Sept. 13, 1938. F. C. KNISS 2,130,138

PERFORATING GUN FOR OIL WELLS

Filed Sept. 18, 1937 2 Sheets-Sheet 1

Fig. 1.

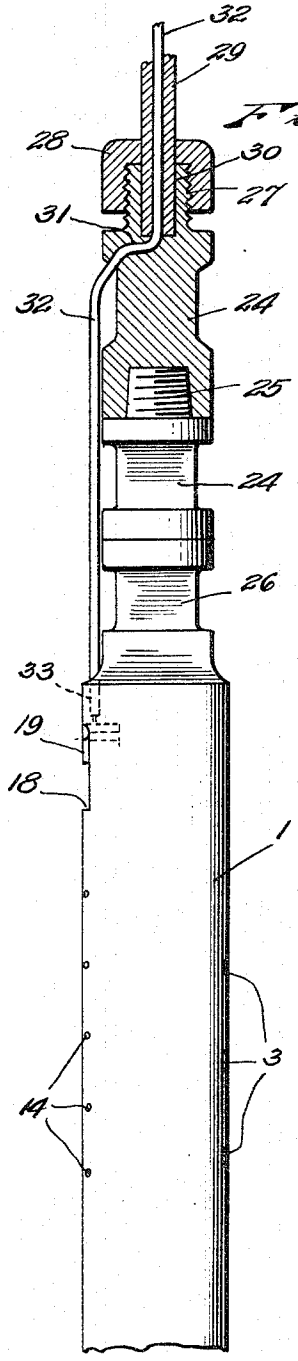
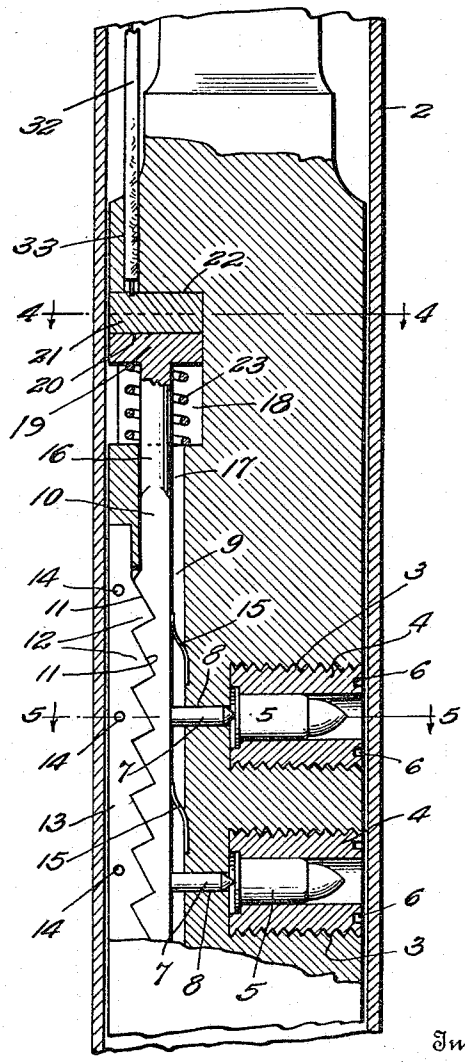


Fig. 2.



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Filed Sept. 18, 1937 2 Sheets-Sheet 2

Fig. 3.

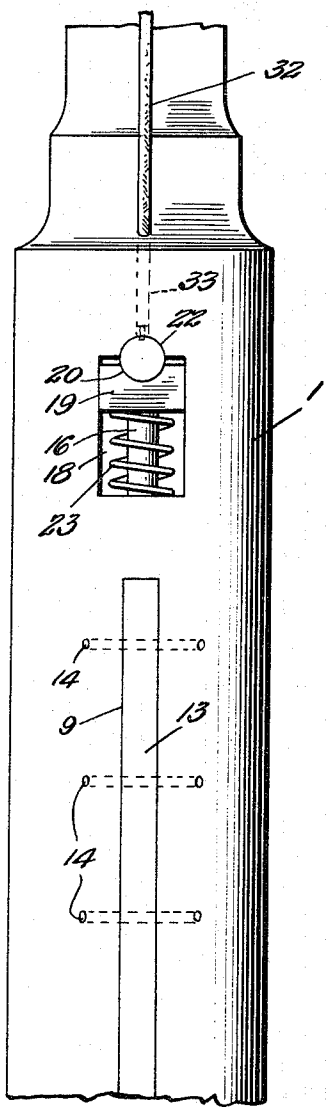


Fig. 4.

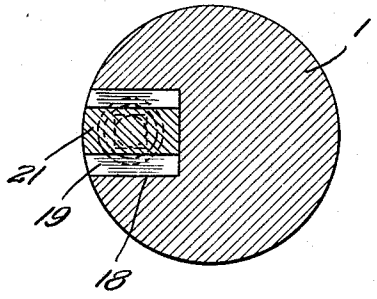


Fig. 5.

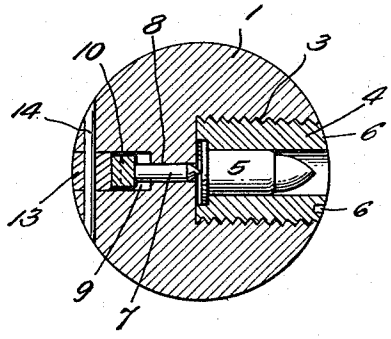
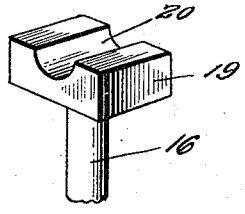


Fig. 6.



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PERFORATING GUN FOR OIL WELLS

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Application September 18, 1937, Serial No. 164,585

7 Claims. (Cl. 164—0.5)

This invention relates to an improved perforating gun for use in wells, such as oil wells, and one object of the invention is to provide a gun which, when loaded, may be lowered into a well and when at the desired depth discharged so that bullets will be fired into walls of the well and thus shatter the walls of the well and reestablish a good flow of oil.

Another object of the invention is to provide a gun of this character wherein movement in a direction to effect discharge of the cartridges is imparted to a firing bar through the medium of a dynamite cap exploded when current is caused to pass through a wire leading to the dynamite cap. It will thus be seen that there will be no danger of the cartridges being prematurely exploded as the dynamite cap can only be exploded when a switch is closed and current caused to pass through a wire leading to the dynamite cap. It should also be noted that since the electric wire takes the place of the core of a cable used for lowering the gun into a well there will be no danger of the wire becoming tangled with the cable by turning of the gun as it is lowered or raised and the gun can be quickly lowered and raised without danger of it becoming wedged in the well.

Another object of the invention is to provide a gun of this character wherein a dynamite cap is held in place by pressure of a spring which urges the firing bar upwardly to such a position that a head at its upper end will be held in engagement with the dynamite cap. By this arrangement the dynamite cap will be firmly held in place during lowering of the gun into a well and when the dynamite cap is exploded its force will be exerted directly upon the head of the firing bar and the firing bar forced downwardly at such speed that discharge of the cartridges will be assured.

The invention is illustrated in the accompanying drawings, wherein

Figure 1 is a view showing the well gun in side elevation and a coupling used therewith shown in section,

Figure 2 is a longitudinal sectional view showing the gun within the tubular casing of a well,

Figure 3 is a side elevation of a portion of the gun, the view being taken when looking from the left of Figure 1,

Figure 4 is a sectional view taken transversely through the gun along the line 4—4 of Figure 2, the oil casing being omitted,

Figure 5 is a similar view taken along the line 5—5 of Figure 2, and

Figure 6 is a perspective view of the upper end portion of the firing bar.

The improved perforating gun has a body 1 which is formed of strong metal and is of such diameter that it may be slidably received in the tubular well casing 2, as shown in Figure 2. A suitable number of threaded sockets 3 are formed in the body transversely thereof in spaced relation to each other longitudinally of the body, it being understood that, while three of these sockets have been shown, any desired number may be provided. A barrel or sleeve 4 formed of metal, such as used for gun barrels, is screwed into each of the sockets 3 and bored to accommodate a cartridge 5 of a predetermined caliber. At its outer end each barrel is formed with a suitable number of small sockets 6 in order that the barrel may be removed and a new cartridge fitted into the barrel from the inner end thereof after the gun has been fired. Firing pins 7 are slidably mounted in openings 8 leading from inner ends of the sockets 3 and projecting into a chamber 9 formed longitudinally of the body, and from an inspection of Figure 2, it will be readily understood that, when the firing pins are forced forwardly to deliver blows upon the primers of the cartridges, the cartridges will be exploded and their bullets fired through the well casing and into walls of the well. The walls of the well will thus be shattered and a good flow of oil reestablished.

In order to explode the cartridges by forcing the firing pins forwardly, there has been provided a firing bar 10. This bar extends longitudinally in the chamber 9 and has its rear edge face deeply serrated to provide a plurality of diagonally extending cam surfaces 11. These cam surfaces cooperate with the diagonally extending surfaces of the teeth 12 of a cam bar 13 which is secured in the rear portion of the chamber 9 by pins 14, and when the firing bar is moved downwardly it will be shifted forwardly by the cam bar against action of the springs 15 and the firing pins will be forced forwardly and cause the cartridges to be exploded. The stem 16 at the upper end of the firing bar extends through the throat 17 of the chamber 9 into the pocket 18 and carries a head 19 which is recessed, as shown at 20, to provide a seat for a dynamite cap 21, a portion of which is received in the seat or recess 22 formed in the top wall of the pocket 18 in cooperating relation to the seat 20. A spring 23, which is coiled about the stem 16 within the pocket 18, has its lower end resting upon the bottom of the pocket about the

throat 17 and its upper end bearing against the under face of the head 19 in order that the firing bar will be yieldably held in its raised or normal position and returned to this position after being shifted downwardly to force the pins forwardly and explode the cartridges.

In order to connect the body of this gun with a cable used for lowering or raising the gun, there have been provided couplings 24. While two of these couplings have been shown, it is to be understood that one or any number desired may be provided. The couplings have threaded engagement with each other, as shown at 25 in Figure 1, and the lower one of the couplings has threaded engagement with the upper end of the neck 26 of the body 1 of the gun. The upper coupling has a threaded neck 27 upon which a cap 28 may be screwed to secure the cable 29 in the socket 30. Near its upper end the coupling is formed with a passage 31 in order that a heavily insulated electric wire 32 which replaces the usual core of the cable may be passed outwardly through this passage and then downwardly along one side of the coupling and have its lower end portion secured in a bore or passage 33 formed in the body 1. The lower end of the passage 33 communicates with the recess 22, and from an inspection of Figure 2, it will be readily seen that, when a switch is closed and current caused to flow through the wire 32, the dynamite cap 21 will be fired and the force of the explosion will cause the firing bar to be shifted downwardly and the firing pin moved forwardly to explode the cartridges so that the bullets will be fired through the well casing and into walls of the well to shatter the walls. In view of the fact that the electric wire takes the place of the core usually provided in the steel cable 29, a single lowering mechanism is needed and the electric wire will not become twisted about the cable by turning of the gun during lowering or raising of the gun. There will also be no danger of the cable and wire not being raised or lowered at the same speed, as would be liable to happen if they were wound upon separate drums, and wedging of the gun in the well casing will be avoided.

Having thus described the invention, what is claimed as new is:

1. A device of the character described comprising a body adapted to be suspended in a well, the body being provided with means for mounting cartridges transversely of the body, firing pins for the cartridges carried by said body, a firing bar slidable longitudinally in said body and having engagement with said pins, means for shifting the firing bar towards the pins when the bar is moved longitudinally in one direction and moving the pins in a direction to explode cartridges, and explosive means for imparting movement to the firing bar in the said direction.

2. A device of the character described comprising a body adapted to be lowered in a well, means for mounting cartridges in the body transversely thereof, firing pins for the cartridges carried by the body and shiftable towards and away from the cartridges, a firing bar slidable longitudinally in the body and shiftable transversely thereof for imparting firing movement to said pins, means for yieldably resisting movement of the firing bar in a direction to shift the pins in a firing direction, and means for supporting an explosive member in operative relation to the firing bar whereby when the explosive member is exploded the firing bar will be moved longitudinally in the direction to explode the cartridges.

3. A device of the character described comprising a body adapted to be lowered into a well, the body being provided with transversely extending cartridge-holding means, firing pins slidable transversely in said body, the body being formed with a longitudinally extending chamber having its upper end communicating with a pocket, a firing bar slidable longitudinally in said chamber and having its upper end extending into said pocket and provided with a head, means yieldably holding the firing bar in a raised position, the head and the upper end of the pocket cooperating with each other for holding an explosive member between the same, means for exploding the explosive member and effect downward movement of the firing bar, and means for shifting the firing bar transversely of the body and imparting movement to the firing pins for discharging cartridges during downward movement of the firing bar.

4. A device of the character described comprising a body adapted to be lowered into a well, the body being provided with transversely extending cartridge-holding means and being formed with a longitudinally extending chamber spaced from inner ends of the cartridge-holding means, firing pins slidably mounted in passages between the cartridge-holding means and chamber, rear ends of said pins projecting into the chamber, a firing bar slidable longitudinally in said chamber, a pocket above said chamber, the chamber having a throat leading to the pocket, a stem for the firing bar extending into the pocket and formed with a head at its upper end, a spring between the head and the bottom of the pocket for yieldably holding the firing bar in a raised position, confronting faces of the head and pocket being recessed to provide a space for receiving an explosive, a bore being formed in the body and leading upwardly from the recess at the top of the pocket, a coupling connected with the upper end of said body and formed with a cable-receiving socket and a bore leading from the bottom of the socket whereby an insulated conductor constituting a core for a cable secured in the socket may pass outwardly through the bore of said coupling and downwardly along the same and be passed through the bore of the body into the recess at the top of the pocket and current pass through the conductor to fire the explosive.

5. A device of the character described comprising a body of dimensions adapting it to be lowered into a well, said body being provided with means for holding cartridges, firing means for the cartridges slidable longitudinally of the body and adapted to be actuated by an explosive member, resilient means yieldably resisting movement of the firing means in a firing direction, and a cable for lowering the device into a well having a core consisting of an insulated conductor through which current may pass to fire the explosive.

6. A device of the character described comprising a body provided with means for holding cartridges and firing means for the cartridges slidably mounted and having a portion constituting a jaw for holding in place withi nthe body an explosive for actuating the firing means, means for yieldably holding said firing means in position to grip the explosive, and a cable for lowering the device into a well having an insulated conductor carried thereby with a portion of the conductor extending from the cable to a position for

delivering current to the explosive and firing the same.

7. A device of the character described including a body adapted to be lowered into a well and provided with means for holding cartridges, an explosive carried by said body, explosive actuated means shiftably carried by said body for firing the cartridges when the explosive is fired, said firing means being yieldably held in its inactive position, and a cable for suspending the body having a core consisting of a conductor for delivering current to the explosive for firing the same.

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