

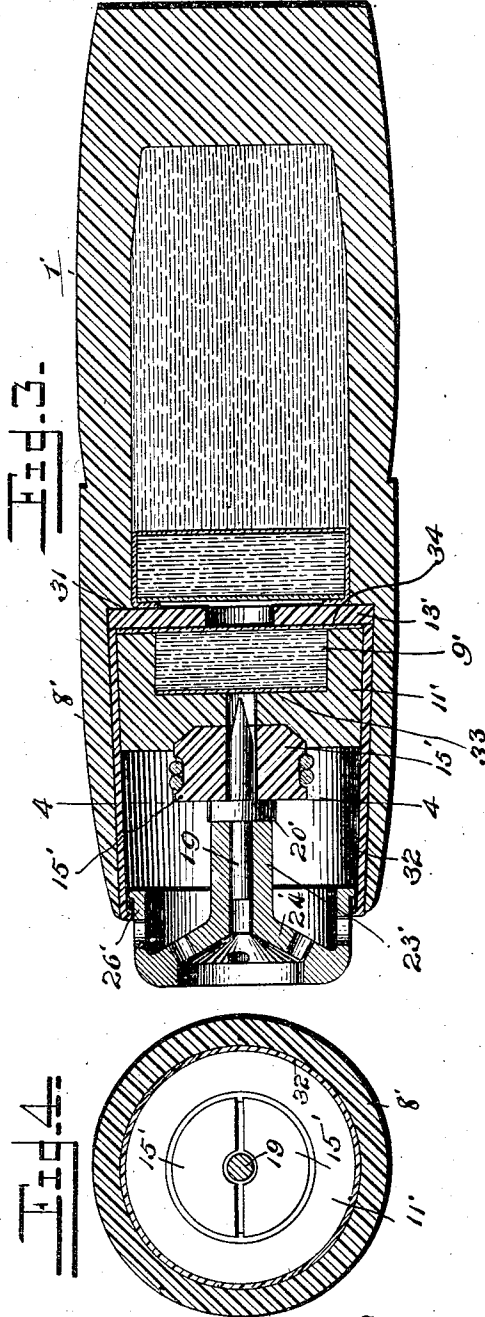
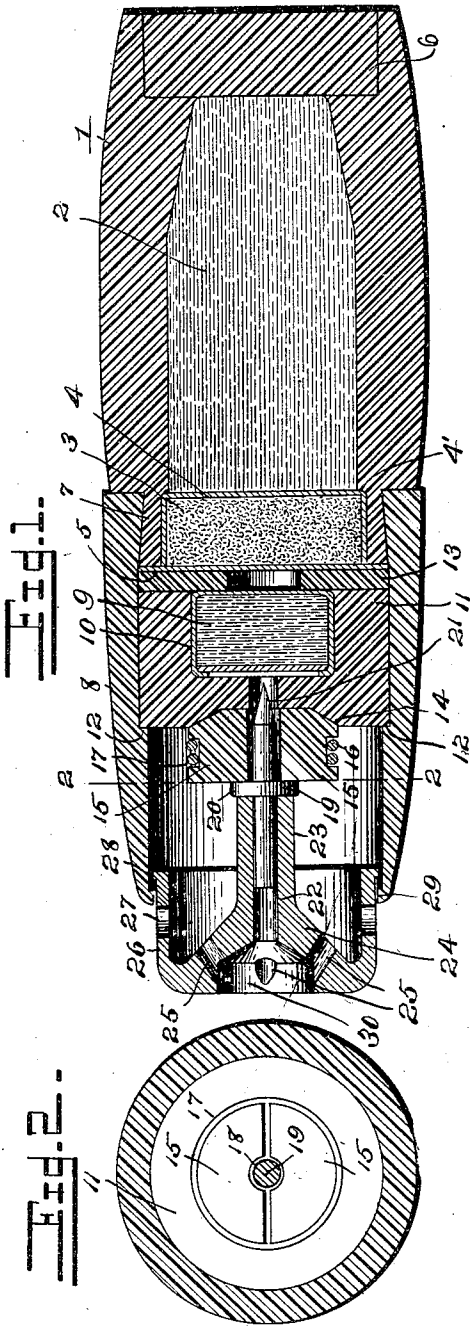
W. L. CLAY AND J. W. TAYLOR.
FUSE.

APPLICATION FILED JUNE 30, 1919.

Patented June 7, 1921.

2 SHEETS—SHEET 1.

1,380,774.



Inventor

W. L. Taylor
J. W. Clay

W. L. CLAY AND J. W. TAYLOR:
FUSE.

APPLICATION FILED JUNE 30, 1919.

Patented June 7, 1921.

2 SHEETS—SHEET 2.

1,380,774.

Fig. 5-

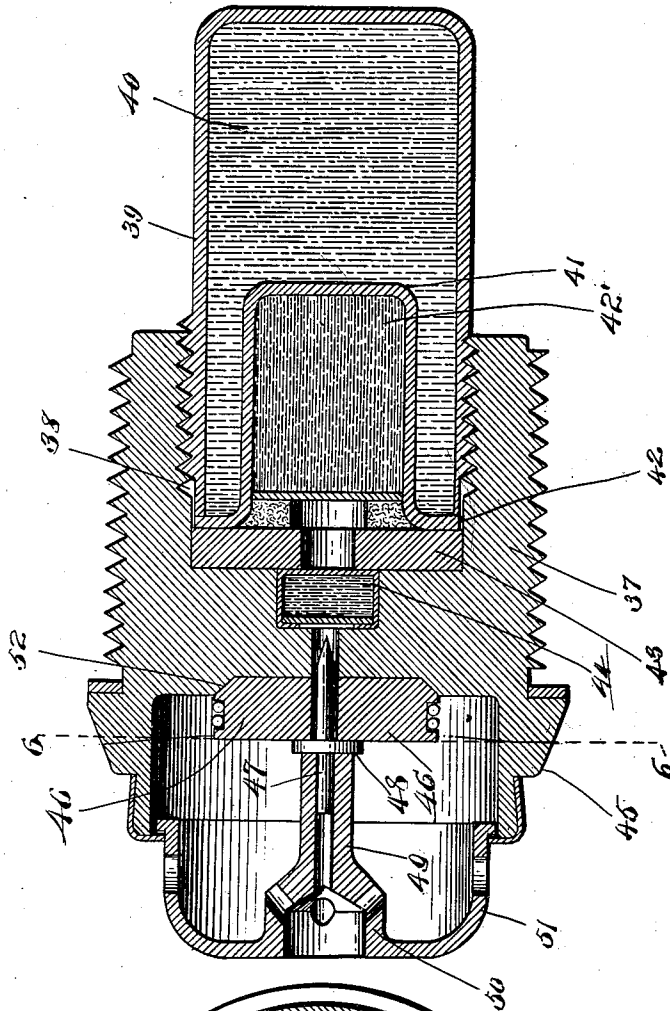
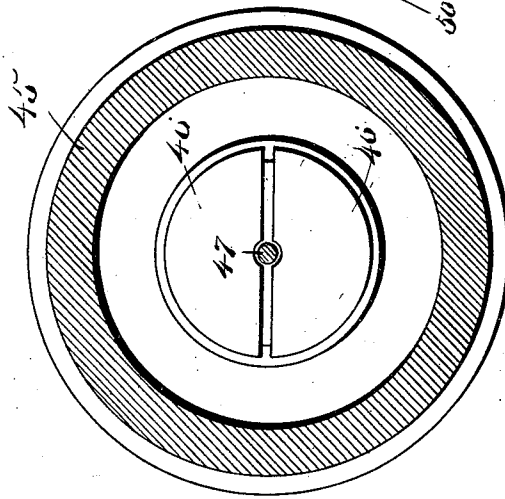


Fig. 6-



Inventor

W. L. Taylor
J. W. Clay

UNITED STATES PATENT OFFICE.

WALLACE L. CLAY, OF BRIDESBURG, AND JOHN W. TAYLOR, OF FRANKFORD,
PENNSYLVANIA.

FUSE

1,380,774.

Specification of Letters Patent.

Patented June 7, 1921.

Application filed June 30, 1919. Serial No. 307,798.

(FILED UNDER THE ACT OF MARCH 3, 1883, 22 STAT. L., 625.)

To all whom it may concern:

Be it known that we, WALLACE L. CLAY and JOHN W. TAYLOR, citizens of the United States, and residents of Frankford Arsenal, Bridesburg, Pa., and Frankford, Pa., respectively, have invented an Improvement in Fuses, of which the following is a specification.

The invention described herein may be used by the Government, or any of its officers or employees in prosecution of work for the Government, or any other person in the United States, without payment of any royalty thereon.

The general object of this invention is to provide a fuse for an explosive bullet which will be of extreme simplicity of construction and of great efficiency in operation, and to this end resides in certain combinations and arrangements of structural parts, as will be clearly hereinafter pointed out.

Other objects will appear as the specification proceeds and the nature of the invention is more fully disclosed.

With these objects in view, the invention resides, generally stated, in an explosive bullet provided with a fuse having a floating striker, the inner or supporting surfaces thereof occupying a position in the air-wave having a greater pressure than the position occupied by the exterior or retarding surfaces thereof.

The invention also resides in providing a firing-pin disposed relative to the primer so that the normal clearance therebetween is so small that chattering or vibration of the striker is prevented.

The invention further resides in safety members, normally holding the firing-pin in unarmed position, provided with inclined end faces seating on a conical seat; said safety members remaining in safe position, while the projectile is in the bore of the gun, solely under the influence of linear acceleration, due to their own weight, the center of gravity of the locking members being well in toward the center, so that centrifugal force is overcome by the linear acceleration without the aid of superimposed weights.

The invention also resides in a peculiar and novel construction of a firing-pin provided with a fixed collar intermediate its

length, which supports the pin against the safety members, and also forms a bearing surface for the superimposed firing-pin holder, as will be more clearly understood by the hereinafter detailed description of the drawings.

The invention also resides in certain felicitous constructions, combinations and arrangements of parts, as will be hereinafter fully explained.

The accompanying drawings clearly disclose an exemplary embodiment of the underlying principles of our invention. Briefly described:—

Figure 1 is a longitudinal diametric section of an explosive bullet equipped with the fuse constituting our invention;

Fig. 2 is a transverse section on the line 2—2, Fig. 1;

Fig. 3 is a view similar to Fig. 1 of an alternate construction of an 11 mm. explosive bullet;

Fig. 4 is a transverse section on the line 4—4, Fig. 3; and

Fig. 5 is a longitudinal diametric section of a 37 mm. fuse, showing the application of our invention thereto;

Fig. 6 is a transverse section on the line 6—6, Fig. 5.

Referring, now, in detail to the drawings, and first, to Figs. 1 and 2 thereof:

1 designates the hollow bullet body containing a suitable explosive charge 2 (the character of which may be varied in accordance with the work to be obtained) and the booster charge 3, the latter being held in a suitable rupturable container or cup 4 seated, at its inner end, against an annular shoulder 4' in the bore interiorly of the bullet body. The open top of the container or cup is closed by a disk 5, to prevent spilling of the booster charge. In spot light work, it may be preferable to provide a loose base plug 6 removably held in place in a suitable manner against accidental removal.

The bullet body 1, is provided, at its open end, with a neck 7, having an inclined outer surface. One end of an elongated hollow head 8 is crimped or spun around the neck 7 and is thereby held to the bullet body 1, against removal. The head 8 incloses the working parts of the fuse. The primer cup

10, containing the primer 9, is disposed in a block 11, which bears, at one end, against an annular shoulder 12 interiorly of the head 8 and, at its other end, against a centrally apertured washer 13 disposed against the disk 5.

Normally seated in a truncated, cone-shaped recess 14 in the outer face of the block 11 are safety members 15, having correspondingly beveled surfaces at one end bearing against the inclined seat 14. These safety members may be in the form of segments, and while, in this instance, two thereof are shown, it is obvious that more may be used, if desired. From the standpoint of simplicity and economy of manufacture, it is advantageous to use but two. Each of these segments is provided with a circumferential groove 16, in which is disposed a helical spring 17 tending to hold the segments together, against separation. The segments are grooved throughout their depth, on the surface adjacent the firing-pin 19, to conform to the cross sectional contour of the latter, as shown at 18.

That portion of the firing-pin, which extends from the collar 20 to the end thereof opposite the penetrating end 21, projects into the axial bore 22 of a firing-pin holder 23 terminating, at its outer end, in an outwardly flaring head 24 having a plurality of symmetrically arranged holes 25, preferably four thereof being used.

Carried by said head, at its outer end, is an inturned, cross sectionally annular skirt or flange 26, provided with a plurality of radial holes 27, preferably 4 thereof being used. The holes 27 are preferably given an effective area of twice that of the holes 25.

The skirt 26 may be provided, at its free end, with an outturned, circumferential lip 28, and the free end of the head 8 may be similarly provided with an inturned lip 29. The lip 28, by engaging the lip 29, limits forward movement of the firing-pin holder 23.

The firing-pin holder 23, as well as the firing-pin 19, is preferably constructed of aluminum.

It will be noted that the flaring construction of the head 24 of the firing-pin holder provides a cavity 30.

The operation is as follows:—

When the bullet is fired in a gun, the inertia of the safety segments 15—15, due to the linear acceleration of the projectile, holds the segments against outward movement on the seat 14 in the primer housing 11. It is obviously necessary to retain these segments in the safety position as long as these segments are in the bore of the gun, as long as linear acceleration is taking place, otherwise a premature explosion will be caused by the set-back of the striker (comprising the firing-pin 19 and the firing-pin holder 23). These segments are designed to obtain this

result. The additional inertia of the superimposed striker is negligible, because of its light weight.

Therefore, in order that the linear inertia moments shall be greater than the centrifugal moments, the center of gravity of the segments is brought well in toward the center, so that the moments tending to hold the segments back in their seat are greater than the moments tending to throw the segments out. As soon as linear acceleration ceases, which is after the bullet leaves the muzzle of the rifle, the centrifugal force throws the segments out. These segments, under the action of centrifugal force, expand their confining spring 17 and leave their seat by tilting slightly and moving the striker slightly away from the primer 11. They then move out toward the wall of the head 8, and are held out of the way in this position by centrifugal force. The shoulder 20 of the firing-pin 19 is then unsupported, and the striker is free to act upon impact.

In flight, the bullet creates a pressure in going through the air. This pressure is in the form of a wave, and, like all waves, the intensity of pressure in the wave varies throughout its depth. This bow wave is not simply formed by the point, but is also formed by the entire head and body of the projectile. The air rushes into the holes 25 and 27 of the firing-pin holder 23 and forms a cushion for supporting this holder. The interior pressure is thus built up to the maximum exterior pressure. The radial holes 27 are given a greater area than the axial holes 25, as above explained. This is not only to prevent an increase of resistance of the striker upon impact. The bow wave formed by the projectile in flight and the maximum pressure in this wave is a little way back from the extreme point due to the ogival shape of the projectile head. This throws the interior of the fuse into communication with the maximum wave pressure, and keeps the striker floating on the air wave. Any tendency to throw the striker out of this floating balance will be liable to cause a premature explosion, by driving the striker onto the primer. Any tendency of the striker to chatter would also be liable to cause a premature explosion if the vibration is sufficient to give the striker the required energy to fire the primer. In order to prevent any vibration of the striker from developing, the clearance between the firing-pin and the primer is kept to a minimum. This does not give an amplitude for vibration to develop sufficient energy to fire the primer prematurely. Further, it even prevents the formation of the chattering or vibration of the striker. In practice, this clearance is kept within the limits of .0005" to .05", depending upon the mass of the striker.

Upon encountering any resistance, such as an airplane wing or balloon, the external force is increased and overcomes the internal pressure, besides cutting off the supply of air necessary to maintain the internal pressure, thus driving the firing-pin holder 23 inward, or stopping it in relation to the movement of the remainder of the bullet, and causing the firing-pin to penetrate the primer 9, which explodes and, in turn, through the booster 3, detonates the explosive charge 2, fragmenting the base of the bullet. Any obstruction that will interrupt the continuity of the bow wave of the projectile will function the fuse, as the striker will then be robbed of its supporting air pressure, and the external pressure will instantly jam back the striker onto the primer. Rain and snow do not interfere with the formation of the atmospheric wave and, therefore, do not interfere with the action of the fuse, though the fuse is sufficiently sensitive to function on a light sheet of cloth.

The simplicity of our fuse is emphasized by the fact that it has made practicable its application to projectiles as small as 30 caliber service bullets.

Figs. 3 and 4 disclose an alternate construction of our 11 mm. explosive bullet. In this construction, instead of making the bullet and its elongated head in two parts, we make them integral. 1' is the hollow body of the bullet and 8' is the elongated head formed integral with the body 1'. The head 8' is provided interiorly, at the end thereof adjoining bullet body 1', with an annular shoulder or ledge 31. The inner surface of the wall of the head 8' is tapered, being of least width at the free end of the head. A tubular liner 32 is carried within the head 8' and snugly fits the same. This liner is of a length nearly equal to that of the head 8' and bears at its inner end upon a centrally apertured washer 13' disposed on said ledge 31. Adjacent said washer and inside of said liner 32 is a primer holder 11', in a recess of which is seated the primer 9' held from spilling by disks 33 and 34 disposed respectively against the bottom of said recess in the primer holder 11' and between the inner end face of said holder and the washer 13'. The safety segments 15'—15', the firing pin 19' carrying the collar 20', and the firing-pin holder 23' with its head 24' and skirt 26' are the same as the corresponding parts in the device of Figs. 1 and 2.

Figs. 5 and 6 disclose a construction of a 37 mm. fuse, with the principles of our invention applied thereto. In this construction, 37 designates the externally threaded fuse body provided, at one end, with an internally threaded socket 38, in which is threaded the cup 39, containing an explosive charge 40. Internally of this cup 39 is

a second cup 41 provided, at its mouth, with an outturned annular flange 42, bearing against a centrally apertured washer 43 in the bottom of the socket 38. The second cup 41 contains an explosive charge 42'. When the larger cup 39 is screwed fully into the socket 38, the wall of the mouth thereof bears against the flange 42 of the smaller cup 41, thus holding the latter firmly in position. Axially of the body 37, is disposed the primer 44. The fuse body 37 is provided, at the end thereof opposite the socket 38, with a hollow head 45 inclosing the safety segments 46—46 the firing-pin having the collar 48, and the firing-pin holder 49 having the head 50 and the skirt 51, these parts being the same as the corresponding parts in the devices heretofore described. The fuse body 37 is provided, at the end thereof adjacent the head 45, with a tapering recess 52, for the reception of the inclined faces of the safety segments 46—46.

Having thus fully described our invention, what we claim as new and desire to secure by Letters Patent is:—

1. In a fuse for projectiles, the combination with the primer, of a firing-pin, safety means for normally maintaining the firing-pin in unarmed position, a firing-pin holder having a tubular stem within which said firing-pin projects, a head at one end of said stem provided with air inlet apertures, and a tubular flange extending circumferentially of said head for guiding the holder during longitudinal motion thereof.

2. In a fuse for projectiles, the combination with the primer, of a firing-pin, safety means normally maintaining the firing-pin in unarmed position, a firing-pin holder having a tubular stem within which said firing-pin projects, a head at one end of said stem provided with air inlet apertures, and a tubular flange extending circumferentially of said head, and provided with air inlet apertures, whereby the firing-pin is maintained in close proximity to the primer, after the release of said safety means, by the balanced internal and external air pressure on said head.

3. In a fuse for projectiles, the combination with the primer, of a firing-pin provided with a fixed collar intermediate its length, safety members normally contacting with said collar and maintaining the firing-pin in unarmed position, a firing-pin holder having a tubular stem within which said firing-pin projects, a head at one end of said stem provided with air inlet apertures, and a tubular flange extending circumferentially of said head, and provided with air inlet apertures, the area of said last mentioned apertures being substantially greater than that of the first mentioned apertures.

4. In a fuse for projectiles, the combination with the primer, of a firing-pin, safety

mechanism normally maintaining the firing-pin in unarmed position, a firing-pin holder comprising a tubular stem into one end of which the firing-pin projects and a head at the other end of said stem, having on its exterior face a pocket against which the air impinges in the passage of the projectile through the atmosphere and a tubular flange extending circumferentially of said head and provided with air inlet apertures for supplying an air pressure on the interior of said holder.

5. In a fuse for projectiles, the combination with the primer, of a firing-pin, a firing pin holder for carrying the firing-pin having one end provided with air apertures, and a tubular flange extending circumferentially of said head having air apertures, whereby said holder is maintained in floating position by the internal and external air pressures thereon, generated during the flight of the projectile.

WALLACE L. CLAY.
JOHN W. TAYLOR.