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G. F. TURECHEK

2,358,951

PERFORATOR GUN

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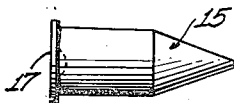
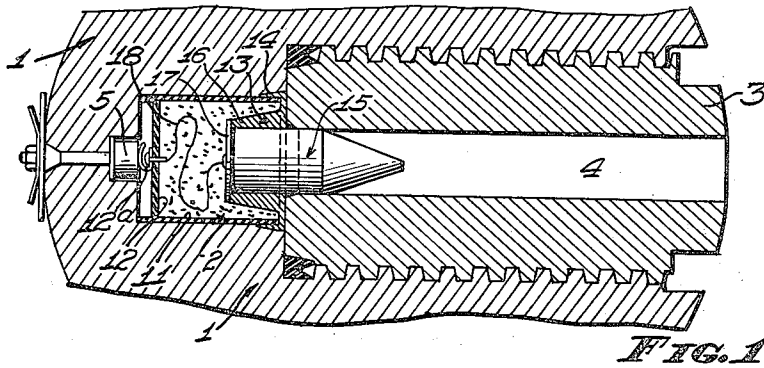


FIG. 2

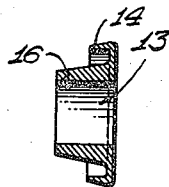


FIG. 3

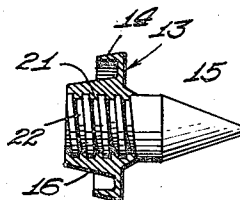


FIG. 4

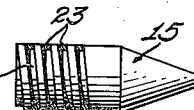


FIG. 5

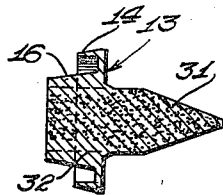


FIG. 6

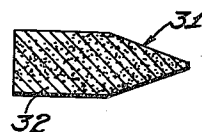


FIG. 7

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2,358,951

PERFORATOR GUN

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4 Claims. (Cl. 89-1)

My invention relates to gun perforator cartridges, that is, to cartridges designed to be used in gun perforators which are lowered within well casing for the purpose of opening the casing to the surrounding formation. Among the objects of my invention are:

First, to provide a gun perforator cartridge which increases the effective length of the gun perforator barrel with which the cartridge is associated;

Second, to provide a gun perforator cartridge which is particularly designed for use in connection with a gun perforator of the type shown in the Johnston Patent No. 2,048,451 issued July 21, 1936, or the Lane Patent No. 2,062,974 issued December 1, 1936, or the Turechek Patent No. 2,092,294 issued September 7, 1937;

Third, to provide a gun perforator cartridge which increases the penetration of the gun perforator in which it is used; and

Fourth, to provide a cartridge of this kind which lends itself to the provision of adequate bullet-delaying means whereby the desired propelling pressure may be built up in the powder chamber before the bullet is released.

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 sectional view through a gun unit of a gun perforator, showing my special cartridge positioned therein and partially in section;

Figure 2 is an elevational view of the bullet used in my cartridge;

Figure 3 is a sectional view through the bullet retainer;

Figure 4 is a partial elevational, partial sectional view of a modified form of bullet and retainer;

Figure 5 is a similar view showing the appearance of the bullet after it has been fired from the cartridge;

Figure 6 is a sectional view similar to Figure 4, showing a further modified form of bullet and retainer; and

Figure 7 is a view similar to Figure 5, showing the bullet as it appears immediately after discharge of the cartridge.

The gun perforator for which my cartridge is especially adapted comprises a gun body 1 having a socket formed therein, at the inner end of which is provided a cartridge chamber 2. Outwardly from the cartridge chamber the socket is enlarged and internally threaded to receive a gun barrel 3 having a gun bore 4 therethrough which

is coaxial with the cartridge chamber and of somewhat smaller diameter. The inner end of the cartridge chamber 2 may be provided with a suitable contact plug 5.

My cartridge comprises a cylindrical shell 11 formed of fiber or analogous insulating material. The inner end is closed by an insulation disc 12 which carries a contact 12a adapted to engage the plug 5. The other or forward end of the shell 11 is covered by a retainer ring 13. The outer periphery of the ring 13 is provided with a rearwardly directed skirt 14 which fits over the end of the shell 11. The ring has a central bore to accommodate a bullet 15 and is provided around the bore with a rearwardly directed rim or sleeve 16 which extends into the shell 11 and forms, in effect, a continuation of the gun barrel 3. The ring rests against the inner end of the gun barrel and the skirt 14 serves to limit the pressure area against the gun barrel to the diameter of the retainer ring, as more fully set forth in the aforementioned Patent No. 2,092,294.

The bullet 15 is provided at its rear end with a shear disc 17 which may be welded thereto and which is of larger diameter so that its margin rests upon the inner end of the rim 16. A fuse wire 18 is connected by one end to the shear disc 17 and by its other end to the contact 12a.

The cartridge is filled with an explosive powder 19 and the cartridge is preferably assembled by placing the bullet and retainer ring on the shell 11, then filling the shell with powder and placing the retainer ring 13 thereover. In this manner the powder may be packed in tightly so that the desired powder pressures may be generated. The cartridge is loaded as a unit in the gun so that all loading of the powder directly into the gun, or other handling of the powder itself, in conjunction with loading the gun is eliminated.

With the shear disc 17 provided, as shown in Figures 1, 2 and 3, a fire delay or expansion delay is obtained which is comparable to that obtained in the gun perforator of the type disclosed in the above entitled patents. By reason of the rearward extension or rim 16 the effective length of the barrel 3 is increased. This is highly important for, assuming a bullet of given mass, the penetration increases materially with increased length of barrel. Increase in the mass of the bullet also increases penetration, thus the increased effective barrel length may be utilized by increasing the length of the bullet 15 so that its mass is greater without shortening the length of the bullet. It will be noted that the walls of

the extension or rim 16 are made relatively heavy and are tapered. However, they do not have to withstand the internal stresses of the barrel 4 for the reason that the powder charge is packed around the outside of the extension. Before the disc 17 ruptures, the bullet supports the extension and after the disc gives way the pressures are equalized.

If it is desired to increase the delayed fire effect so as to impart higher acceleration to the bullet, this may be done by the arrangement shown in Figures 4 and 5. The retainer here shown is the same as that illustrated in Figures 1 and 3, with the addition that internal threads 21 are provided in the bore of the retainer, which threads cooperate with threads 22 provided on the bullet 15. These threads are preferably square and relatively shallow so that the effective diameter of the bullet is decreased a minimum amount. Upon generating a predetermined pressure within the cartridge the threads shear as shown best in Figure 5 and form, in effect, piston rings 23 around the thread 22 of the bullet, which tend to prevent gas leakage around the bullet.

A still further modification is illustrated in Figures 6 and 7. In this construction the bullet 31 is formed of tungsten carbide and the retainer (similar in form to that previously described) is molded or cast upon the bullet itself, or it may be drop-forged or otherwise pressed in place, inasmuch as the tungsten carbide is capable of withstanding the necessary heat. Within the extremities of the retainer the tungsten carbide particles of the bullet do not extend to the full bullet's diameter so that the tungsten carbide bullet itself is not placed in shear, but only the metal comprising the retainer. Thus, after the bullet is sheared from its retainer a comparatively soft shell 32 is formed around the rear end of the bullet and tends to form a gas seal.

Inasmuch as tungsten carbide has almost twice the density of a steel bullet, it can be seen that the increased mass will materially increase the penetrating power of the bullet. Thus, with the construction shown in Figures 6 and 7 there is gained not only the increased barrel length, but also the fire-delay effect may be materially increased and, in addition, the mass of the bullet for a given size may be materially increased.

The material comprising the retainer is, of course, selected to develop a predetermined shear strength so that the desired pressure is generated before the bullet shears from the retainer. All three of these factors together tend to increase penetration, and the added penetration is, in effect, the sum of the individual factors named. This is not to mention the further advantage gained, namely, the tight packing of the explosive charge in the powder chamber made possible by the unitary construction of the gun cartridge as a whole.

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. The combination with a gun perforator having a gun unit in which is provided a gun barrel having a bore therethrough and an explosive chamber at the inner end of the gun barrel, of a cartridge comprising: a shell adapted to contain an explosive and fit said chamber; an axially directed barrel extension fitting an end of said shell and abutting said gun barrel bore to form an extension thereof; an integral skirted flange radiating from said barrel extension and overlapping the periphery of said shell to localize the pressure generated therein; and a bullet within said barrel extension and projecting partially into said gun barrel bore.
2. A combination, as set forth in claim 1, wherein means are provided between said bullet and said barrel extension to restrain said bullet until the pressure within said shell exceeds a predetermined value.
3. A combination, as set forth in claim 1, wherein the bullet is integral with said barrel extension and forms therewith a cleavage face which is substantially coaxial with said gun barrel, adapted to give way when the pressure within said cartridge exceeds a predetermined value.
4. A combination, as set forth in claim 1, wherein a screw-threaded connection is provided between the bullet and barrel extension, said connection being designed to give way when the pressure within said cartridge exceeds a predetermined value.

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