

Jan. 5, 1943.

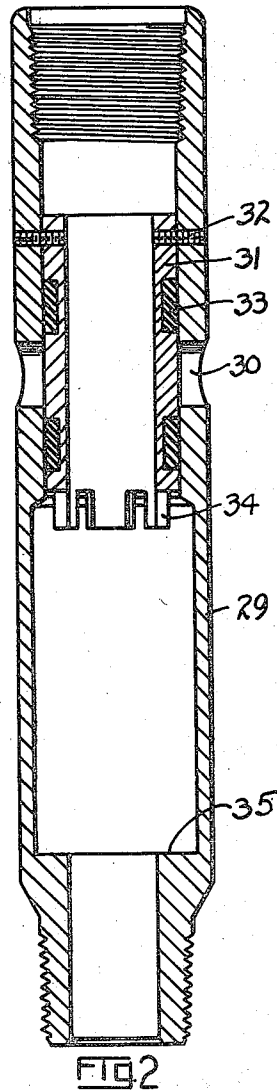
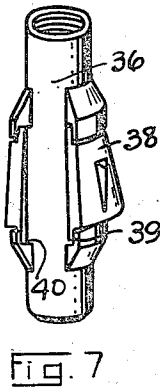
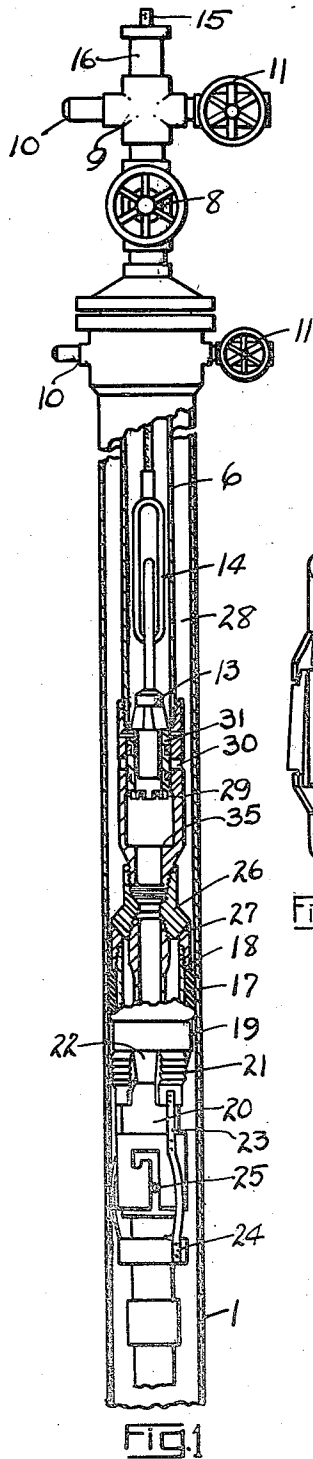
A. S. BAYLOR

2,307,662

MEANS FOR CONTROLLING WELLS

Filed July 22, 1939

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

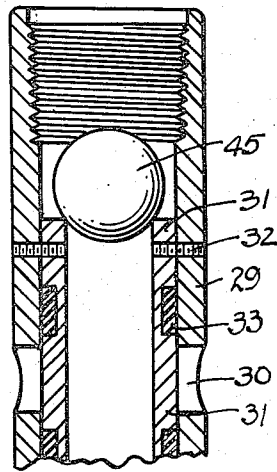
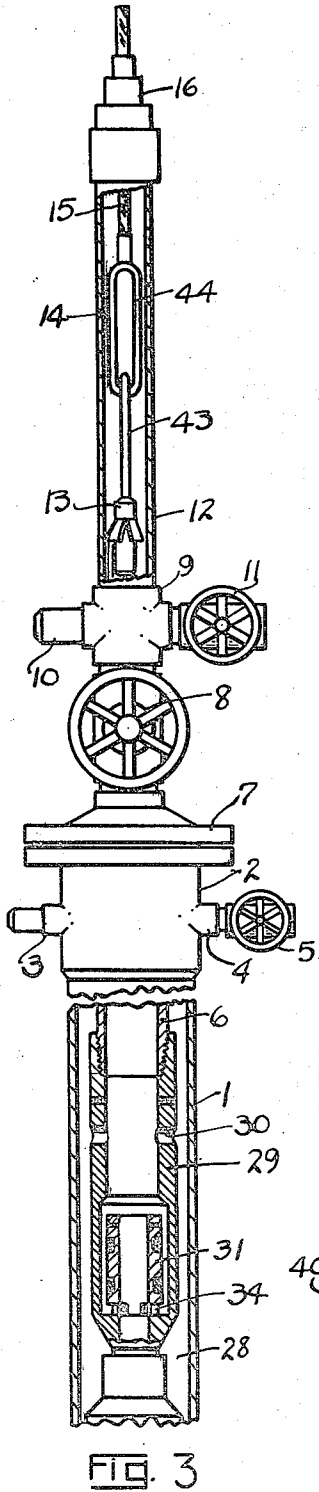


FIG. 4

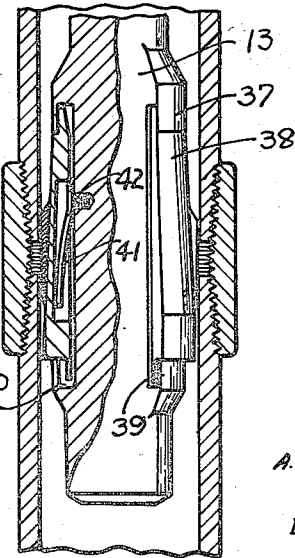


FIG. 6

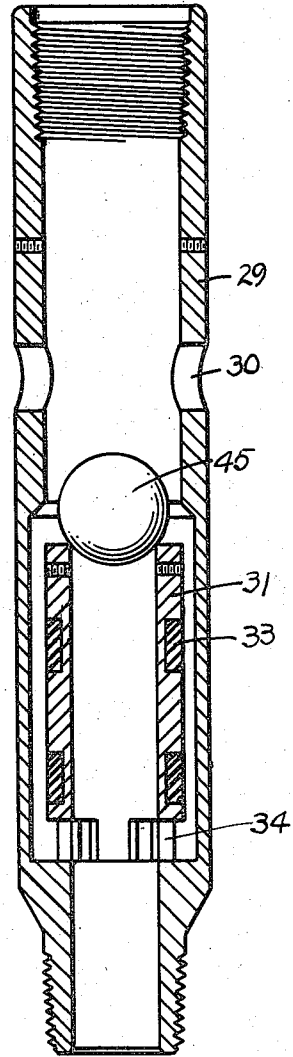


FIG. 5

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UNITED STATES PATENT OFFICE

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MEANS FOR CONTROLLING WELLS

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3 Claims. (Cl. 166—1)

My invention relates to means for introducing pressure fluid into the well to shut off the escape of fluid under pressure from the producing formation.

It sometimes becomes necessary after a well has been equipped for flowing to later kill the well so that the tubing or other equipment may be removed without danger of blowout.

After the tubing or flow string has once been suspended in the casing head and sealed off so that fluid can not escape between the upper end of the casing and the tubing it is practically impossible without special costly equipment to move the tubing from its position. When therefore it becomes necessary to introduce mud into the casing it can not be forced past the packer which is normally upon the tubing into the lower end of the well.

It is an object of the invention to provide a simple and economical equipment for use upon a flow string or tubing which makes it possible to introduce fluid into the tubing from within the casing string at any desirable time when it becomes necessary to force the mud into the lower end of the well and cut off the escape of the gas under pressure from the bottom of the well.

I desire to be able to introduce mud into the lower end of the well without the necessity of moving the tubing and by the use of means which may be easily and quickly handled.

My invention lies particularly in the simple and economical equipment which I provide for handling the introduction of the mud into the well which will be more clearly understood when taken in connection with the drawings herewith.

In the drawings

Fig. 1 is a side view of the well casing with the tubing equipment therein and in which the portions of the casing and tubing are in central longitudinal section.

Fig. 2 is a longitudinal sectional detail showing the structure of my sleeve valve.

Fig. 3 is a side view of the apparatus partly in section and illustrating the use of the lubricator on the upper end of the flow string.

Figs. 4 and 5 show a broken longitudinal section through a portion of the tubing string illustrating one means of opening the valve and tubing.

Fig. 6 is a longitudinal section through the tubing and illustrating the structure of my valve opening means.

Fig. 7 is a perspective view showing the valve-opening device removed from the tubing.

My invention is applied particularly to a well having a well casing 1 therein and which may, if desired, be perforated at the lower end. Said casing has at its upper end a casing head 2 of ordinary construction having lateral ports

therein, one port indicated at 3 as being closed by a bull plug, the opposite port 4 being equipped with a valve 5. It is understood that fluid may be introduced into or allowed to flow from the casing to either one of these lateral ports.

The upper end of the casing head furnishes a support for an inner tubing or flow line 6. The upper end of the casing head is closed and sealed about by means of a plate or cap 7, which is understood as being bolted to a flange upon the casing head in the usual manner. The flow line is connected into the cap 7 by threaded connection or otherwise and above the cap is a master valve 8 which may be closed to obstruct the upper end of the flow line.

Above the valve is cross 9, which may have lateral branch lines joined thereto. I have shown a bull plug 10 closing the opening at one side and a valve controlled fitting 11 on the opposite side. The upper end of the cross fitting 9 is threaded to engage with other equipment secured thereto. In Fig. 3 I have shown a lubricator barrel 12 connected therein, said lubricator barrel being adapted to receive a tool 13 connected by a jar 14 to a wire line 15. A series of stuffing boxes 16 may be employed to close between the upper end of the lubricator barrel and the wire line 15.

With reference particularly to Fig. 1, the flow line 6 is shown as having adjacent its lower end a packer including an expansible sleeve 17 mounted upon a tubular body 18 and supported at its lower end upon a collar 19 at the upper end of an anchor member 20. It will be understood that the anchor 20 is of ordinary construction. It is equipped with a plurality of slips 21 resting upon an upwardly flaring seat 22 and supported upon arms 23 connected with the lower collar 24. These slips are held from upward movement on the tapered surface 22 by means of a pin and jaw slot connection shown at 25. When this packer is set it serves to seal the space between the flow line and the casing at a point spaced somewhat above the lower intake end of the flow line.

When the head 26 on the flow line is seated at the upper end 27 of the packer member the passage from the casing to the tubing above the packer is entirely closed off and can not be opened without the movement of the tubing which is to be avoided after it is once set particularly where the well is under pressure.

In order to be able to open up a passage from the space 28 between the tubing and the casing I provide a nipple or barrel 29 secured in the flow line and forming a part thereof. This nipple has a plurality of openings 30 therein so that a flow of fluid through the wall of the tubing may be possible. These openings, however, are normally closed by means of a sleeve 31 which acts

as a valve to close the openings 30. This construction is best shown in Fig. 2. The sleeve 31 which forms the valve is held in position to close the opening 30 by means of one or more frangible pins 32. There may be rings of packing material 33 on the valve sleeve 31 to provide a seal against the passage of fluid from the tubing to the casing space. At the lower end of the sleeve 31 are a plurality of downwardly projecting legs 34 which, when the valve is moved downwardly from its closed position will engage upon a shoulder 35 at the lower end of the nipple. It will be noted that the interior passage through the nipple is recessed outwardly above the shoulder 35 so that when the sleeve is dropped downwardly from closed position as indicated in Fig. 5 there will be a passage of fluid around the valve sleeve and between the supporting legs 34 so that fluid may bypass the valve.

In order to open this valve and allow passage of fluid from the casing to the tubing it is necessary to exert pressure upon the upper end of the valve sleeve 31. This may be done by means of a weighted head 36 which is shown best in Figs. 6 and 7. The head is provided with a plurality of radially extending shoulders 37 beneath the lower end of which are engaged dogs 38. The lower ends of said dogs are formed with projections 39, said projections engaging within recesses 40 in the lower end of the head, said recesses being wide enough to allow the dogs to move outwardly a predetermined distance. Said dogs are held normally in outwardly projecting position by means of the springs 41 secured at their upper ends at 42 to the head, the lower ends being extended outwardly to bear against the inner faces of the dogs.

As seen in Figs. 1 and 3, the head 36 is preferably connected to the lower member 43 of a jar of common construction. Said jar includes two links coupled together and adapted to move relative to each other, the upper link 44 being connected to the cable 15. It will be seen that when the upper link 44 is dropped against the lower link 43 a blow may be struck which will urge the head 36 downwardly.

When it is desired to use this type of valve releasing means the lubricator barrel 12 will be secured above the cross 9 and with the stuffing box 16 removed the jar and the head may be introduced into and house within the lubricator barrel. The stuffing boxes 16 will then be fitted around the wire line 15 to provide a sliding and sealing fit around the wire line. The valve 8 may then be opened and the head 36 dropped downwardly until it engages the upper end of the valve sleeve 31, as seen in Fig. 1. If the engagement does not shear the pins 32 the jar may be employed to strike a series of blows upon the head 36 and thus shear the pins and move the valve sleeve 31 down to open position.

The weighted head 36 may be then withdrawn if desired and the valve 8 closed. With the openings 30 from the casing to the tubing thus being exposed heavy fluid may be pumped inwardly through the opening 4 in the casing and circulated downwardly through the casing and the passages 30 and into the tubing. It may be desirable to allow the pressure fluid in the well to become stabilized and to fill the casing space and tubing uniformly before pressure is exerted upon the fluid in the well through pumps connected with the inlet 4 to the casing. In this manner the mud may be caused to circulate downwardly through the tubing to the lower end

of the well and pressure exerted thereon sufficiently to kill the well. When this has been done the equipment at the upper end of the well may be removed without danger.

While I have shown the use of a weighted head 36 to open the valve 31 I have shown in Figs. 4 and 5 another device by means of which this sleeve may be moved to open position. This involves the dropping from the lubricator 12 past the valve 8 of a ball 45 which will strike upon the upper end of the valve sleeve and tend to shear the pin 32. However, if the pin is not thus sheared pump pressure may be exerted later on to shear the pins and open the valve.

By the use of the tubing valve which has been described it will be possible to handle the tubing in the usual manner in setting and flowing the well, but if occasion arises where it is necessary to pump fluid from the casing through the tubing into the lower end of the well this may be later accomplished in the manner described. It will be seen therefore that without danger to the well fluid may be pumped into the casing so that a blowout will be prevented or the well will be prevented from flowing while removal of the safety equipment at the upper end of the well may be accomplished. The advantages of this construction will be obvious to those skilled in the art.

What I claim is:

1. In a well equipment including a well tubing, means to support said tubing and seal the upper end of the well and a packer on said tubing sealing with the wall of said well, the combination of a nipple secured in said tubing above said packer, said nipple having openings therein, a sleeve in said nipple normally closing said openings, means to retain said sleeve in position closing said openings, said means being releasable by pressure thereon to allow said sleeve to move downwardly and expose said openings, said tube being of increased inner diameter to form a chamber below said openings and means to support said sleeve in said chamber to allow a bypass of fluid past said sleeve.

2. In a well equipment including a well tubing, means to support said tubing and seal the upper end of the well and a packer on said tubing sealing with the wall of said well, the combination of a nipple secured in said tubing above said packer, an opening in the wall of said nipple, a valve closing said opening, means movable downwardly in said tubing from the upper end thereof to engage and open said valve and allow passage of fluid into said tubing through said openings, means to support said valve below said opening and a bypass around said valve in its open position.

3. In combination with a well casing, a tubing suspended in said casing, means to seal the upper end of said casing with said tubing, a nipple in said tubing spaced above the lower end thereof, a packer below said nipple on said tubing, a sleeve in said nipple, means to retain said sleeve in position closing lateral openings in said nipple, releasing means adapted to be introduced into the upper end of said tubing and moved downwardly to engage and strike a blow upon said sleeve to move said sleeve downwardly to open position, means to conduct fluid under pressure into said casing to said lateral openings, and means to withdraw said releasing means from said tubing.

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