Sept. 2, 1958 C. C. BROWN 2,850,099

WELL PRODUCTION APPARATUS

Filed April 13, 1953 5 Sheets-Sheet 1

Fig. 1

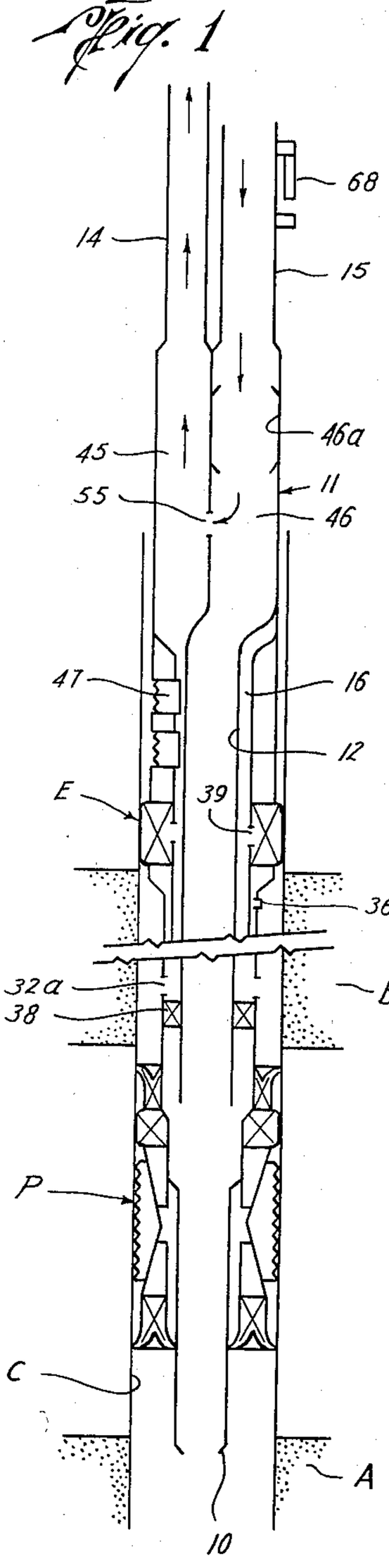


Fig. 2

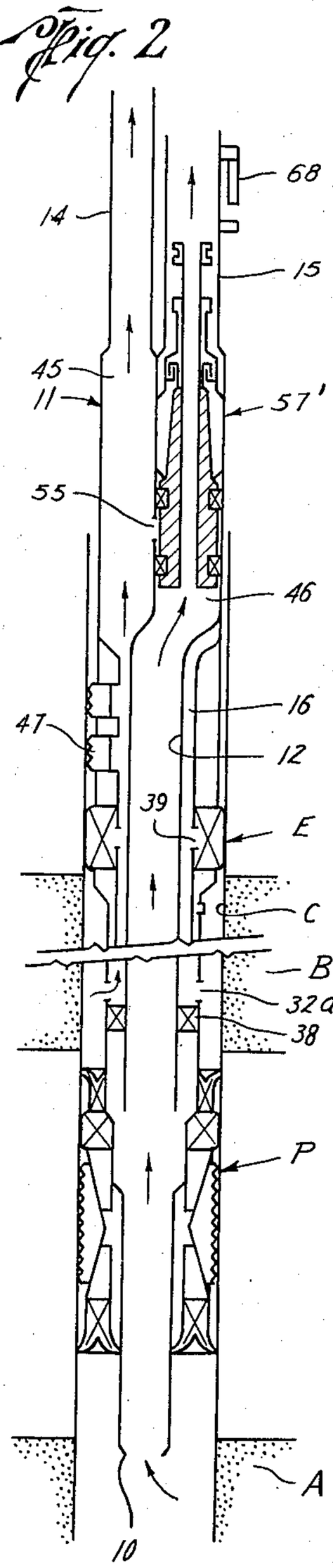
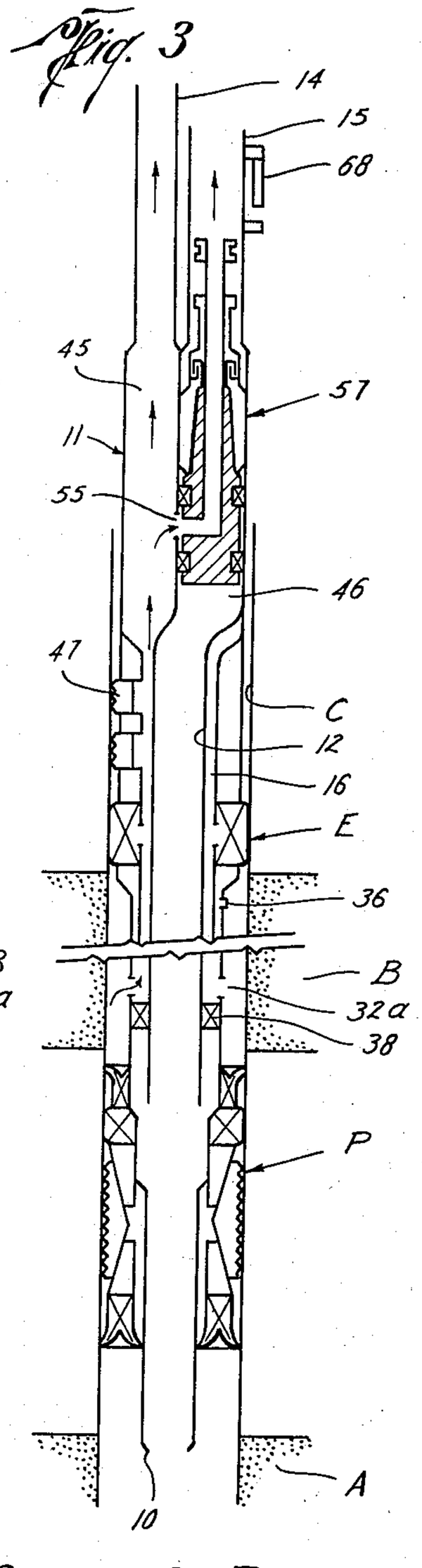


Fig. 3



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Sept. 2, 1958 C. C. BROWN 2,850,099

WELL PRODUCTION APPARATUS

Filed April 13, 1953 5 Sheets-Sheet 2

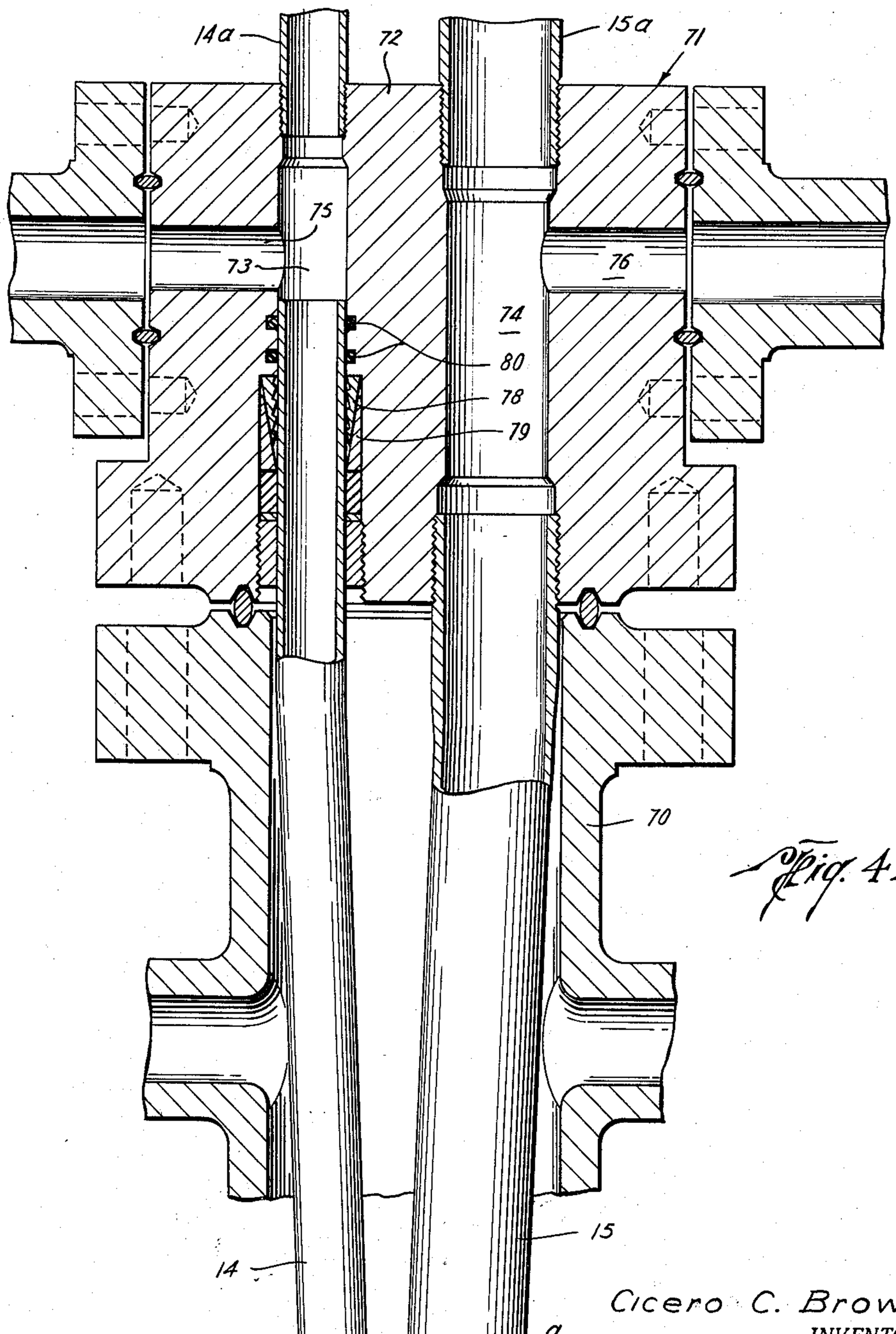

Fig. 4A

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WELL PRODUCTION APPARATUS

Filed April 13, 1953 5 Sheets-Sheet 3

Fig. 4B

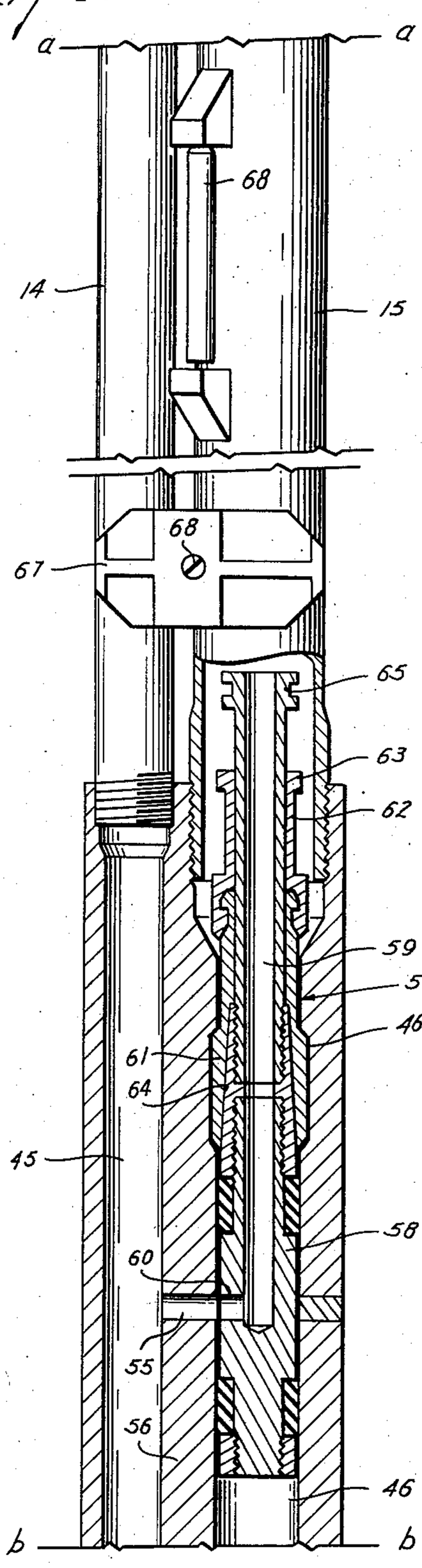
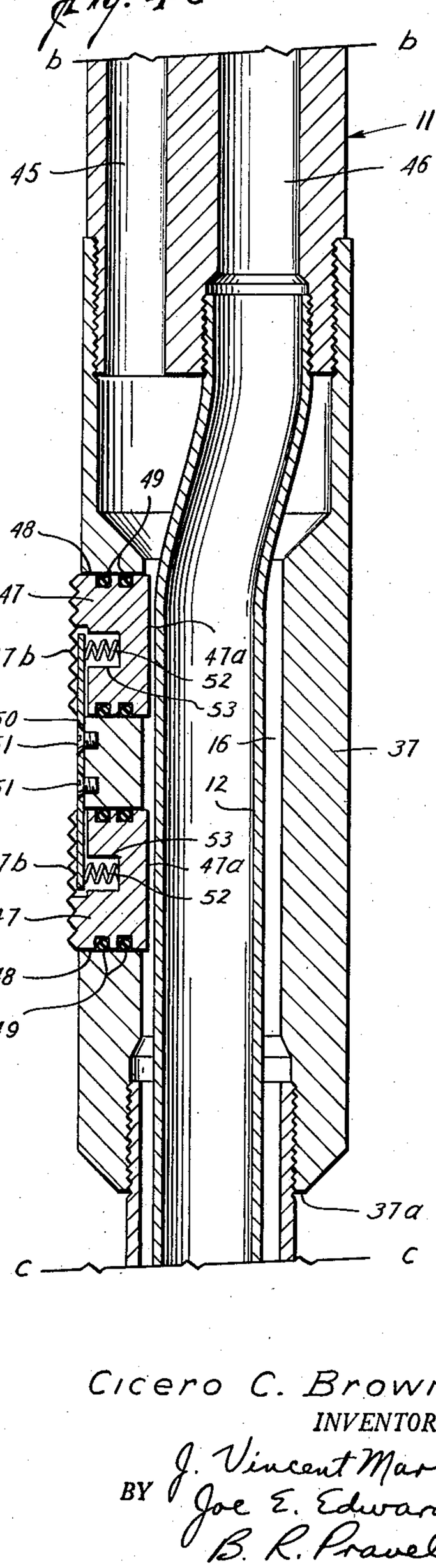


Fig. 4C



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WELL PRODUCTION APPARATUS

Filed April 13, 1953 5 Sheets-Sheet 4

Fig. 4D

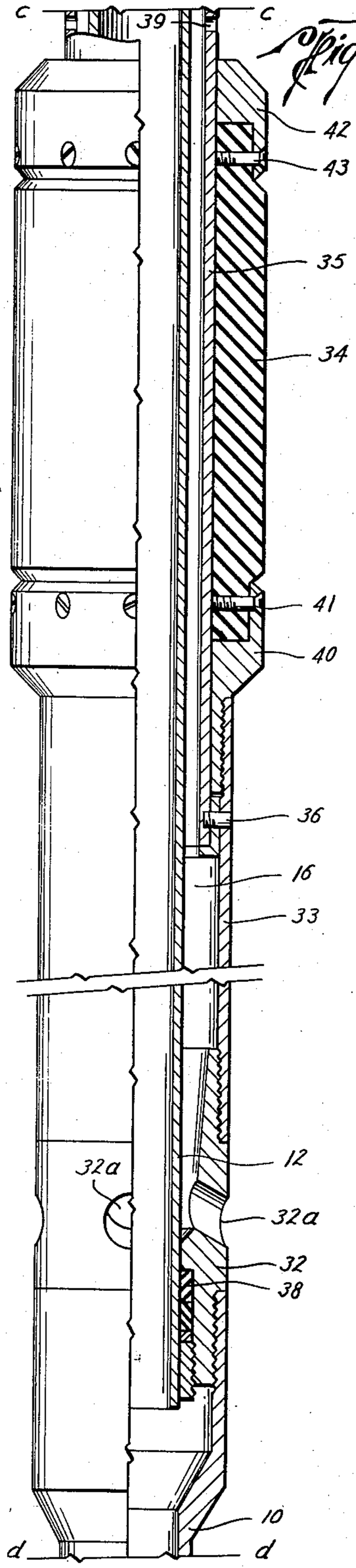
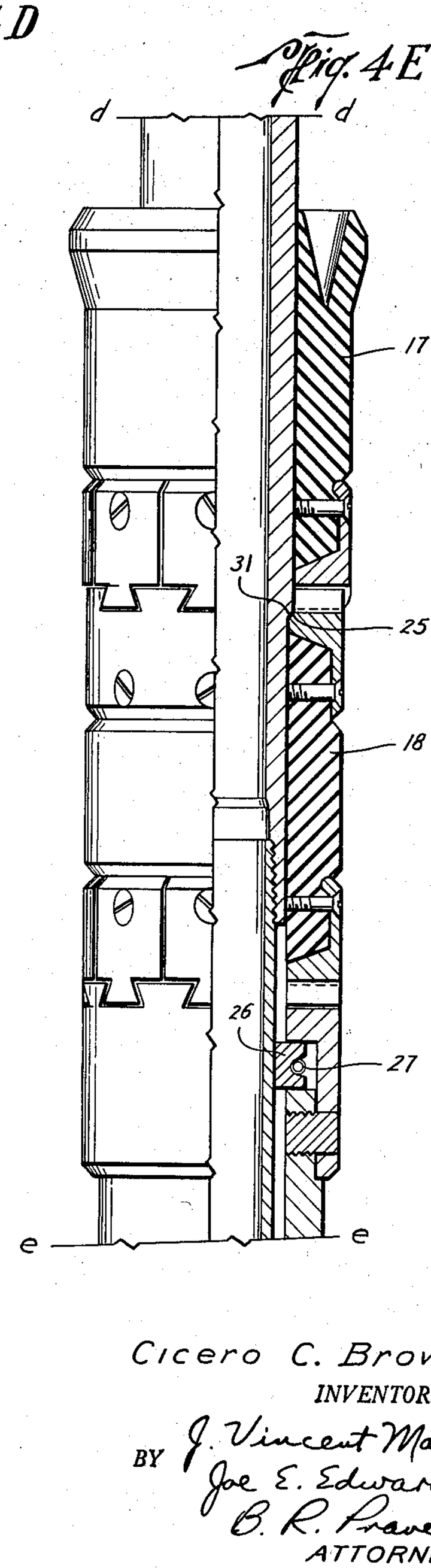


Fig. 4E



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Sept. 2, 1958 C. C. BROWN 2,850,099

WELL PRODUCTION APPARATUS

Filed April 13, 1953 5 Sheets-Sheet 5

Fig. 4F

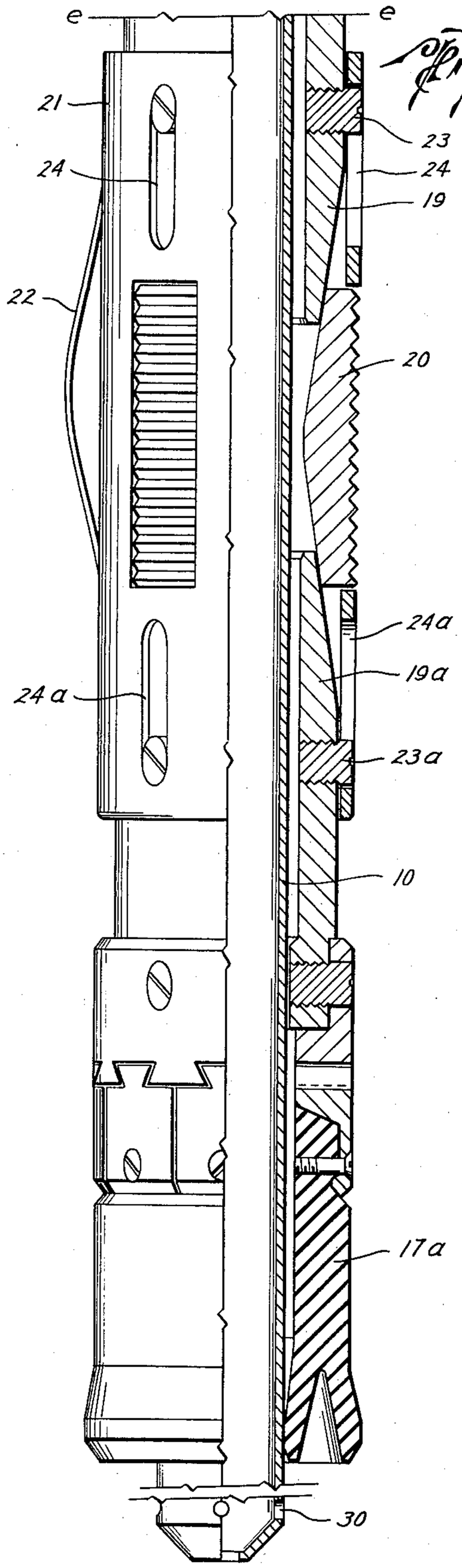
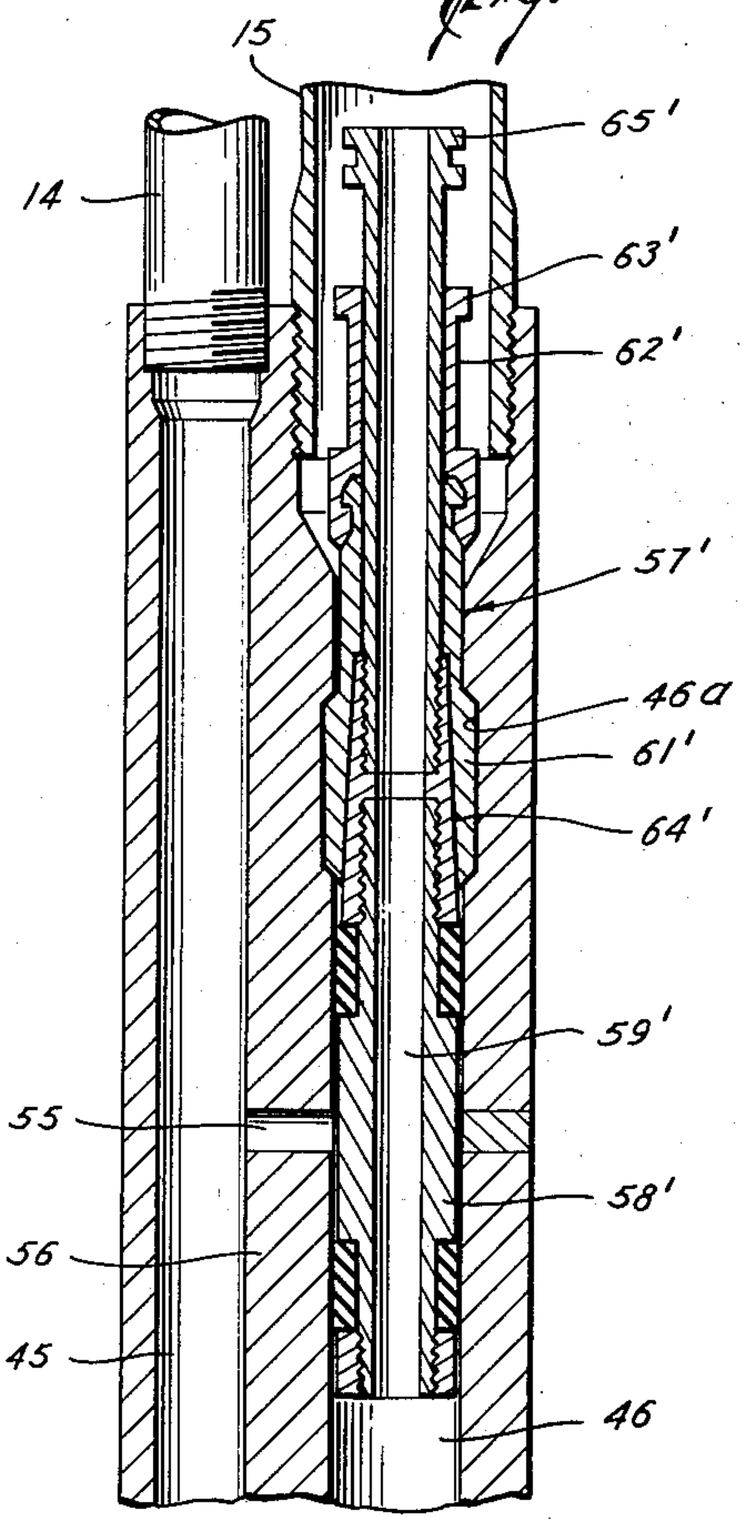


Fig. 5



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United States Patent Office

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2,850,099

WELL PRODUCTION APPARATUS

Cicero C. Brown, Houston, Tex.

Application April 13, 1953, Serial No. 348,173

14 Claims. (Cl. 166—127)

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

It is an object of this invention to provide an improved well packer for sealing off an upper and a lower well formation wherein the packer is so constructed that production from the formations or other operations on the formations can be performed after the packer has been set without the necessity of pulling or removing the tubing associated with said packer.

It is an important object of this invention to provide an improved well packer for dual production from an upper and a lower well formation wherein the packer is constructed to receive a separate tubing string for each of the formations, whereby production of oil and other operations in connection with each formation can be conducted separately without the necessity of removing the tubing strings from the well bore and without permitting oil or other fluids passing to or from the formations from entering the casing whereby the casing annulus can be utilized for gas lift purposes.

It is another object of this invention to provide an improved well packer having a lower packing unit disposed between the lower well formation and an upper well formation and an upper packing unit disposed above the upper formation, the packer units each having communication with a separate tubing string extending to the surface of the well, the tubing strings having means for establishing fluid communication therebetween which is capable of being opened or closed without removing either tubing string from the well bore.

A further object of this invention is to provide in a dual production well packer which is adapted to be lowered into a well casing, a coupling member which is adapted to be connected at one end to a pair of tubing strings which extend to the surface of the well and which is adapted to be connected at its other end to concentrically arranged tubes in the packer units, whereby fluid may flow from the concentric tubes through the coupling member and into the pair of tubing strings thereabove to the surface of the well without entering the casing above the packer so that the casing annulus can be utilized for gas lift purposes.

The construction designed to carry out the invention will be hereinafter described together with other features thereof.

The invention will be more readily understood from a reading of the following specifications and by reference to the accompanying drawings forming a part thereof, wherein an example of the invention is shown, and wherein:

Figure 1 is a diagrammatic view of the well packer of this invention within a well bore in position for washing in both formations.

Figure 2 is a view similar to Figure 1, but illustrating the use of a straight plug in one of the tubing strings for controlling the production from the formations.

Figure 3 is a view similar to Figure 1, but illustrating the use of the packer with a side door plug in one of the

tubing strings to close off the flow from the lower formation and to direct the flow from the upper formation through both of the tubing strings.

Figures 4A, 4B, 4C, 4D, 4E, and 4F are consecutive views, partly in elevation and partly in section, illustrating the details of the complete packer of this invention, from the upper to the lower end of the packer, respectively.

Figure 5 is a view, partly in elevation and partly in section, of a portion of the coupling member of the packer of this invention with a straight opening plug therein.

In the drawings, the letter P designates the lower packer unit of the improved well packer of this invention, which unit is disposed in a well casing C between a lower well formation A and an upper well formation B. Above the lower packer unit P, is a second or upper packer unit E which is adapted to be set in the well casing C above the upper formation B. A flow tube **10** extends through both the upper and lower packer units and has connection with a coupling member **11** disposed above the upper packer unit E. An inner flow tube **12** is concentrically disposed within the upper portion of the outer flow tube **10** with an annular space **16** formed therebetween and is connected with the lower end of the coupling member **11**. The coupling member **11** is connected at its upper end with a pair of tubing strings **14** and **15** which extend to the surface of the well and are mounted in a tubing head, as will be explained. When the packers P and E are set in the casing C, the lower formation A flows upwardly through the flow tube **10** and thence through the inner flow tube **12** into the tubing string **15**, while the fluid from formation D flows into the annular space **16** between the outer flow tube **10** and the inner flow tube **12** upwardly through the coupling member **11** to the tubing string **14**. As will be explained, this normal flow from the formations to the tubing strings **14** and **15** can be changed by the use of various types of plugs which are adapted to be disposed within the coupling member **11**.

The details of the complete dual production packer of this invention are illustrated in Figures 4A–4F. Figures 4E and 4F illustrate the lower packer unit P which is of the wire line type as disclosed in my co-pending U. S. patent application Serial No. 260,859, filed December 10, 1951, now Patent No. 2,739,651. This packer P is initially lowered into the well casing C on a wire line lowering or running-in tool prior to the time that the remainder of the dual packer of this invention is lowered into the casing. Thereafter the wire line lowering tool is removed leaving the bore of the packer unit P open for the reception of the flow tube **10**. This lower packer P includes an upper seal cup **17** which has a radially expansible annular sealing member **18** connected therebelow. The annular expansible sealing member **18** is connected to a conical slip expander **19** which co-acts with gripping slips **20** which are carried by a sleeve **21** provided with frictional springs **22** for engaging the well casing C. The conical slip expander **19** has a plurality of radial pins **23** extending outwardly therefrom and into corresponding vertical slots **24** in the sleeve **21** to permit relative longitudinal movement of the expander **19** with respect to the slips **20** for moving the slips **20** radially into anchoring engagement with the interior of the well casing C. Below the gripping slips **20** a conical expander **19***a* is disposed which is in a reversed position compared to the upper expander **19** but is otherwise identical in construction. Such lower expander **19***a* has a plurality of radial pins **23***a* which extend through corresponding vertical slots **24***a* in the slip carrier or sleeves **21**. The lower end of the lower expander **19***a* has connection with a sealing cup **17***a* which is identical in construction with

the upper sealing cup **17** but is in a reversed position. This packing unit P shown in Figures 4E and 4F is adapted to be set by a differential in well pressure above and below the unit. When such differential occurs, the sealing elements **17** and **17***a* are urged toward each other to thereby urge the expanders **19** and **19***a* toward each other to radially move the gripping slips **20** into a gripping engagement with the interior of the well casing C. The packing unit P includes a radially movable latch **26** which includes a plurality of segments which are urged into a circular arrangement by a circular coil spring **27**, as explained in detail in my above referred to co-pending application. This latch **26** is merely for the purpose of removing the packer unit P from the well and the details thereof form no part of this invention.

After the lower packer unit P has been set in the well casing with the gripping slips **20** in engagement with the wall of the well casing, the bore of the packer P is open for the reception of the outer flow tube **10**, which is then lowered into position within the packer unit P as the tubing strings **14** and **15** are lowered into the casing. It is to be noted that during the setting of the lower well packer P and the insertion of the remainder of the dual packer of this invention into the casing, the well formations are "killed," that is, held inactive or are prevented from flowing by weighted drilling mud which is disposed in the casing.

The flow tube **10** has a plurality of openings **30** at its lower end whereby fluid may pass from the area below the lower packer unit into the interior or bore of the tube **10**. When the sealing elements **17** and **17***a* are expanded by the differential in well pressure acting thereagainst, the sealing elements seal off between the interior of the casing C and the exterior of the tubing **10**. The tubing **10** has a radial external shoulder **31** which is adapted to engage an internal shoulder **25** within the bore of the packer P, just below the sealing element **17**. When the shoulder **31** engages the internal shoulder **25**, the weight of the remainder of the dual packer and the pipe thereabove is imposed upon the lower packer P to maintain same in its set position in sealing and gripping contact with the well casing.

As best seen in Figures 4C and 4D, the flow tube **10** extends upwardly from the portion within the lower packer unit and has connection with an inlet ring **32** thereabove. The upper end of the inlet ring **32** is connected with a sleeve **33** which has its upper end connected to the lower end of the resilient annular packing element **34** of the upper packing unit E and also has a connection with a sleeve **35** through a shear pin or pins **36**. The sleeve **35** is disposed within the annular sealing element **34** and serves to prevent the collapse of such sealing element **34** inwardly. The upper end of the sleeve **35** is connected to a slip carrying annular member **37** which has its upper end connected to the periphery of the lower end of the coupling member **11**. It can thus be seen that the inlet ring **32**, the sleeve **33**, the sleeve **35** and the annular member **37** form a continuation of the flow tube **10** for connection with the coupling member **11** with the sleeve **35** and member **37** being detachable from the portion of the tube therebelow upon a shearing of pin **36**, as will be explained.

The inner flow tube **12** is disposed within such continuation of the outer flow tube **10** and a resilient annular seal **38** is provided on the interior of the inlet ring **32** in contact with the exterior of the lower end of the inner tube **12** to thereby provide a fluid seal at the lower end of the annular space **16**, such seal being maintained even during longitudinal movement of the inner tube **12** relative to the outer tube **10**. The inlet ring **32** has a plurality of upwardly inclined openings **32***a* extending through the wall thereof above the seal **38**, whereby when the packing element **34** is set, fluid may flow through such openings from the upper formation B into the annular space **16**. Equalization ports **39** are provided in the sleeve **35** above the packing element **34** to equalize the well pressure above and below the element **34** prior to the time that such packing element is set to thereby prevent premature setting of same.

The packing element **34** is securely connected to the upper end of the sleeve **33** by a connector ring **40** and bolts **41**. A rigid ring **42** is connected to the upper end of the sealing element **34** by bolts **43**; such ring **42** and the sealing element **34** are entirely free from any connection with the sleeve **35**, although the shear pin **36** maintains the sleeve **35** fixed relative to the sealing element **34** prior to the time the pin **36** is severed.

The slip carrying member **37** is threaded to the sleeve **35** thereabove and has mounted therewith a plurality of piston slip members **47**, each of which is disposed in a radial opening **48** in the wall of the member **47** with seal rings **49** being provided between the exterior of each piston gripping slip **47** and the wall of the opening **48**. A retaining plate **50** is bolted to the member **37** by bolts **51** in order to confine a spring **52** within a recess **53** in each of the members **47**. The spring **52** thus serves to maintain the gripping members **47** in a retracted position. However, when a fluid force is exerted on the inner surface **47***a* of each of the pistons **47**, they are moved radially outwardly so that the teeth **47***b* are forced into gripping engagement with the well casing C. The member **37** is adapted to move downwardly upon a shearing of the shear pin **36** so that the lower end **37***a* contacts the upper retainer ring **42** on the expander seal member **34**, whereby the sealing member **34** is expanded into sealing engagement with the wall casing. When such sealing occurs with the sealing member **34**, and fluid from the upper formation passes into the annular space **16**, the fluid pressure in the annular space acts upon the rear or inward surface **47***a* of each of the piston gripping members **47** to urge them outwardly into gripping contact with the wall casing, to thereby hold the sealing element **34** in its set or sealing position.

As best seen in Figures 4B and 4C, the coupling member **11** has two substantially parallel vertical flow passages **45** and **46** which extend entirely thrcugh the coupling member **11**. The upper end of the inner flow tube **12** is connected by threads or other means to the flow passage **46**, so that fluid flow from the interior of the inner tube **12** passes into the flow passage **46**. The lower end of the flow passage **45** is open and communicates with the annular space **16** by reason of the connection of the member **37** to the periphery of the lower end of the member **11**, so that fluid flowing from the annular space **16** can pass into such flow passage **45**. The flow passage **45** is therefore in fluid communication with the upper formation while the flow passage **46** is in fluid communication with the lower formation.

Referring now to Figure 4B, therein it can be seen that the flow passages **45** and **46** are in fluid communication by reason of a lateral port **55** extending through the wall **56** separating such flow pasasges **45** and **46**. In the flow passage **46**, above the lateral port **55**, there is provided an annular recess **46***a* for anchoring a plug **57** therein for the control of the flow through the port **55**. The plus **57** illustrated in Figure 4B is of a conventional construction and includes a central member **58** which has a longitudinal bore or opening **59** therethrough which communicates with a lateral opening **60** near the lower end thereof. Loosely suspended dogs **61** surround the central member **58** and an annular support ring **62** is provided thereabove with an annular flange **63**. The central member **58** has an expansion cone **64** on its exterior surface which co-acts with the anchoring dogs **61**, while at the upper end of the central member **58** a radial flange member **65** is provided. The method of inserting the plug **57** into and removing the plug **57** from, the flow passage **46** will be explained hereinafter, but as can be seen in Figure 4B, the plug **57** is positioned for use in the passage **46** so that the lateral opening **60** in the plug is aligned with the lateral port

55 in the coupling member 11 to thereby close the flow passage 46 below the plug 57 and to direct the flow from the flow passage 45 into the flow passage 46 above the plug 57.

The upper end of the coupling member 11 has one tubing string 14 threaded or otherwise connected to the flow passage 45 and a second tubing string 15 threaded or otherwise connected to the flow passage 46. These tubing strings are clamped together with any suitable means such as the U-shaped clamp 67, which has a connecting bolt 68 extending between the tubings 14 and 15 to a similar clamping plate on the opposite side (not shown). The tubing string 15 preferably carries a gas lift valve 68 on the exterior thereof within the casing annulus, such valve 68 being of any conventional construction for assisting in the lifting of the oil from the formation in communication with the tubing string 15.

The tubing strings 14 and 15 diverge somewhat at their upper ends from their otherwise parallel relationship and pass through a casing head 70 of conventional construction and are connected into a tubing head 71 thereabove. The tubing head 71 includes a body 72 which has a pair of vertical passages 73 and 74 extending therethrough, with the passage 73 communicating with a lateral passage 75 and the passage 74 communicating with a lateral passage 76. At the upper end of the passages 73 and 74 there can be connected extensions 14*a* and 15*a*, respectively, with suitable valves being associated with the tubing head for controlling flow through the extensions 14*a* and 15*a* and the lateral passages 75 and 76. The upper end of the tubing string 15 is threadedly connected to the lower end of the vertical passage 74 of the tubing head 71, while the upper end of the tubing string 14 is disposed in the passage 73 in engagement with slidable latching slips 78 positioned within the passage 73. These latching slips 78 are adapted to slide upwardly to permit the insertion of the upper end of the tubing string 14 but prevent downward movement of such tubing string 14 after it has been inserted by reason of a wedging action with an annular wedge member 79 disposed below the slips 78. Suitable seals 80 may be provided above the latching member 78 to prevent leakage around the exterior of the tubing string 14.

In Figure 5, a portion of the coupling member 11 is illustrated with a straight hole plug 57′ disposed in the flow passage 46. The straight hole plug 57′ is identical with the side door plug 57 illustrated in Figure 4B, except that the vertical or longitudinal opening 59′ extends entirely through the center member 58′ instead of having its end closed and also the lateral port 60 of plug 57 is eliminated. The latching dogs 61′, expander cone 64′, annular support ring 62′, shoulder 63′ and the upper flange 65′ are identical with the corresponding parts of the side door plug 57 illustrated in Figure 4B. As can be seen, the straight hole plug 57′ closes off the lateral port 55 so that production of oil, or operations in connection with the upper and lower formations are entirely separated.

In the operation or use of the dual production well packer of this invention, the lower packer unit P is first lowered into the casing C on a wire line running-in tool (not shown) to a position between the lower formation A and the upper formation B. It should be pointed out that when the packer unit P is lowered into the well casing, the well is "killed," that is, is prevented from flowing by weighted mud in the casing. As explained in my above referred to co-pending application, the lower packer unit P is set in gripping contact and sealing engagement with the well casing upon a raising of the running-in tool relative to the packer unit P. The friction springs 22 on the slip carrier 21 frictionally engage the well casing C to hold the lower packer unit P during the upward movement of the running-in tool,

whereby the differential in well pressure acting above and below the well packer unit P effects a movement of the sealing cups 17 and 17*a* toward each other to move the slip expander members 19 and 19*a* toward each other for radially moving the gripping slips 20 into gripping contact with the well casing. Thereafter the running-in tool is removed from the casing, leaving the bore of the lower packer unit P open. The remainder of the dual production packer of this invention is then inserted into the well casing with the flow tube 10 being lowered into the open bore of the lower well packer unit P. As the well packer is lowered relative to the packer unit P, the flow tube 10 passes downwardly into the lower packer unit P and the weight of the dual packer is imposed upon the lower packer unit P when the annular shoulder 31 engages the internal projection 25 of the lower packer unit. Thus, the weight of the packer above the lower packer unit serves to assist in maintaining the lower packer unit in gripping and sealing engagement with the well casing. It should be noted that during the lowering of the packer unit P and the remainder of the dual packer of this invention into the well casing, the tubing head 71 is not in position on the casing head 70 so that as the packer is lowered additional sections of tubing can be added to the tubing strings 14 and 15.

After the shoulder 31 has contacted the inner projection 25 and the weight is imposed on the lower packer unit to hold the tube 10 against downward movement, then the upper packer unit E is set in sealing engagement with the well casing. This is accomplished by lowering the tubing strings 14 and 15 and imposing the weight thereof on the annular sleeve 35 to shear the shear pin or pins 36, whereby the annular sleeve 35 moves downwardly relative to the packing element 34, which is maintained in a fixed position since it is connected to the flow tube 10 which is held against downward movement. After the shear bolt 36 is severed, and downward movement of the tubing and the sleeve 35 is continued, the lower end 37*a* of the slip carrier member 37 abuts against the upper ring 42 of the packing element 34 to apply weight thereto for radially expanding the sealing element 34 into sealing engagement with the well casing. Also, it will be evident that the equalizer openings 39 move below the sealing element 34 so that the equalizing flow or circulation which prevents premature setting of the sealing element 34 is thereby closed and any flow through the inlet ports 32*a* into the annular space 16 will continue on upwardly to the flow passage 45 in the coupling member 11. Since the inner tube 12 is connected to the member 37, it will also move downwardly relative to the tube 10 as the sleeve 35 is lowered.

With the lower packer unit P and the upper packer unit E set aganst the casing, the parts are in the position illustrated in Figure 1. The tubing head 71 is then added to the upper end of the tubing strings 14 and 15. The upper end of the tubing strings 15 is inserted prior to the insertion of the upper end of the tubing string 14. This is accomplished by positioning the upper end of the tubing string 15 sufficiently above the upper end of the tubing string 14 so that the tubing head 71 can be rotated to thread the tubing head 71 to the upper end of the tubing string 15 without interference from the tubing string 14. Since the tubing strings 14 and 15 extend for a very long distance in the well casing (usually hundreds of feet) it is possible to compress or slacken the pipe string 15 upon lowering the tubing head 71 until it rests upon the upper end of the casing head 70. At the same time that the tubing head 71 is lowered, the upper end of the tubing string 14 is passed upwardly into the passage 73 of the tubing head. The slidable latching jaws 78 permit the upward movement of the upper end of the tubing string 14 but prevent subsequent downward movement of such string 14 due to the wedging action of the latching dogs 78 against the wedges

79. The tubing head 71 is then bolted to the casing head 70 in the usual manner.

With the tubing head thus in position and the suitable valves associated therewith being properly regulated, the well is then washed in by circulating a washing fluid downwardly through the passage 74 and the tubing string 15 and thence through the lateral port 55 and then upwardly through the tubing string 14 to the surface of the well. This circulation of the washing fluid removes the heavy drilling mud from the tubing strings 14 and 15 and therefore removes the mud retaining force which has previously been holding the formations A and B against flow. Thus, by the washing in circulation in the tubing strings 14 and 15, production from the formations A and B is brought about. The formation A produces into the well casing below the well packer of this invention and flows in through the openings 30 in the lower end of the flow tube 10 and thence upwardly through the flow tube 10 and into the bore of the inner tube 12 which carries the oil into the flow passage 46 of the coupling member, and then upwardly into the tubing string 15. The upper formation B is in communication with the inlet opening 32a so that the oil from the formation B flows through said openings 32*a* into the annular space 16 and thence upwardly into the flow passage 45 of the coupling member 11 for transmission to the tubing string 14. When the lateral port 55 is open, there will of course be some intermingling of the oil passing upwardly through the flow passages 45 and 46 from the two formations.

However, under normal circumstances the production from the two formations will be separated by the use of a straight hole plug 57′ (Figure 2). The use of the straight hole plug 57′ permits the upper and lower formations to produce separately by closing off the lateral port 55 in the coupling member 11. If necessary or desirable, the gas lift valve 68 on the tubing string 15 may be utilized to raise the oil in such tubing string by injecting gas under pressure through the casing head 70 into the annular space in the casing surrounding the tubing strings 14 and 15. This is possible since the casing annulus around the tubing strings is not utilized for conducting fluid to or from the well formations.

In some instances it may be desirable to close off the flow from the lower formations and to provide a gas lift for the oil flowing from the upper formation. This can be effected by utilization of the side door plug 57 (Figure 3).

Although the insertion and removal of the straight hole plug and side door plug is by conventional means, following is the basic procedure in connection with the side door plug 57. The procedure would be identical for the straight hole plug 57′. Referring to Figure 4B in connection with the setting and releasing of the side door plug 57, such plug 57 is lowered upon a wire line or similar device (not shown) having means for holding the flange 63 in abutment with the flange 65, so that the latching dogs 61 are suspended above the expander cone 64. The latching dogs 61 can then pivot inwardly so as to pass through the upper end of the flow passage 46. When the latching dogs 61 have passed below the annular recess 46*a*, the tool holding the flange 63 in engagement with the flange 65 is released so that well pressure acting from below the plug 57 will force the central member 58 upwardly to wedge the expander 64 inside of the latching dogs 61 to thereby lock the dogs 61 in the recess 46*a* as shown in Figure 4B. The plug 57 is released by a wire line tool or a similar device having means for forcing the flange 65 downwardly into engagement with the lower flange 63 whereupon the latching dogs 61 upon an upward movement of the plug 57 will move inwardly, since the expander cone 64 has moved below the dogs 61. The plug can thereby be readily removed and another plug such as the straight hole plug 57′ may be inserted in an identical manner. In some cases it may be desirable to insert a completely closed plug (not shown), which would have no passage therethrough in order to close the lateral port 55 and also to close the flow in the flow passage 46.

From the foregoing description, it is believed evident that a dual production packer has been provided in which separate tubes are provided for an upper and lower formation so that production or other operations can be conducted in connection with each of the formations separately and without the necessity of pulling the tubing strings. Also, since the casing annulus is not utilized in the dual production with this packer, a gas lift valve may be incorporated with one of the tubing strings to increase production from either of the formations.

The foregoing disclosure and description of the invention is illustrative and explanatory thereof and various changes in size, shape and materials, as well as in details of the illustrated construction may be made, within the scope of the appended claims, without departing from the spirit of the invention.

What is claimed is:

1. A dual production well apparatus adapted to be positioned in a well casing and comprising, a lower packer unit adapted to be set in sealing contact with the well casing and also adapted to be disposed between a lower well formation and an upper well formation, an upper packer unit adapted to be set in sealing contact with the well casing and also adapted to be disposed above the upper well formation, an outer flow tube extending through the packer units and in sealing engagement therewith whereby said packer units seal off the annular space between the well casing and said outer flow tube, an inner tube disposed within the outer tube and extending through the upper packer unit, said inner tube being spaced from the outer tube to form an annular space therebetween, sealing means between the inner tube and the outer tube for preventing flow from the bore of said inner tube into said annular space, said outer tube having an opening near its lower end below said sealing means and said packer units whereby fluid from the lower formation may pass upwardly into the outer tube and into the inner tube, said outer tube also having an opening above said sealing means and between said packer units to establish fluid communication between said upper formation and said annular space, and a coupling member comprising a tubular body coupled to said outer tube and having two substantially parallel flow passages therethrough, a pair of tubing strings connected to said tubular body, one of said flow passages establishing fluid communication between one of said tubing strings and the annular space between the inner tube and the outer tube, and the other of said flow passages establishing fluid communication between the other of said tubing strings and the interior of said inner tube.

2. A dual production well packer apparatus adapted to be lowered into a well casing for producing from an upper well formation and from a lower well formation and including, a tubular coupling member having connected to its upper end a pair of tubing strings which extend to the surface of the well, said coupling member having a pair of substantially parallel flow passages extending therethrough, each of said passages being in communication with one of the tubing strings, a first tubular conductor connected to said coupling and extending downwardly therefrom with its upper end in communication with one of the passages, the lower end of said first conductor communicating with one of the well formations, a second tubular conductor connected to the coupling and extending downwardly therefrom with its upper end in communication with the other of said passages, the lower end of said second tubular conductor being in communication with the other of said well formations, a lower packer unit surrounding one of the tubular conductors sealing off the annulus between

the conductor and the well casing and located at an elevation between the upper and lower producing well formations, and an upper packer surrounding both tubular conductors sealing off the annulus between said conductors and the well casing and located at an elevation above the upper producing well formation.

3. A dual production well packer apparatus adapted to be lowered into a well casing for producing from an upper well formation and from a lower well formation and including, a tubular coupling member having connected to its upper end a pair of tubing strings which extend to the surface of the well, said coupling member having a pair of substantially parallel flow passages extending therethrough, each of said passages being in communication with one of the tubing strings, a first tubular conductor connected to said coupling and extending downwardly therefrom with its upper end in communication with one of the passages, the lower end of said first conductor communicating with one of the well formations, a second tubular conductor connected to the coupling and extending downwardly therefrom with its upper end in communication with the other of said passages, the lower end of said second tubular conductor being in communication with the other of said well formations, a lower packer unit surrounding one of the tubular conductors sealing off the annulus between the conductor and the well casing and located at an elevation between the upper and lower producing well formations, an upper packer surrounding both tubular conductors sealing off the annulus between said conductors and the well casing and located at an elevation above the upper producing well formation and means in the tubular coupling member establishing communication between the parallel flow passages to establish communication between the bores of the tubing strings.

4. A dual production apparatus as set forth in claim 3, together with a removable plug member lowerable into one of the flow passages of the coupling member by means of a flexible line, said plug member having means for closing the communication-establishing means when in position within said passage to shut off communication between the two tubing strings.

5. A dual production apparatus as set forth in claim 3, together with a removable plug member lowerable into one of the flow passages of the coupling member by means of a flexible line, said plug member having means for closing the communication-establishing means when in position within said passage to shut off communication between the two tubing strings, said plug member having a bore extending entirely therethrough so that flow through the passage in which the member is disposed is not interrupted when said member is located therein.

6. A dual production apparatus as set forth in claim 3, together with a removable plug member lowerable into one of the flow passages of the coupling member by means of a flexible line, said plug member having means for closing the communication-establishing means when in position within said passage to shut off communication between the two tubing strings, said plug member being solid in cross-section whereby when in position in said passage it not only shuts off communication between the tubing strings but also closes flow through the passage in which it is disposed.

7. A dual production apparatus as set forth in claim 3, together with a removable plug member lowerable into one of the flow passages of the coupling member by means of a flexible line and adapted to occupy a final position therein, said plug member having an angular passage therein which passage establishes communication between that passage of the coupling member which is not occupied by the plug member and the tubing string which is connected to the upper end of the passage in which the plug member is disposed.

8. A well production apparatus for producing from an upper producing formation and a lower producing formation and including, a pair of tubing strings extending downwardly within a well bore, one of said tubing strings having its lower portion communicating with the upper formation and the other tubing string having its lower portion communicating with the lower formation, a well packer within the well bore sealing off the well bore around said other tubing string which has its lower portion communicating with the lower formation at an elevation between the upper and lower formations, whereby the flow from each formation is directed into its communicating tubing string, conduit means connected to said tubing strings and having fluid passages communicating with the tubing strings and a lateral port communicating said fluid passages at an elevation within the well bore above said well packer, and a removable plug member lowerable into one of the tubing strings and having means insertable into the conduit means to close the lateral port therein and shut off communication between said tubing strings.

9. A well production apparatus as set forth in claim 8, wherein the plug member is formed with an axial bore extending therethrough so that flow through the tubing string in which said plug member is mounted is not interrupted when the plug is in position therein.

10. A well production apparatus as set forth in claim 8, wherein the plug member is solid in cross section and not only shuts off communication between the tubing strings but also closes flow through that string in which said member is mounted.

11. A well production apparatus for producing from an upper producing formation and a lower producing formation and including, a pair of tubing strings extending downwardly within a well bore, one of said tubing strings having its lower portion communicating with the upper formation and the other tubing string having its lower portion communicating with the lower formation, a well packer within the well bore sealing off at an elevation between the upper and lower formations, the well bore around said other tubing which has its lower portion communicating with the lower formation, whereby the flow from each formation is directed into its communicating tubing string, conduit means connected to said tubing strings and having fluid passages communicating with the tubing strings at an elevation within the well bore above said well packer, and a plug member lowerable into one of the tubing strings into a position adjacent the passage means, which establishes communication between the tubing strings, said member having a flow passage which establishes communication between that tubing string in which the plug member is not disposed and the portion of the tubing string in which the plug member is disposed above the plug member.

12. A dual production well apparatus adapted to be positioned in a well casing and comprising, a lower packer unit adapted to be set in sealing contact with the well casing and also adapted to be disposed between a lower well formation and an upper well formation, an upper packer unit adapted to be set in sealing contact with the well casing and also adapted to be disposed above the upper well formation, an outer flow tube extending through the packer units and in sealing engagement therewith whereby said packer units seal off the annular space between the well casing and the said outer flow tube, an inner tube disposed within the outer tube and extending through the upper packer unit, said inner tube being spaced from the outer tube to form an annular space therebetween, sealing means between the inner tube and the outer tube for preventing flow from the bore of said inner tube into said annular space, said outer tube having an opening near its lower end below said sealing means and the packer units whereby fluid from the lower formation may pass upwardly into the outer tube and into the inner tube, said outer tube also having an opening above said sealing means and between said packer units to establish fluid communication between

said upper formation and said annular space, and a coupling member coupled to said outer tube comprising a tubular body having two substantially parallel flow passages therethrough, a pair of tubing strings connected to said tubular body, one of said flow passages establishing fluid communication between one of said tubing strings and the annular space between the inner tube and the outer tube, and the other of said flow passages establishing fluid communication between the other of said tubing strings and the interior of said inner tube, and means establishing fluid communication between said flow passages in the coupling member whereby the well may be washed in to obtain production from the formations by a circulation of a washing fluid from one of said flow passages into the other of said flow passages.

13. A dual production well apparatus adapted to be positioned in a well casing and comprising, a lower packer unit adapted to be set in sealing contact with the well casing and also adapted to be disposed between a lower well formation and an upper well formation, an upper packer unit adapted to be set in sealing contact with the well casing and also adapted to be disposed above the upper well formation, an outer flow tube extending through the packer units and in sealing engagement therewith whereby said packer units seal off the annular space between the well casing and the said outer flow tube, an inner tube disposed within the outer tube and extending through the upper packer unit, said inner tube being spaced from the outer tube to form an annular space therebetween, sealing means between the inner tube and the outer tube for preventing flow from the bore of said inner tube into said annular space, said outer tube having an opening near its lower end below said sealing means whereby fluid from the lower formation may pass upwardly into the outer tube and into the inner tube, said outer tube also having an opening above said sealing means to establish fluid communication between said upper formation and said annular space, and a coupling member coupled to said outer tube comprising a tubular body having two substantially parallel flow passages therethrough, a pair of tubing strings connected to said tubular body, one of said flow passages establishing fluid communication between one of said tubing strings and the annular space between the inner tube and the outer tube, and the other of said flow passages establishing fluid communication between the other of said tubing strings and the interior of said inner tube, said lower packer unit having annular sealing elements and slips which are set in sealing and gripping contact, respectively, with the well casing by a differential in well pressure above and below the packer unit, means on the outer tube for assisting in maintaining said lower packer unit in its set position in sealing and gripping engagement with the casing, said outer tube having an upper portion and a lower portion thereof which are longitudinally movable with respect to each other, said upper packer unit including an annular sealing element mounted on said lower portion of the outer tube and means on said upper portion of the outer tube to effect a compression and lateral distortion of the upper packer unit into sealing engagement with the well casing upon a longitudinal movement of said upper portion relative to said lower portion of said outer tube.

14. A dual production well apparatus adapted to be positioned in a well casing and comprising, a lower packer unit adapted to be set in sealing contact with the well casing and also adapted to be disposed between a lower well formation and an upper well formation, an upper packer unit adapted to be set in sealing contact with the well casing and also adapted to be disposed above the upper well formation, an outer flow tube extending through the packer units and in sealing engagement therewith whereby said packer units seal off the annular space between the well casing and the said outer flow tube, an inner tube disposed within the outer tube and extending through the upper packer unit, said inner tube being spaced from the outer tube to form an annular space therebetween, sealing means between the inner tube and the outer tube for preventing flow from the bore of said inner tube into said annular space, said outer tube having an opening near its lower end below said sealing means and said packer units whereby fluid from the lower formation may pass upwardly into the outer tube and into the inner tube, said outer tube also having an opening above said sealing means and between said packer units to establish fluid communication between said upper formation and said annular space, and a coupling member coupled to said outer tube comprising a tubular body having two substantially parallel flow passages therethrough, a pair of tubing strings connected to said tubular body, one of said flow passages establishing fluid communication between one of said tubing strings and the annular space between the inner tube and the outer tube, and the other of said flow passages establishing fluid communication between the other of said tubing strings and the interior of said inner tube, said outer tube comprising telescoping upper and lower tube portions, said upper packer unit including an annular sealing element having connection at its lower end with the upper end of said lower tube portion of the outer tube, the upper end of the sealing element being free to move downwardly relative to the upper end of the lower portion of the outer tube for expansion of the sealing element into sealing engagement with the well casing, said upper tube portion extending within said sealing element and said lower tube portion and means on said upper tube portion for setting the sealing element upon a downward movement of said upper tube portion relative to said lower tube portion.

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