July 10, 1945. G. F. TURECHEK 2,380,204

GUN PERFORATOR

Filed Nov. 24, 1943

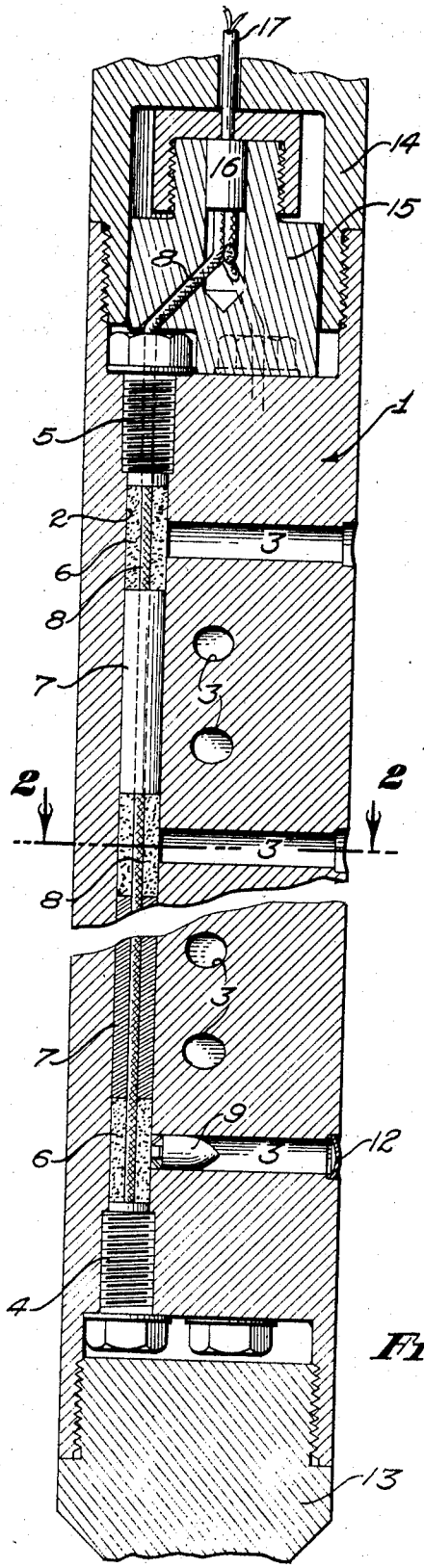


FIG. 1

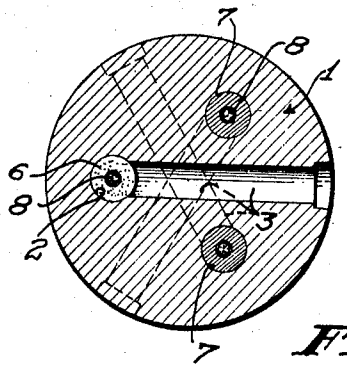


FIG. 2

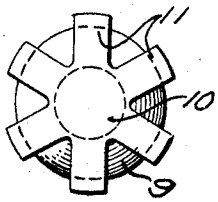


FIG. 4

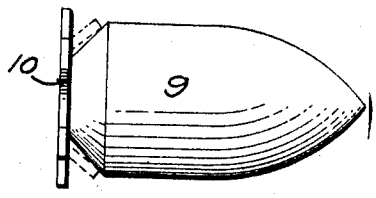


FIG. 3

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GUN PERFORATOR

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Application November 24, 1943, Serial No. 511,756

9 Claims. (Cl. 164—0.5)

My invention relates to gun perforators, that is, to devices adapted to be lowered into a well casing for the purpose of firing bullets therethrough and providing passages for the inflow of oil. Among the objects of my invention are:

First, to provide a gun perforator wherein several gun units are ignited by a common fast burning fuse cord capable of igniting all of the gun units virtually simultaneously, so that pressures develop equally in the different gun units and little or no pressure differential is created between them, thus eliminating practically all erosion caused by the flow of gases at high velocity through the connecting passages between the gun units;

Second, to provide a gun perforator which is particularly simple, yet rugged, in construction and which comprises a minimum number of parts;

Third, to provide a gun perforator which is easy to load and service; and

Fourth, to provide a gun perforator wherein the gun bores have maximum length in proportion to the gun body diameter and which is inherently capable of permitting close spacing of the gun units so that a large number of gun units may be incorporated in a gun body of given length and weight.

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 longitudinal sectional view of a gun perforator incorporating my invention;

Figure 2 is a transverse sectional view thereof through 2—2 of Figure 1;

Figure 3 is an enlarged side view of a bullet adapted to fit my gun perforator; and

Figure 4 is a base end view of the bullet.

The gun perforator includes a gun body 1 in the form of a cylindrical bar of metal having internally threaded sockets at each end. The sockets are connected by one or more longitudinal bores 2. Three such bores are shown in the drawing. Each of the longitudinal bores 2 are intersected at equally spaced intervals by laterally directed gun bores 3. The longitudinal bores are closed at their ends by upper end plugs 5 and lower end plugs 4 which are screw-threaded therein. Each longitudinal bore 2 receives a plurality of explosive cartridges 6 which are tubular in form and adapted to be positioned opposite the gun bores 3. Filler plugs 7 are interposed between the cartridges 6. The filler plugs likewise are tubular in form. The bores through the cartridges 6 and filler plugs 7 are of such size as to accommodate without excess space a fuse cord 8.

It is essential for proper operation of my gun perforator that a particular type of fuse cord be used, namely, an instantaneous burning fuse cord. One such cord known commercially as "Primacord," having an explosive core of pentaerythritetetranitrate (PETN), is satisfactory for this purpose. The ignition progresses in Primacord at the rate of about 20,350 feet per second. This is important for by such fast ignition the cartridges are caused to ignite virtually simultaneously, the fillers act, in so far as known, as if no pressure differential exists. There may be in fact, virtually no pressure differential, or it may be that the duration of any pressure differential is so short that the inertia of the filler is not overcome and hence does not move appreciably. In any event, the several explosive cartridges each fire as if the filler plugs therebetween were rigid or a part of the gun body itself. The filler plugs may be made of steel or, if desired, may be made of plastic or other substantially non-compressible material which disintegrates or fractures when subjected to the enormous compression pressures created by the ignition of the cartridges, so that they may be readily removed for reloading the gun perforator.

Each of the gun bores 3 receives a bullet 9. The bullets have preferably an ogive forward end and a frusto-conical rear or base end. To the base end is spotwelded a retaining spider 10 in the form of a disk having radiating arms 11 which, when the disk is flat, as shown by solid lines in Figures 3 and 4, define a circle slightly larger than the bullet. By reason of the clearance formed by the frusto-conical end of the bullet the arms 11 of the spider yield so that the bullet may be forced into the gun bore, but cannot be manually withdrawn. The extremities of the gun bores are closed by seal disks 12.

The lower end of the gun body is provided with a base plug 13 and the upper end is provided with a head member 14. A cavity is provided between the head member and the gun body, which cavity receives a fuse block 15 adapted to receive the fuse cords 8, and provided with a central bore in which is positioned an igniter 16. The igniter 16 is adapted to be set off by current supplied through an electrical cord 17 which extends through the head member 14 and communicates with the conductor core of a suitable suspension cable not shown.

In the structure shown one igniter is provided for all three fuse cords, so that all the bullets

are fired very nearly simultaneously. However, each of the fuse cords may be individually ignited so that the different groups of gun units may be fired separately.

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.

I claim:

1. A gun perforator comprising: a gun body defining a longitudinal bore and several laterally directed gun bores communicating with said longitudinal bore; explosive cartridge units and non-explosive filler units slidably contained and positioned in alternate succession end to end in said longitudinal bore, said cartridge units being located in said longitudinal bore opposite the points of communication with said gun bores and said filler units being located in said longitudinal bore intermediate said cartridge units; and an ignition fuse interconnecting said cartridge units.

2. A gun body comprising: a gun body defining a longitudinal bore of uniform diameter and a plurality of gun bores communicating therewith; a plurality of tubular shaped explosive cartridge units and a plurality of non-explosive tubular shaped filler units slidably contained and positioned in alternate succession end to end in said longitudinal bore, said cartridge units being located in said longitudinal bore opposite the point of communication with said gun bores and said filler units being located in said longitudinal bore intermediate said cartridge units and substantially filling the space therebetween; and a fast burning ignition cord threaded through said spacer units and cartridge units; and means for igniting said ignition cord to effect virtual simultaneous ignition of said cartridge units.

3. A single piece gun perforator comprising: a gun body defining a plurality of laterally directed gun bores; a continuous longitudinal cartridge chamber common to said gun bores; explosive cartridges for said cartridge bore adapted to be positioned opposite each of said gun bores; separate inert filler members in said cartridge bore between said cartridges; said cartridges and filler members defining a passageway extending the length of said cartridge bores; and a fuse extending continuously throughout said passageway defined by said cartridges and filler members.

4. A gun perforator comprising: a gun body defining a longitudinal bore extending end to end and a plurality of laterally directed gun bores intersecting said longitudinal bore; removable plugs closing the ends of said longitudinal bore; a plurality of explosive cartridge units and non-explosive spacer units adapted to be inserted into said longitudinal bore through its ends and arranged in alternate succession therein between said plugs, said cartridge units being positioned opposite said gun bores and said spacer units substantially filling the spaces between said cartridge units; said cartridge units and spacer units defining a continuous longitudinal passageway between said removable plugs; and means fitting said passageway for effecting initially simultaneous ignition of said cartridge units.

5. A gun perforator comprising: a gun body defining a longitudinal bore and several laterally directed gun bores communicating with said longitudinal bore; explosive cartridge units and non-explosive filler units adapted to be slipped in alternate succession into said longitudinal bore, the filler units being proportioned to fill the spaces between said cartridge units when said cartridge units are disposed opposite said gun bores; and means extending continuously through said cartridges and spacer units for effecting virtually simultaneous ignition of said cartridge units.

6. A gun perforator comprising: a gun body defining a plurality of laterally directed gun bores; a longitudinal cartridge bore common to said gun bores; explosive cartridges for said cartridge bore adapted to be positioned opposite each of said gun bores; separate inert filler members in said cartridge bore between said cartridges; said cartridges and filler members defining a passageway extending the length of said cartridge bore; and means extending continuously through said passageway for effecting virtual simultaneous ignition of said cartridges.

7. A gun perforator comprising: a gun body defining a longitudinal cartridge chamber and a plurality of laterally directed gun bores communicating therewith; successively disposed longitudinally slidable explosive cartridge units and non-explosive spacer units in said cartridge chamber; and means common to said cartridges for effecting virtually simultaneous ignition thereof, whereby, the effective pressures at the extremities of each spacer unit remain substantially equal and hold said spacer units against displacement in said longitudinal cartridge chamber.

8. A gun perforator comprising: a gun body in the form of a single piece cylindrical block defining at least one longitudinal continuous bore of uniform diameter and longitudinally spaced laterally directed gun bores intersecting said longitudinal bore; a plurality of explosive cartridges and non-explosive filler blocks of equal diameter slidably mounted in alternate succession in said longitudinal bore, the cartridges being opposite said gun bores; and a means connecting said cartridges in series whereby the cartridges may be ignited virtually simultaneously to maintain, in effect, substantially equal and opposite pressures against the extremities of said filler blocks.

9. A gun perforator comprising: a gun body in the form of a single piece cylindrical block defining at least one longitudinal continuous bore of uniform diameter and longitudinally spaced laterally directed gun bores intersecting said longitudinal bore; a plurality of tubular explosive cartridges and tubular filler blocks slidably fitting and completely filling said longitudinal bore, the cartridges being disposed opposite said gun bores; and means threaded through the bores of said cartridges and filler blocks to connect said cartridges in series whereby the cartridges may be ignited virtually simultaneously to maintain, in effect, substantially equal and opposite pressures against the extremities of said filler blocks.

GEORGE F. TURECHEK.