packer, comprising, a mandrel, a sleeve slidable on the mandrel, slips arranged to slide vertically on said sleeve into gripping relation with the well casing to prevent upward movement of said sleeve in the casing, means for connecting the sleeve with the mandrel to prevent downward movement of the mandrel through the sleeve, an elastic packing element carried by the mandrel arranged to be expanded into frictional engagement with the casing and held in expanded position by the gripping means, a vertically movable rod extending downwardly through each slip and through the sleeve and gripping means, means on the rod for releasing said gripping means and disengaging said slips when said rod is raised to permit removal of the packer from the well, and a head slidably mounted on the mandrel and secured to the upper end of said rods, whereby raising of said head on the mandrel will move said rods.

9. A well packer comprising, a mandrel hav-

ing ratchet teeth on its surface, a sleeve slidable on said mandrel and having a plurality of inclined outer surfaces, slips slidably mounted on said inclined surfaces and arranged to be disengaged from the wall of the well casing during downward movement of the sleeve and mandrel in the casing and arranged to move to an engaged gripping position upon upward movement of the parts, inner slips carried by the sleeve for engaging the teeth of the mandrel to secure said mandrel to the sleeve, the teeth of the mandrel and slips being so arranged that downward movement of the mandrel within the sleeve is prevented while upward movement thereof may be accomplished, an elastic packing element carried by the sleeve and arranged to be expanded into frictional engagement with the well casing by upward movement of the mandrel within the sleeve, being held so by the inner slips, and means for releasing both sets of slips to retract the packing element and permit removal of the packer from the well.

10. A well packer comprising, a mandrel having ratchet teeth on its surface, a sleeve slidable on said mandrel and having a plurality of inclined outer surfaces, slips slidably mounted on said inclined surfaces and arranged to be disengaged from the wall of the well casing during downward movement of the sleeve and mandrel in the casing and arranged to move to an engaged gripping position upon upward movement of the parts, inner slips carried by the sleeve for engaging the teeth of the mandrel to secure said mandrel to the sleeve, the teeth of the mandrel and slips being so arranged that downward movement of the mandrel within the sleeve is prevented while upward movement thereof may be accomplished, an elastic packing element carried by the sleeve and arranged to be expanded into frictional engagement with the well casing by upward movement of the mandrel within the sleeve, being held so by the inner slips, and a single means for simultaneously releasing the outer slips and disengaging the inner slips from the teeth of the mandrel to permit removal of the packer from the casing.

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