March 10, 1942. C. C. COLE 2,276,161

GUN TYPE CASING PERFORATOR

Filed July 5, 1940

Fig. 1

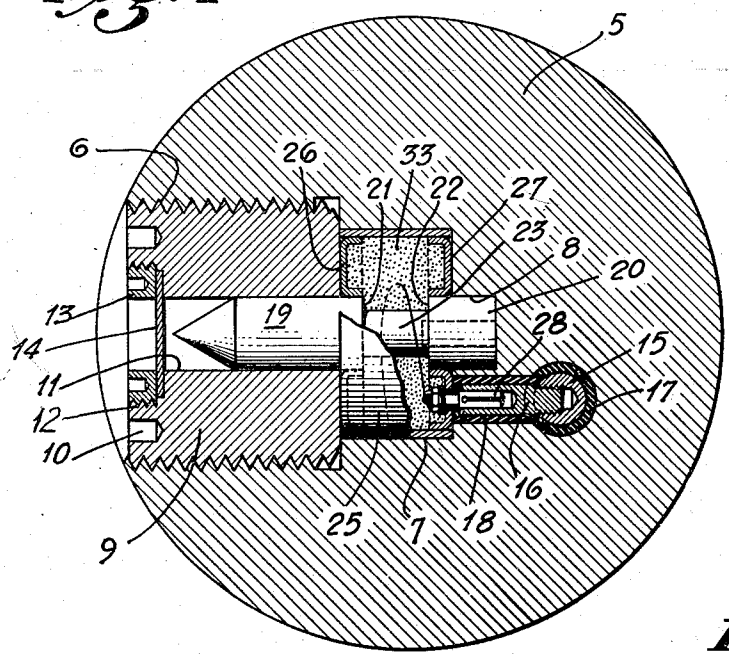


Fig. 2

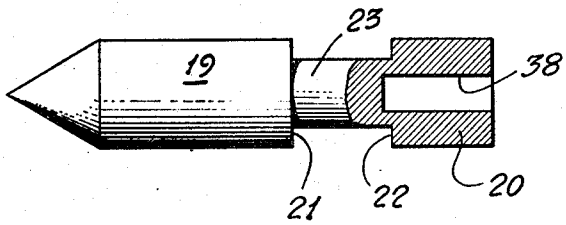


Fig. 3

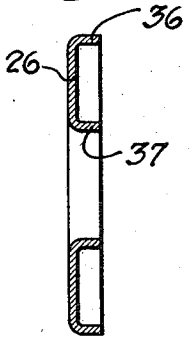
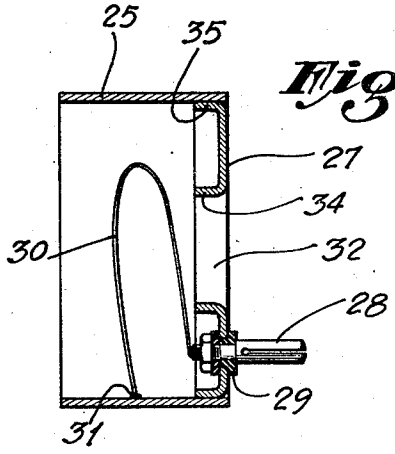


Fig. 4



INVENTOR.

C. C. Cole

Patented Mar. 10, 1942

2,276,161

UNITED STATES PATENT OFFICE

2,276,161

GUN TYPE CASING PERFORATOR

Cawthern C. Cole, Whittier, Calif.

Application July 5, 1940, Serial No. 344,115

21 Claims. (Cl. 164—0.5)

This invention relates to improvements in gun perforators of the type intended for perforating casing in well bores.

Included in the objects of my invention are the following:

First, to provide a novelly constructed projectile, the use of which compensates for the restricted barrel length of perforating guns adapted for operation inside of well casing.

Second, to provide an explosive receptacle of novel construction which may be readily assembled on the projectile.

Third, to provide a novel gun constructed to receive the projectile and explosive receptacle and incorporating a seal resistant to external fluid pressure and particularly rugged electrical conductors and contacts.

Other objects and advantages of the invention will become apparent hereinafter and in the accompanying illustrative drawing, in which:

Fig. 1 is a transverse sectional view through a cylindric gun body showing the projectile barrel, explosion chamber and breech bore, in longitudinal section, the projectile in elevation and the explosive receptacle partly in elevation and partly in longitudinal section.

Fig. 2 is a view of the projectile partly in elevation and partly in longitudinal section.

Fig. 3 shows an explosive receptacle end in longitudinal section.

Fig. 4 is a view of the explosive receptacle, less the end illustrated in Fig. 3, in longitudinal section and the electrical contact and firing members in elevation.

Referring to Fig. 1, 5 designates the gun body which provides the laterally directed and threaded bore 6, explosion chamber 7 and breech bore 8. Barrel 9, providing wrench sockets 10 and projectile bore 11, is threadably inserted in bore 6. Counter bore 12 threadably receives ring nut 13 which serves to retain in place sealing plate 14. As illustrated, electrical conductor rod 15 threadably receives socket member 16. The numerals 17 and 18 designate insulating sleeves for conductor 15 and socket 16 respectively.

My projectile as illustrated in Fig. 2 comprises penetrating end 19, rearward end 20, bore 38 formed therein, opposing faces 21 and 22 and the intervening connecting portion 23.

In Figs. 3 and 4, which illustrate the explosive receptacle or cartridge of my invention, 25 designates the outer shell thereof; said shell being preferably tubular in form and adapted to receive by means of a force fit the annular, skirted ends 26 and 27, each providing outer and inner skirts 36, 37 and 35, 34 respectively.

Split, electrical contact plug 28 is insulated from skirted end 27 by means of bushing 29 and has secured to its inner end detonating wire 30 which in turn is grounded to shell 25 at 31.

In the assembly of the cartridge upon the projectile, the end 20 thereof is passed through the loop of detonator 30 and into skirted aperture 32, making a tight fit therewith.

The shell is then filled with an explosive material 33 and end 26 forced into position, the outer skirt 36 engaging the inner surface of shell 25 and inner skirt 37, engaging projectile end 19. The fit in each case being sufficiently tight to permit handling. The assemblage as above described is clearly illustrated in Fig. 1, in which it will be noted that projectile end 20 is inserted in breech bore 8 and plug 28 is received by and makes electrical contact with socket 16. Conductor rod 15 extends to a controlled source of electrical energy for actuating detonator 30.

The patent literature affords examples of cylindric type perforating guns providing laterally directed bores and incorporating electrical firing circuits, consequently such circuits are not illustrated here.

With projectile and explosive cartridge positioned in the gun, as above described, and with barrel 6 and sealing member 14 in place, all as illustrated in Fig. 1, detonation of the explosive causes explosion pressure to be exerted against the projectile opposing faces 21 and 22, thereby subjecting the connecting portion 23 to longitudinal tension. For a given pressure in the explosion chamber the force acting against faces 21 and 22 depends upon the areas thereof. In the practice of my invention I prefer to construct the projectile with faces of such an area and bore 21 of such a size that rupture of portion 23 occurs when substantially maximum explosive pressure is reached in the explosion chamber; bore 38 being for the purpose of decreasing the resistance of portion 23 to tension or break. For given areas of faces 21 and 22 the magnitude of the pressure in the explosion chamber required to rupture portion 23 is determined by the size of recess or bore 38.

Thus it will be seen that I have provided a projectile for use in the short barrel of a gun perforator the propulsion of which is delayed until maximum explosive pressure is reached and connecting portion 23 is broken, thereby compensating for the necessarily short barrel.

In a copending application entitled "Projectiles

and barrels for gun type perforators," filed August 7, 1939, Serial No. 288,853, I describe a projectile for gun perforators which, however, bears no structural relationship to the invention herein disclosed.

It will be seen that my invention is subject to various modifications. By way of examples, rearward face 22 may be made larger, but obviously not smaller than face 22. Bore 38 may be extended and enlarged at its inner end so that break will occur adjacent face 21. Although I prefer to insert projectile end 20 in breech bore 8, it will be apparent that a skirted end 27 or like element may serve as a seal to prevent pressure building up behind the projectile. It will further be seen that faces 21 and 22 may take any form so long as the effect of explosive pressure thereagainst is to rupture portion 23.

Although I have described and illustrated in detail a particular embodiment of my invention, I desire it to be understood that no limitations upon the invention are intended other than those imposed by the scope of the appended claims.

I claim:

1. A projectile for gun perforators providing opposing faces and a connecting portion therebetween frangible by total explosive propulsive pressure against said faces.

2. A projectile for gun perforators providing forward and rearward faces arranged in opposition, the effective area of the rearward face being at least as great as that of the forward face, and means connecting said faces rupturable by total explosive propulsive pressure exerted against said faces.

3. A projectile for gun perforators comprising a penetrating end, a rearward end and an intervening connecting portion of reduced cross-sectional area relative to said ends whereby opposing faces are formed, said portion being rupturable by total high explosive propulsive pressure against said faces and resistant to rupture at initial pressure.

4. A projectile for gun perforators comprising a penetrating end, a rearward end and an intervening connecting member of reduced diameter relative to said ends whereby opposing faces are provided, said member being rupturable by total propulsive pressure against said faces.

5. A projectile for gun perforators providing surfaces arranged in opposition and intervening connecting portions rupturable by total explosive propulsive pressure against said surfaces.

6. A projectile for gun perforators comprising a forward end, a rearward end providing a bore, and a portion of less outside diameter than said ends connecting the same together whereby opposing surfaces are formed, said portion being frangible by total explosive, propulsive pressure against said surfaces.

7. A cartridge for gun perforators comprising an outer shell, annular ends in said shell having outer and inner peripheral skirts directed into said shell.

8. A cartridge for gun perforators comprising an outer shell, annular ends in said shell having outer and inner peripheral skirts directed into said shell, and including electrical contact and detonating means.

9. In a gun perforator a gun body providing a muzzle bore, rearwardly therefrom a breech bore and an explosion chamber having a relatively greater area than said bores intermediate the same.

10. In a gun perforator a gun body providing an explosion chamber, a breech bore in the rearward wall thereof, a counterbore at the outward end, a bored barrel in said counterbore and means securing said barrel in said counterbore.

11. A combination as in claim 10; said barrel providing a counterbore at the muzzle thereof and sealing means therein.

12. In a gun perforator the combination of a cartridge having apertured ends, the outer and aperture peripheries thereof having inwardly directed skirts, a projectile extending through said apertures and engaging the skirts thereof, said projectile having a portion of reduced section inside of said cartridge whereby opposing faces are formed.

13. In a gun perforator the combination of a projectile and an explosive receiving cartridge, said projectile extending through said cartridge and outwardly therefrom and having a portion of reduced cross-sectional area inside of said cartridge whereby opposing surfaces are formed, said portion being rupturable by total explosive propulsive force against said surfaces.

14. In a gun perforator, a gun body providing a muzzle bore, rearwardly therefrom a breech bore and an explosion chamber intermediate said bores, a projectile comprising a penetrating end, a rearward end and an intervening connecting portion of reduced cross-sectional area whereby opposing surfaces are formed, said penetrating end positioned in said muzzle bore, said rearward end positioned in said breech bore and said intervening connecting portion extending across said explosion chamber, the opposing surfaces facing into said explosion chamber.

15. A combination, as in claim 14, including an explosive receiving cartridge mounted on said projectile and positioned in said explosion chamber.

16. In a gun perforator the combination of, a gun body providing an explosion chamber, a breech bore in the rearward wall thereof, a counterbore at the outward end, a bored barrel in said counterbore and means releasably securing the same therein; a projectile having its penetrating end positioned in said barrel bore, its rearward end in said breech bore and a connecting portion of reduced cross-sectional area between said projectile ends extending across said explosion chamber, said projectile ends thereby providing opposing surfaces facing into said explosion chamber; an explosive receiving cartridge mounted on said projectile and positioned in said explosion chamber; electrical contact and detonating means for firing a charge of explosive in said cartridge and including sealing means in the muzzle end of said barrel bore.

17. In a gun perforator, the combination of, a body having a barrel formed therein, an explosion chamber rearwardly therefrom, a projectile having its penetrating end positioned in said barrel and its rearward end in said chamber and having a portion of relatively restricted section securing said ends together whereby opposing surfaces are formed facing into said chamber, said portion being rupturable by explosive pressure against said surfaces and sealing means adjacent said rearward end whereby total, explosive, propulsive pressure is prevented from building up rearwardly of said end.

18. A projectile for gun perforators providing opposing surfaces, a recess extending from the rearward end thereof and a member connecting said surfaces rupturable adjacent the longitu-

dinal inner end of said recess by explosive pressure against said surfaces.

19. In a gun perforator the combination of a gun body providing a bore, a projectile positioned in said bore providing opposing surfaces and means connecting said surfaces rupturable by total explosive propulsive pressure against said surfaces, and sealing means adjacent the rearward end of said projectile whereby explosive pressure is prevented from building up rearwardly of the same.

20. In a gun perforator the combination of a gun body providing a bore, a projectile positioned in said bore and providing opposing surfaces, means connecting said surfaces resistant to rupture by initial explosive pressure exerted against said surfaces and rupturable by subsequent total, propulsive pressure against the same whereby the propulsion of said projectile is delayed until maximum explosion force is built up.

21. In a gun perforator the combination of a projectile and an explosive receiving cartridge mounted thereon, said projectile extending through said cartridge and providing opposing surfaces facing into the same and means connecting said surfaces rupturable by total explosive propulsive pressure thereagainst.

C. C. COLE.