July 23, 1935. E. NELSON, SR 2,009,322

FEATHER TYPE VALVED WELL PACKER

Filed Oct. 29, 1934 4 Sheets-Sheet 1

Fig. 1.

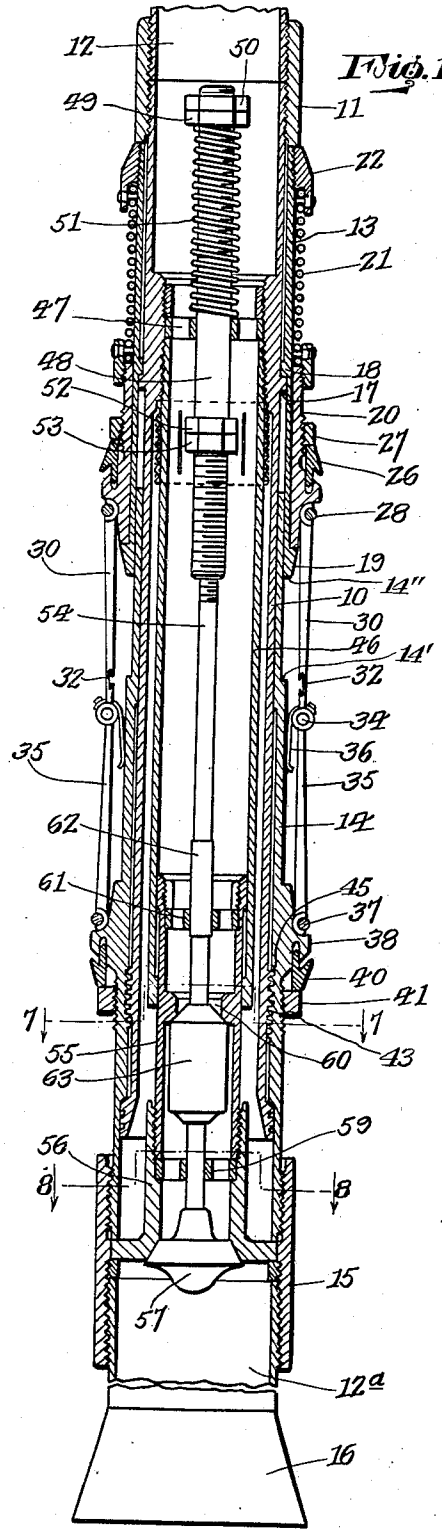
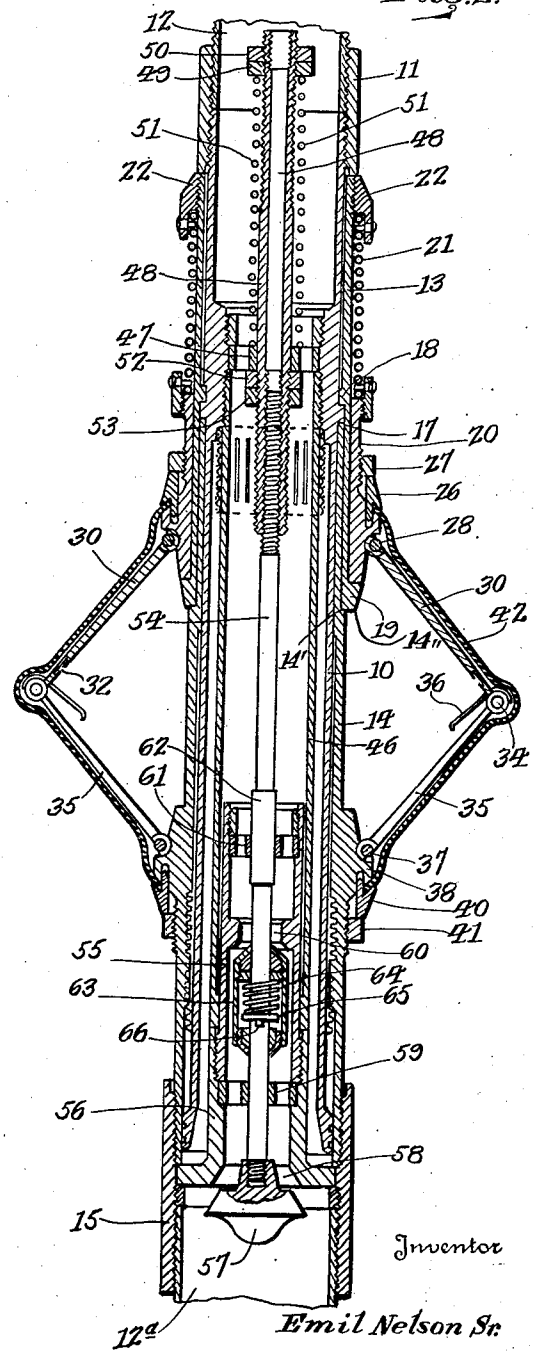


Fig. 2.



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FEATHER TYPE VALVED WELL PACKER

Filed Oct. 29, 1934 4 Sheets-Sheet 2

Fig. 3.

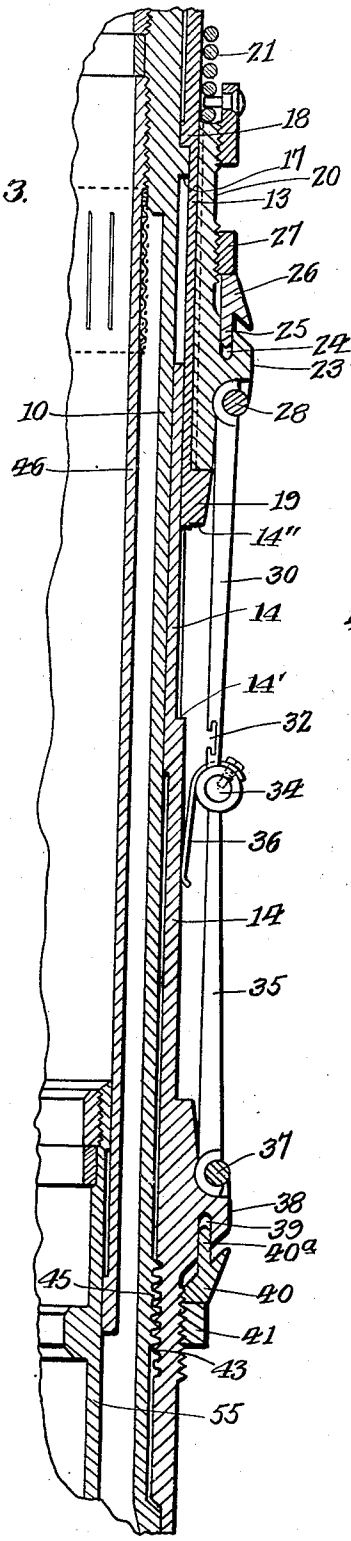
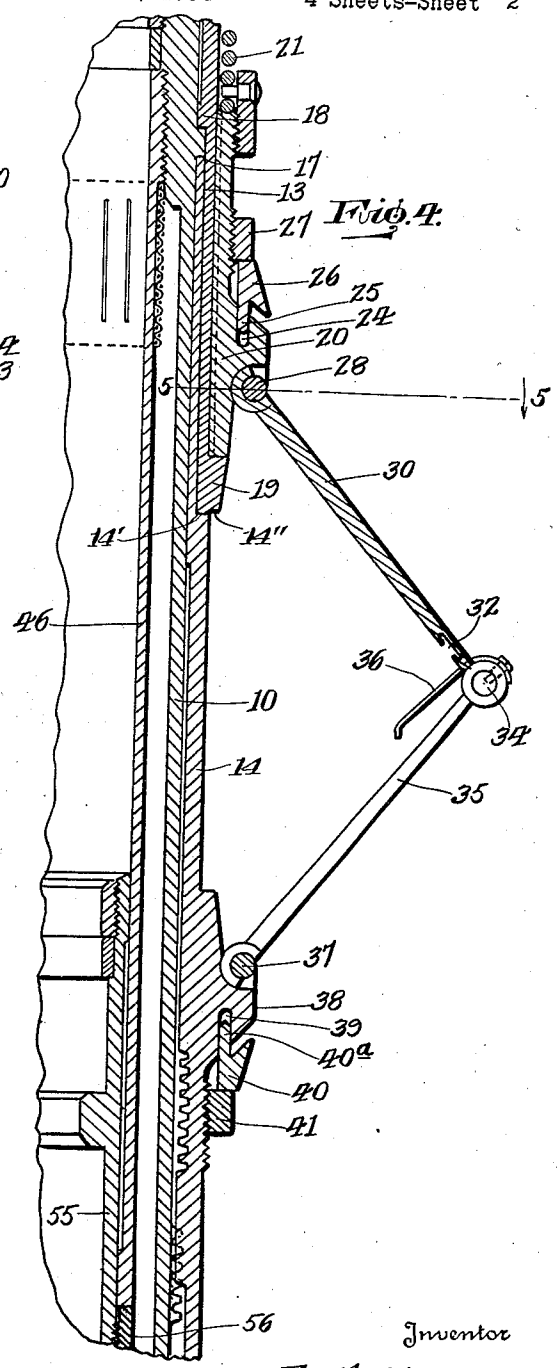


Fig. 4.



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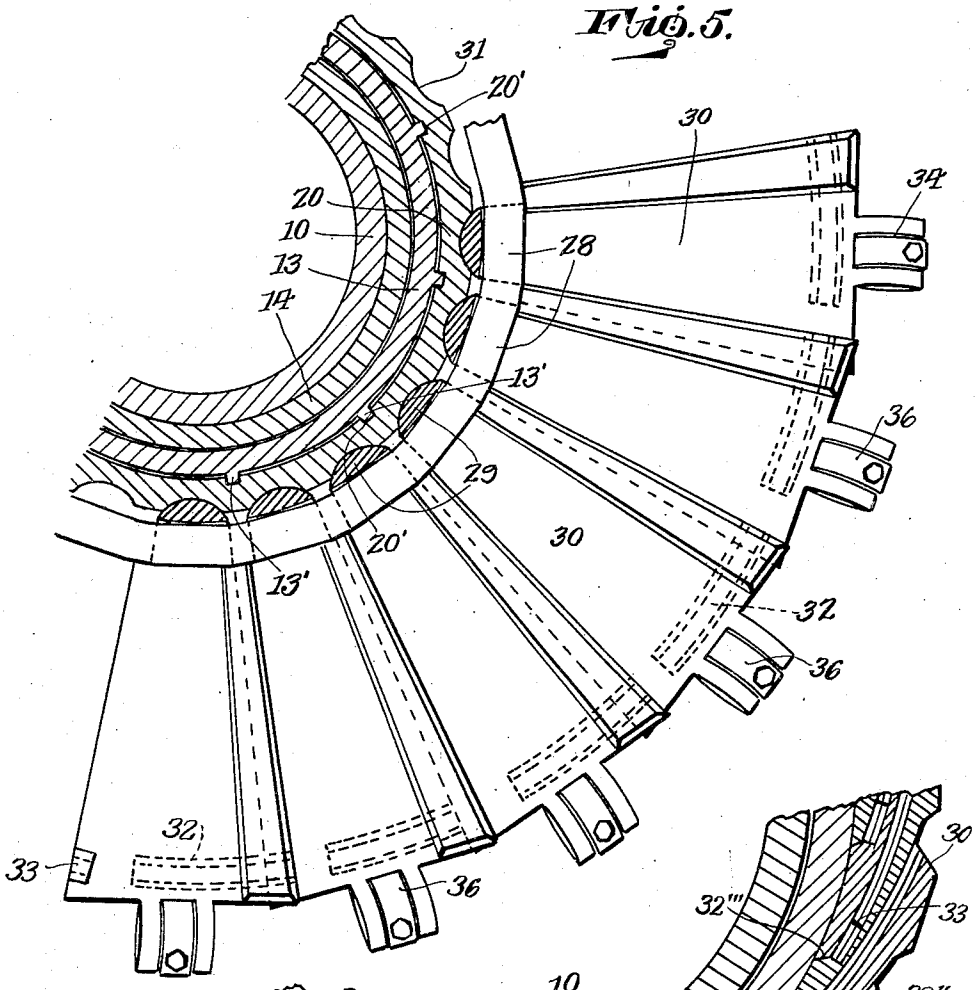
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FEATHER TYPE VALVED WELL PACKER

Filed Oct. 29, 1934 4 Sheets-Sheet 3

Fig. 5.



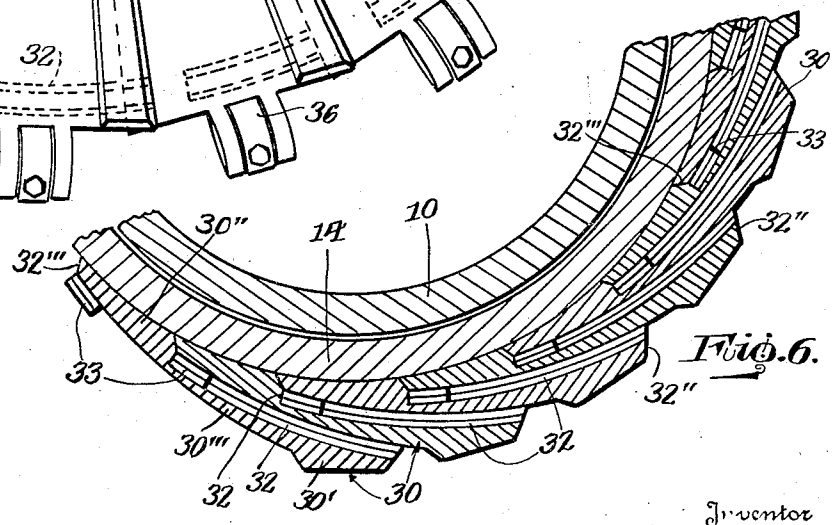


Fig. 6.

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FEATHER TYPE VALVED WELL PACKER

Filed Oct. 29, 1934 4 Sheets-Sheet 4

Fig. 7.

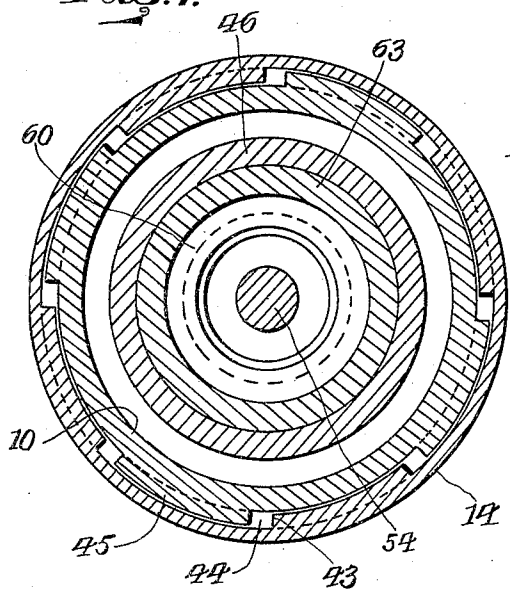


Fig. 9.

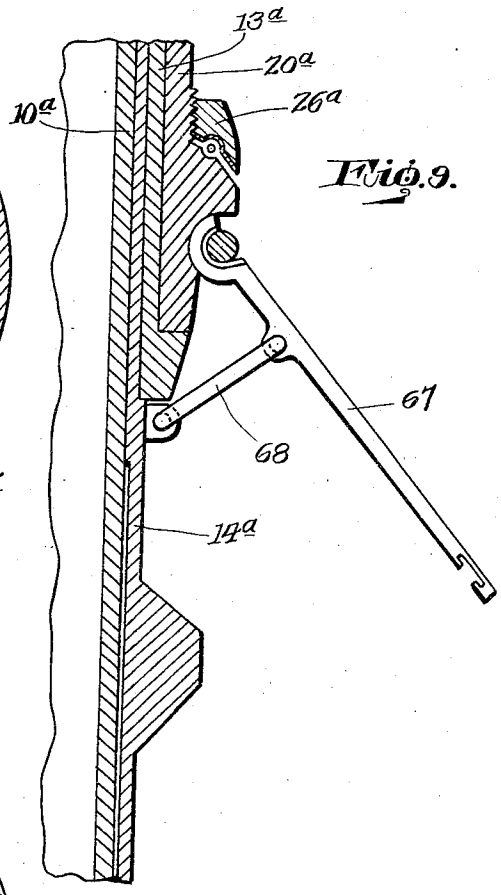
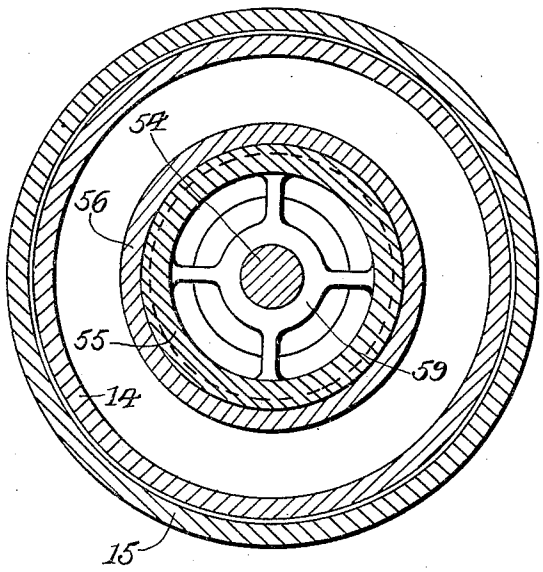


Fig. 8.



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Patented July 23, 1935 2,009,322

UNITED STATES PATENT OFFICE

2,009,322

FEATHER-TYPE VALVED WELL PACKER

Emil Nelson, Sr., Lake Charles, La., assignor of one-fourth to I. C. Carter and one-eighth to Alvin O. King, Lake Charles, La.

Application October 29, 1934, Serial No. 750,577

11 Claims. (Cl. 166—10)

My present invention relates generally to tools or implements for use in connection with oil and gas wells, and more particularly to a testing apparatus useful in instances where a preliminary or permanent test for oil, gas or other fluids is desired without cementing the bottom of the hole or setting and drilling a cement plug.

Generally speaking, my invention, which has for its primary object the ready and convenient testing of the well at any point thereof, contemplates a packing device which may be lowered into the well with the usual drill string and expanded into desired position with ease and facility and as quickly and readily collapsed and removed when its purpose has been served.

My invention further contemplates a well packer with a valve arrangement permitting of effectively sealing off either the lower portion of the hole or any selective or desired area of its length.

With the above in mind, my invention resides in the several features, with respect to construction, arrangement and operation, to be now described in connection with the accompanying drawings forming a part of this specification and clearly illustrating my invention, and wherein

Figure 1 is a vertical longitudinal section taken centrally through my improved valve packer, with the flexible cover removed, and the feathering blades retracted;

Figure 2 is a similar view showing the packer blades expanded and the flexible cover in place;

Figure 3 is an enlarged view of a portion of Figure 1.

Figure 4 is a similarly enlarged view of a portion of Figure 2.

Figure 5 is a fragmentary view having a portion in top plan and the remaining portion thereof in horizontal section illustrating the packer blades extended;

Figure 6 is a fragmentary view in horizontal section showing the packer blades collapsed;

Figures 7 and 8 are sectional views taken respectively on lines 7—7 and 8—8 of Figure 1; and

Figure 9 is a fragmentary view having portion in vertical section and its remaining portion in side elevation illustrating a slightly modified form of my invention.

Referring now to these figures, my invention contemplates a packer consisting of a main cylindrical barrel or body tube 10 whose upper end is externally threaded for engagement by a coupling 11 with the lower end of the upper portion of the main drill tubing or string 12.

Rotatably disposed around the barrel 10 are upper and lower cylindrical sleeves 13 and 14, slidable relative to one another, the lower sleeve 14 at its upper end telescoping within the upper sleeve 13, and at its lower end extending below the lower end of barrel 10 and externally threaded to receive a coupling 15 connecting the same with the lower portion of the drill string 12a having at its lower end a chisel-shaped foot anchor 16. The sleeve 14 is formed with a peripheral shoulder 14' arranged in the downward path of the lower end 14'' of sleeve 13.

At a point substantially below the coupling 11, the barrel 10 has an external annular rib 17 disposed immediately below an internal rib 18 on the upper sleeve 13, so that the sleeve, extending at its upper end closely adjacent to the coupling 11 is thus confined and held against lengthwise movement on the barrel, leaving the latter free to rotate within the sleeve.

The lower end of sleeve 13 has a terminal annular rib 19 to engage and limit downward movement of a sliding collar 20, to the upper end of which is connected the lower end of a spring 21 coiled around sleeve 13. The upper end of this spring is anchored to a ring 22 threaded on the upper end of the sleeve. The collar 20 has an annular outstanding rib 23, the upper surface of which is grooved as at 24, to receive the pendant rib 25 of a clamping ring 26 engaged by a second ring 27 threaded on the collar 20.

Below the annular rib 23, the collar 20 has a circumjacently disposed pivot ring 28 forming a hinge in connection with the upper reduced ends 29 of the curved downwardly-flaring upper sections 30 of the packer blades. The collar 20 is provided with sockets 31 (see Figure 5) thereabout cooperating with the blade sections 30 to permit the latter to swing upwardly and outwardly from the collapsed position as shown in Figure 2, and vice versa, and to also swing in a direction around the collar during the first mentioned movements.

The blade sections 30 are of like form and each includes a pair of side parts 30', 30'' and an intermediate part 30''' (Figures 5 and 6). The part 30' is of greater thickness than and is outset with respect to part 30'''. The part 30'' is of greater thickness than and is inset with respect to part 30'''. The inner face of part 30'' is positioned against the outer face of sleeve 14. The outer face of part 30'' is flush with the outer face of part 30'''. The inner face of each blade section, in proximity to its outer end edge, is formed with a dove-tail groove 32 extending from the inner lengthwise edge 32' of part 30''

to the lengthwise edge 32'' of the part 30'. The outer face of part 30'', inwardly adjacent the outer end of the latter is provided with a guide lug 33 of dove-tail form which registers at its outer side edge with the outer lengthwise edge 32''' of part 30''. The parts 30', 30''' of one section 30, when the sections are non-extended overlap the parts 30'', 30''' of an adjacent section 30. The lug 33 of one section 30 is arranged in the groove 32 of an adjacent section 30. The lugs 33 in connection with the grooves 32 slidably couple sections 30 together. The edges 32' and 32''' of part 30'' are beveled. The outer ends of sections 30 are pivotally connected at 34 with the upper ends of the lower blade 35. Adjacent to the connections 34 are inwardly directed angular spring fingers 36 for a purpose to be referred to.

The lower reduced ends of the lower blade sections 35 are hingedly connected by a pivot ring 37 in a manner similar to the before-described upper ends of the upper sections 30, to an annular rib 38 integral with and around the lower sleeve 14 at a point substantially above the lower end. This rib 38 has a lower groove 39 receiving the rib 40*a* of a clamping ring 40 engaged by a second ring 41 threaded on sleeve 14. In this way the blades may readily expand to the position of Figure 2 upon movement of collar 20 downwardly with sleeve 13, the spring 21 permitting collar 20 to yield upwardly when the blades engage the wall of the well opening.

A flexible canvas, rubber or other apron 42 (see Figure 2) is used around the several blades to form an effective seal, with its upper and lower ends or edges securely clamped to the ribs 23 and 38 by the respective clamping rings 26 and 40.

Internally thereof, the lower sleeve 14 has a threaded portion 43, and as shown in Figure 7, these threads are interrupted by vertical grooves 44 so that the similarly interrupted external threads 45 of the barrel 10, which normally engage threads 43 to hold the barrel in upper position supporting the sleeves 13 and 14 in such spaced apart relation as to hold the blades in the retracted position of Figure 1, may, by a turning movement of the barrel, be shifted into the grooves 44 as in Figure 7, permitting the barrel to move downwardly.

It will be understood that the above described position of the parts with the barrel threads 45 engaging the lower sleeve threads 43 is the normal locked position of the parts shown in Figure 1, in which they are lowered into the well. Sufficient pipe string 12*a* is attached below the packer so that the latter will be slightly above the point to be packed off when the chisel bit 16 is set in the bottom of the hole, that is, if the test is to be made at the bottom. One or more sections of screen tubing will in this event be included in the string of tubing 12*a* below the packer.

When the chisel bit 16 is set in the bottom of the hole, the barrel 10 is turned to released position with its threads 45 in the grooves 44, and it may then be lowered, carrying the upper sleeve 13 downwardly with it, to the position shown in Figure 2. At the start of downward movement of the sleeve 13, the spring fingers 36 initiate outward movement of the connected ends of the packer blades 30 and 35 and it is obvious that this movement will be continued until they engage the wall of the hole, as the collar 20 continues to lower with the sleeve 13. While the downward movement of sleeve 13 is a positive movement, that of collar 20 is brought about through the spring 21 which will permit of a yieldable engagement of the packer blades with the wall of the hole so that the apron may seal the hole at the packed off point.

Obviously in withdrawing the packer from the hole after its purpose has been served, the reverse of the above setting operation may be easily and quickly accomplished to retract the packer blades and restore the parts to the position of Figure 1 for convenient withdrawal, since the barrel rib 17 forces the sleeve 13 to move upwardly with the barrel and the sleeve rib 19 forces the collar 20 to move upwardly with the sleeve 13.

Within the barrel 10 and threaded at its upper end internally of the barrel, is a pendant inner barrel 46 and at the upper end of barrel 46 is a cross guide in the nature of a spider 47 through which the upper valve adjusting tube 48 is both rotatable and lengthwise movable axially of the packer. This adjusting tube 48 has the upper portion of its surface threaded to receive an adjusting nut 49 and a lock nut 50, which abut the upper end of a spring 51 around the tube, and the lower end of which spring is seated on the spider guide 47.

Below guide 47, the valve adjusting tube 48 is also externally threaded to receive an adjusting nut 52 and lock nut 53 to abut the guide and limit upward movement of the tube. Moreover, tube 48 is internally threaded at its upper end to receive any suitable adjusting rod (not shown) and has its lower portion internally threaded to adjustably receive the upper end of the valve stem 54 which extends below the inner barrel 46, through a valve cylinder 55, and a valve cage 56, and carries a valve 57, securely fastened onto its lower end and adapted to seat upwardly against a valve seat 58 formed on the valve cage 56.

The valve cage 56, which is clamped between the coupled ends of the lower sleeve 14 and the lower tubing string 12*a*, has a threaded connection with, and supports, the valve cylinder 55, and the upper end of the latter slidably and rotatably telescopes within the lower end of the inner barrel 46. Thus the inner barrel 46 is free to rotate and shift vertically with the main barrel 10 to which it is connected.

The cage 56 carries an internal stem guide 59. The cylinder 55 has an internal annular rib 60 forming a valve seat and, above this rib, is provided with a spider 61 presenting a squared guide opening for cooperation with a squared portion 62 of the valve stem 54 so that by rotation of the adjusting tube 48, the valve stem 54, in threaded connection therewith and held against rotation, will be screwed into or out of tube 48 to lengthen or shorten the effective length of the stem as desired.

On the valve stem 54 a second valve 63 is slidably disposed at a point below the rib 60 to seat upwardly against the valve seat on said rib, it being noted that valve 63 is positioned to normally seat slightly in advance of valve 57 upon upward movement of valve stem 54, but is yieldable downwardly on said stem against the tension of a spring 64 within the valve which spring has its lower end seated on a washer 65 slidable on the stem and held by a cross pin 66 through the stem.

If, as before described, the test is to be taken from the hole below the packer, the tension of spring 51 is so adjusted that upon downward movement of the main barrel 10 and inner barrel 46, to the position of Figure 2, the valves 57 and 63 will sag to open position, as shown, but if

the test is to be taken from above the packer, spring 51 is so adjusted by tightening down the nuts 49 and 50, that it will retain sufficient tension to maintain the valves closed in spite of lowering of the barrels.

In certain instances it may be desired to pack off a portion of the hole so as to eliminate oil and gas from above and below that portion from which the test is wanted, two of my improved packers may be used in vertically spaced relation. In this instance the valves of the lowermost of the two packers will be tensioned to remain closed, while the valves of the uppermost packer will be tensioned to open.

As shown in Figure 9, I may use in some instances, an arrangement in which but single section packer blades 67 are hinged, in the manner previously explained, to the collar 20a and connected by pivoted links 68 to the upper end of the lower sleeve 14a. In this figure, the upper sleeve appears at 13a and the main barrel at 10a, and it is obvious the apron before referred to may be employed, one of the apron clamps being shown at 26a.

My improved packer is thus capable of convenient and effective use for making quick tests or for any other temporary purpose, though it is equally effective for permanent use in shutting off water or any fluid circulation or leakage around the casing, tubing or line when used as a permanent packer. As a temporary well fitting, however, its ready application and equally ready removal particularly recommends the same, while its wide range of use, strength, and durability are factors whose importance in practical work cannot be over-emphasized.

The sleeve 13 is formed with peripheral spaced ribs 13' lengthwise thereof, and the collar 20 with vertically disposed spaced grooves 20' to prevent the collar 20 which accommodates the ribs shifting circumferentially of sleeve 13, but do not interfere with the sliding of collar 20 lengthwise with respect to sleeve 13. The ribs 13' correspond in length to that of collar 20 and have their inner ends positioned at the upper face of the annular rib 19.

What I claim is:

1. In a well packer, expansible and retractible packer blades, a pair of relatively, movable sleeves supporting and actuating said blades, a rotatable vertically movable main barrel encompassed by said sleeves and bodily supporting and carrying therewith one of said sleeves; and a locking connection between said barrel and the other sleeve for locking the barrel from vertical movement and releasable by rotation of the barrel.

2. In a well packer, expansible and retractible packer blades, a pair of relatively slidable blade actuating sleeves, a vertically movable rotatable main barrel bodily carrying one of said actuating sleeves, a locking connection between the barrel and the other actuating sleeve for locking the barrel from vertical movement and releasable by rotation of the barrel, a flexible apron around the packer blades, and clamps carried by said sleeves for supporting said apron.

3. In a well packer, expansible and retractible packer blades, a pair of relatively, slidable blade actuating sleeves, a vertically movable rotatable main barrel bodily carrying one of said actuating sleeves, a locking connection between the barrel and the other actuating sleeve for locking the barrel from vertical movement and releasable by rotation of the barrel, and a member having a spring controlling connection with one of said relatively movable sleeves, and to which the packer blades are hinged at one end.

4. In a well packer, expansible and retractible packer blades, a pair of relatively slidable blade actuating sleeves, a vertically movable rotatable main barrel bodily carrying one of said actuating sleeves, a locking connection between the barrel and the other actuating sleeve for locking the barrel from vertical movement and releasable by rotation of the barrel, and a flexible apron around the blades and anchored to said blade actuating sleeves.

5. In a well packer, expansible and retractible packer blades, a pair of cylindrical upstanding relatively movable sleeves having actuating connections with said blades and one telescoping within the other, a rotatable vertically movable barrel arranged within said sleeves and bodily carrying one of the sleeves, a locking connection between the barrel and the other sleeve for locking the barrel front vertical movement and releasable by rotation of the barrel.

6. In a well packer, expansible and retractible packer blades, a pair of cylindrical upstanding relatively movable sleeves having actuating connections with said blades and one telescoping within the other, a rotatable vertically movable barrel arranged within said sleeves and bodily carrying one of the sleeves, a locking connection between the barrel and the other sleeve for locking the barrel from vertical movement and releasable by rotation of the barrel, and a valve carried by the barrel for controlling inflow into the lower end of the barrel.

7. In a well packer, expansible and retractible packer blades, a pair of cylindrical upstanding relatively movable sleeves having actuating connections with said blades and one telescoping within the other, a rotatable vertically movable barrel arranged within said sleeves and bodily carrying one of the sleeves, a locking connection between the barrel and the other sleeve for locking the barrel from vertical movement and releasable by rotation of the barrel, and a valve carried by the barrel for controlling inflow into the lower end of the barrel, and connections for opening the valve upon release and sliding movement of the barrel.

8. In a well packer, expansible and retractible packer blades, a pair of cylindrical upstanding relatively movable sleeves having actuating connections with said blades and one telescoping within the other, a rotatable vertically movable barrel arranged within said sleeves and bodily carrying one of the sleeves, a locking connection between the barrel and the valve sleeve for locking the barrel from vertical movement and releasable by rotation of the barrel, and a valve carried by the barrel for controlling inflow into the lower end of the barrel, and connections for opening the valve upon release and sliding movement of the barrel, said last named connections being adjustable to hold the valve closed in both positions of the barrel.

9. In a well packer, expansible and retractible packer blades, a pair of relatively movable members to which the blades are hingedly connected, each of said members having a grooved outstanding rib, an apron around the packer blades having its ends overlying the said ribs, clamping rings engaging the apron ends and having portions coacting with the grooves of the ribs, and rings threaded on said members for seating and holding said clamping rings.

10. In a well packer, a cylindrical barrel thread-

ed at its upper end for attachment to drill tubing, upper and lower sleeves in rotatable relation on said barrel, the lower sleeve being threaded at its lower end for attachment to drill tubing, the barrel and the upper sleeve having engaging portions securing the same together for simultaneous lengthwise movement, and the barrel and lower sleeve having engaging portions forming a lock against their relative lengthwise movement and releasable by rotative movement of the barrel within the sleeves, expansible and retractible packer blades in a series around and between said sleeves and hingedly connected at their lower ends to the lower sleeve, a collar on the upper sleeve to which the upper ends of the blades are hingedly connected, said upper sleeve having an annular rib abutting the lower end of the collar, and a spring around the upper sleeve between a portion thereof and the upper end of the collar yieldably permitting the latter to move in an upward direction.

11. In a well packer, a cylindrical barrel threaded at its upper end for attachment to drill tubing, upper and lower sleeves in rotatable relation on said barrel, the lower sleeve being threaded at its lower end for attachment to drill tubing, the barrel and the upper sleeve having engaging portions securing the same together for simultaneous lengthwise movement and the barrel and lower sleeve having engaging portions forming a lock against their relative lengthwise movement and releasable by rotative movement of the barrel within the sleeves, expansible and retractible packer blades in a series around and between said sleeves and hingedly connected at their lower ends to the lower sleeve, a collar on the upper sleeve to which the upper ends of the blades are hingedly connected, said upper sleeve having an annular rib abutting the lower end of the collar, and a spring around the upper sleeve between a portion thereof and the upper end of the collar yieldably permitting the latter to move in an upward direction, said collar and the lower sleeve having outstanding annular ribs, a flexible apron around the series of packer blades, and means for clamping the ends of said apron in connection with the said ribs.

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