

Oct. 4, 1932.

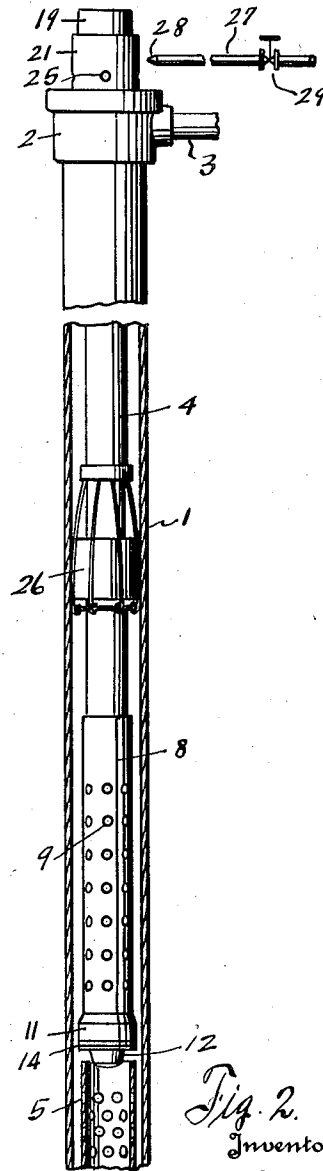
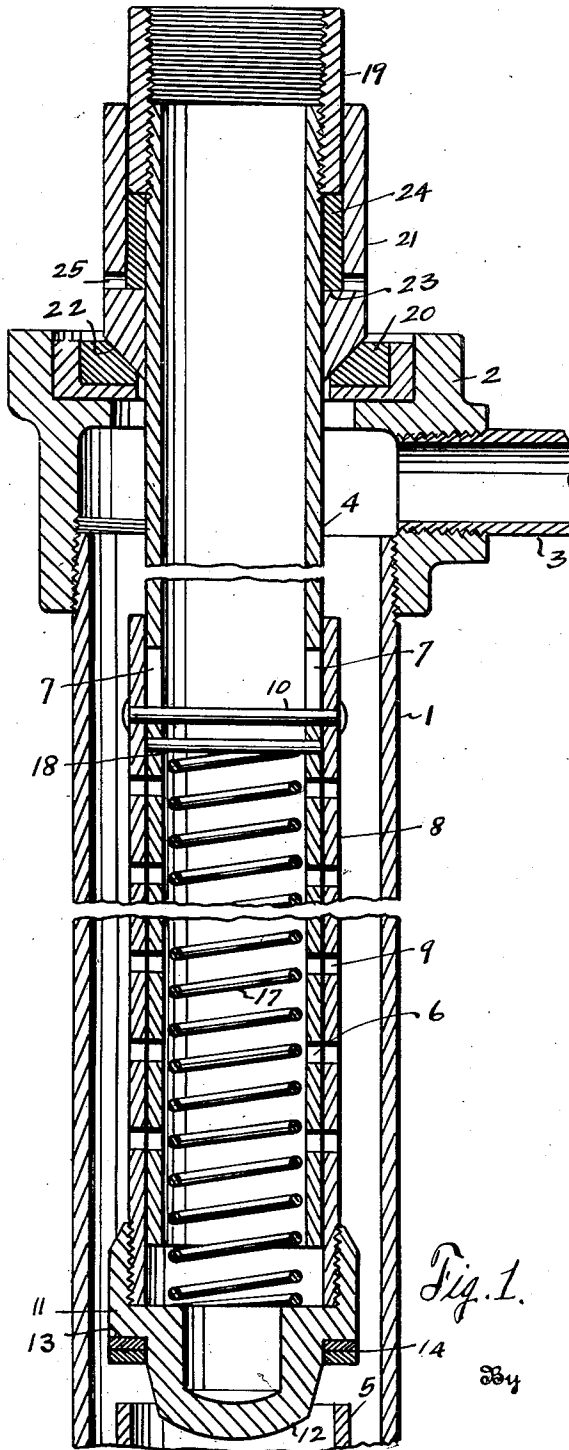
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FLOW CONTROLLING APPARATUS

Filed Nov. 20, 1931

2 Sheets-Sheet 1



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Hardware Patent

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2 Sheets-Sheet 2

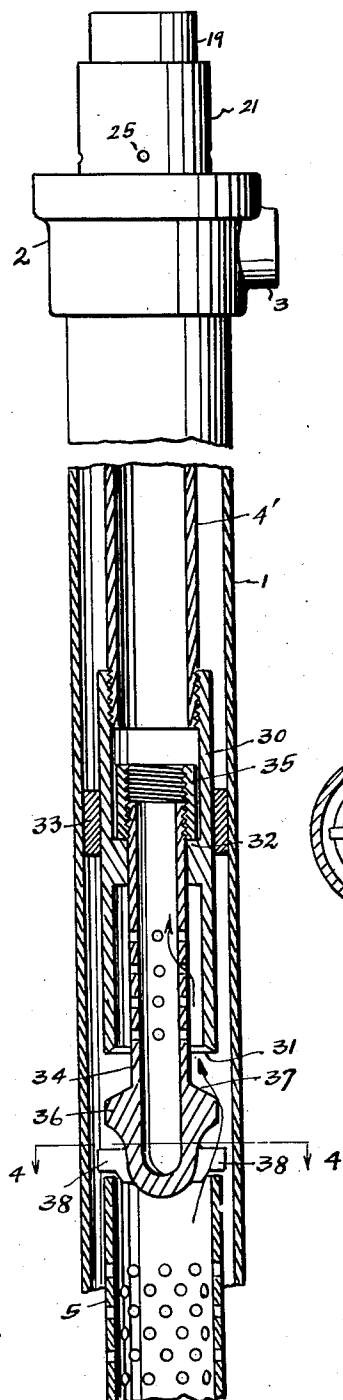


Fig. 3.

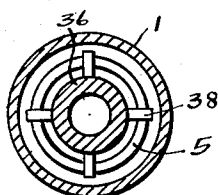


Fig. 4.

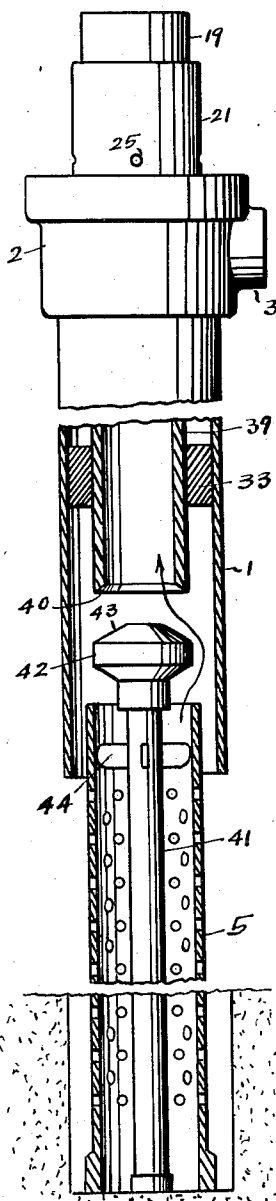


Fig. 5.

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UNITED STATES PATENT OFFICE

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FLOW CONTROLLING APPARATUS

Application filed November 20, 1931. Serial No. 576,339.

This invention relates to a flow controlling apparatus.

An object of the invention is to provide apparatus of the character described particularly designed for use in oil and gas wells for permitting the flow of fluid therefrom and whereby said flow may be automatically stopped.

Another object of the invention is to provide apparatus of the character described which will permit the flow of oil or gas from a producing well and which is of such construction that the flow of fluid will be stopped in case the oil or gas flowing from the well becomes ignited.

Another object of the invention is to provide, in apparatus of the character described, a flow line in the well through which the fluid may flow from the well and which is suspended by means of a fusible or displaceable support which, when removed, will permit the flow line to be lowered into the well, said apparatus being provided with means for closing the lower end of the flow line when so lowered to prevent the flow of fluid from the well, upwardly therethrough.

With the above and other objects in view the invention has particular relation to certain novel features of construction, operation and arrangement of parts, an example of which is given in this specification and illustrated in the accompanying drawings, wherein:

Figure 1 shows a vertical sectional view of the apparatus.

Figure 2 shows a side view thereof shown located in the well.

Figure 3 shows a side view partly in section of a modified form thereof.

Figure 4 shows a cross sectional view taken on the line 4-4 of Figure 3, and

Figure 5 shows a side view partly in section of still another modification thereof.

In the drawings the numeral 1 designates a casing in a well having a casing head 2 of any conventional construction attached to the upper end thereof, said casing head having the usual lateral outlet line 3. The numeral 4 designates a flow line or tubing which extends down in the casing and whose lower end

is adjacent the upper end of the screen or liner 5 in the well. This screen may be of any conventional construction, and as shown, consists of a perforated length of pipe.

The lower end of the flow tube 4 may be provided with perforations as 6 and above said perforations may have the oppositely disposed vertical slots 7, 7.

Around, and slidable on, the perforated lower end of the flow tube 4 there is a sleeve-like valve 8 which may consist of a length of pipe of the required dimensions and which has the perforations 9 adapted to be moved into and out of registration with the perforations 6. A cross pin 10 has its ends anchored to the valve 8 and works through the slots 7.

On the lower end of the valve 8, and closing said lower end, there is the head 11 having its lower end reduced as at 12, so that it will fit within the upper end of said screen and forming the external annular shoulder 13 which is faced with the seal rings as 14 formed of lead or other soft metal.

Within the lower end of the flow tube 4 and seated on the head 11 there is a coil spring 17 whose upper end abuts the cross pin 18 whose ends are anchored to said tube 4.

The flow tube 4 extends up through the casing head 2 and has a coupling 19 on the upper end thereof.

On the wear ring 20 of the casing head there is a sleeve like housing 21 whose lower end may be tapered to fit into a downwardly tapering seat 22 in said ring. Said housing 21 may be supported on the casing head, however, in any selected manner.

The upper end of the housing 21 fits closely around the coupling 19 and its lower end is inwardly thickened to fit closely around the flow tube 4 thus providing an annular internal shoulder 23 within said housing.

The space between the lower end of the coupling 19 and the shoulder 23 is filled with a supporting bushing 24, preferably of lead or other readily fusible metal, that is a metal having a lower melting point than that of the casing head 2, or flow line 4, or housing 21 and which forms a support for the flow tube 4 and supports said tube with the head

11 at the lower end thereof spaced above the upper end of the liner or screen 5.

The housing 21 has one or more ports 25 adjacent the shoulder 23 and leading outwardly from the space in which the support 24 is located.

When the well is producing the fluid will flow from the producing strata into the screen 5 and thence up through said screen and around the head 11 and thence in through the registering ports 9, 6 and on up through the tube 4. While the apparatus is in this position the cross rod 10 will hang on the lower ends of the slots 7 with said perforations 9, 6 in registration.

In case of fire at the mouth of the well, that is, in case the oil or gas should become ignited, the housing 21 will ordinarily become heated to a sufficient temperature to melt out the support 24 which when melted will flow out through the ports 25 and the tubing 4 will be correspondingly lowered by gravity. Thereupon the seal rings 14 will land on the upper end of the screen or liner 5 and substantially shut off the flow of fluid up through said screen and the tubing will be further lowered, relative to the valve 8 to carry the perforations 6 out of registration with the perforations 9. The spring 17 will at this time act as a shock absorber to minimize the shock as the lower end of the tube 4 lands on the head 11. Any oil or gas within the casing will thus be prevented from entering the tube 4 and flowing up to feed the flame. The oil or gas passing up through the casing around the tube 4 may be drawn off through the flow line 3 or a suitable packing as 26 may be installed on the flow tube 4 to close the space between said tube and casing. The fire will thus be automatically extinguished by cutting off the fuel which feeds the same.

Additional means may be provided if desired to heat the housing 21 so as to hasten the melting out of the support 24. For this purpose a gas line 27 may be installed having a nozzle 28 adjacent the housing 21 and having a control valve 29 located at a safe distance from the well. In case of fire as above stated the valve 29 may be opened to supply gas to the nozzle 28 under pressure, and this gas will be directed against the housing 21 and when ignited will heat and melt out the fusible support 24.

Other means are shown for closing the lower end of the flow tube in Figures 3 and 5.

As shown in Figures 3 the lower end of the flow tube 4' has an elongated tubular shoe 30 secured thereon whose lower end is preferably formed with the flared seat 31. Intermediate its ends the shoe 30 has an internal annular shoulder 32 and a surrounding packing 33 closing the space between it and the casing 1. There is a perforated nipple 34 fitted up through the shoe 30 and whose up-

per end has the coupling 35 thereon which rests on the shoulder 32 and supports said nipple. The lower end of the nipple 34 is formed with the head 36 having the upwardly facing tapering seat 37 and whose lower end has the radial lugs 38 which rest on the upper end of the liner or screen 5. In this form of the device, the oil or gas may flow up through the screen 5 and pass between the lugs 38 and thence up and into the nipple 34 and thence on to the ground surface through the flow tube 4'.

The flow tube 4' is supported in the casing head, in a similar manner as that shown in Figure 1 and in case of fire, when the support 24 is melted out the tube 4' will descend until the seat 31 rests on the seat 37 and the flow of fluid will be cut off.

In the form shown in Figure 5, the flow tube 39 is supported in the same manner as shown in Figure 1 and its lower end is preferably formed with the flared seat 40. In this form there is an anchor pipe 41 resting on the bottom of the hole and whose upper end carries a head 42 whose upper end 43 is upwardly tapered. The anchor pipe 41 may be held centered in the screen or liner by means of the radial arms 44. In this form the packing 33 surrounds the lower end of the flow tube 39 and closes the space between it and the casing 1.

In case of fire as above stated, when the support 24 is melted out the flow tube 39 will descend until its seat 40 rests closely against the seat 43 and the flow of fluid upwardly therethrough will be completely cut off and the fire thus extinguished.

The drawings and description disclose what is now considered to be preferred forms of the invention by way of illustration only while the broad principle of the invention will be defined by the appended claims.

What I claim is:

1. The combination with a flow tube in a well, of means for suspending the tube including a fusible support, said tube being movable downwardly, when said support is removed, and means for closing said tube upon such downward movement to prevent the inflow of fluid into said tube.

2. The combination with a flow tube in a well, of means, displaceable by heat, for supporting said tube in the well, said tube being movable downwardly by gravity upon displacement of said supporting means, and means for closing the tube against the inflow of fluid from the well, upon such downward movement of the tube.

3. The combination with a flow tube in a well, of a support for suspending said tube, said support being disintegrative under the influence of heat to permit the tube to move downwardly, said tube being open to permit the inflow of fluid, from the well, and means for closing said tube, against such inflow.

upon such downward movement of the tube.

4. The combination with a flow tube in a well having an inlet to permit the inflow of fluid from the well into said tube, a support from which the tube is suspended, said support being of a nature to be affected by heat to release the tube to permit said tube to descend, and means for closing said inlet upon such descent of said tube.

5. The combination with a flow tube in a well, said tube having an inlet for the inflow of fluid from the well, a fusible metal support adjacent the mouth of the well from which the tube is suspended in the well, and means for closing said inlet upon the removal of said support and the descent of the tube in the well.

6. The combination with a casing in a well, of a flow tube in said casing having an inlet to permit the inflow of fluid from the well, a means on the casing including a fusible metal support for suspending said tube, said tube being movable downward, by gravity, upon the melting of said support and means for closing said inlet upon such downward movement of said tube.

7. The combination with a casing in a well, of a flow tube in said casing having an inlet to permit the inflow of fluid from the well into the tube, means on the casing for suspending the tube in the well, said suspending means including a housing having a drain opening and a support within said housing supporting said tube and formed of fusible metal, said drain port being arranged to permit said support to drain out when melted whereby the tube will be permitted to move downwardly by gravity and means in the well for closing said inlet upon such downward movement of said tube.

In testimony whereof I have signed my name to this specification.

HARRY J. BYERS.

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