April 22, 1952 W. R. EVANS 2,593,866

WELL CASING GUN

Filed Nov. 4, 1947

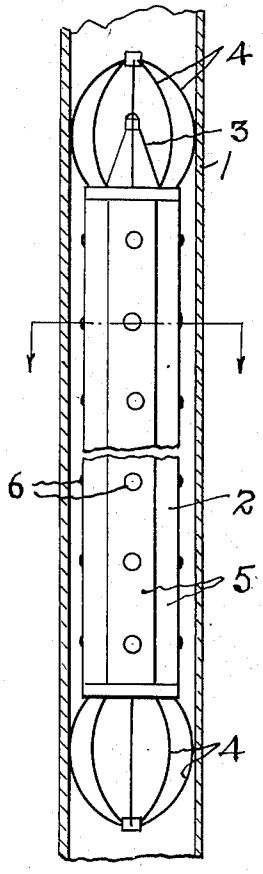


Fig. 1

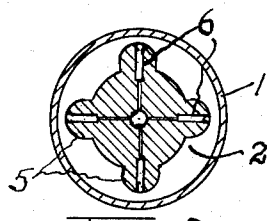


Fig. 2

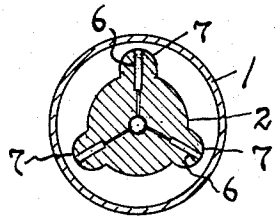


Fig. 3

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WELL CASING GUN

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3 Claims. (Cl. 164—0.5)

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This invention concerns improvements in casing perforators for oilwells and the like.

The broad objects of this invention are to provide a new structural form of oilwell casing perforator as a result of which the gun barrels are brought closer to the casing and movement thereof, particularly ascent through the casing, can be speeded up without an excessive tendency to swab the hole, and thereby possibly prematurely induce the well to flow.

It is a common practice today to construct the perforator housing or sinker bar of cylindrical cross-sectional form, thereby requiring undesirable clearance between it and the casing in order to minimize swabbing of the hole as it is withdrawn therefrom.

It is well understood, all other conditions being the same, that the penetration force of the bullets is increased by lengthening the gun barrels mounted on the sinker bar. The length of the gun barrels can only be increased by reducing the clearance between the well casing and the sinker bar. However, reducing this clearance increases the resistance to flow of the drilling mud in the bore around the sinker bar as it descends. Therefore, if a minimum of clearance is maintained between the gun casing and the well casing the "round trip" time of the sinker bar is increased by reason of the fact that it must be withdrawn at a correspondingly slower rate from the well bore in order to prevent what is called a "swabbing" action which tends to lift the protective mud column and cause a blowout. It has become common practice, therefore, in order to prevent this "swabbing" action to make the diameter of the perforator casing or sinker bar small enough to allow the mud to flow therearound as it is withdrawn from the well bore. Obviously the selected diameter is a matter of compromise with respect to the maximum speed at which it may be withdrawn without causing a blowout.

The main object of this invention is to provide a perforator housing or sinker bar of a novel cross-sectional form by means of which there is obtained simultaneously a minimum of clearance between it and the bore casing and a maximum rate of ascent without causing a blowout. Of course, it follows that with a minimum of clearance there is obtained a maximum of gun barrel length, and therefore a maximum penetration force for the bullets.

Other and more detailed objects of the invention will be apparent from the following disclosure of the embodiments herein disclosed.

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This invention resides substantially in the combination, construction, arrangement and relative location of parts, all as will be described in detail below.

In the accompanying drawing,

Figure 1 is a vertical, central, cross-sectional view through a section of an oil bore casing showing the sinker bar of this invention therein;

Figure 2 is a cross-sectional view taken at any level on the gun; and

Figure 3 is a similar cross-sectional view of a modified form of sinker bar by means of which the objects of this invention are also obtained.

The bore hole casing is illustrated at 1. The sinker bar generally is indicated at 2. As shown, it is provided at its upper and lower ends with spring steel centering members 4 of the type commonly used in this art by means of which the sinker bar is maintained on the axis of the casing. It is well understood that if the sinker bar is allowed to lie at an angle to the axis of the casing that the bullets on opposite sides thereof will have different penetration effects. Those on the near side will have a greater penetration effect than those on the far side, so that the effectiveness of the latter may be for practical purposes nullified. As illustrated, the sinker bar is provided with any suitable form of fixture 3 by means of which the lifting cable, not shown, is attached.

As illustrated in Figures 1 and 2, the cross-sectional shape of the perforator housing or sinker bar is modified to a non-circular form, in this case the form of a unilateral cross providing four ribs 5. The diametral spread of these ribs may approximate much more closely than in the case of a circular housing the internal diameter of the well casing. As a result of this close approach of the tops of the ribs to the inner wall of the casing the length of the gun barrels 6 can be increased, from which it follows that the penetration force of the bullets is increased for the same charge and the distance through which the bullets must travel through the mud in the bore is reduced. It will be recognized that there is no disclosure of the details of the housing structure, the gun barrel structure and the disposition of the control and firing equipment by means of which the bullets are fired. This seems unnecessary, however, due to the fact that the subject matter of this invention is concerned only with the shape of the housing and the relative position of the gun barrels therein, both of which features are clearly illustrated in the drawings.

To give scope to this disclosure there has been illustrated in Figure 3 another cross-sectional shape for the perforator housing suitable for the attainment of the purposes of this invention. In this case the housing is provided with three longitudinal webs 7 of a lateral extent sufficient to bring their crests closely adjacent to the inner wall of the casing. In this case, as before, the gun barrels 6 are mounted in the crests so that their length can be a maximum within the limits provided and their muzzles brought close to the inner wall of the casing 1.

It will be understood that the perforator housing may take either form while attaining the objects emphasized herein. The two cross-sectional shapes illustrated provide channels along the sides of the sinker bar through which the mud may pass therearound as it is withdrawn, making it possible to increase the speed of withdrawal without swabbing the bore hole. It will be recognized that substantially the same result can be secured by constructing the housing so as to form one or more helical channels therearound to permit the mud to flow thereby with a minimum resistance while permitting increase in the gun barrel length and bringing the muzzles of the gun barrels closely adjacent to the inner wall of the casing.

In view of the above suggested scope of the invention I do not desire to be strictly limited to the disclosure shown in the attached drawings, but prefer that the scope of my protection be defined by the claims granted me.

What is claimed is:

1. A gun type well casing perforator comprising a sinker bar in the form of a housing having a length to provide longitudinal axial spacing for a plurality of gun barrels and having a horizontal cross-sectional shape to form a plurality of continuous ribs, the section between ribs being substantially of a smaller diameter than that defined by the extreme radial ends of the ribs, and a plurality of gun barrels mounted in said ribs transversely thereof in circumferential and longitudinal spacing.

2. In a well casing gun type perforator, the combination comprising a housing having a non-circular, horizontal, cross-sectional shape to form continuous ribs on an axis of maximum diameter, and a plurality of vertically spaced gun barrels mounted on the axis of maximum diameter of the housing, the section between ribs being of substantially smaller diameter than that of the ribs.

3. A well casing gun type perforator comprising a housing having a plurality of continuous surface ridges extending substantially the length thereof, the section between ridges being substantially smaller than that of the ribs, and gun barrels mounted therein so that their muzzles lie transversely of and vertically spaced at the points of maximum diameter of the housing.

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