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GUN PERFORATOR

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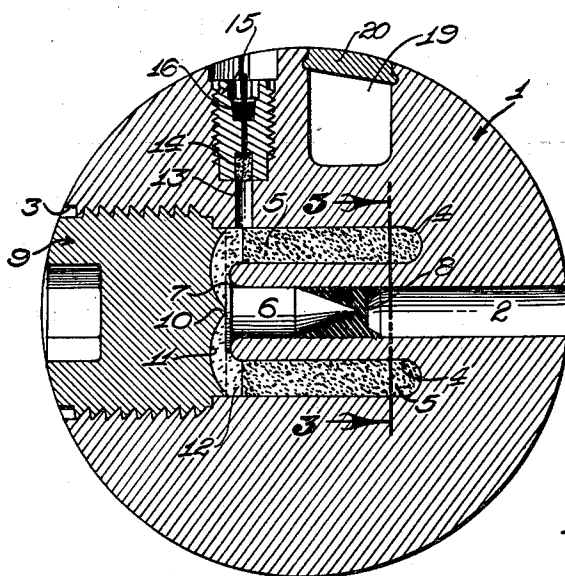


FIG. 2

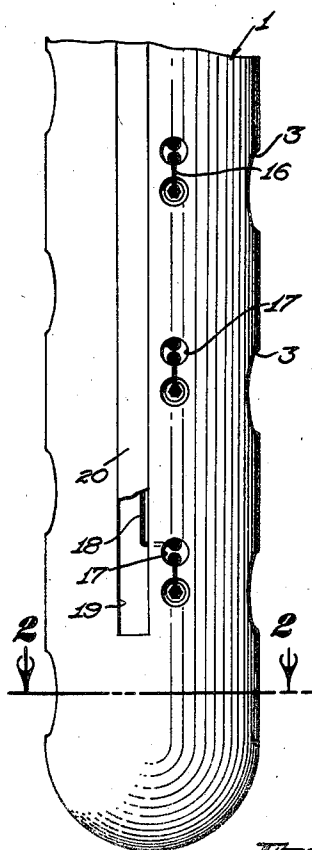


FIG. 1

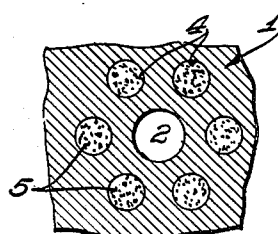


FIG. 3

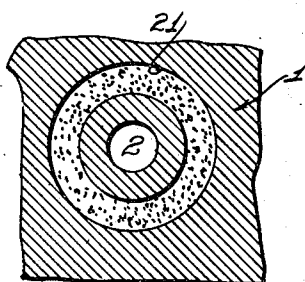


FIG. 4

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GUN PERFORATOR

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12 Claims. (Cl. 164—0.5)

My invention relates to gun perforators; that is, to devices adapted to be lowered within well casings for the purpose of perforating the casing and permit the inflow of well fluids. Among the objects of my invention are:

First, to provide a gun perforator of the breech-loaded type wherein a plurality of gun barrels are incorporated in a single gun body;

Second, to provide a gun perforator which incorporates an inherently large powder chamber;

Third, to provide a gun perforator which lends itself to electrical operation;

Fourth, to provide a novelly constructed gun perforator in which the cartridge chamber is arranged concentrically about the gun barrel, as distinguished from the end of the gun barrel, so that the gun barrel may have a maximum length, the powder chamber being in the form of a single annular space or divided into independent pockets; and

Fifth, to provide a gun perforator which is so arranged that the bullet may be subjected to the external well pressures, that is, the gun barrel ahead of the bullet may fill with water or other well fluids without damage.

With the above and other objects in view, as may appear hereinafter, reference is directed to the accompanying drawing, in which:

Figure 1 is a fragmentary elevational view of a gun perforator embodying my invention;

Figure 2 is an enlarged transverse sectional view through 2—2 of Figure 1;

Figure 3 is a fragmentary detailed sectional view through 3—3 of Figure 2, showing in cross section the gun bore and a cartridge pocket; and

Figure 4 is a fragmentary sectional view similar to Figure 3, in which a single annular cartridge chamber is substituted for the cartridge pockets.

My gun perforator comprises a gun body 1 in the form of an elongated cylindrical member in which are provided a plurality of laterally directed gun bores 2. At the breech end of each gun bore the gun body is enlarged to form an internally threaded breech socket 3 of larger diameter than the gun bore. Around the gun bore and communicating with the inner end of the breech socket are a plurality of cartridge pockets 4 which extend substantially parallel with the gun bore. These pockets receive cartridges 5 which are preferably preformed or molded so as to be readily inserted therein.

Each gun bore receives a bullet 6 which has welded or otherwise secured to its inner end a shear disk 7 which is adapted to overlay the

breech end of the gun bore, so as to restrain initially the outward movement of the bullet. The outer end of the bullet is covered by a sealing plug 8 of yieldable material for the purpose of excluding well fluids.

Each breech socket 3 is closed by a breech block 9. The inner end of each breech block is provided with a central stop lug 10 which, when the breech block is in position, engages the center of the shear disk 7 to prevent inward movement of the bullet by reason of the hydrostatic pressure of the fluids in which the gun perforator may be submerged. Around the central stop lug 10 the breech block is provided with an annular clearance channel 11 which is preferably rounded so as to direct the exploding gases from the several cartridge pockets into the gun bores. The space between the inner end of the breech block and the several cartridges may be filled with an auxiliary powder charge 12, or the auxiliary powder charge may be molded as a unit with the several cartridges.

One of the cartridge pockets, preferably at a point close to the breech block, is intersected by a fuse port 13, preferably of small diameter. The fuse port is enlarged at its outer end to receive a fuse plug 15 which contains a suitable fuse element 14 preferably adapted to be fired electrically. A lead wire 16 extends from the fuse element outwardly through the fuse plug and into a suitable connector 17 which forms the terminal of a conductor 18. It is preferred to fire the several gun units in sequence; consequently, each gun unit is provided with an individual conductor and the several conductors are distributed along the gun body through one or more conductor channels 19, which are provided with suitable covers 20.

In place of the several cartridge pockets 4, an annular recess or chamber 21 may be drilled around the inner end of the gun barrel, as shown in Figure 4, and filled with either a premolded cartridge or loose powder. Because of the greater volume provided in the annular chamber its width may be less than the corresponding cartridge pockets so that the walls between the gun bore and chamber 21 may be increased in thickness. However, the walls between the cartridge pockets or the cartridge chambers and the gun bores need not be thick for the reason that by the time dangerously high pressures have been reached the bullet has moved part way down the gun bore and, consequently, the pressures are equalized in the region behind the bullet and in the several cartridge pockets or annular cartridge chambers.

Various changes and alternate arrangements may be made within the scope of the appended claims, in which it is my intention to claim all novelty inherent in the invention as broadly as the prior art permits.

I claim:

1. A gun perforator unit comprising: a body block having a breech socket, a gun bore continuing therefrom, and at least one cartridge chamber also continuing therefrom along the side of said gun bore; a bullet for said gun bore; an expansion-delay disk connected with said bullet and overlying the breech end of said gun bore; a breech block closing said breech socket and including a stop means for limiting said bullet against inward movement; and a cartridge for said cartridge chamber.

2. A gun perforator unit comprising: a gun body defining a laterally directed gun bore, a laterally directed cartridge chamber, and a breech recess embracing both the gun bore and cartridge chamber; and a breech block for said breech recess, the inner end of said breech block defining with said recess a passageway between said cartridge chamber and said gun bore.

3. A gun perforator unit comprising: a gun body defining a cartridge chamber, a gun bore, and a breech socket common to said cartridge chamber and gun bore; and a breech block closing said breech socket.

4. A gun perforator comprising: a gun body having a plurality of gun bores, cartridge chambers for said gun bores and breech recesses embracing the breech end of each gun bore and the associated cartridge chamber; and removable breech blocks for said breech recesses spaced from the inner ends of said cartridge chambers to provide communication between the gun barrels and their associated cartridge chambers.

5. A gun perforator unit comprising: a gun body defining a breech socket, a gun bore extending therefrom and a plurality of cartridge pockets surrounding said gun bore and connecting with said breech socket; and a breech block for said breech socket.

6. A gun perforator unit comprising: a gun body defining a breech socket, a gun bore extending therefrom, and an annular cartridge chamber surrounding said gun bore and communicating with said breech socket; and a breech block for said breech socket.

7. A gun perforator unit comprising: a gun body defining a cartridge chamber, a gun bore, and a breech socket common to said cartridge chamber and gun bore; a breech block closing said breech socket; a bullet for said gun bore; sealing means for said gun bore covering said bullet whereby said bullet is subjected to hydrostatic pressure of fluid in which the gun perforator unit may be immersed; said breech block

including a stop means engaging the inner end of said bullet to restrain said bullet against inward movement.

8. A gun perforator unit comprising: a gun body defining a cartridge chamber, a gun bore, and a breech socket common to said cartridge chamber and gun bore; a breech block closing said breech socket; a bullet for said gun bore; and a disk secured to said bullet and having marginal portions overlying the breech end of said gun bore to restrain initially the discharge of said bullet.

9. A gun perforator unit comprising: a gun body defining a breech socket, a gun bore extending therefrom and a plurality of cartridge pockets surrounding said gun bore and connecting with said breech socket; a breech block for said breech socket; a bullet for said gun bore; sealing means for said gun bore covering said bullet whereby said bullet is subjected to hydrostatic pressure of fluid in which the gun perforator unit may be immersed; said breech block including a stop means engaging the inner end of said bullet to restrain said bullet against inward movement.

10. A gun perforator unit comprising: a gun body defining a breech socket, a gun bore extending therefrom and a plurality of cartridge pockets surrounding said gun bore and connecting with said breech socket; and a breech block for said breech socket; a bullet for said gun bore; and a disk secured to said bullet and having marginal portions overlying the breech end of said gun bore to restrain initially the discharge of said bullet.

11. A gun perforator unit comprising: a gun body defining a breech socket, a gun bore extending therefrom, and an annular cartridge chamber surrounding said gun bore and communicating with said breech socket; a breech block for said breech socket; a bullet for said gun bore; sealing means for said gun bore covering said bullet whereby said bullet is subjected to hydrostatic pressure of fluid in which the gun perforator unit may be immersed; said breech block including a stop means engaging the inner end of said bullet to restrain said bullet against inward movement.

12. A gun perforator unit comprising: a gun body defining a breech socket, a gun bore extending therefrom, and an annular cartridge chamber surrounding said gun bore and communicating with said breech socket; a breech block for said breech socket; a bullet for said gun bore; and a disk secured to said bullet and having marginal portions overlying the breech end of said gun bore to restrain initially the discharge of said bullet.

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