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G. C. SINGER

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BLOWOUT PROTECTOR FOR OIL AND GAS WELLS

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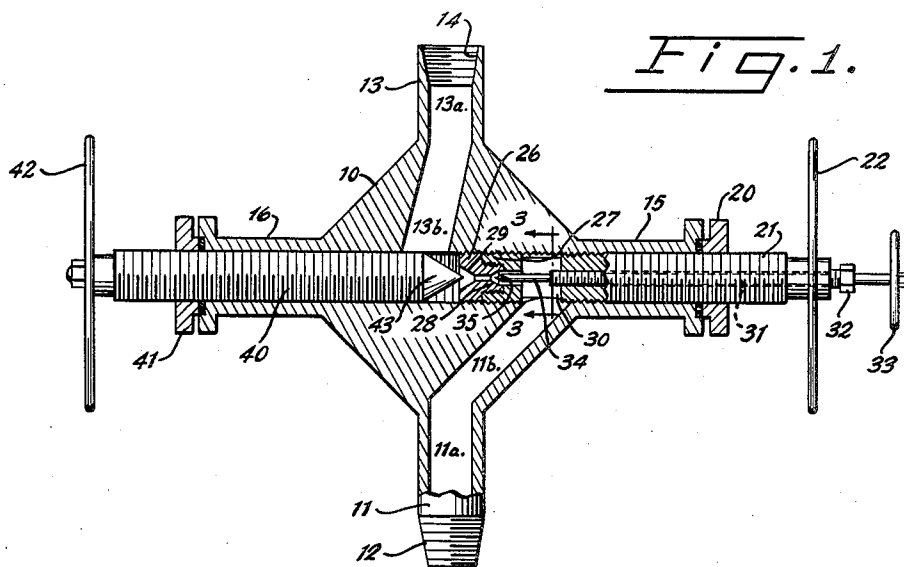


Fig. 1.

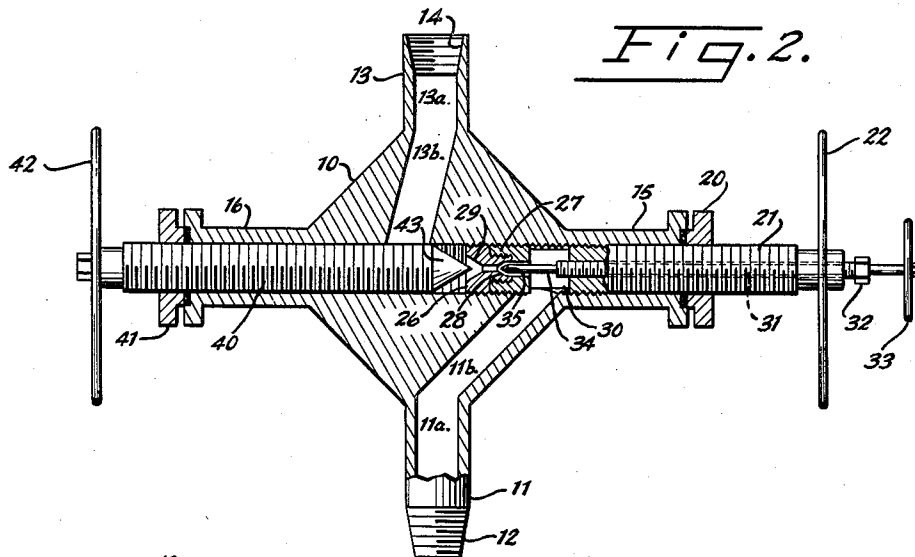


Fig. 2.

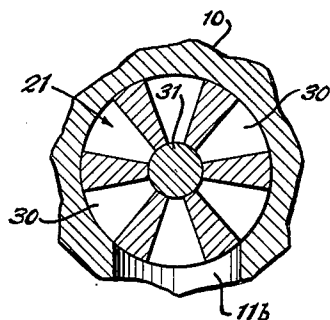


Fig. 3.

Inventor

G. C. Singer

By *Wm. L. Liddell* Attorney

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BLOWOUT PROTECTOR FOR OIL AND GAS
WELLS

Grover Clearence Singer, Brownsville, Tex.

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4 Claims. (Cl. 277-66)

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My present invention relates to control valves for use in connection with apparatus used in the drilling of oil and gas wells and it has for its object to provide a valve head particularly adapted for use in fields where high pressures are encountered when the producing horizon is encountered by the drilling tools.

My invention comprehends a blow out protector especially adapted to be applied to either a rotary drill stem or to a well casing having an interior construction in which opposed shut off valves cooperate to control the escape of fluid, either of which may be adjusted to effect a complete shut off of the outlet passage.

Another object of my invention is the provision of aligned adjustable members one forming a valve seat through which fluid under pressure may escape under control of an internal needle valve, the other member cooperating with said first mentioned member to further reduce the pressure of fluid which passes said needle valve.

To these and other ends my invention comprises further improvements and advantages as will be further described in the accompanying specification, the novel features thereof being set forth in the appended claims.

In the drawings:

Figure 1 is a vertical sectional view of a blow out preventer embodying my invention showing the valves in one position of adjustment.

Figure 2 is a similar view showing one of the valves completely closing off the outlet passage, and

Figure 3 is a cross sectional view taken on the line 3-3 of Fig. 1.

Similar reference numerals, in the several figures, indicate similar parts.

Primarily my blow out protector is intended for use in conjunction with the surface end of a rotary drill stem above the usual turntable after the Kelly joint has been disconnected although it will be understood that it may with equal facility be applied as a head on the exposed end of a well casing which has been cemented in the well, the only difference in the two constructions being in the nipple connections. Such uses are determined by circumstances as some wells blow in before it has been possible to elevate the complete length of drill stem from the hole. On other occasions wells do not manifest themselves until after much of the drilling fluid has been bailed out of the hole or until after the oil string of casing has been set and the producing strata either shot or acidised.

In illustrating the essential features of my in-

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vention I have shown a heavy metal body 10 having an inlet nipple or lower end 11 threaded exteriorly at 12 to fit within the tapered threaded joint on the upper end of a section of drill stem. In line with this nipple is a second nipple 13 similarly threaded interiorly at 14 so that if occasion requires two or more similar preventers may be mounted one on top of the other in the nature of so called "Christmas Tree" by means of which excessive well pressures are stepped down by means of a series of manually operated valves.

Extending laterally at opposite sides of the body 10 are tubular arms 15 and 16. With one of these the passage 11^a in the lower nipple 11 is connected by a diagonal passage 11^b which terminates at one side of the median line of the body at its point of juncture with arm 15. The upper nipple passage 13^a veers off at its lower end 13^b slightly in the opposite direction and communicates with the arm 16.

Secured within the arm 15 by a gland and stuffing box 20 is a threaded shaft 21 which can be advanced and retracted by the rotation of a hand wheel 22 attached to its outer end. This shaft has at its inner end a tip or die 25 removably secured by screw threads 27 so that it may be renewed as occasion requires. Both the shaft and die are provided with longitudinal perforations the opening through the die being smaller so as to provide on its inner side a conical seat 28. A larger conical seat 29 is formed on the forward face of the die. The over-all length of the shaft 21 and die 27 is such that normally the forward face of the die lies adjacent the proximate edge of opening 13^b and may if necessary be advanced to close off said opening completely. In a suitable position at the inner end of shaft 21 for registration with the opening 11^b in the body 10 are a plurality of radial passages 30, as shown in Fig. 3, one or more of which will always be open to the flow of fluid from passage 11^b although their area may be diminished by screwing the shaft 21 inwardly.

Threaded in the central longitudinal opening of shaft 21 is a stem 31 the outer end of which extends beyond a packing gland 32 and is provided with a hand wheel 33. At its inner end this stem is provided with a reduced portion 34 and a conical tip 35 adapted to cooperate with the seat 28 on the inner side of the die 26.

By means of the above described arrangement of parts it will be seen that by rotating the hand wheel 22 the area of the pressure outlet may be varied in the first instance by the extent to which the openings 30 in shaft 21 are

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advanced over the edge of opening 11^b and secondly by the relation of the needle valve 35 to its seat 28. It will also be noticed that with the area of the valve opening 30 adjusted as desired for any given condition that the needle valve may be independently adjusted.

A main shut off valve in the form of a shaft 40 is threaded in the second arm 16. Its outer end passes through a stuffing box and gland 41 and is provided with an operating wheel 42. At its inner end shaft 40 has a conical tip 43 alined with the seat 29 of die 26 by means of which the outlet for oil or gas may be further regulated.

Valves of this character are employed to bring a newly completed well under control. Initially the fluid, be it oil or gas, or a combination thereof, carries detritus in the form of particles of fine sharp sand which escaping under high pressure will rapidly wear away the valve parts. In order that these may be readily replaced and the outlet of the well head controlled the shafts 21 and 40 are made of the same size and alined and provided with identical threads. Thus constructed and each given an over all length it will be seen that shaft 21 may be backed off and shaft 40 correspondingly advanced to completely shut off all communication between passages 11^b and 13^b and the parts restored to their normal working position by moving them in the reverse direction. Likewise if repair is required of shaft 40 as it is retracted shaft 21 may be advanced.

I claim:

1. A blowout preventer comprising a body having a threaded opening therethrough and being provided with inlet and outlet fluid passages terminating at spaced points within said opening, a shut off valve in one end of said threaded opening, said valve carrying a removable metering die at the inner end thereof and having radial slots for connecting said die with the fluid inlet, a needle valve within said shut off valve cooperating with the outer end of said die for controlling the pressure of the conducted fluid and a second shut off valve adjustable relative to the inner end of said die for further reducing the fluid pressure.

2. A blowout preventer comprising a body having a threaded opening therethrough and being provided with inlet and outlet fluid passages terminating at spaced points within said opening, a shut off valve in one end of said threaded opening, said valve carrying a removable metering die at the inner end thereof and having radial slots for connecting said die with the fluid inlet, a needle valve within said shut off valve cooperating with the outer end of said die for controlling the pressure of the conducted fluid and a second shut off valve adjustable relative

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to the inner end of said die for further reducing the fluid pressure, either of said shut off valves being adjustable to effect shut off of said outlet passage.

3. A blowout preventer comprising a body having a threaded opening therethrough and being provided with inlet and outlet fluid passages terminating at spaced points within said opening, a shut off valve in one end of said threaded opening, said valve carrying a removable metering die at the inner end thereof and having radial slots, and an axial passage for connecting said die with the fluid inlet, said die having an axial metering passage with a conical valve seat at each end thereof, a needle valve within said shut off valve cooperating with one of said valve seats in said die for controlling the pressure of the conducted fluid, a second shut off valve threaded within said opening adjustable relative to the other valve seat in said die for further reducing the fluid pressure, either of said shut-off valves being adjustable to effect shut-off of said outlet passage.

4. A blowout preventer comprising a body having a threaded opening therethrough and being provided with inlet and outlet fluid passages terminating at spaced points within said opening, a shut off valve in one end of said threaded opening, said valve carrying a removable metering die at the inner end thereof and having radial slots movable relative to the fluid inlet for connecting said die with the fluid inlet and controlling the amount of flow therethrough, said die having an axial metering passage with a conical valve seat at each end thereof, a needle valve within said shut off valve cooperating with one of said valve seats in said die for controlling the pressure of the conducted fluid, a second shut off valve threaded within said opening adjustable relative to the other valve seat in said die for further reducing the fluid pressure, either of said shut-off valves being adjustable to effect shut-off of said outlet passage.

GROVER CLEARANCE SINGER.

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