Aug. 7, 1923. 1,464,192

R. A. WILLSON

ANTIAIRCRAFT SHELL

Original Filed Dec. 6, 1917 3 Sheets-Sheet 1

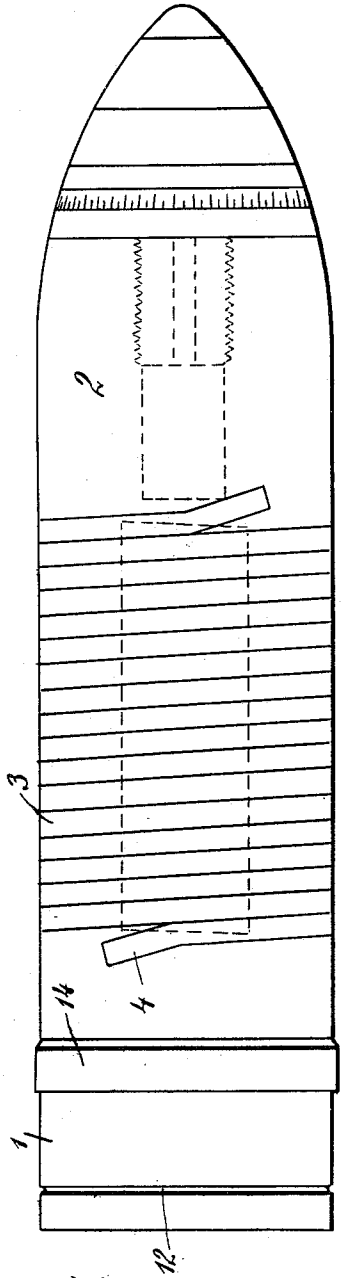


Fig. 1.

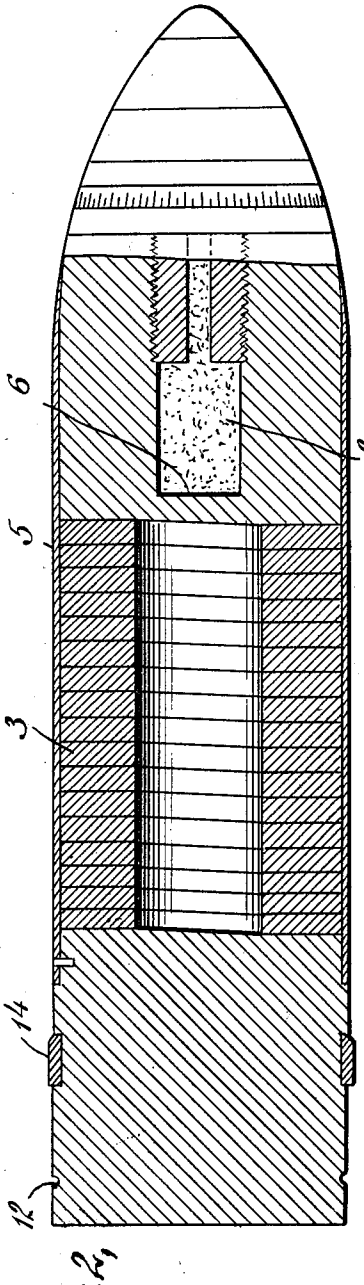


Fig. 2.

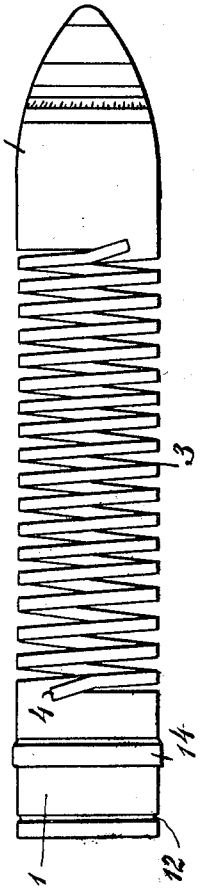


Fig. 3.

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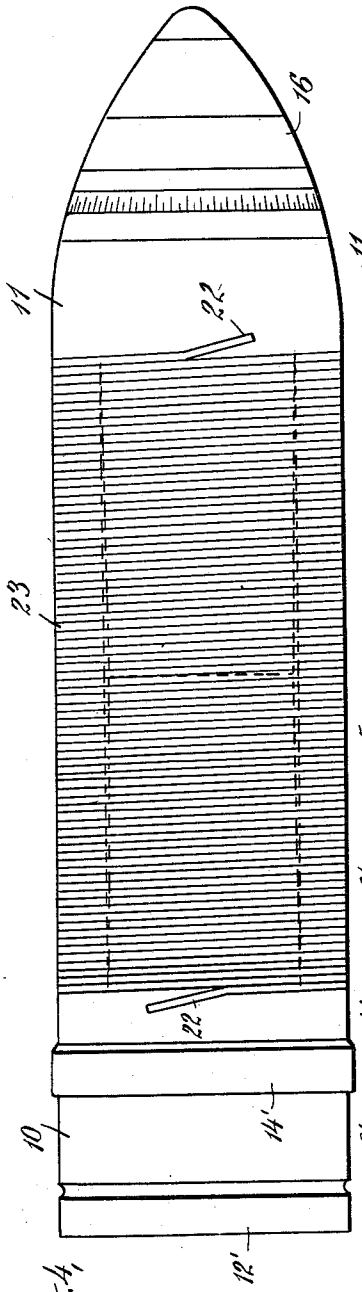


Fig. 4.

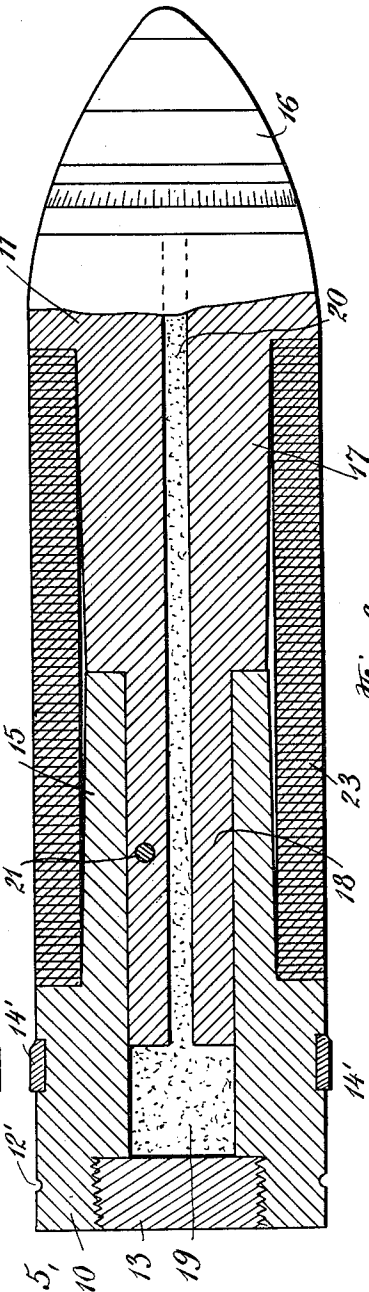


Fig. 5.

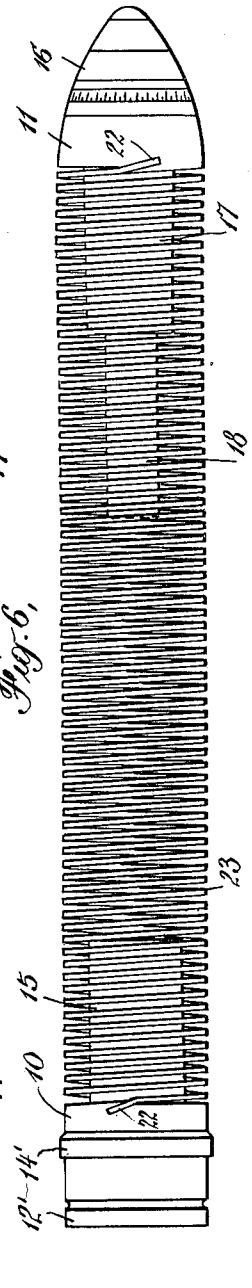


Fig. 6.

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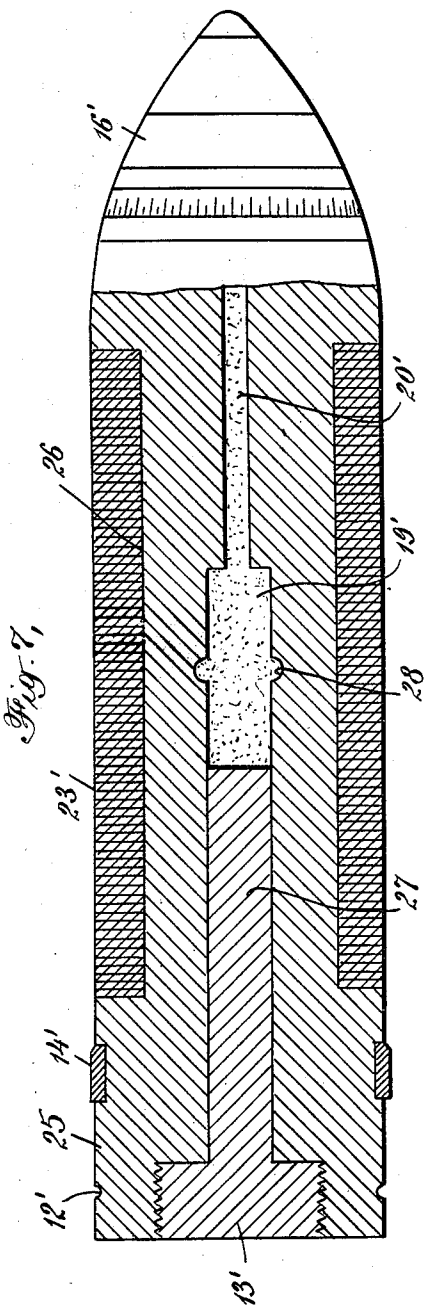


Fig. 7.

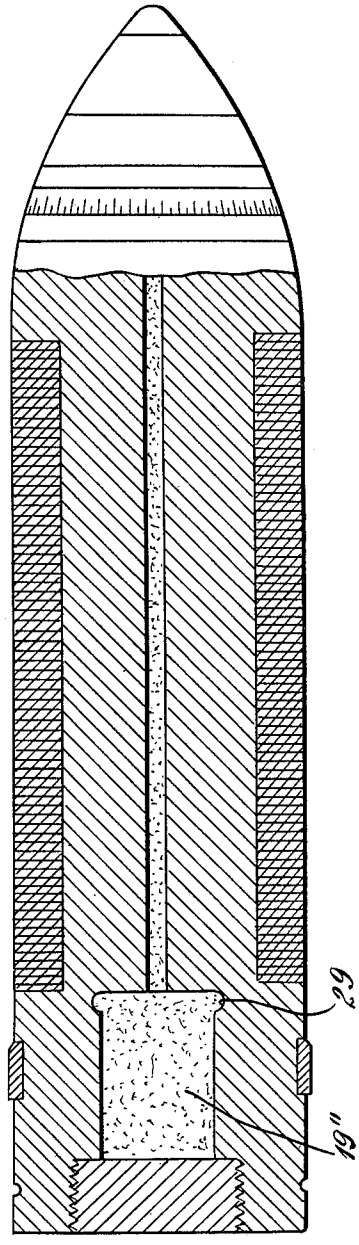


Fig. 8.

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Patented Aug. 7, 1923. 1,464,192

UNITED STATES PATENT OFFICE.

RUSSELL A. WILLSON, OF SPOKANE, WASHINGTON.

ANTIAIRCRAFT SHELL.

Refile of abandoned application Serial No. 205,752, filed December 6, 1917. This application filed January 18, 1922. Serial No. 530,011.

To all whom it may concern:

Be it known that I, RUSSELL A. WILLSON, a citizen of the United States, residing at Spokane, in the county of Spokane, State of Washington, have invented certain new and useful Improvements in Antiaircraft Shells; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to projectiles especially adapted for air craft defense, the destruction of entanglements and similar purposes.

Anti-air-craft shells based upon various adaptations of the well known principle of the chain shot have been proposed, the idea being that when the shell has exploded the portions thereof which are connected by the chains will be separated, and the projectile will then be capable of producing a long slashing cut that will cause far more destruction to an aeroplane or balloon than would a single shell or even a shrapnel shell. On account of the length of chain between the separated parts of the shell there is greater likelihood that some portion of the chain will come in contact with the target than would a single shell, and especially is this true in the case of air craft where the altitude may be considerable and the motion may render it difficult to properly place the shell to disable or destroy the craft.

It is an object of the present invention to improve the construction of projectiles of this general type by producing a shell in which the separable sections and the connection between them are so disposed that when in normal condition the shell possesses the shape and ballistic characteristics of an ordinary shell, so that when fired from a gun it will traverse the usual trajectory without deviations due to any peculiarities of shape or disturbing weight. In other words the shell may have the same range and may be fired with the same accuracy and properly timed for explosion as an ordinary or a shrapnel shell of the same size.

To attain the above objects, as well as others which will hereinafter appear, I construct the body of the shell of sections adapted to be separated at the proper time by an explosive charge within the shell, and I connect to these sections of the shell the ends of a long metal strip, cable, wire, chain or ribbon which in the normal condition of the shell is wound in a cylindrical helix about the central portion of the shell, the adjacent convolutions preferably being in contact and forming the casing of the shell and having the same diameter as the section to which the strip is connected. When the shell is exploded, its balance is upset and it takes the form of heavy end portions connected by a relatively flexible member of considerable length.

The particular nature of the invention will appear most clearly from a description of certain preferred embodiments thereof as shown in the accompanying drawings in which Fig. 1 is a view of a shell in normal unexpected condition; Fig. 2 is a longitudinal section of a like shell with slight modification; Fig. 3 is a view showing the parts of the shell in partially separated condition; Figs. 4, 5 and 6 are similar views of a modified form; Fig. 7 is a longitudinal sectional view of a further modification, and Fig. 8 is a similar view of another modification.

Referring particularly to the embodiment shown in Figs. 1, 2, and 3, the projectile has a base portion 1, which in this case is solid, and a nose portion or head 2 equipped with the usual timing mechanism as indicated, and these portions are connected by a strip of metal 3 wound on edge into the form of a cylindrical helix, the adjacent convolutions being in contact and their outer edges forming the outer surface of the shell and having the same diameter as the end portions 1 and 2. If the strip 3 is formed separately its ends may be securely connected to the portions 1 and 2, as, for example, by cutting an inclined slot as shown at 4 and welding the offset end of the strip into that slot. Or the strip 3 may be made integral with the portions 1 and 2 by boring a central chamber in a solid shell and then cutting through the wall of the shell in a spiral cut to form the strip 3; or the entire shell may be formed of a strip of metal formed into a cylindrical helix heating the ends of the coil to a welding heat and bulldozing a solid point on one end of the coil to form the head and a solid cylindrical portion on the other end to form the base. In any case the adjacent convolutions of the coil should be stuck together sufficiently to hold them during flight by galvanizing

or sweating them, or the portion of the shell made up of the coil strip 3 should be encased in a thin sheathing as indicated at 5 in Fig. 2. The explosive charge may be enclosed in the space inside of the coil strip, but inasmuch as a large explosive charge is not necessary, I prefer to employ the arrangement illustrated in these figures, in which the nose portion of the shell is bored to a point as indicated at 6, such that a relatively thin partition is left between the extremity of this bore and the open space within the coil portion of the shell. The bore is then plugged by a plug, such as 7, having a central passage for the ignition element of the timing device as illustrated at 8, sufficient space being left between the plug 7 and the point 6 to serve as an explosive chamber. It is intended that the shell shall be attached in the usual way to the end of the cartridge containing an explosive for propelling the shell and a groove 12 is formed near the rear end of section 1 for this purpose. Surrounding the section 1 and partly embedded therein is the usual soft metal collar 14 for engaging the rifled grooves of the gun to produce rotation of the shell. In Fig. 3, the shell is shown, for purposes of illustration, with its end portion separated in a straight line and the coil portion partially drawn out, but it will be understood that the effect of the explosion will in fact be to throw the heavy end portions of the shell off the very normal trajectory and there will result a tumbling action of the shell as a whole and simultaneous drawing out of the intermediate coil flexible connection portion. The length adopted for the intermediate flexible connecting portion will depend somewhat upon the purpose for which the shell is to be used, but it will be understood that the drawn out projectile will have sufficient energy to cut through or break the wings of an aeroplane or rupture the casing of a balloon, and the shell will also be found effective, if the cutting portion is made relatively short and strong, for destroying barbed-wire or other entanglements, on account of the slashing cut inflicted by the strip connecting the end sections.

In Figs. 4, 5 and 6, there is shown another embodiment of the shell and as here illustrated the connecting strip is made longer than in Figs. 1, 2 and 3, but it will be understood that this is only for purposes of illustration, and that the construction of base and head elements of any of these figures may be used with a connecting portion of any desired length.

In the embodiment shown in Figs. 4, 5 and 6, the projectile is made up of two sections 10 and 11, the former constituting the base and the latter the head of the shell. In accordance with the usual practice, a plug 13 is screwed into the base of the section 10 to serve as a protection against fissures that might exist in the metal composing this section. The section 10 is formed with an integral extension 15 having a diameter somewhat less than the main portion of the section and preferably provided with a slight taper toward the front of the shell. The main portion of the section 10 as well as the extension 15 are both formed with a bore of uniform diameter.

The head section 11 is provided with the usual timing apparatus 16. This section is formed with an integral extension 17 of substantially the same size and taper as the extension 15 of the other section. Extension 17 is also provided with an extension 18 of uniform diameter adapted to fit within the bore of section 10, but short enough to leave a space within which may be placed the explosive charge 19 for separating the two sections of the shell, when the charge is ignited by a suitable fuse extending through a bore 20 in the section 11 and communicating with the timing mechanism located in the head of the shell. To lock the two sections of the shell together a pin 21 may be provided. This pin passes through the extensions 15 and 18 and should be small enough so that it may be easily sheared when the shell is exploded.

Each of the sections 10 and 11 is provided with a diagonal slot 22 and into these slots are secured, by welding or by any other suitable mode of attachment, the ends of a strip or band 23 of appropriate metal which is wound about the extensions 15 and 17, the convolutions of the metal lying in contact and being formed with an outer diameter substantially equal to that of the sections 10 and 11. While the strips have been shown in the form of a metallic ribbon wound on edge, it will be understood that this portion of the shell may be made of material of other cross sections provided the same may be wound compactly about the extensions 15 and 17 and may have a smooth outer surface corresponding in effect to the outer surface of an ordinary shell. In any event the outer surface of the winding should be finished smoothly. On account of the disposition of metal composing the winding, this portion of the shell will present substantially the same appearance and cause the shell to have substantially the same ballistic properties as an ordinary shell of the same size constructed of solid metal.

The shell may be fired from any gun adapted to fire an ordinary shell of the same size, it being understood that the timing mechanism is set to cause the explosion of the shell at the desired instant in accordance with the usual practice. When the explosion occurs, the section 11 will be driven forward cutting off the pin 21, and the extended portion 18 fitting within the bore in

the section 10 will guide the section 11 until the parts clear each other, thus avoiding any cramping of the winding and insuring a full separation. The tapering contours of the extensions 15 and 17 will also tend to relieve the windings 23 of any binding action during separation.

Fig. 7 shows a one-piece shell in which the body is composed of a member 25 enlarged at its front and rear ends, so that between these portions is an annular channel 26 within which may be placed the strip of material 23′ corresponding to that used in the modification described above. The projectile of this modification is provided with a groove 12′, a collar 14′, and a timer 16′, as in the shell shown in Figs. 1 and 2, but the rear plug 13′ is provided with an extension 27 fitting partly through a bore in the rear portion of the body 25. The forward portion of the body is provided with a bore 20′ for the fuse. At or near the center of the shell is a chamber for receiving the explosive 19′ and the wall of the chamber is provided with a groove 28 to weaken the shell and insure that it will break into two pieces at this point. When this occurs, the two sections will separate and draw out the winding 23′ in the manner already described.

Another form of one piece shell is shown in Fig. 8 in which the chamber for the explosive 19″ is located near the rear of the shell and a groove 29 is provided at the forward end of the chamber and approximately at the point where the shell is of lesser diameter to insure fracture at this point. The remaining portions of the shell shown in this figure correspond substantially to those shown in the other modifications and the behavior of the shell when exploded is substantially the same.

While certain preferred embodiments of the invention have been illustrated and described, it will be understood that various changes may be made in the details of construction of the apparatus without departing from the principle of the invention.

I claim:

1. An explosive shell having two heavy end portions united by a flexible connection wound to complete the contour of the shell between the end portions, together with an explosive charge and timing mechanism for firing the charge while the shell is in flight to upset the balance and cause the heavy ends to separate and draw out the flexible connections to considerable length.

2. An explosive shell having two heavy end portions united by a flexible connection in the form of a metal strip wound to complete the contour of the shell between the end portions, together with an explosive charge and timing mechanism for firing the charge while the shell is in flight to upset the balance and cause the heavy ends to separate and draw out the flexible connections to considerable length.

3. A projectile comprising the combination of two separated end pieces, a flexible strip attached to and wound between the end pieces to form the central body of the shell casing and adapted upon separation of the end pieces to be drawn out to considerable length, and an explosive charge for separating the end pieces during the flight of the projectile.

4. A projectile comprising the combination of two separated end pieces, a flexible strip attached to and wound between the end pieces to form the central body of the shell casing and adapted upon separation of the end pieces to be drawn out to considerable length, an explosive charge carried by the projectile timed to explode during flight to separate the end pieces, and a thin sheathing for the wound central body portion of the shell casing.

In testimony whereof I affix my signature.

RUSSELL A. WILLSON.