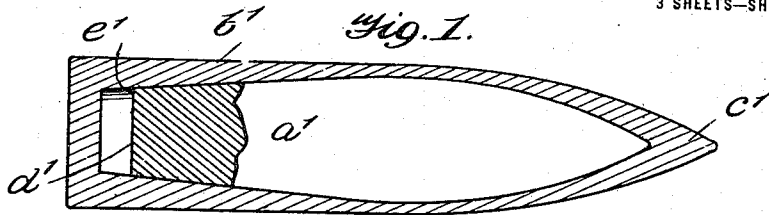
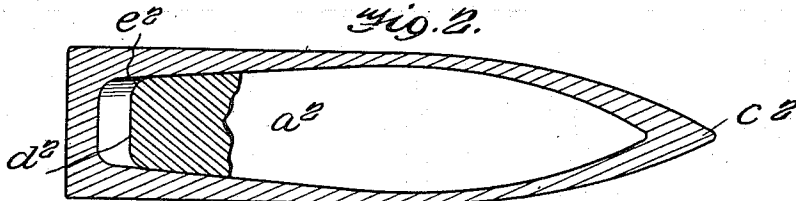
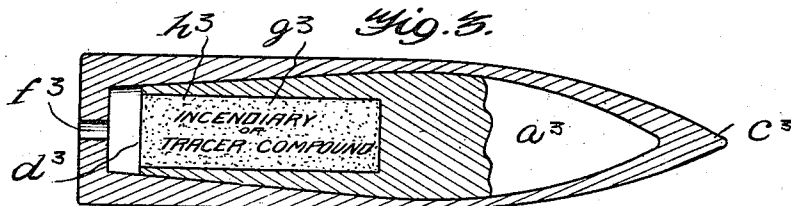
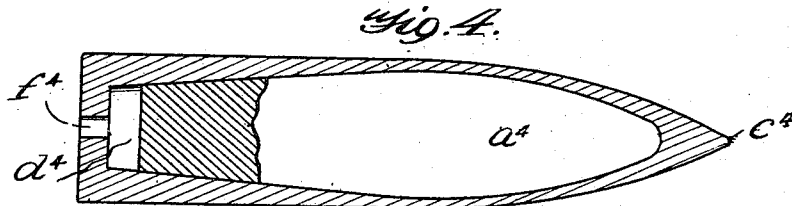
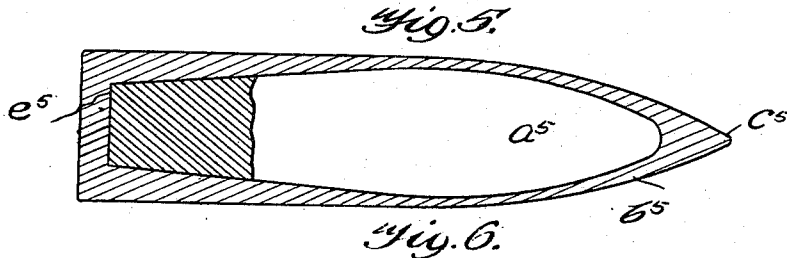
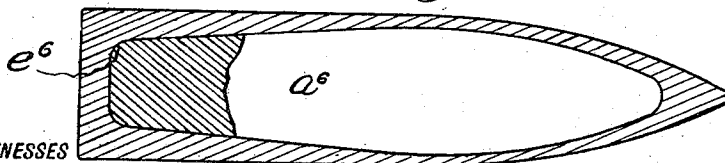


T. A. BOWERS.
ARMOR PIERCING PROJECTILE.
APPLICATION FILED SEPT. 25, 1917.

1,294,329.

Patented Feb. 11, 1919.
3 SHEETS—SHEET 1.



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3 SHEETS—SHEET 2.

Fig. 7.

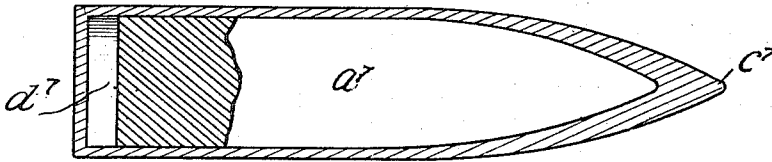


Fig. 8.

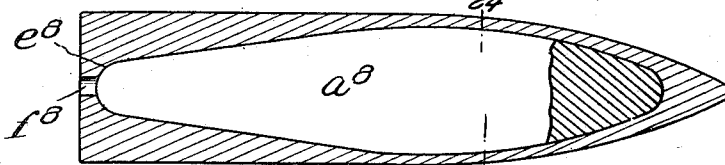


Fig. 9.

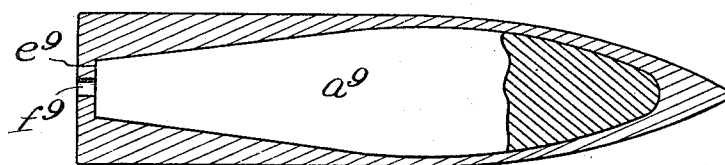


Fig. 10.

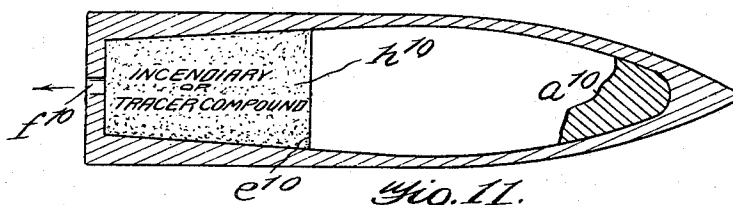


Fig. 11.

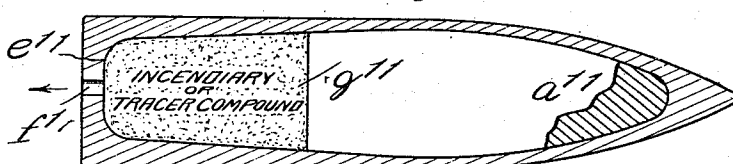
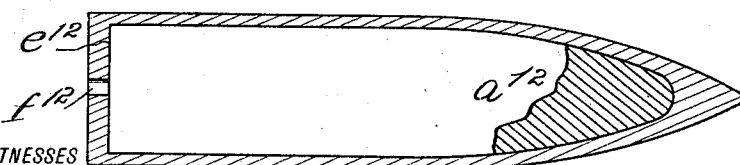


Fig. 12.



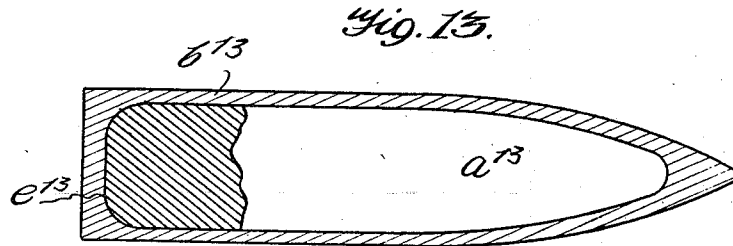
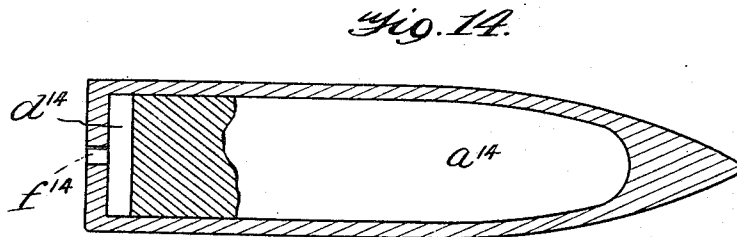
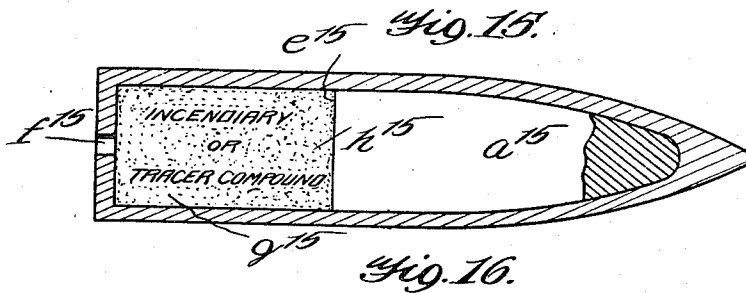
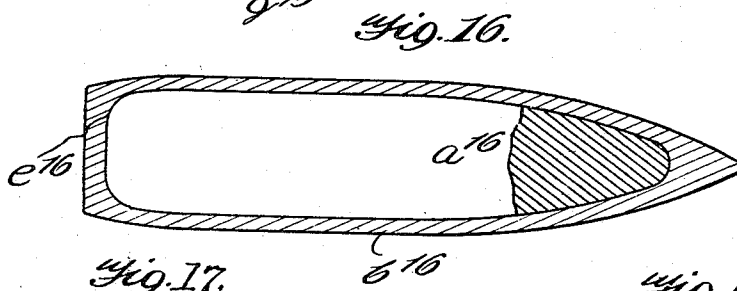
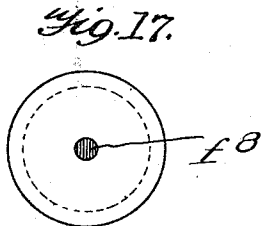
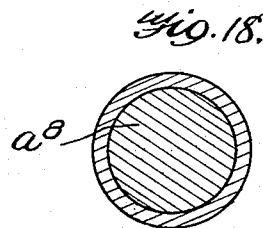
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3 SHEETS—SHEET 3.



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ARMOR-PIERCING PROJECTILE.

1,294,329.

Specification of Letters Patent.

Patented Feb. 11, 1919.

Application filed September 25, 1917. Serial No. 193,148.

To all whom it may concern:

Be it known that I, THOMAS A. BOWERS, a citizen of the United States, and a resident of Brookline, in the county of Norfolk and State of Massachusetts, have invented a new and useful Improvement in Armor-Piercing Projectiles, of which the following is a specification.

The object of my invention is to produce an armor piercing bullet or projectile in the simplest manner and at the minimum cost which will be accurate in flight, will not injure the gun barrel to any appreciable extent, will penetrate to the maximum extent through the toughest, hardest material, and in doing so, its core or body portion will remain intact without shattering.

In order to accomplish this object, I provide a hard core or body portion for purposes of penetration and which presents relatively softer outer portions for pressure-receiving, barrel-filling, and impact-cushioning purposes. In practice, I prefer to make these softer outer portions in the form of a jacket or casing which covers the periphery, the base and the nose of the harder core. Thus, the entire bullet may be formed of only two parts or pieces.

The relative shapes of the core and its jacket are such that at the instant of firing, the pressure on the base of the jacket and the inertia of the core cause the metal at the rear end to flow or be forced forwardly and the metal encircling the core to expand diametrically to completely fill the barrel and the rifling thereof. This is of great importance as it prevents leakage of gas past the bullet and consequent loss of pressure and barrel erosion, insures accurate traverse of the bore and resulting accuracy in flight, and gives these advantages and results even though the barrel be materially worn or eroded. This forward and expanding movement of the jacket portions relatively to the core may be accomplished by a variety of different shapes and forms of the core and jacket. I may and preferably do make the core smaller at its extreme rear end than at an intermediate portion, the core being tapered rearwardly or rounded at the end. In conjunction with said tapering or rounding, or even without it, I may leave an air chamber between the rear of the core and the rear of the jacket, thereby allowing for the desired forward movement of the rear

of the jacket and the expansion of the encircling portion.

The portion of the jacket covering the nose, being softer than the core, is of importance in that at the instant of impact with a harder substance, such as an armor plate, it acts as a cushion, thereby preventing the core from shattering or glancing, straining the plate before the core reaches the latter to exert the main breaking impact, and probably by softening or melting, lubricating the core in its passage through the plate.

The core is of hard and tough material such for instance as tempered steel while the jacket is of softer, ductile, tough material of sufficiently high melting point to resist the high temperature and friction in the gun barrel, such, for instance, as copper or copper alloy.

My invention is illustrated in the accompanying drawings forming part of this application, in which:—

Figures 1, 2, 3, 4, 7 and 14 are longitudinal sectional views through different forms of bullets, each of the forms having a void near the rear end,

Figs. 5, 6, 8 and 9 are similar sections through bullets which have a tapered body portion but without the void.

Figs. 10, 11 and 15 are similar sections showing a space in the rear of the body portion of the bullet for combustible material for forming incendiary bullets.

Fig. 12 is a similar section of a bullet having a cylindrical body but provided with an aperture in the base of the jacket.

Fig. 13 is a similar section of a bullet having a substantially cylindrical body portion but rounded at the rear end.

Fig. 16 is a similar section showing a bullet similar to Fig. 13 but having the jacket itself slightly rounded or tapered to form a boat-tail rear portion, giving a stream line form,

Fig. 17 is a rear view of the bullet shown in Fig. 8, and

Fig. 18 is a section on the line 24—24 of Fig. 8.

All of the bullets or projectiles illustrated herein have certain generic features. They all have a body portion which is hard and tough. This body portion is preferably made of steel. Each bullet has an outer portion which is made of comparatively soft

uctile metal such as copper. The outer portion covers the front end of the body or core to form a soft nose of greater or less length which is integral with the outer portion or jacket. Each of the bullets is designed to expand on firing to fill the bore of the gun so as to make a tight fit thereby increasing the accuracy of the bullet.

Referring now to the drawings it will be seen that in Fig. 1 I have shown a bullet having a body portion a^1 which is preferably of steel and having a jacket b^1 of softer metal such as copper. The body portion a^1 is tapered toward the front to facilitate the piercing of the armor plate. The entire body portion is inclosed by the jacket, the front portion of the latter being tapered to a point and of considerable increased thickness at the point so as to form the nose c^1 . The body portion a^1 terminates short of the rear portion of the jacket b^1 so as to leave a void d^1 . It will be noted that the rear portion of the body a^1 is tapered and that the jacket is tapered similarly, the outer surface of the jacket being cylindrical to fit the bore. It will also be noted that the rear end of the body portion is flat and has a sharp edge as shown at e^1 . This is not essential as an even better forward forcing or flowing of the metal may be secured by rounding this edge or the rear end d^2 of the body portion a^2 as shown at e^2 in Fig. 2. The construction shown in Fig. 2 differs from that of Fig. 1 only in the rounded edge or end and the corresponding rounding in the rear end of the jacket. The forward forcing or flowing of the metal along the sides of the body portion to increase the diameter of the bullet and thereby fit the barrel and the rifling also involves a slight increase in the diameter of the extreme rear end of the shell.

In Fig. 4, I have shown a construction similar in most respects to Fig. 1 except that an opening f^4 is formed through the base of the jacket in the rear of the void d^4 so as to facilitate the expansion and movement of the rear end of the jacket during the forcing of the jacket metal along the taper of the body a^4 .

It is not essential that a void be left in the rear of the body portion as the pressure of the gas and the inertia of the body portion or core is sufficient to cause the desired flow or movement of the jacket metal particularly if the core or body be tapered toward the rear. In Fig. 5, I have shown a construction similar in most respects to that shown in Fig. 1 except that no void is left. The rear end e^5 of the body a^5 fits snugly against the rear of the jacket b^5 . Although I have shown the rear end flat, yet, as in Fig. 2, the movement of the jacket metal is facilitated by the rounding of the end of the body and in Fig. 6 I have shown

a construction similar to Fig. 5 but with the rear end e^6 of the body a^6 rounded as in Fig. 2.

By the use of the void, it is not absolutely essential that the body portion be either tapered toward the rear or rounded at the rear end as the mere leaving of a void will allow the forward movement of the rear end of the jacket and the corresponding compression or flowing of the metal along the periphery of the body to expand the jacket diametrically. In Fig. 7, I have shown such a construction in which the body a^7 is cylindrical and flat at the rear end but the relative movement of the jacket is facilitated by the void d^7 .

The extent of the taper of the rear portion of the body may be varied. For instance, in Fig. 8, I have shown a construction somewhat similar to that of Fig. 6 except that the rear of the body a^8 is tapered to a very much greater extent and the end e^8 is more nearly hemispherical. The provision of an aperture f^8 facilitates the flow or forward and expanding movement of this larger amount of jacket metal. It is of course evident that the rear end of the body may be flat instead of rounded as shown at the end e^9 of the body a^9 in Fig. 9. Here, there is also provided the aperture f^9 for the same purpose as in Fig. 8. The aperture, by facilitating the expansion or enlargement of the base permits of the use of a core or body portion which is substantially cylindrical at its rear portion, as for instance the body a^{12} shown in Fig. 12. This has a flat rear end e^{12} but the jacket has a central aperture f^{12} . It is important that the jacket cover a substantial portion of the base of the bullet and that the aperture be small compared to the diameter of the bullet so as to present a large portion of the base of the jacket for the propelling pressure.

The body portion which is cylindrical throughout the major portion of its length as in Fig. 12, will operate more satisfactorily if the rear end be rounded or if a void be left behind the body. In Fig. 13, I have shown such a body portion a^{13} with a rounded end e^{13} completely filling the rear of the jacket b^{13} without void or aperture, and in Fig. 14 I have shown a bullet similar to Fig. 12 but with a void d^{14} behind the body a^{14} and with the aperture f^{14} instead of the rounded corners as in Fig. 13. In the various different forms I have shown the points of the body comparatively sharp in some instances and very much more rounded and blunt in others, indicating that the particular shape of this point is no important portion of my invention and may be varied to give the best penetrating effect.

From the foregoing, it will be seen that I may secure the forward forcing, sliding

or flowing of the metal of the jacket to increase the diameter of the jacket, and thereby fill the barrel and engage the rifling, by various different coacting shapes of body and jacket. Preferably, this is accomplished by a tapering of the rear portion of the body although it may be accomplished by the mere rounding of the end of the body, or by a void in the rear of the base end of the body and is facilitated by an aperture in the center of the base of the jacket which is not sufficiently large to prevent a substantial portion of the propelling pressure to be exerted on the jacket instead of the body alone. The tapered body, rounded end, void and aperture may be employed separately or may all be combined in one construction, or combined in various combinations as indicated in the drawings. They all contribute to the same desired result.

A void is provided at the rear end of the body portion in Figs. 1, 2, 3, 4, 7 and 14. In this construction when the bullet is fired the pressure at all times will tend to force the jacket forward and owing to the inertia of the body portion the latter will move relative to the jacket and will cause the jacket to expand. This is especially true in Figs. 1 and 2 in which the body portion is tapered toward the rear. The bullet is so formed that substantially all of the pressure is received on the copper base. This base or pressure receiving portion is of a thickness sufficiently great to insure the transmission of the pressure to the peripheral part of the jacket and insure the expansion of the latter. In practice it is made of substantially the same thickness as the average thickness of the peripheral wall portion of the jacket. It will be noted that the taper is such as to cause an even expansion all around so that the major axis of the bullet is not disturbed. This insures the accuracy of the bullet.

In Figs. 7 and 14 the expanding of the jacket is due rather to a flowing of the metal. In the ordinary rifle the pressure is from 48,000 to 50,000 pounds per square inch while the copper which may be used will flow at a lower pressure, the pressure being sufficient to expand the jacket so as to fit tightly in the bore and thus permit the bullet to follow the rifling, even if the gun has been slightly worn.

In Figs. 5 and 6 there is no void and the expansion of the rear end of the jacket depends entirely upon the pressure of the charge but, as stated, this is great enough to cause the end of the jacket to be pushed forwardly along the taper of the core and thereby expanded so as to engage the grooves of the rifle and to follow them, thus insuring the accuracy of the bullet.

In Figs. 8 and 9 I have shown an open-

ing leading rearwardly from the body portion, this opening being small enough to permit the major portion of the pressure to engage the softer metal and not the body portion of the bullet. This opening is desirable as it aids in permitting the forward flow or movement of the metal of the jacket but it is not essential and may be omitted as in Figs. 1, 2, 5, 6, 7, 13 and 16, whether a void be used or not.

In Fig. 13 there is no opening.

In Figs. 3, 10, 11 and 15, I show various forms of the incendiary or tracer bullets. In each of these forms an opening extends rearwardly from the chamber in which the combustible material is held so as to permit the products of combustion to escape. The jackets, however, are made of comparatively soft metal as in other instances, so that they will expand.

In Fig. 3, the incendiary compound g^3 is contained within a chamber h^3 formed within the body or core and a similar chamber may be employed in any of the other bodies which are inclosed within a jacket having an aperture corresponding to the aperture f^3 of Fig. 3. The void in this construction not only aids in the forward and expanding movement of the jacket at the instant of firing, but also forms an air chamber to aid in the combustion of the compound. Instead of placing the compound directly within a chamber of the body, it may be placed in the rear of the body as in Figs. 10, 11 and 15.

In Figs. 10 and 11, I have shown the bodies a^{10} and a^{11} slightly tapered toward their rear ends to facilitate the forward and expanding movement of the jacket although this is not an essential inasmuch as the pressure on the base of the jacket will tend to expand the walls inclosing the compound h^{10} or j^{11} .

In Fig. 15, I have shown the jacket of uniform thickness and the rear portion of the body a^{15} cylindrical but the same expansion and filling of the barrel is produced by the pressure on the base of the bullet and the inertia of the body.

From the foregoing description of this form of my device, the operation thereof may be readily understood. The bullet is carried by the cartridge and is inserted in the gun in the usual manner. If the barrel should be worn, the bullet may fit loosely. Now, when the bullet is fired, the inertia of the body portion causes the casing to be driven forward, and since the interior of the casing is tapered, the sides of the bullet will tend to force the walls of the casing outwardly. That is to say, it will expand the bullet until it fits snugly in the bore. It will be observed that the cylindrical casing is expanded equally at different points of its length, because of the fact of the ta-

pered portion of the bullet—i. e., the body portion, and of the interior of the casing. The farther the body portion is pushed into the casing or, putting it another way, the farther the casing is pushed over the body portion, the greater will be the expansion of the casing. But the bullet as a whole retains its central position, but merely enlarges to fill the size of the bore and to engage the rifling of the bore.

It will also be observed that the bullet is made of only two pieces, but in use it is virtually a one-piece bullet, that is to say, it does not fly apart after leaving the gun, as would be the case if the bullet had an auxiliary expansion member associated with it but not forming part of the bullet itself. The outer casing presents very little resistance to the air, owing to its stream lines.

I desire to call particular attention to the fact that my two-piece bullet construction dispenses with the use of lead or similar metal which melts at a low temperature. The copper jacket is soft enough to expand to fill the bore but is hard enough to prevent melting at the high temperatures of the ignited charge.

While I have specified copper as being a material of which the jackets may be made, it will be understood that any soft metal which does not have a low melting point such as lead but which is sufficiently soft to be readily expanded so as to follow the rifling, may be used without departing from the spirit of the invention.

I claim:

1. The herein described bullet comprising a body portion of heavy, hard material, and a casing of relatively softer material, said casing completely covering the bullet and being capable of expansion due to the inertia of the body portion, to fit the bore of a gun tightly.

2. A bullet comprising a heavy, hard body portion and being provided with an outer casing of relatively soft material, said casing having a cylindrical portion and completely covering the bullet, said casing being arranged to expand uniformly along its cylindrical portion, due to the inertia of the body portion, and to tightly fit the bore of the gun.

3. A bullet comprising a relatively heavy, hard body portion, said body portion having a maximum diameter and tapering toward the front and toward the rear from said maximum diameter, the front taper being curved and the rear taper being substantially the frustum of a cone, and a relatively softer casing entirely covering the bullet, said casing having a cylindrical portion on its exterior, and having a tapered portion at its interior, arranged to conform with the tapered rear portion of the body portion.

4. A bullet comprising an inner body por-

tion entirely composed of hard and tough material, an outer soft and comparatively ductile jacket, said jacket having a rear portion adapted to be forced forwardly in respect to the core and expanded to fit tightly in the bore of a gun, and an integral extension covering the front of the body portion.

5. A two-piece bullet comprising an inner hard and tough portion of steel, and an outer soft and comparatively ductile jacket, said jacket having a rear or base part adapted to receive the pressure at the instant of firing and be expanded to fit the bore of the gun and said jacket also having a front integral extended portion to form a soft nose.

6. A two-piece bullet comprising a body portion of hard tough material tapered toward the front and toward the rear and an outer jacket comprising a soft metal coating having a portion at its rear adapted to expand under pressure and having a forward portion extending beyond said body portion to form a soft nose.

7. A two-piece bullet comprising a body portion of hard tough material tapered toward the front and toward the rear, and an outer jacket comprising a soft metal coating having a portion at its rear adapted to expand under pressure and having a forward portion extending beyond said body portion to form a soft nose, the rear portion of said jacket having an opening extending rearwardly from said body portion.

8. A two-piece bullet comprising a body portion of hard tough material tapered toward the front and toward the rear and being rounded at the front and at the rear, and an outer jacket comprising a soft metal coating having a portion at its rear adapted to expand under pressure and having a forward portion extending beyond said body portion to form a soft nose.

9. A two-piece armor piercing bullet comprising a body or core of hard, tough material tapered toward the front and a jacket of softer ductile material, said jacket including a pressure-receiving portion extending transversely of the base of the body, a body-encircling portion adapted to be expanded by the pressure of the gas on said pressure-receiving portion at the instant of firing, and a cushioning portion covering the nose of the body.

10. A two-piece armor piercing bullet comprising a body or core of hard, tough material tapered toward the front and of smaller diameter at its extreme rear end than at an intermediate portion, and a jacket of softer ductile material, said jacket including a pressure-receiving portion extending transversely of the base of the body, a body-encircling portion adapted to be expanded by the pressure of the gas on said pressure-receiving portion at the instant of

firing, and a cushioning portion covering the nose of the body.

11. A two-piece armor piercing bullet comprising a body or core of hard, tough material tapered toward the front and of smaller diameter at its extreme rear end than at the intermediate portion, and a jacket of softer ductile material, said jacket including a pressure-receiving portion extending transversely of the base of the body and having a small central aperture, a body-encircling portion adapted to be expanded by the pressure of the gas on said pressure-receiving portion at the instant of firing, and a cushioning portion covering the nose of the body.

12. A two-piece armor piercing bullet,

comprising a body or core of hard tough material tapered toward the front and more gradually toward the rear from an intermediate portion of maximum diameter and having its extreme rear end or base rounded, and a jacket of soft ductile material including a pressure receiving and transmitting portion extending transversely of the base of the body, a body encircling portion having its exterior substantially cylindrical and its interior fitting the tapers of said body and a covering portion for the nose of the body, said pressure receiving portion being comparatively strong and of a thickness substantially equal to the average thickness of the body encircling portion.

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