Dec. 8, 1942.

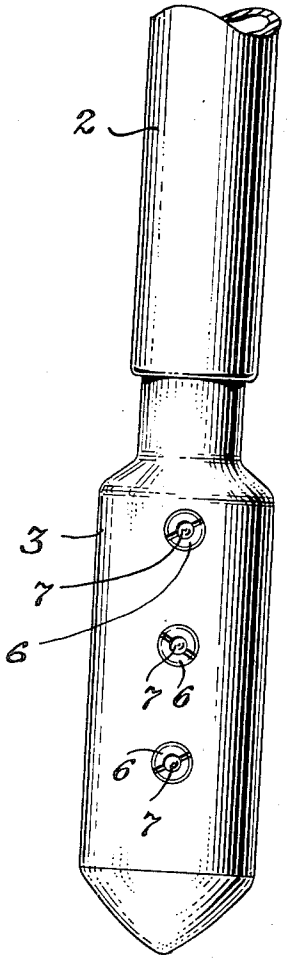
A. J. HOLIFIELD

2,304,408

GUN PERFORATOR

Filed March 30, 1942

Fig. 1.



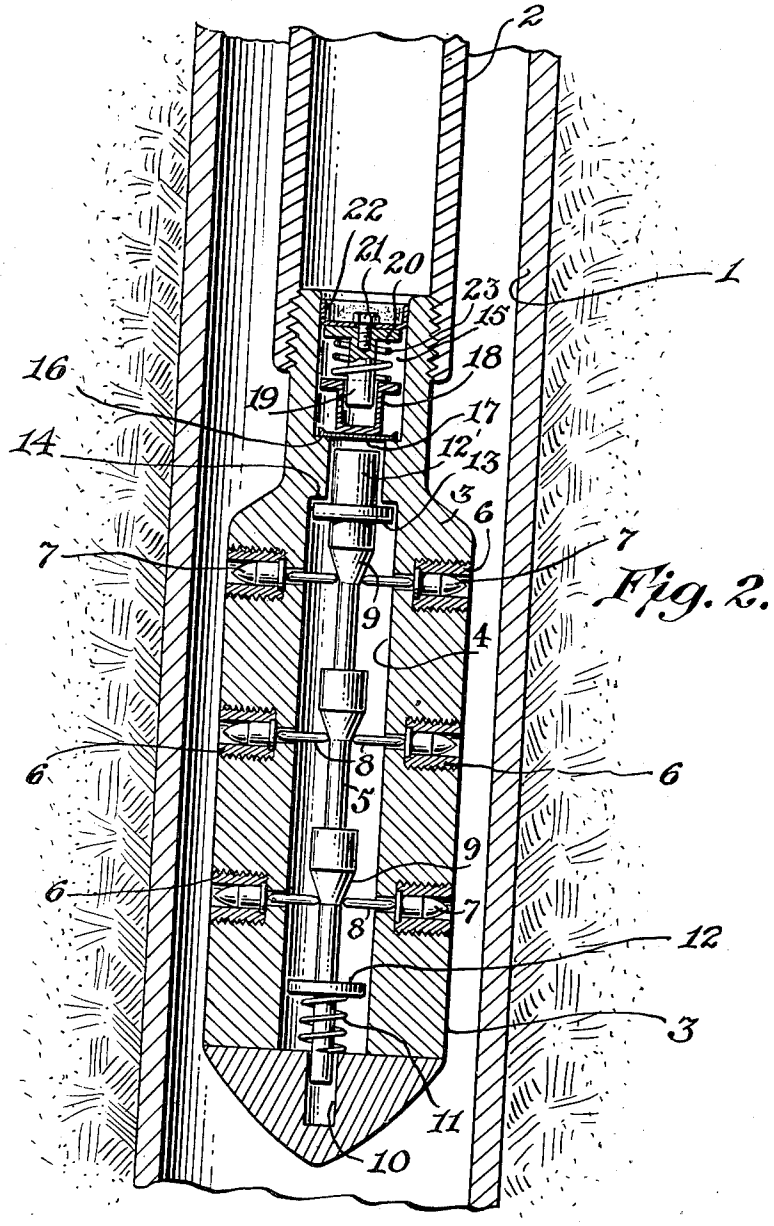


Fig. 2.

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GUN PERFORATOR

Alsae J. Holifield, Mobile, Ala., assignor of one-fourth to E. H. Planck, and one-half to M. H. Dees, both of Mobile, Ala.

Application March 30, 1942, Serial No. 436,892

10 Claims. (Cl. 164—0.5)

This invention relates to a gun perforator for oil wells and the like, the use of which facilitates the extraction of oil from different strata.

It is an object of the invention to generally improve perforating guns of this type, and to provide simplified means for operating them, thereby reducing the initial cost of the guns as well as the cost of operation in actual practice.

A further object of the invention resides in the provision of a perforating gun which is fired mechanically through the medium of hydraulic pressure, thereby avoiding the use of any equipment other than that usually employed in connection with the drilling and operation of oil wells.

Other objects and advantages of the invention will be apparent from the following description when taken in connection with the accompanying drawing, in which,

Figure 1 is a longitudinal sectional view of the improved gun shown in relation to the well tubing, etc., and

Figure 2 is a side elevational view of the gun.

Referring to the drawing in greater detail, the numeral 1 indicates the well casing and the drill pipe or tubing is indicated by the numeral 2. These parts are of course standard equipment in the conventional drilling and operation of the usual oil wells.

Threaded or otherwise connected to the lower end of the drill pipe 2 is the perforating gun 3. The body of the gun is provided with a central longitudinal compartment 4 in which is mounted a plunger 5. Extending radially from the compartment 4 are a plurality of cartridge chambers which are threaded to receive threaded thimbles 6. The cartridges, which are indicated by the numeral 7, are held in position in their compartments by the thimbles, the inner ends of which engage the flanges around the bases of the cartridges. It will be apparent therefore that the gun may be readily loaded by placing the cartridges within the thimbles and threading the thimbles into their compartments. While six of the cartridge chambers are shown it will be understood that the number may be increased or decreased as desired.

Associated with each cartridge chamber is a firing pin 8 which has its inner end located in compartment 4 and its outer end is positioned adjacent the percussion cap of the cartridge. These pins are operated by means of cams 9 which are spaced along the plunger 5 and are frusto-conical in shape.

The lower end of plunger 5 is slidably mounted in a cylindrical recess 10 formed in the lower end of the gun body, and the plunger is normally held at the upper limit of its movement by a relatively weak coil spring 11. A disc 12 fixed to the plunger 5 forms a bearing for one end of spring 11 and the other end of the spring rests upon the bottom wall of compartment 4. This spring serves not only to return the plunger 5 to inoperative position after the gun is fired, but also provides a safety feature in that it retains the plunger 5 and cams 9 in inactive position until such time as the gun is to be fired, thereby tending to prevent accidents during handling.

The upper end of the plunger 5 is provided with an enlarged head portion 12' which is slidably mounted in a narrowed portion of the compartment 4, and a disc 13 fixed to the head serves to limit the upward movement of the plunger by engaging an annular shoulder 14 on the compartment wall.

Communicating with the narrowed portion of compartment 4 is an upper compartment 15 in the form of a cylinder and in which is mounted the means for imparting a sharp blow to the plunger head 12'. This compartment is provided with an annular shoulder 16 at its lower end on which is seated a frangible wafer diaphragm 17. This diaphragm loosely supports a flanged thimble or striking member 18 in which is slidably mounted a guide pin 19 provided with a head 20. Attached to the head 20, as by means of a screw 21 is a piston 22. The piston 22 is normally held at the outer end of cylinder 15 by means of a relatively strong coil spring 23 encircling the pin 19. One end of the spring engages the underside of the head 20 and the other end thereof is supported on the flange of the striking member 18.

As previously stated it is intended that the gun be hydraulically operated, and it will therefore be understood that water is passed down the tube to apply pressure to the upper-side of the piston 22.

In the operation of the device, a cartridge is secured in each of the several chambers by the thimbles 6, and the gun is then attached to the lower end of the drill pipe 2 and lowered to the proper point in the casing 1. After the gun is thus positioned, water or other fluid is directed down the pipe 2 so as to force the piston 22 downwardly and thus compress the spring 23 which presses against the thimble or striking member 18. A head of liquid will build up in pipe 2 until sufficient energy is stored in spring

23 and member 18 to break the frangible disc 17. Upon this occurrence, spring 23 will cause the thimble 18 to strike the head 12' of plunger 5 with considerable impact, and thus through cams 9 cause the firing pins 8 to strike the percussion caps and explode the cartridges 7, thereby producing the desired perforations in the casing 1.

In this operation of the device it will be understood that the relatively weak spring 11 will be compressed, but will return the plunger 5 to normal position when the hydraulic pressure is removed, and will maintain the plunger in safety position until the gun is recharged and again fired by hydraulic pressure.

The perforating gun as herein shown and described is exceedingly simple and inexpensive in construction, and is easily and simply operated by hydraulic pressure which is always at hand where drilling operations are taking place, thereby eliminating the costly equipment generally employed in connection with electrically-operated guns.

In accordance with the patent statutes I have described what I now believe to be the preferred form of the invention, but it will be apparent that minor changes may be made in the details of construction without departing from the spirit of the invention and it is intended that all such changes be included within the scope of the appended claims.

What I claim is:

1. A gun perforator comprising a body member having a plurality of cartridge chambers, plunger-operated firing pins associated with the cartridge chambers, means for normally holding the plunger in inoperative position, and hydraulic means adapted to communicate with a drill pipe for moving the plunger to operative position.

2. A gun perforator comprising an elongated body portion having a central longitudinal compartment and a plurality of cartridge chambers radiating therefrom, a plurality of firing pins associated with the cartridge chambers, a plunger for operating the firing pins, and hydraulically operated means for operating the plunger.

3. A gun perforator comprising a body portion having a central longitudinal compartment and a plurality of cartridge chambers radiating therefrom, a plurality of firing pins associated with the cartridge chambers, a plunger in the central compartment for operating the firing pins, hydraulically operated means for operating the plunger, and spring means for normally holding the plunger in inoperative position.

4. A gun perforator comprising a body portion having a central longitudinal compartment and a plurality of cartridge chambers radiating therefrom, a plurality of firing pins associated with the cartridge chambers, a plunger for operating the firing pins, a striking member for engaging the plunger, a frangible member for normally holding the striking member in inoperative position, and hydraulic means for causing the striking member to shear the frangible member and strike the plunger.

5. A gun perforator comprising a body portion having a central longitudinal compartment and a plurality of cartridge chambers radiating therefrom, a plurality of firing pins associated with the cartridge chambers, a plunger in the central compartment for operating the firing pins, a spring-pressed striking member for engaging the plunger, a frangible element for normally holding the striking member in retracted position, and hydraulic means for causing the striking member to shear the frangible element and strike the plunger.

6. A gun perforator comprising a body portion having a central longitudinal compartment and a plurality of cartridge chambers radiating therefrom, a plurality of firing pins associated with the cartridge chambers, a plunger in the central compartment for operating the firing pins, a spring-pressed striking member for engaging the plunger, a frangible element for normally holding the striking member in retracted position, and a hydraulically-operated piston associated with the striking member to store energy in the spring and thereby cause the striking member to shear the frangible element and strike the plunger.

7. A gun perforator comprising a body portion having a central longitudinal compartment and a plurality of cartridge chambers radiating therefrom, a plurality of firing pins associated with the cartridge chambers, a plunger in the central compartment for operating the firing pins, spring means normally holding the plunger in inoperative position, a spring-pressed striking member for engaging the plunger, a frangible element normally holding the striking member in retracted position, and hydraulic means associated with the striking member to cause the same to shear the frangible element and strike the plunger.

8. A gun perforator comprising a body portion having a central longitudinal compartment and a plurality of cartridge chambers radiating therefrom, a plurality of firing pins associated with the cartridge chambers, a plunger in the central compartment for operating the firing pins, spring means normally holding the plunger in inoperative position, a spring-pressed striking member for engaging the plunger, a frangible disc normally holding the striking member in retracted position, and a hydraulically-operated piston associated with the spring-pressed striking member for storing energy therein and causing the same to shear the frangible disc and strike the plunger.

9. In combination a drill pipe, a gun perforator attached to the lower end of the drill pipe, said gun perforator comprising a body member having a plurality of cartridge chambers, and firing means for the cartridges including firing pins and a hydraulically operated cylinder and piston in communication with the drill pipe for operating the pins.

10. In combination a drill pipe, a gun perforator attached to the lower end of the drill pipe, said gun perforator comprising a body member having a plurality of cartridge chambers, a cylinder and piston in the upper end of the body portion and in direct communication with the lower end of the drill pipe, and impact means associated with the piston for firing the cartridges when hydraulic pressure is applied to the upper side of the piston.

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