May 15, 1934. I. A. MORRIS 1,958,545

FLOW CONTROLLING MECHANISM

Filed Dec. 4, 1931

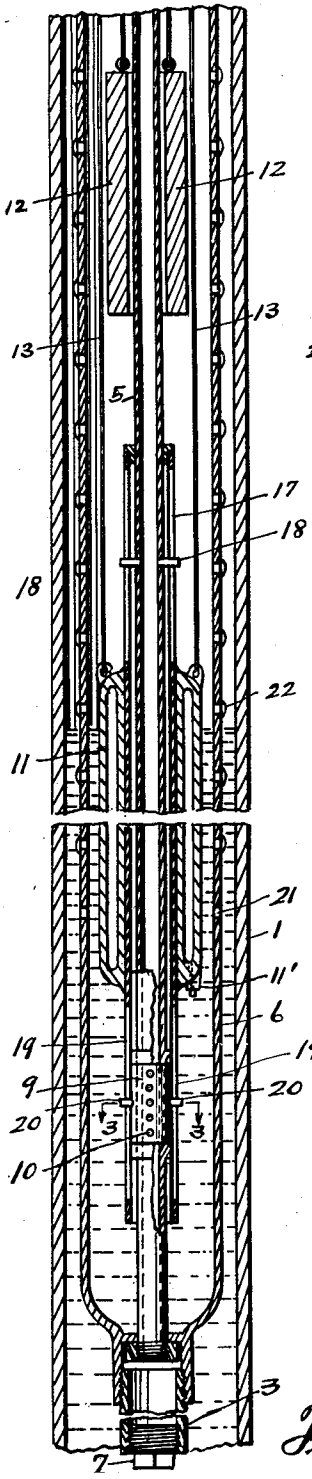


Fig. 2.

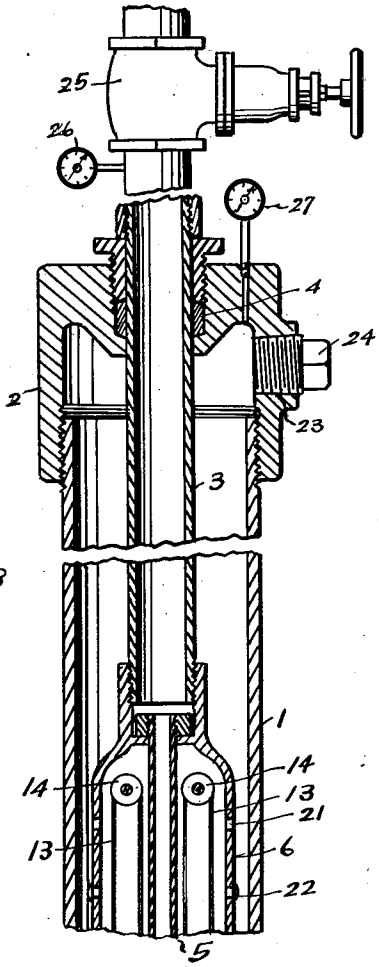


Fig. 1.

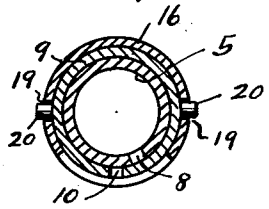


Fig 3

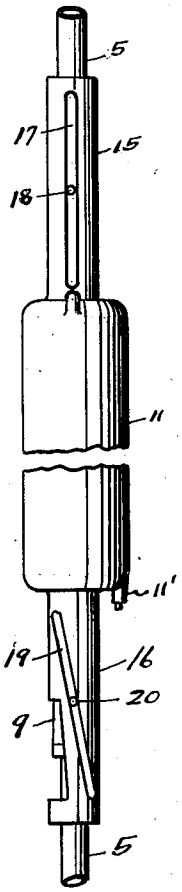


Fig. 4.

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FLOW CONTROLLING MECHANISM

Ira A. Morris, Houston, Tex.

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5 Claims. (Cl. 166—2)

This invention relates to flow controlling mechanism.

This invention consists of certain improvements over that type of flow line disclosed in my pending application Serial No. 551,120, filed July 16, 1931.

An object of the invention is to provide a flow line for wells such as oil wells, which will permit the free flow of oil from the well and at the same time will prevent the escape of gas from the well.

Another object of the invention is to provide a flow line for wells of the character described having an inflow opening beneath the normal level of the oil in the well with a float operated valve arranged to control said opening to the end that when the opening is submerged beneath said level, the valve will remain in open position to permit the flow of oil from the well through said flow line and to prevent the escape of gas but when said level is lowered beneath the opening, the valve will operate to close said opening. Another object of the invention is to provide a flow controlling device whereby the fluid level in the well may be maintained at the desired point.

Another object of the invention is to provide a flow controlling apparatus of the character described whereby the pressure at the bottom of the hole may be readily ascertained.

A further feature of the invention is to provide an apparatus of the character described which may be readily closed to stop production of the well and which at the same time will prevent the well from being killed to the end that the flow from the well may be resumed at any time without the necessity of swabbing, bailing or pumping the well.

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 drawing, wherein:

Figure 1 shows a vertical sectional view of the upper end of the apparatus.

Figure 2 shows a vertical sectional view of the lower end thereof.

Figure 3 shows an enlarged transverse sectional view taken on the line 3—3 of Figure 2, and

Figure 4 shows a side elevation of the device.

Referring now more particularly to the drawing wherein like numerals of reference designate similar parts in each of the figures, the numeral 1 designates the casing set in a well bore. This casing has a suitable head 2 connected to the top thereof and the flow line 3 extends down through the casing into the well, there being a stuffing box 4 in the casing head around the flow line to form a fluid tight joint. If desired an intermediate section as 5 of the flow line may be reduced and this reduced portion is inclosed by an elongated tubular housing 6 whose upper and lower ends are attached to the upper and lower sections 3 of the flow line above and beneath. The lower end of the flow line 3 may be closed in any suitable manner as by a plug 7.

The reduced section 5 of the flow line has a plurality of inlet openings as 8 which are submerged beneath the normal level of the fluid in the casing 1 and these openings may be opened and closed by means of a rotatable sleeve valve 9 around the section 5 and having the openings 10 arranged to be brought into and out of registration with the openings 8.

Around the flow line and movable thereon there is a sleeve like float 11 formed of strong material such as steel and formed hollow and counterbalanced by the weights 12, 12 which are suspended by the cords 13, 13 which pass over the sheaves 14, 14 mounted in the upper end of the housing 6 and whose lower ends are attached to said float. The float 11 is filled with air, or the like, under pressure, through the valve 11', and is made of heavy, strong material, so that it will not be crushed by the pressure in the well to which it is subjected and hence the necessity of counterbalancing it so that it will rise and fall with the level of the oil in the well. The float has the upper and lower sleeves 15, 16 around the flow line 5 and the upper sleeve has the vertical slots 17 to receive the guide pins 18 which are anchored to the flow line 5 and project through said slots to permit the vertical movement of the float but to prevent its rotation. The lower sleeve 16 has the spiralled slots 19 to receive the pins 20 which project out from the valve 9 and through which said valve may be turned. The float rides up and down as the level in the casing varies. When the openings 10 are in registration with the openings 8 the oil may flow in through said registering openings and on up through the flow line to the ground surface due to the internal pressure of the gas in the well. The gas however will be trapped in the casing above the oil and the gas pressure thus maintained in the well to the end that the internal pressure in the well will not be reduced materially and to the further end that the gas in the well will not escape with the oil and become intermingled therewith so that the oil flowing out will not have to be treated in order to remove the gas therefrom. The upper portion of the housing

6, above the valve 9, as will be noted, has the perforations 21 to permit the free inflow of oil and gas therethrough. Some of these perforations are provided with the removable buttons or closures as 22 whereby they may be closed. As shown only the lower and upper openings 21 are open and the intermediate openings are closed. The oil and gas from the well beneath will rise up and the oil will flow in through the lower openings 21 into the housing 6 and will pass thence into the flow line 5 through the registering openings 8, 10 and will flow on out but the gas will pass on up around said housing and will be trapped in the casing above. Any gas entering the housing 6 may rise and pass out through the upper openings 21. The openings 21 that are to be left open and those that are to be closed in order to more effectively separate the gas from the oil are to be determined by the condition of the pressure in the particular well in which the apparatus is to be installed.

Sometimes there is sufficent gas pressure within the well to maintain a continuous flow of the oil in the well through the flow line. Then at other times the well flows by heads, that is, intermittently, due to the fact that there is not sufficient pressure to keep up the flow. When a well flows intermittently the level in the well will vary, the level becoming lower as the oil flows out. With the type of apparatus herein described, when the level of the well descends the float 11 will descend with it and the valve 9 will thereupon be rotated to close the openings 8 to prevent said openings 8 from becoming uncovered when not submerged in the well to the end that when the oil level in the well is beneath the openings 8, said openings will be closed by the valve 9 and the gas prevented from escaping. When the oil level again rises the float 11 will rise with it and the valve 9 will be rotated through the connections between the sleeve 16 and said valve and the openings 8 and 10 will be brought into registration to permit the inflow of oil into the flow line.

The casing head 2 is provided with a lateral outlet opening 23 normally closed by a plug 24.

If it be desired to relieve gas pressure from the well for the purpose of utilizing the gas, the plug 24 may be removed for that purpose.

The flow line 3 is provided with a suitable gate valve 25 and beneath this valve there is a pressure gauge 26 by means of which the pressure in the flow line 3 may be determined and the casing head is also provided with a pressure gauge 27 by means of which the pressure within the casing 1 may be determined.

The fluid level in the well may be maintained at any desired point but suitably locating the valve at such a point in the well as will maintain the desired level.

The pressure at the bottom of the hole may be readily ascertained. The fluid level, as hereinabove stated is known and consequently the static head will also be known. The casing head pressure can be readily ascertained by inspecting the gauge 27 and with this data at hand the bottom hole pressure can be readily computed.

By the use of the apparatus hereinabove described the gas and oil ratio may be ascertained by the pressure required to lift the fluid column. This pressure may be readily ascertained. Since the fluid level in the well is known and since the casing head pressure is revealed by the gauge 27, by closing the valve 25 the pressure registering on the gauge 26 may be ascertained and the difference between the casing head pressure as indicated by the gauge 27 and the flow line pressure as indicated by the gauge 26 will give the pressure required to lift the fluid column flowing through the line 3.

In case it be desired to close down the well, the valve 25 may be closed and production stopped. The fluid level in the well is thus maintained at the desired point and when the flow line is again opened by opening the valve 25, the well will immediately start flowing without swabbing, bailing or pumping.

The drawing and description disclose what is now considered to be a preferred form 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. A flow line for wells having an inlet beneath the upper end thereof, a housing supported on the flow line, a valve within said housing arranged to open and close said inlet, said housing having openings above said inlet, a float within the housing connected to the valve to open and close the same and means for sealing the well around the flow line above said housing.

2. A flow line for wells having a surrounding housing thereon and having an inlet within said housing, a rotary valve on said line arranged to open and close said inlet, a float in the housing associated with the line and connected to said valve to open and close the same, said housing having inlets above said valve and means for sealing the well around said flow line above said housing.

3. The combination with means for sealing the top of a well, of a flow line extending through and forming a fluid tight joint with said sealing means, said flow line extending down into the well, a housing on the flow line spaced beneath said sealing means, said flow line having an inlet within the housing, a rotary sleeve valve on the flow line arranged to open and close said inlet and means controlled by the fluid level in the well and operatively connected to the valve and effective to vary the position of the valve as the liquid level in the well varies.

4. The combination with means for sealing the top of a casing in a well, of a flow line extending through said sealing means into the well and having an inlet spaced beneath said sealing means, a rotary valve arranged to open or close said inlet, a float on the flow line, means for preventing the rotation of the float on said flow line, a sleeve around the flow line depending from said float having a spiralled slot and a projection on the valve working in said slot whereby a vertical movement of the float will be effective to impart a rotary movement to the valve.

5. A flow line for wells having a fluid inlet, means for controlling said inlet, a hollow float containing a fluid under pressure and affected by the liquid level in the well connected to, and controlling the inlet controlling means, a counterbalance for said float and a housing on the flow line inclosing said float and counter-balance.

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