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LINE INSERTING DEVICE

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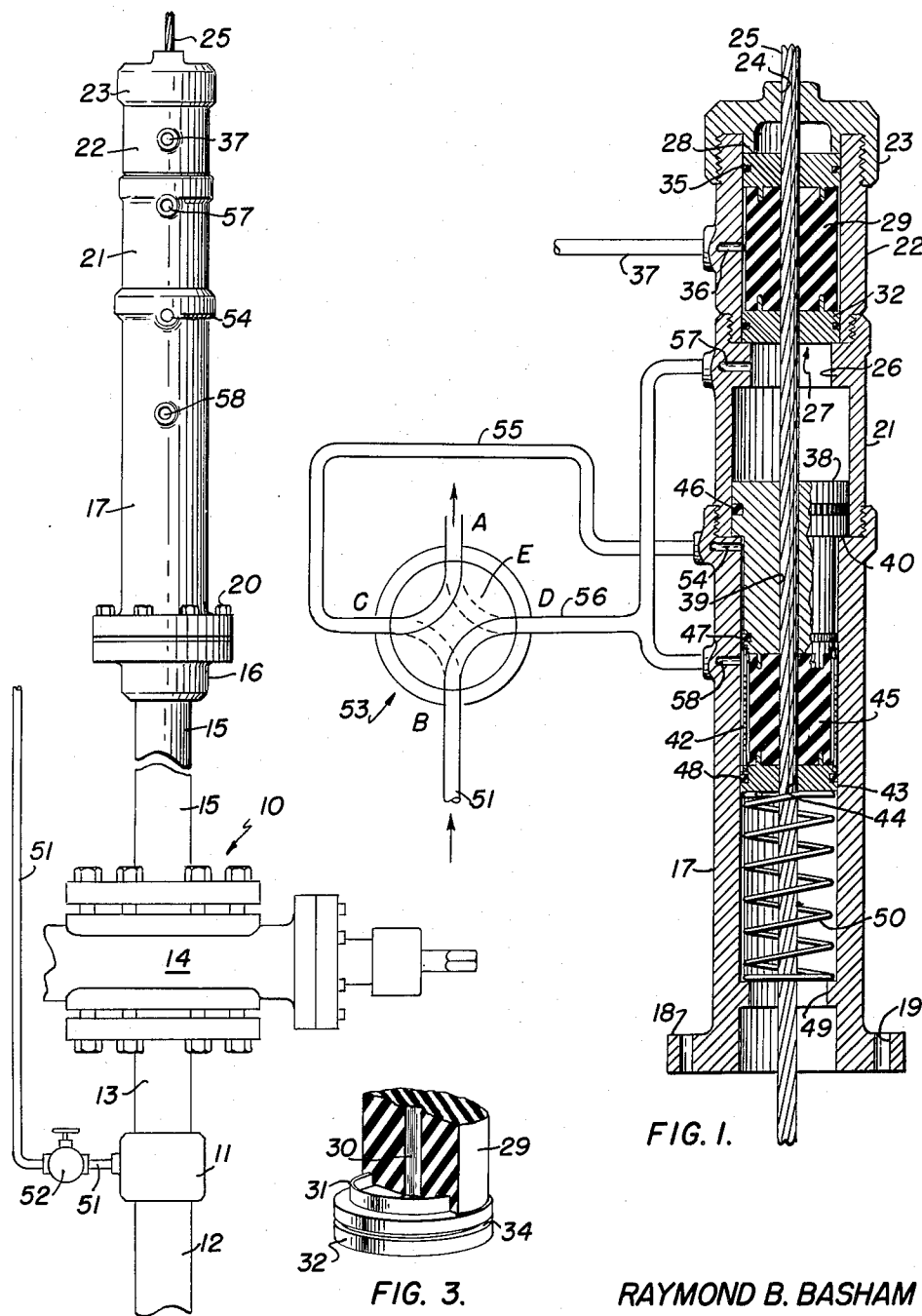


FIG. 2.

FIG. 1.

FIG. 3.

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LINE INSERTING DEVICE

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5 Claims. (Cl. 166—77)

This invention relates to well servicing equipment and has reference to apparatus for inserting a wire line or cable in a closed well casing or tubing having high gas pressures therein. Wire lines are lowered into wells for various purposes, such as logging temperatures, testing bottom hole pressures, etc., and an instrument or tool is suspended on the lower end of the line for carrying out such operations.

The pressures referred to act on the initially inserted length of line as if it were a piston, thus tending to blow it out of the well head. This effect continues until the weight of the instrument or tool and the weight of the length of line inserted overcome the well pressure. The weight of the instrument or tool lowered into the well is limited by its diameter or transverse dimension which must often pass into small diameter pipe. The length of the instrument or tool is also limited by the size of the equipment used at the well head for lowering the line.

Heretofore, wire lines have been manually inserted into the well head by means of hand tools, which operation was dangerous and time consuming, or the lines were inserted by means of complicated and expensive equipment which worked against the well pressure.

An object of the invention is to provide a relatively simple and inexpensive device for inserting a wire line or the like in a closed well having gas pressure therein.

Another object is to provide a device for inserting a wire line or the like in a well head having pressure therein, and which device subjects only the cross sectional area of the line being inserted to the well pressure.

A further object is to provide a device for the described purpose receiving its source of power from the pressure it overcomes.

These and other objects of the invention will become apparent from the following description and accompanying drawing of an exemplary form of the invention, wherein:

Figure 1 is a vertical sectional view of a line inserting device in accordance with the invention, and also showing a schematic arrangement for supplying operating gas pressures.

Figure 2 is a schematic elevation of a well head showing the device illustrated in Figure 1 positioned thereon, and

Figure 3 is a broken perspective view of the compressible packing assembly.

The well head 10, shown in Figure 2, is typical and includes a fitting 11 on the upper end of a well casing 12 which projects above the earth's surface. Above the fitting 11, and in axial alignment with the casing 12, there is a tubular pipe member 13 on which a blowout preventer 14 is mounted. A length of pipe 15 is mounted on the blowout preventer 14, and which pipe has a flanged fitting 16 on its upper end on which the device comprising the present invention is mounted.

The illustrated form of the invention includes a cylindrical body 17 having a flanged lower end 18 and holes 19 therethrough for receiving bolts 20 by means of which

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the body 17 is secured to the flanged pipe fitting 16. An intermediate tubular member 21 is threadedly secured in the upper end of the body 17, and an upper tubular member 22 is threadedly secured in the upper end of the intermediate member. A cap 23 is secured on the upper end of the upper tubular member 22, and which cap is closed except for a central opening 24 for receiving the cable 25 to be inserted in the well casing 12. The upper end of the intermediate member 21 is provided with an internal shoulder 26 for supporting an upper seal assembly 27. The inner surface of the cap 23 is provided with an integral and circular projection 28 which also holds the sealing assembly in place. The packing assembly 27 is comprised of a cylindrical resilient body 29 having an axial opening 30 therethrough for receiving the wire line 25. The ends of the resilient body 29 are provided with circular grooves which snugly receive circular projections 31 on the inner surfaces of cylindrical holding plates 32 on each end of said body. The holding plates 32 are slidably received within the upper tubular member 22 and are provided with grooves 34 around their cylindrical surfaces for retaining sealing rings 35. The diameter of the resilient body 29 is less than the inside diameter of the upper tubular member 22, thus providing an annular space therein. The tubular member 22 includes a port 36 in the side thereof intermediate the ends of the body 29 for connection with an air or hydraulic supply line 37. Any suitable externally controlled fluid force may be used for the last referred to purpose, such as a hand pump, not shown.

The intermediate tubular member 21 provides a cylinder for slidably receiving a piston 38 having an axial opening 39 therethrough for slidably receiving the wire line 25. The inside diameter of the intermediate tubular member 21 is greater than the inside diameter of the tubular body 17, thus, providing a shoulder 40 between said members for limiting the downward movement of the piston 38. A portion of the piston 38 extends into and is spaced from the tubular body 17 when the piston is in its lower position, and which extending portion is provided with a perforated sleeve 42 threadedly secured on said piston and a cylindrical holding plate 43 secured on the lower end of said sleeve. The plate 43 slides in the body 17 and has a central opening 44 therethrough for slidably receiving the wire line 25. A resilient cylindrical body 45 is received within a perforated tube 42, and the ends of the body are provided with recesses, not numbered, for tightly receiving circular projections on the lower end of the piston 38 and the upper end of the cylindrical holding plate as described in connection with the upper packing assembly 27. Ring type seals 46, 47 and 48 are provided around the upper and lower ends of the piston 38, and around the circumference of the holding plate 43.

An internal shoulder 49 is provided in the lower portion of the tubular body 17 for supporting a coiled compression spring 50 which bears against the holding plate 43 on the lower end of the perforated tubular member 42.

A small tubular line 51, having a manually operated valve 52 connected therein, is connected with the well head fitting 11, and which line extends to a four way valve 53, schematically shown in Figure 1. The port A, opposite the intake port B, connected with the supply line 51 opens to atmosphere, and one of the remaining ports C is connected with a port 54 in the upper end of the tubular body 17 and adjacent the piston stop shoulder 40. The last referred to connection is by means of a line 55. The remaining port D of the four way valve 53 is connected with a line 56 which is branched and extends to a port 57 in the upper end of the intermediate tubular member 21 and with a port 58 in the tubular body at a

point below the piston 38 when the latter is in its lowermost position.

In operation, the line 25, which extends from a service truck, is threaded through the described line stuffing device, and the tool or instrument to be lowered in the well is attached to the lower end of said line by removing said device from the pipe fitting 16. The instrument or tool is then lowered into the pipe 15 mounted on the blowout preventer 14. During the preceding operation the casing 12 is closed, as by means of a gate valve, not shown, and which valve may be located anywhere in the casing above the earth's surface. After the stuffing line device is reassembled on the pipe 15 the gate valve is opened, and the resilient cylindrical body 29 of the upper packing assembly 27 is compressed against the line 25 by introducing a fluid under pressure through the upper supply line 37. The amount of pressure supplied is not excessive and causes the resilient body 29 to frictionally engage the line 25, but does not materially retard the operation to be performed. The pressure applied remains constant, or nearly so, throughout the line stuffing operation.

As shown in Figure 1, the piston 38 has reached its lowermost position by the introduction of well pressure through the supply line 51, through ports B and D of the four way valve 53, and to the upper or large end of the piston by way of the connecting line 56 and port 57 in the upper portion of the intermediate tubular member 21. The branched line 56 also supplies pressure to the port 58 in the body 17, and thus compresses the resilient cylindrical body 45 around the wire line 25 as the piston 38 moves downwardly. The pressure supplied is sufficient to grip and move the line 25 downwardly with the piston 38. During the preceding operation, the annular space, not numbered, beneath the large end of the piston 38 is vented to atmosphere by way of the port 54 in the upper end of the tubular body 17 and the connecting line 55 which registers with port C of the four way valve 53 and the exhaust port A thereof. When the element E of the four way valve 53 is turned, the ports A, B, C and D register as shown by means of dotted lines in Figure 1. In this position the well pressure is delivered to the annulus around the small end of the piston 38; thus, the sum of the transverse area of the small end of the piston plus the circular area defined by shoulder between said small and large ends of the piston equals the transverse area of the large end of the piston. Since the same well pressure is applied to both ends of the piston 38, the pressures on each end thereof are, in effect, equalized. At this time the compression spring 50 raises the piston 38 to its uppermost position. The length of the perforated tube 42 is substantially equal to the stroke of the piston 38; thus, during the downward movement of said piston the compressible cylindrical body 45 grips the line 25 throughout the piston stroke. The frictional engagement of the upper cylindrical resilient member 29 maintains the line 25 in the lowered position during the upstroke of the piston 38 and throughout the operation provides an adequate seal beneath the cap 23. During the downstroke of the piston 38, air is evacuated from the referred to annulus beneath the shoulder formed by the two diameters of the piston 38, whereas, during the upstroke, the arrangement of the valve element E, ports A and C permit air to be drawn into said annulus. The valve element E may be mechanically rotated to provide automatic operation, if so desired.

The invention is not limited to the exemplary construction herein shown and described, but may be made in many ways within the scope of the appended claims.

What is claimed is:

1. At line stuffing device for mounting on the head of a well having gas pressure therein, said device comprising a tubular vertical cylinder having a cap on the upper end thereof, said cap including a central opening therein for receiving the line to be stuffed by said device, said line extending through and beyond both ends of said cylinder, the end of said cylinder opposite said cap being in open communication with the pressure of said well, said cylinder including an enlarged inside diameter intermediate the ends thereof, a shouldered piston in said cylinder, the larger diameter of which is slidably mounted in the referred to enlarged diameter of said cylinder and the smaller diameter of which is downwardly directed and spaced from the lower inside diameter of said cylinder, a cylindrical compressible body secured to the lower end of said piston, a cylindrical holding plate on the end of said compressible body opposite said piston, said cylindrical holding plate being in sliding contact with the inside diameter of said cylinder, said piston, compressible body and holding plate having axial openings therethrough receiving said line, a spring in said cylinder arranged to move said piston toward said capped end thereof, an upper port in said cylinder located at the upper end of said enlarged inside diameter and in communication therewith, an intermediate port in said cylinder beneath said enlarged inside diameter and in communication with the space between the inside diameter of said cylinder and the smaller diameter of said piston, a lower port in said cylinder below the lower end of said piston when the latter is in its down position and above the lower end of said compressible body when the latter is in its up position, and means alternately supplying fluid pressure first to the upper and lower of said ports and subsequently to said intermediate port.

2. A stuffing line device as defined in claim 1, wherein said means supplying fluid pressure to the upper and lower said ports comprise tubular lines connected with said well.

3. A stuffing line device as defined in claim 1, and wherein said means alternately supplying fluid pressure includes a four way valve.

4. In a stuffing line device as defined in claim 1, the construction wherein a seal is provided between said resilient body and the lower end of said piston, said seal comprising a circular projection on the end of said piston, and a circular groove in the end of said body receiving said projection.

5. In a line stuffing device as defined in claim 1, a packing assembly in said cylinder in the end thereof adjacent said cap, said assembly comprising a cylindrical resilient body having an axial opening therethrough receiving said line, and seals at the ends of said resilient body making contact with the inner surface of said cylinder, said cylinder including a port intermediate said seals for admitting fluid pressure.

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