

March 17, 1953

A. L. ARMENTROUT

2,631,670

APPARATUS FOR HANDLING FLUID IN A WELL

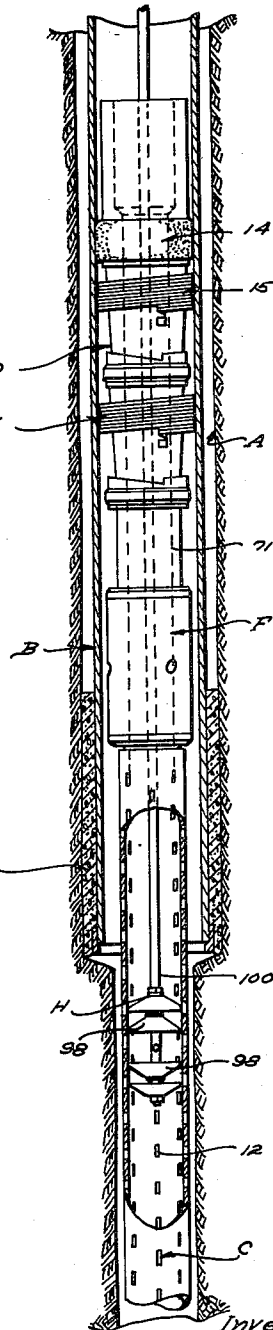
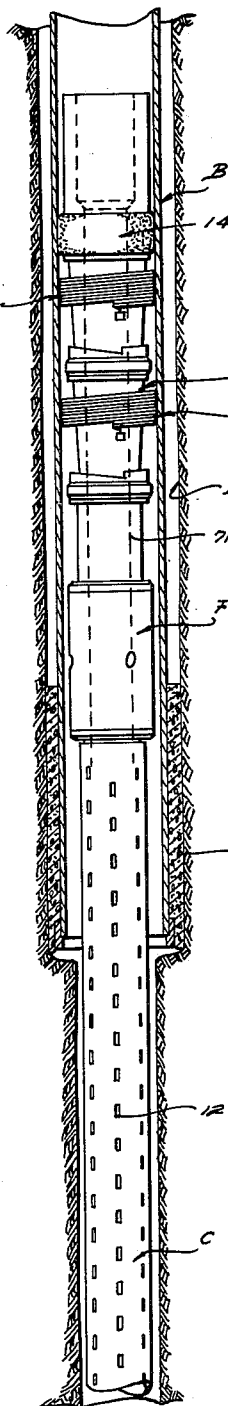
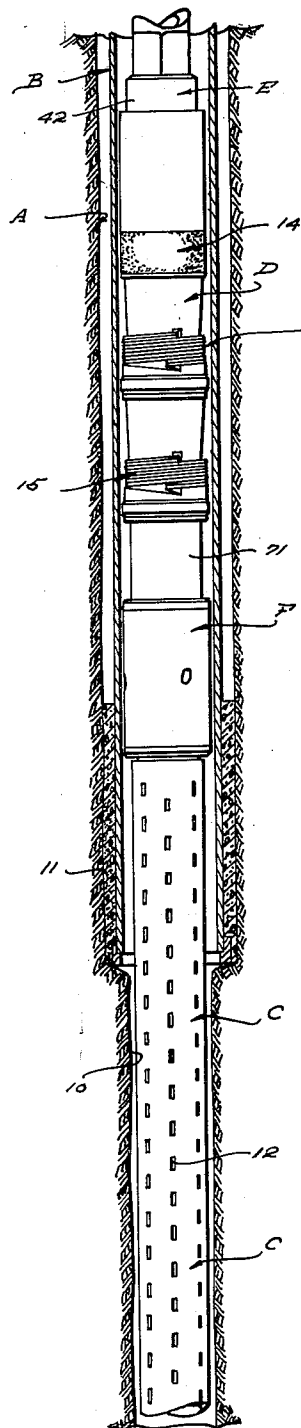
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6 Sheets-Sheet 1

Fig. 1.

Fig. 2.

Fig. 3.



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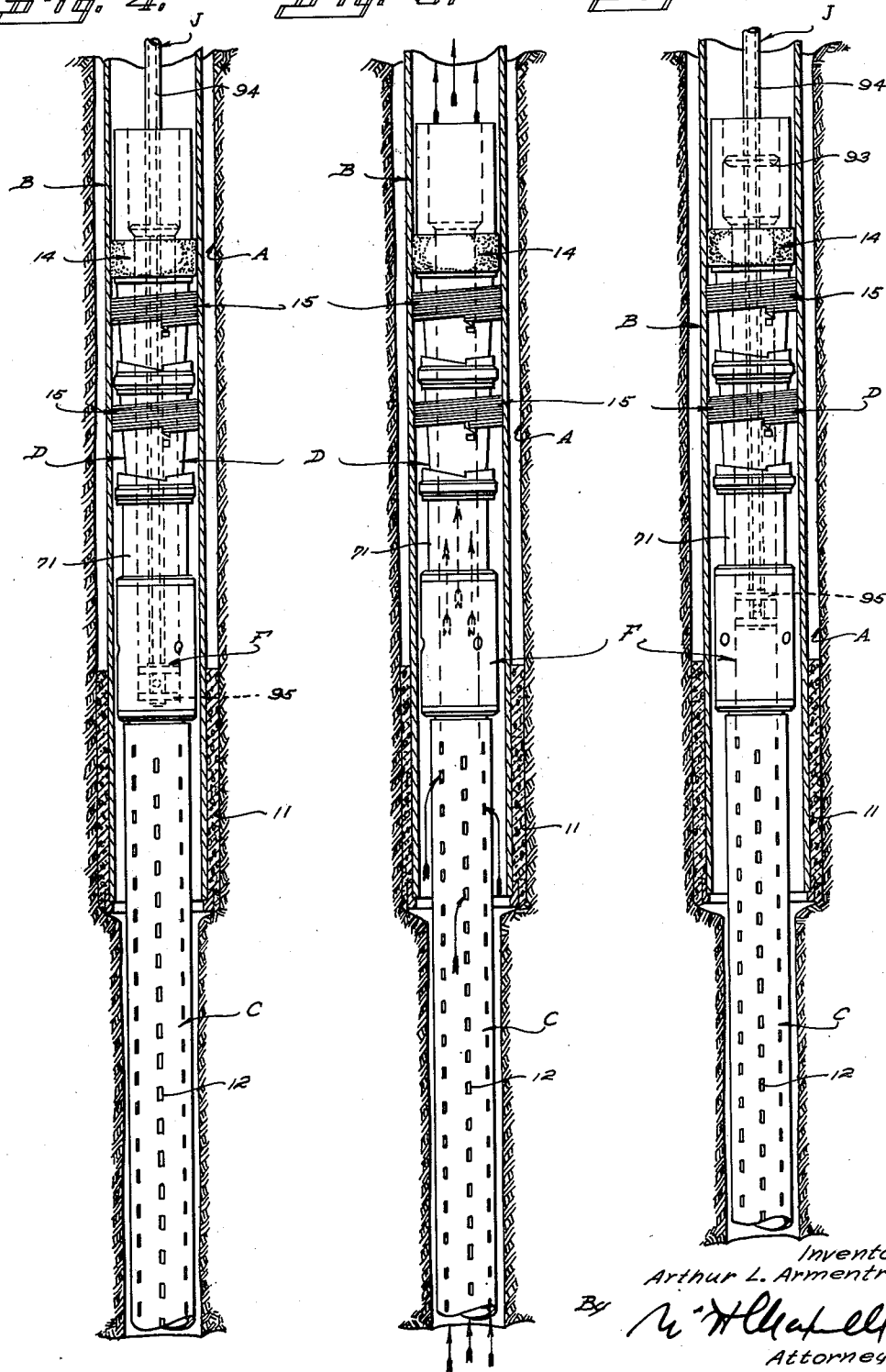
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Fig. 4.

Fig. 5.

Fig. 6.



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Fig. 7.

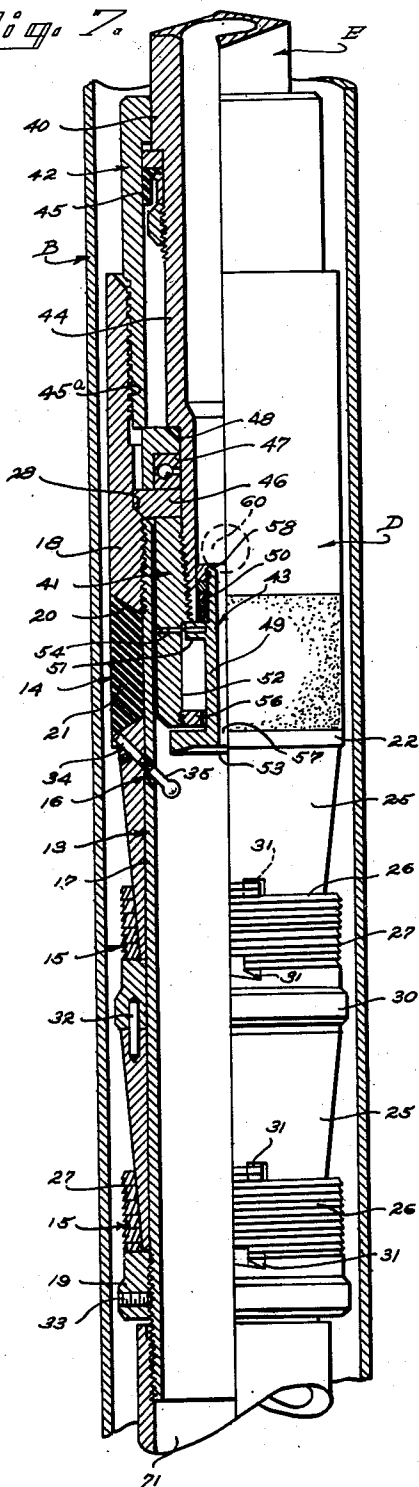
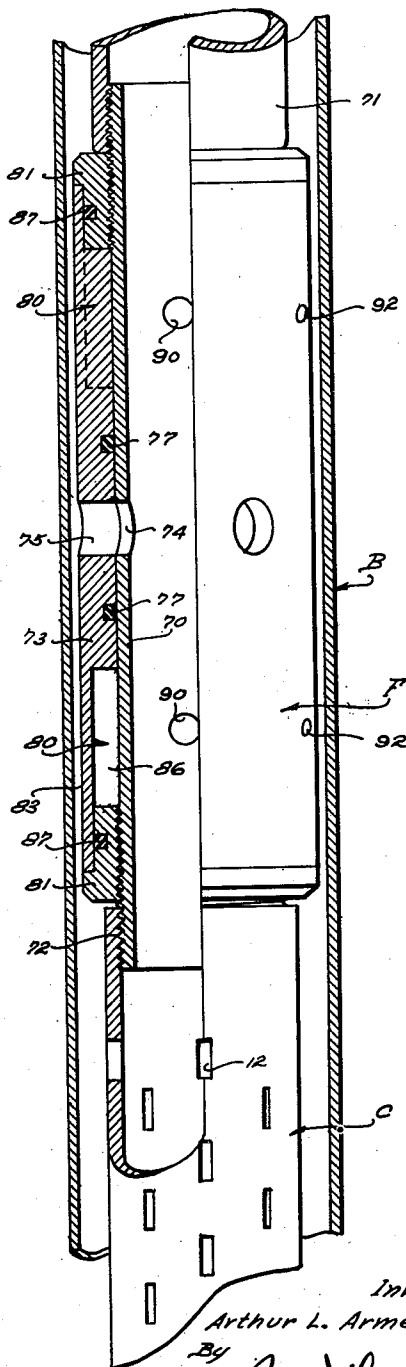


Fig. 7A.



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Fig. 8.

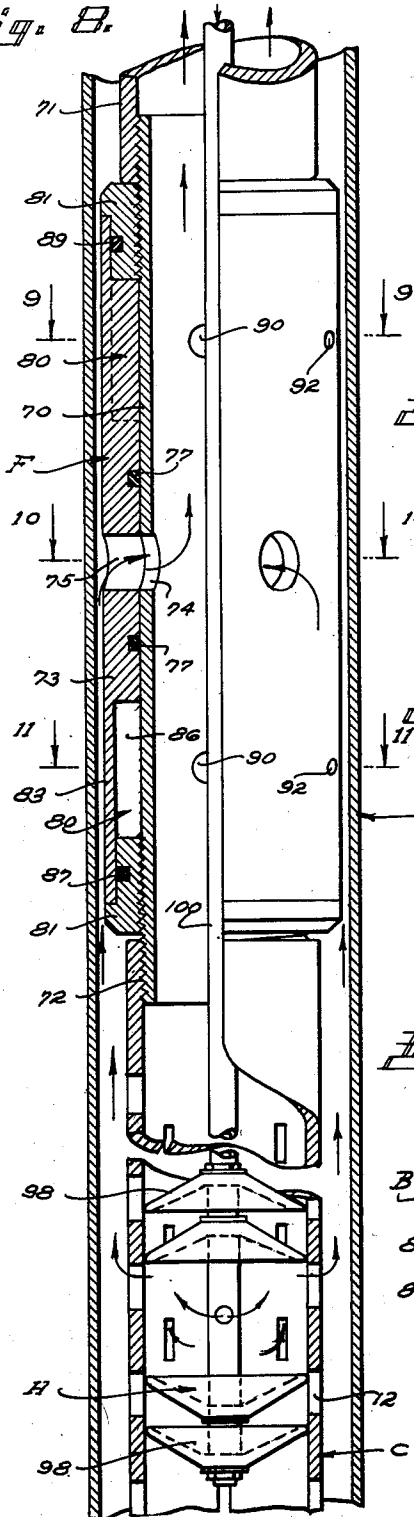


Fig. 9.

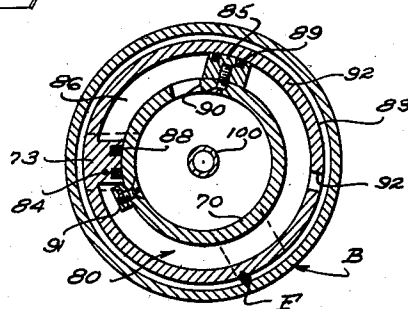


Fig. 10.

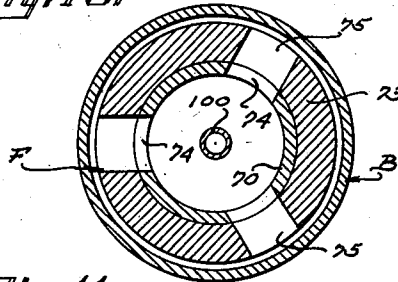


Fig. 11.

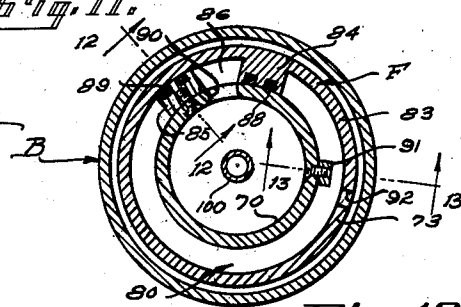


Fig. 12.

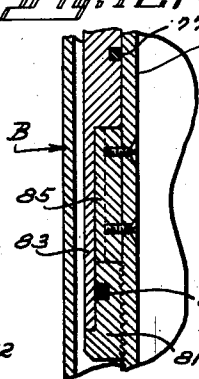
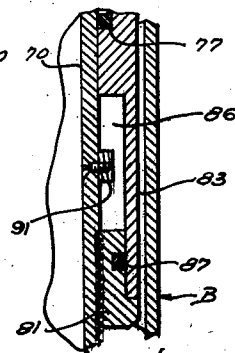


Fig. 13.



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Fig. 14.

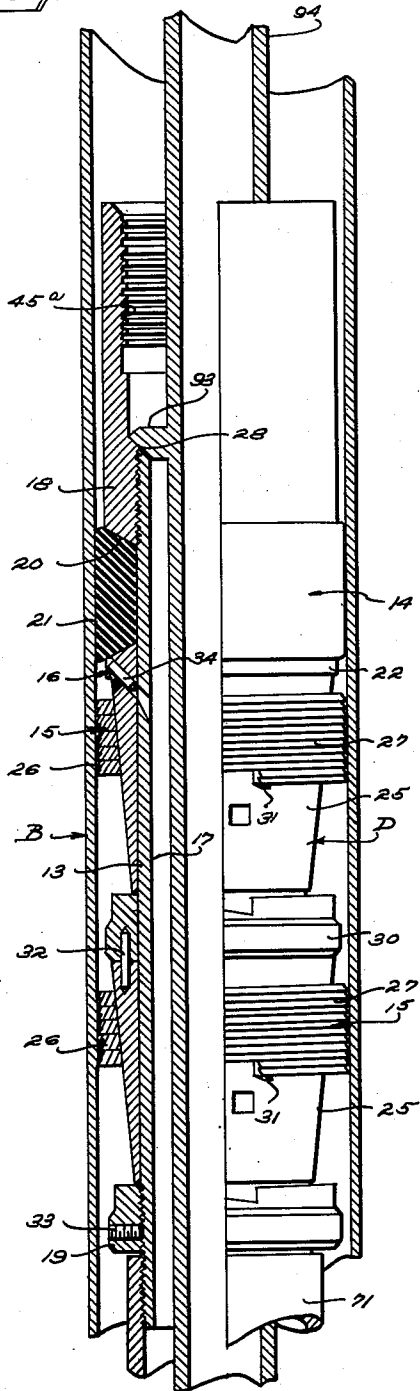
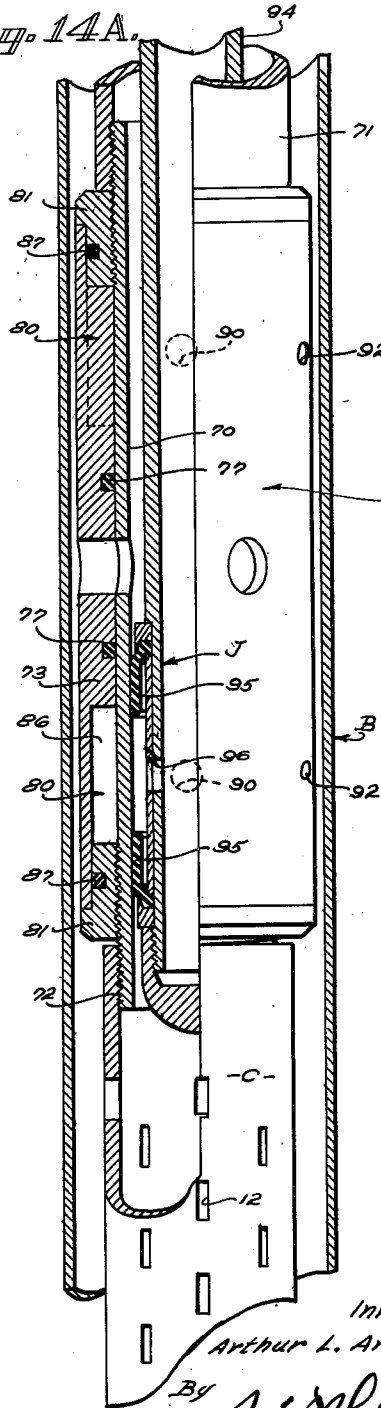


Fig. 14A.



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Fig. 15.

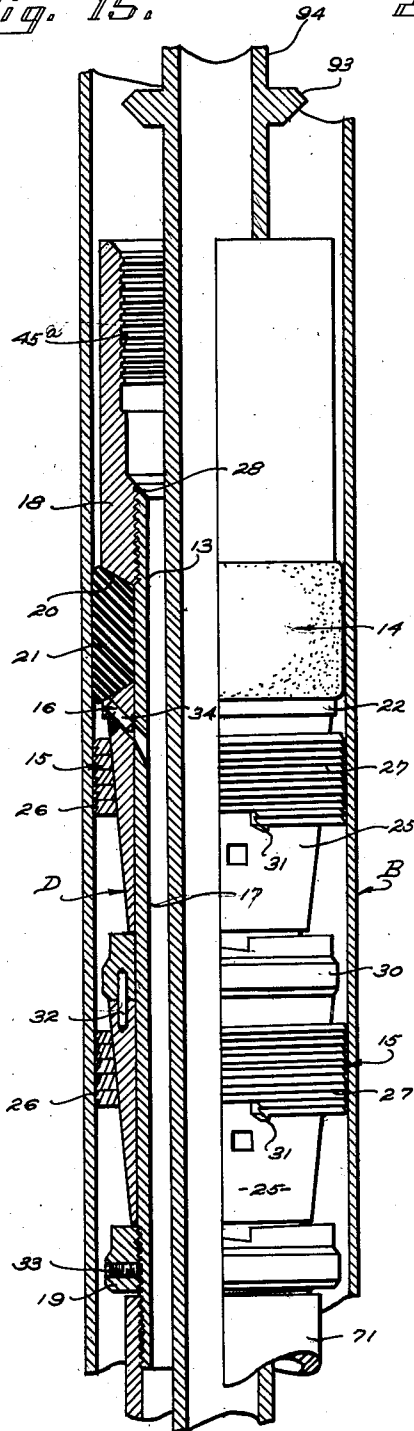
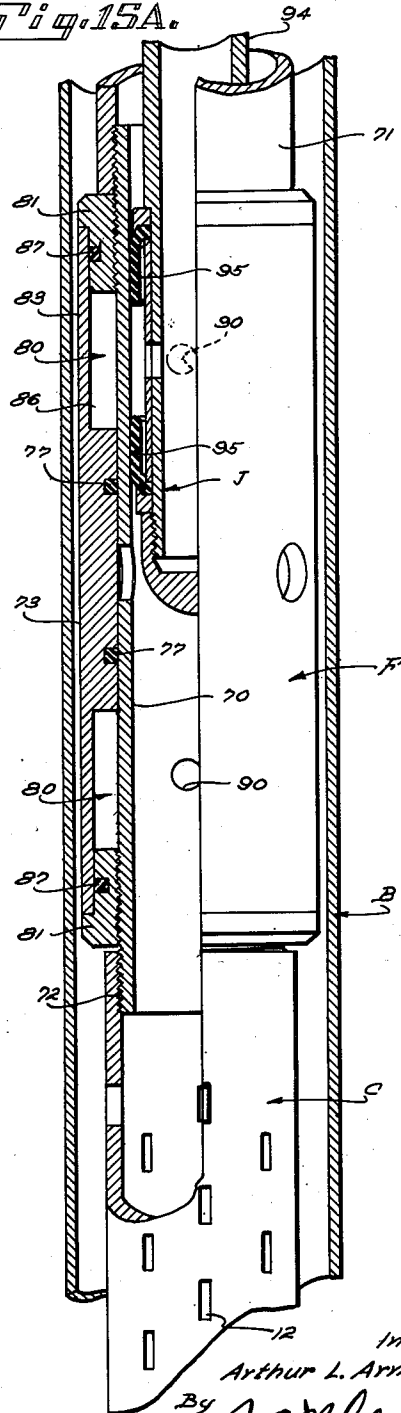


Fig. 15A.



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UNITED STATES PATENT OFFICE

2,631,670

APPARATUS FOR HANDLING FLUID IN A WELL

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Application September 30, 1948, Serial No. 52,038

12 Claims. (Cl. 166-1)

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This invention has to do with a method and apparatus for handling fluid in a well and it is a general object of the invention to provide for the handling of a well liner and the circulation of fluid therethrough to the end that the operator can gain flow or circulation of fluid in either direction through the perforations of the liner.

In the ordinary oil well it is common to install a liner which is usually an elongate perforate member through which well fluids are admitted to thereafter flow up through the well to the surface. It is not infrequent that circumstances arise when it would be highly desirable to be able to reverse circulation through the perforations of the liner. With the usual well equipment such a reversed circulation is difficult if not almost impossible to gain, since it requires introduction of pressure inside the liner to overcome well pressures on the exterior of the liner, and any effective flushing action is difficult, if not impossible, to gain since certain perforations of the liner must be relied upon to admit fluid into the well while others are having circulation forced outwardly through them.

It is a general object of the present invention to provide apparatus serving to mount a liner in a well and including a circulation control actuated by a simple operator or operating device or tool so that circulation may normally occur in through the perforations of the liner while a reverse circulation through the perforations can be effectively established whenever desired by permitting flow to occur from the well in a manner to bypass the liner.

Another object of the present invention is to provide apparatus of the general character referred to including few simple, easily operated parts, rendering the structure practical, effective and dependable.

It is a further object of the present invention to provide a unique effective apparatus involving a hanger, a circulation control and an operator or tool for the control cooperating with a fixed part at the hanger to enable the user of the equipment to manipulate it in the desired manner with reference to the control.

It is another object of the invention to provide a method of handling fluids in a well in such manner as to gain effective and desired circulation in either direction through the perforations of a liner located in the well. It is a feature of the present invention that when circulation is outward through the perforations, fluid at the exterior of the liner does not have

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to flow inward through the perforations of the liner, but is bypassed to enter the well without having entered through the liner.

The various objects and features of my invention will be fully understood from the following detailed description of a typical preferred form of apparatus and a typical manner of carrying out the method of my invention, throughout which description reference is made to the accompanying drawings, in which:

Fig. 1 is a sectional view of a typical well at the lower end portion thereof, showing a casing set in the well and a liner hung in the well by means of the hanger included in the apparatus of the present invention to depend below the casing, the setting device for operating the hanger being shown engaged therewith and the gripping units of the hanger being shown retracted ready for operation. Fig. 2 is a view similar to Fig. 1, showing the gripping units of the hanger engaged or set fixing the hanger in the casing, the setting device having been removed. Fig. 3 is a view of the apparatus shown in Fig. 2 with a portion broken away to illustrate the swab in operating position in the liner, illustrating the manner in which a swab may be operated in the liner in a manner corresponding to that ordinarily employed with reference to a well liner. Fig. 4 is a view similar to Fig. 3 showing the operating tool for the circulation control engaged in the apparatus and in one operating position therein which may, for example, be the position employed when the circulation control is operating to the closed position so that all flow from the well must be through the liner. Fig. 5 is a view illustrating the apparatus with the operator or operating tool removed and the circulation control in the closed position, in which case all well flow is through the perforated liner and out of the upper end of the liner hanger to be conducted from the well through the casing. Fig. 6 is a view similar to Fig. 4 but showing the operator for the circulation control in another operating position, such for example as may be required to reverse the positioning of the control so that it is opened, allowing flow from the well to enter the casing through the control rather than, or as well as, through the liner. Fig. 7 and Fig. 7a are enlarged detailed sectional views showing the structure as it is run into the well and showing the equipment that is illustrated in Fig. 1 of the drawings, and showing it positioned as it is shown in Fig. 1 of the drawing. Fig. 8 is a view illustrating the circulation control posi-

tioned as shown in Fig. 7 of the drawings illustrating and showing a swab operating in the liner which extends downwardly from the control, and showing the manner in which circulation may occur when the apparatus is in the condition illustrated in Fig. 3 of the drawings. Fig. 9 is a detailed transverse sectional view taken as indicated by line 9—9 on Fig. 8. Fig. 10 is a detailed transverse sectional view taken as indicated by line 10—10 on Fig. 8. Fig. 11 is a detailed transverse sectional view taken as indicated by line 11—11 on Fig. 8. Figs. 12 and 13 are enlarged detailed vertical sectional views taken as indicated by lines 12—12 and 13—13 on Fig. 11. Fig. 14 and Fig. 14^a are sectional views similar to Fig. 8 of the drawings illustrating the apparatus positioned as it appears in Fig. 4 of the drawings, parts of the apparatus being broken away to show in section, and Fig. 15 and Fig. 15^a are views similar to Fig. 14 and Fig. 14^a, respectively, showing the parts positioned as they appear in Fig. 6 of the drawings.

The apparatus provided by the invention coordinates a well casing a well liner and acts to handle or control fluid with reference to these parts, and particularly with reference to the liner. In accordance with the broader principles of the invention it is applicable to various well conditions and may be utilized in carrying out various operations as circumstances may require. In the particular case illustrated in Figs. 1, 2 and 3 I have shown a simple and typical well condition wherein there is a well bore A having a casing B set therein while a portion 10 of the well bore extends below the lower end of the casing. A liner C is set in the well, preferably in the lower end portion of the casing B to depend therefrom and into the open hole at 10. The liner is shown supported by a liner hanger D and the present invention provides a setting device E cooperating with the hanger to engage or operate it as will be hereinafter described. The invention also provides a circulation control F governing or controlling flow through the apparatus as, for instance, from the liner or into the casing. Swabbing equipment H is provided to be employed as illustrated in Figs. 3 and 8 and an operator J is provided for the circulation control.

The casing B is shown set in the well in the usual manner as by means of cement in at 11, and the liner C is shown or indicated as a simple typical liner which is an elongate tubular part provided with a plurality of small or fine perforations 12 designed to admit desired flow into the well while undesirable materials are checked or held back.

The liner hanger D is provided to support or to form a mounting for the liner so that it hangs or depends from the well casing B in the desired manner. The liner hanger may, in accordance with the broader principles of the invention, vary considerably in form and construction, as well as in mode of operation. However, it is preferred that it be of the form and construction which is described and claimed in my copending application entitled "Liner Hanger and Actuator Therefore," filed on even date herewith, Serial No. 52,037.

The particular liner hanger illustrated is characterized by an elongate tubular body 13, packing means 14 carried by the body, gripping units 15 carried by the body, and control means 16 by which the action of the hanger is made responsive to the setting device E.

The body is shown as made up of a main or

central section 17 which is a simple straight tubular part, a top or shoulder section 18 on the upper end of section 17, and a bottom or stop section 19 on the lower end of section 17. The several sections of the body are preferably joined, as by threads or the like, so that they form a unitary structure or assembly carrying the packing means 14 and gripping units 15.

The top or shoulder section 18 of the hanger body is shown threaded on the upper end of the main body section 17 and it is characterized by an internal upwardly facing shoulder 28 serving as an abutment against which the setting device operates or is engaged, and serving as a part in known position and with which the operator for the circulating control cooperates. The body section 18 has an external downwardly facing shoulder 20 with which the packing means 14 cooperates.

The packing means 14 is carried on the exterior of the body section 17, preferably on the upper end portion thereof, to be adjacent the shoulder section 18. In the case illustrated the packing means involves an annular body of packing 21 surrounding the body section 17 engaging shoulder 20 of body section 18 and operated by a sleeve 22 slidably carried on the body section 17 at the lower end of the packing 21. The structure is such that the packing ring 21 is normally collapsed or retracted as shown in Fig. 7 in which case it is clear of the casing B. However, when the sleeve 22 is operated, as by being moved upwardly or toward shoulder 20 the packing ring 21 is operated or expanded into sealing engagement with the interior of casing B, as shown in Fig. 14 of the drawings. In accordance with the preferred form of the invention one or more gripping units 15 is employed in carrying out the present invention and they are such as to be operated from a retracted position as shown in Fig. 7 where they are clear of casing B to an operating or set position such as is shown in Fig. 14, where they have gripping engagement with the casing. The particular gripping units illustrated in the drawings are of the type more fully described and claimed in my copending application entitled "Gripper and Method of Making the Same," filed on even date herewith, Serial No. 53,338.

Each gripper unit 15 is characterized by a wedge 25 and gripping parts 26 cooperating with the wedge to be expanded or moved outwardly thereby into gripping engagement with the casing. In the particular form of gripper illustrated the parts 26 are adjacent turns or convolutions of a helically formed member, the exterior of which is scored to present gripping teeth 27 while the interior slides on the wedge 25. The member forming the parts 26 is a resilient member, for example, a spring normally tending to assume an expanded position where it grips the casing, as shown in Fig. 14. With this type of gripping construction one end of the member forming the parts 26 is secured to the wedge 25 while the other end is secured to an anchor part 30. As shown in the drawings, lugs 31 are provided on the ends of the member forming the parts 26 to engage in openings in wedge 25 and anchor 30.

Where two gripper units 15 are employed, as shown in the drawings, it is preferred that there be an anchor ring 30 for the uppermost gripper unit, whereas the section 19 of the hanger body may serve as the part to which one end of the gripper member of the lower unit may be attached. When this arrangement is employed the anchor 30 for the upper unit is preferably

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keyed to the wedge 25 of the lower gripper unit as by means of a key 32, so that the grippers are, in effect, in series. The control means 16 of the hanger is shown as including a releasable fastener operating to hold one end of the series of gripper units, the other end being secured to the fixed body section 19 which may, in practice, be effectively set against movement by a set screw 33. The means 16 is shown as involving a shear pin 34 carried in registering openings provided in the body section 17 and the unit formed by the sleeve 22 and the uppermost wedge member 25, which parts are integrally formed as clearly shown in the drawings. The shear pin has an inwardly projecting part or head 35 that extends or projects into the interior of the hanger body.

Employing the structure just described the gripper units 15, which are in series, are operated to the retracted or collapsed position, as shown in Fig. 7, by rotating the uppermost wedge 25 on the body section 17 until the desired retracted condition of the spring gripping members is gained. With this positioning of parts the shear pin 34 is arranged in place and the gripping units are thus releasably held retracted.

It is to be observed that with the construction just described failure of the shear pin 34 releases the wedge member 25 of the uppermost gripper unit so that the sleeve 22 which is on or carried by this wedge part is free to shift toward shoulder 20 in a manner to compress the packing 21. Furthermore, when the shear pin is released the units 15 are both freed so that the spring parts thereof forming the gripper parts 26 are free to expand to their normal position in which they grip the casing B. With the gripping parts expanded and in engagement with the casing, lowering of the structure causes the wedges 25 to engage behind the gripping parts setting them securely in the casing.

The setting device E best shown in Fig. 7 of the drawings is characterized by a stem 40 that may be carried by or on the lower end of a tubular operating string, or the like, a head 41 on the lower end of the stem 40, a coupler 42 carried by the stem and cooperating with the hanger, and a striker 43 carried by the head 41 to act upon shear pin 34.

The upper end portion of the stem 40 which may be joined to the lower end of an operating string in any suitable manner or through any suitable manner or through any suitable connection, is preferably polygonal, say for instance square, in cross sectional configuration and the coupler 42 is slidably engaged thereon to be free to move longitudinally thereof but cannot rotate thereon. The lower end portion 44 of the stem is reduced in size and carries a packer 45 which engages the interior of the coupler 42.

The coupler 42 is releasably coupled or engaged with the upper end portion of the hanger body. In the particular case illustrated it has a coarse external thread engaged in a coarsely threaded socket 45^a in the upper end of body section 18. The threaded engagement just referred to is preferably lefthanded and such that suitable lefthanded rotation of the string carrying the stem 40 causes the coupler to back out of the socket 45^a freeing the setting device from the hanger. While the coupler 42 is engaged with the body of the hanger as shown in Fig. 7 the head 41 of the hanger is engaged in the body section 17 supporting the striker 43 in position to operate the shear pin 34. A stop 46 is provided on the

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stem immediately above the head 41 to seat on the shoulder 28 when the parts are assembled as shown in Fig. 7, and a bearing 47 is provided between the stop 46 and the lower end of the coupler and a shoulder 48 on the stem.

The head 41 of the setting device is shown as an enlargement threaded on the lower end of the stem 40 and it engages beneath the stop 46 and depends from the lower end of the stem. The striker 43 is carried by the head 41 and operates to break the shear pin 34. The striker is shown as including a tubular shank 49 carrying packing 50 at its upper end slidably engaged in the lower end of the stem 40, having a flange 51 operating in a bore 52 in the head, and having an enlargement or pin striking member 53 at its lower end. The pin striking member is below the lower end of the head 41 and is so located and proportioned as to be above the head 35 of the shear pin 34 so that as the striker is operated downwardly it engages the head 35 and breaks the shear pin. The striker is normally releasably held in an up or unactuated position by a shear pin 54 coupling the flange 51 and the head 41 and the downward movement of the striker relative to the head 41 is limited by the flange 51 cooperating with a flange 56 in the lower end portion of the head.

The stem portion 49 of the striker is tubular so that there is a flow passage 57 extending completely through the striker from one end to the other. The upper end of the flow passage is provided with a seat 58 to receive a valve which may be a spherical member or ball 60 to be dropped through the operating string and through the stem 40 when it is desired to actuate the structure in order to effect shearing of the pin 34. When the ball or valve 60 is dropped through the operating string it closes the passage 57 through the striker, whereupon pressure may be applied to the upper end of the operating string, causing the shear pin 54 to fail, whereupon the striker moves downwardly with force sufficient to break the shear pin 34.

The circulation control, the details of which will be apparent from consideration of Figs. 8 to 13, inclusive, on sheet 4 of the drawings, is shown as of the form and construction which is described and claimed in my copending application entitled "Circulating Unit and Actuator Therefor," filed on even date herewith, Serial No. 53,337. It is to be understood, however, that the details of this portion of the apparatus may be varied widely without departing from the spirit of the present invention, as for example, this portion of the apparatus may be of the form or type which is subject of my copending application entitled on "Circulation Control For Wells and Actuator Therefor," filed on even date herewith, Serial No. 52,036, now Patent No. 2,616,503.

The particular circulation control shown in the drawings is characterized by a central tubular body 70 which may be joined to the lower end of the hanger body by any suitable means, as for instance by a tubular coupler 71. The particular body 70 shown is directly joined to the upper end of the liner C by means of a threaded connection 72.

The circulation control further includes a valve sleeve 73 operating on the body so that it is shiftable relative thereto to move ports 74 and 75 into and out of register. In the particular case illustrated there are circumferentially spaced ports 74 in the body 70 and a correspond-

ing number and arrangement of ports 75 in the valve sleeve 73. The arrangement and spacing of ports is such that the sleeve can be operated relative to the body between a position where the parts register, as shown in Figs. 8 and 10, and a position where the ports are out of register, as will be the case when the sleeve 73 has been rotated through about 45° in either direction from the position shown in Figs. 8 and 10. In practice the valve sleeve 73 may be accurately seated on the exterior of body 70 to properly operate thereon and to provide a reasonably tight valve construction, and if desired, packing means such as rings 77 may be incorporated in the construction, as shown in the drawings. It will be apparent that when the ports 74 and 75 are in register, as shown in Figs. 8 and 10, effective communication is established between the interior of the casing or the well bore and the interior of the body 70 which may be in free communication with the upper end portion of the casing through the body of the liner hanger.

The circulation control further includes motor means 80 operating to shift the valve sleeve in order to move the ports 75 into and out of register with the ports 74. In the particular case illustrated where the sleeve 73 operates around the body 70 or, in other words, is rotatable on the body to result in the desired valve action, the motor means 80 may be any simple or suitable structure serving to gain the desired relative rotation between the sleeve and the body. In the particular case illustrated the motor means 80 is divided into two parts or units located at the ends of the valve sleeve 73 between the valve sleeve and shoulder members 81 which are fixed on the ends of the body confining the valve sleeve and motor means on the body.

Each motor means involves a cylindrical extension 83 carried on or extending from the sleeve valve 73 and cooperating vanes 84 and 85 in the chamber 86 established between the exterior of body 70 and the interior of the cylinder. The cylinder 83 is shown overlapping the stop 81 at which point there may be a suitable seal 87. Vane 84 extends lengthwise throughout the length of chamber 86 and is fixed on the interior of the cylinder 83 and has sliding engagement with the exterior of the body 70 with which it may be sealed by suitable packings 88. The vane 85 is provided on the exterior of the body 70 and extends throughout the length of the chamber 86 and has sliding engagement with the interior of cylinder 83 with which it may be sealed by suitable packings 89. A pressure inlet port 90 is provided in the body 70 communicating with chamber 86 and a stop 91 is provided in the structure to limit rotation of the cylinder valve assembly about the body 70. It is to be observed from the drawings that exhaust ports 92 are provided in the cylinders 83 allowing fluid to escape from the chambers 86 when pressure greater than well pressure is admitted through ports 90.

From an examination of Figs. 9 and 11 of the drawings it will be apparent that the units of the motor means occurring at the two ends of the sleeve valve 73 are related so that when the ports 74 and 75 are in communication or are in register, as shown in Figs. 8 and 10, the parts of the uppermost motor unit have vane 84 stopped against the stop 91 while the parts in the lowermost motor unit are related ready for operation so that when fluid pressure is admitted through the port 90 the cylinder valve assembly will ro-

tate about the body moving vane 84 into engagement with stop 91, in which position the parts will be stopped with the ports out of register.

The operator J for the circulation control F includes a stop 93 on a tubular operating string 94 and spaced packing elements 95 on the operating string 94 in predetermined spaced relation to the stop 93 with the space between the packing 95 in communication with the interior of the operating string 94 through a port 96. The tubular operating string may be full of fluid and pressure may be applied to such fluid from the upper end of the operating string so that high pressure is available between the spaced packers 95. Through the present invention the shoulder 28 in the liner hanger which is in a fixed position relative to the ports 90 of the circulation control is coordinated with the spacing of the stop 93 and the spaced packers 95 so that when the stop 93 is in engagement with the stop shoulder 28 as shown in Fig. 14 of the drawings, the spaced packers 95 are opposite the lowermost unit of the motor mechanism of control F so that pressure from the operating string carrying the packers 95 is communicated to the lowermost unit of the motor mechanism through its port 90 and if that pressure is greater than the well pressure that motor mechanism is operated, with consequent rotation of the valve sleeve 73 to a position where the ports 74 and 75 are out of register. At any time after the mechanism has been operated in the manner just described, if it is desired to open the circulation control as by registering ports 74 and 75 the apparatus may be operated until the stop 93 engages the shoulder 28 followed by lifting of the operating string 94 enough to move the spaced packers 95 to a position in body 70 opposite the upper unit of the motor mechanism, as shown in Fig. 15, so that pressure can be applied to that unit of the motor mechanism through its port 90 in a manner to operate it returning the valve sleeve to its original position, as shown in Fig. 8.

It will be apparent that with the apparatus provided by the present invention effective swabbing or washing of the liner C may be gained by suitable operation of a swab assembly carried by a suitable operating string or rod. In Fig. 8 of the drawings opposed swab rubbers 98 are shown carried by an operating string 100 so that they are within the liner C and flow is indicated issuing from the string 100 between the swab rubbers so that it flows out through perforations of the liner from which point it may flow up around the liner and out through the circulation control F.

In accordance with the method of the present invention a perforated liner set in a well through a hanger is subject to control so that fluid from the well may flow in through the perforations of the liner and flow up through the hanger and out through the casing, all in the manner common to ordinary well practice, or flow from the well may be bypassed so that it does not necessarily occur through the liner but rather is allowed to enter the casing through the hanger without passing through the liner and while the liner is thus bypassed it may be swabbed and flushing or cleaning fluid may be circulated out through the perforations of the liner, as will be apparent from Fig. 8 of the drawings. Further, by my invention elements such as are included in the apparatus hereinabove described are effectively oriented or positioned to gain the desired operation by actuating them into engagement with or rela-

tive to a known fixed part in the well, as for instance the fixed shoulder provided in the liner hanger.

In employing the apparatus of the present invention and in carrying out the method, the liner hanger with the liner attached thereto may be lowered into the well to the desired point by means of the setting device, and with the flow control set so that the ports are either open or closed, as circumstances may require. With the hanger located the setting device may be operated by merely dropping the control valve or ball through the string handling the setting device to close the striker so that pressure may be applied to operate the striker so that the shear pin controlling the hanger is broken. With the hanger thus set the setting device may be disengaged from the hanger and removed from the well and the well swabbed or allowed to flow in the conventional manner. It is to be understood, of course, that in initiating flow or operation of the well swabbing may be employed and it will be apparent that by being able to gain well circulation either through the bypass or circulation control or through the liner, well action may be varied to the best advantage. With the structure provided by the present invention, and in carrying out the method, it is possible to open or close the circulation control whenever desired, operation of the control being such that it can be easily, quickly, and dependably carried out with simple, inexpensive equipment.

Having described only a typical preferred form of apparatus and manner of carrying out the method of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art and fall within the scope of the following claims.

Having described my invention, I claim:

1. Apparatus operable in a well casing including, a liner, a hanger supporting the liner and having a casing engaging packer, and a circulation control at the upper end of the liner including, a valve below the packer controlling flow between the exterior of the liner and the interior of the hanger and acting when closed to confine flow to the liner and when open acting to bypass the liner, and fluid pressure actuated means operating the valve.

2. In combination, a well casing, a liner, a hanger supporting the liner from the casing and having a casing engaging packer, and a circulation control at the upper end of the liner including a valve operating while the packer seals with the casing between a closed position confining well flow to the liner and an open position conducting well flow to bypass the liner, and motor means confined to the control and operating to open and close the valve while the packer seals with the casing.

3. Apparatus operable in a well casing including, a liner, a hanger supporting the liner and having a casing engaging packer, a circulation control at the upper end of the liner including, a fluid pressure actuated valve acting when closed to confine flow to the liner and when open to bypass the liner, and an operator engageable with the control to supply operating pressure thereto.

4. In combination, a well casing, a liner, a hanger supporting the liner from the casing and having a casing engaging packer, a circulation control at the upper end of the liner including a fluid pressure actuated valve acting when closed

to confine well flow to the liner and when open conducting well flow to bypass the liner, and an operator engageable with the control to operate the valve thereof and including, an element cooperating with the control to supply fluid thereto, and a member extending through the casing and carrying said element.

5. In combination, a liner, a hanger supporting the liner and having a casing engaging packer, a fluid pressure actuated circulation control at the upper end of the liner including a valve acting when closed to confine flow to the liner and when open acting to bypass the liner, and an operator engageable with the control to operate the valve including an element cooperating with the control to supply fluid thereto, and a fluid conducting member extending through the casing and carrying said element.

6. An assembly applicable to the lower end portion of a well casing including, a liner, a liner hanger having a normally engaged casing engaging packer, and a circulation control including, a valve, and fluid pressure actuated means operating the valve, there being a stop in one element of the assembly, and an actuator including, a member extending to the assembly through the casing, and a part carried by said member and oriented relative to the control by said stop and delivering fluid from said member to the control.

7. An assembly applicable to the lower end portion of a well casing including, a liner, a liner hanger having a normally engaged casing engaging packer, and a circulation control including, a valve, and fluid pressure actuated means operating the valve, there being a stop in the hanger, and an actuator including a member extending to the assembly through the casing and a part carried by said member and oriented relative to the control by said stop.

8. An assembly applicable to the lower end portion of a well casing including, a liner, a liner hanger above the liner having a normally engaged casing engaging packer, and a circulation control between the liner and hanger and including, a sleeve valve, and fluid pressure actuated means operating the valve, there being a stop at the hanger, and an actuator including a tubular member extending to the assembly through the casing and a part carried by said member and oriented relative to the control by said stop and delivering operating fluid from said member to the said means of the control.

9. A swab passing assembly applicable to a well casing including, a liner, a tubular circulation control at the upper end of the liner and a tubular hanger supporting the liner through the control, the control including, a tubular body, a sleeve valve carried by the body, and a vane type motor carried by the body and operating the valve.

10. In combination, a liner, a hanger supporting the liner, a circulation control at the upper end of the liner including, a valve acting when closed to confine flow to the liner and when open acting to bypass the liner, and a vane type motor confined to the control and coupled with the valve to operate it.

11. A swab passing assembly applicable to a well casing including, a liner, a tubular circulation control at the upper end of the liner, and a tubular hanger supporting the liner through the control and having a casing engaging packer, the control including, a tubular body, a sleeve valve carried by the body, and a vane type motor carried by the body and operating the valve and operable by fluid from an actuator insertable

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through the casing, the hanger including an orienting stop receiving an actuator and located in a predetermined fixed position relative to the motor.

12. In combination, a liner, a hanger supporting the liner, a circulation control at the upper end of the liner including, a body, a valve carried by the body and acting when closed to confine flow to the liner and when open acting to bypass the liner, and a vane type motor carried by the body and operating the valve, the hanger including a stop in a predetermined position relative to the motor, and an operator for the motor including an operating string engageable through the casing, a part cooperating with the stop to be positioned thereby, and an element cooperating with the motor and positioned relative thereto by said part.

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