July 17, 1923. 1,462,314

J. H. WOODBERRY

FUSE

Filed Dec. 10, 1918 2 Sheets-Sheet 1

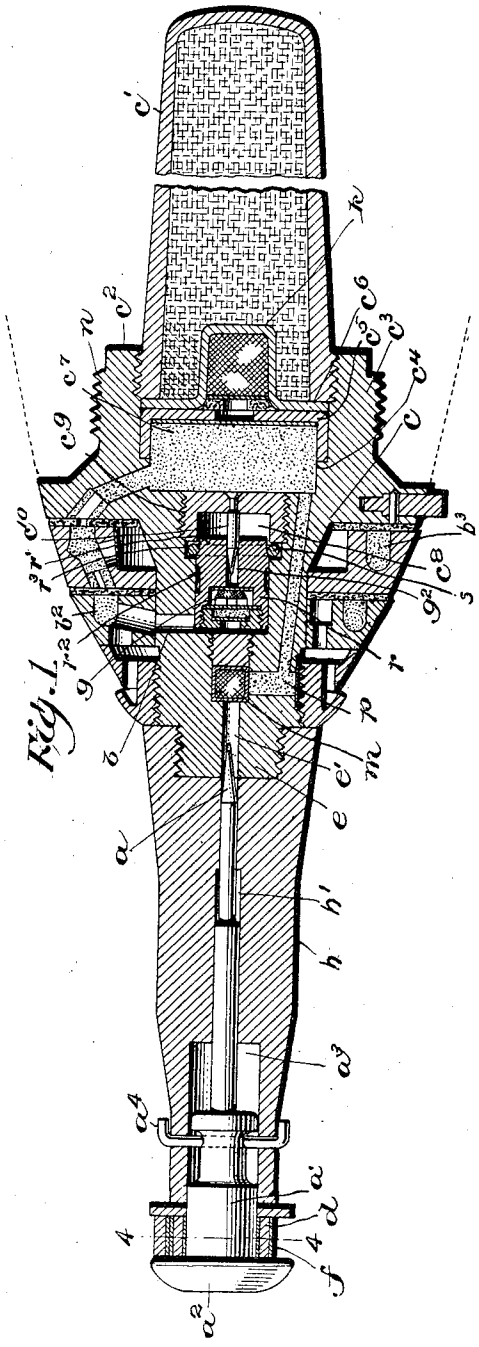


Fig. 1.

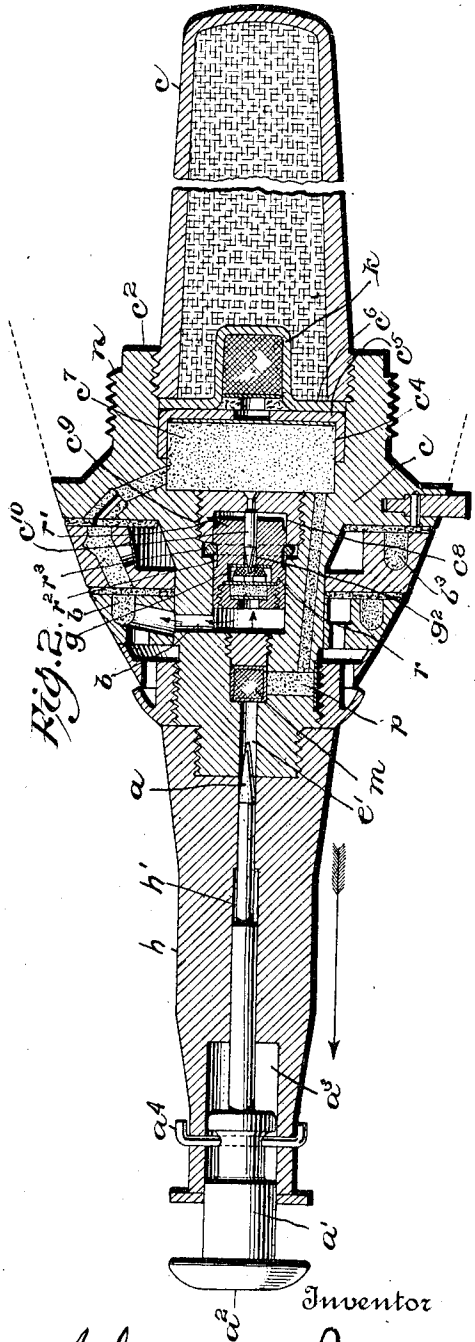


Fig. 2.

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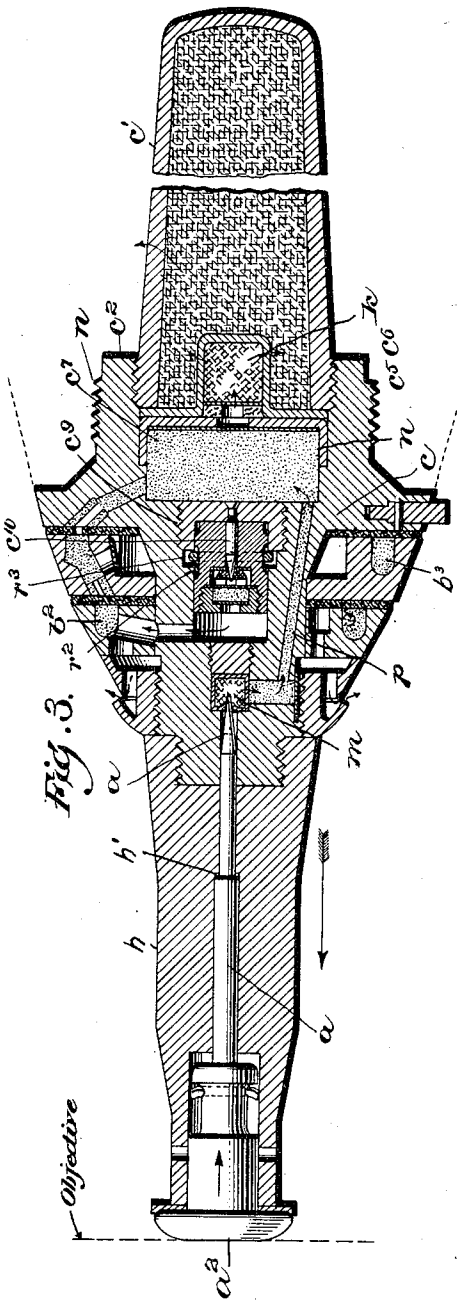


Fig. 3.

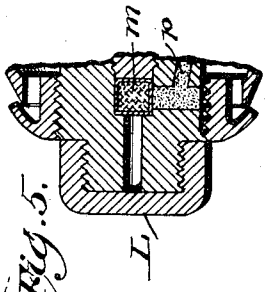


Fig. 5.

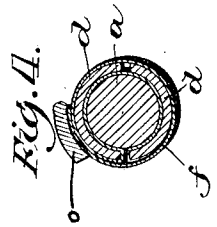


Fig. 4.

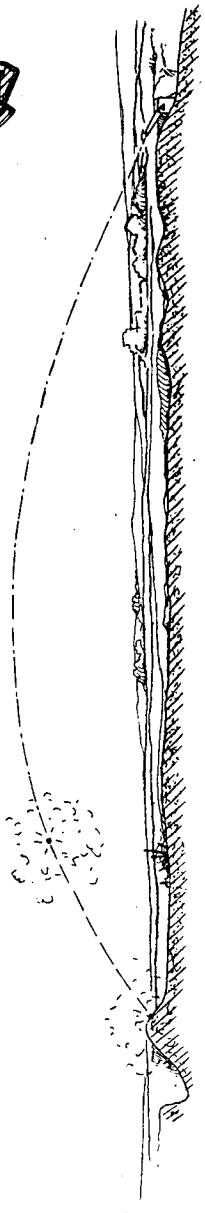


Fig. 6

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UNITED STATES PATENT OFFICE.

JOHN H. WOODBERRY, OF THE UNITED STATES ARMY.

FUSE.

Application filed December 10, 1918. Serial No. 266,146.

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

To all whom it may concern:

Be it known that I, Major JOHN H. WOODBERRY, Ordnance Department, United States Army, a citizen of the United States, stationed at Washington, District of Columbia, in the Office of the Chief of Ordnance, United States Army, War Department, 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 by any other person in the United States, without the payment of any royalty thereon.

The principal object of my invention is to provide an efficient means for securing the burst of a projectile in the air and to this end I make use of a time fuse in combination with a sensitive acting firing pin in a nose extension of the fuse, the firing pin having a construction which will insure the firing of the fuse upon slight impact with a target. With the ordinary combination time and percussion fuse it is possible to obtain a burst above ground only through a medium of a time action, as the percussion plunger being operated by inertia, is slow to act upon impact and therefore allows the shell to bury itself before exploding. With my improvement as embodied in the accompanying drawing, should the fuse come in contact with an object before the time element has acted, the sensitive nature of the firing pin will nevertheless cause the shell to burst above ground, thereby obtaining the maximum effect of the exploding shell. To this end, the invention resides, inter alia, in an extension or nose removably secured to the fuse stock, and carrying a compression type of firing pin engageable with a primer which communicates through a powder passage with an explosive magazine. Axially alined with this primer, and between it and said magazine, is a concussion plunger carrying another primer, and leading from the front end of the chamber, in which the plunger moves, to the said magazine is a time train. With this nose in position, upon firing the gun, the concussion plunger, by its inertia, moves relatively rearwards thus bringing the primer carried by the plunger into contact with the firing pin, thereby communicating the explosion to the time-train. If the burning powder-train reaches the magazine, the magazine explodes, exploding the shell in flight. However, if for any reason the time train rings fail to effect the explosion of the fuse before it strikes the ground, the sensitive firing pin will then fire the percussion primer and explode the shell instantly and as mentioned above. This sensitive arrangement will explode the shell while it is still above the ground. The distance above the ground at which the explosion takes place is regulated by the length of the nose extension. The extension nose may if desired be removed with the percussion firing pin for convenience in storage or when it is not desired to use the sensitive action of this pin in firing.

Another object is to provide means for closing the front end of the fuse, when the extension nose is not used, whereby moisture and dirt are prevented from entering the fuse through the channel or port leading from said front end to the primer.

With these objects in view, and others appearing as the specification proceeds, and the nature of the invention is more fully defined, the invention resides in the novel construction, combination and arrangement of parts of a combination time and instantaneous percussion detonating fuse, as will be hereinafter fully described in the specification, summed up in the claim, and illustrated in the drawings.

While I intend my fuse more particularly for use with a shell filled with smoke-producing material, obviously this same fuse might be used in incendiary, gas, or high explosive shells. Whether the fuse is operated by impact or timing action, the shell explodes under the influence of a booster contained in the shell thereby breaking up the shell and scattering the material.

The accompanying drawings form part of my specification and show an exemplary embodiment, capable of carrying out the underlying principles of my invention. Like reference characters indicate corresponding parts throughout the several views. The different views may be briefly described as follows:

Fig. 1 is a central, vertical longitudinal section of a fuse embodying my improve-

ments, and with the extension nose in position, showing the position of the parts thereof before the gun is fired;

Fig. 2 is a similar view showing the position of the parts after firing the gun, when the concussion-plunger has moved, by "set-back" or inertia, to bring the primer carried thereby into contact with the firing-pin:

Fig. 3 is a similar view showing the position of the parts after the fuse strikes the target:

Fig. 4 is a transverse sectional view on the line 4—4, Fig. 1:

Fig. 5 is a fragmentary sectional view of the forward portion of the fuse, with the nose removed and showing said forward end closed by a screw cap:

Fig. 6 is a diagrammatic view, showing a landscape and gun in operation.

Referring now, in detail to the drawings:

C designates the fuse stock carrying, at its rear, the booster-tube c^1, which may be conveniently secured to the rear coupling or nipple c^3 of the fuse stock by a screw-threaded connection c^2, as shown.

The coupling c^3 is provided with an internal annular shoulder c^4 forming a seat for a centrally-apertured diaphragm c^5. Bearing against the rear end of said diaphragm is the outwardly projecting marginal flange c^6 of the detonator cup k, disposed within the booster-tube c^1.

Directly in front of the diaphragm c^5 is a chamber or magazine c^7 filled with an explosive charge, as shown.

Adjacent to, and in front of, the magazine c^7 is an axial chamber c^8, the rear end of which is closed by a screw-plug c^9 screwed into the fuse stock, internally thereof. The plug carries an axial, forward-projecting, stationary firing-pin c^{10}.

Rectilinearly slidable in said chamber c^8 is a concussion plunger r normally retained in forward or safe position by a split ring s disposed circumferentially of said plunger and normally enclosing a reduced portion r^1 at the rear end thereof. The plunger is also provided with a circumferential pocket r^2 at a point substantially midway of the length thereof, in which said ring springs when the plunger moves from the position shown in Fig. 1 to the position thereof shown in Fig. 2. The ring s is retained against axial movement by an annular shoulder r^3 in the wall of the chamber c^8 and by the forward end of the plug c^9, as clearly shown in the drawings (Figs. 1, 2, and 3).

The plunger carries the primer g at the forward end thereof, and is provided with an axial port g^2.

The front end of the chamber c^8 communicates, through a flash passage b, and the time trains b^2 and b^3 with the magazine charge in the magazine-chamber c^7.

Disposed axially of the fuse-stock and in front of the primer g is a percussion-primer m, which communicates, by a passage p, containing a loose powder train, with the magazine c^7.

The forward end of the fuse-stock is provided with a threaded coupling or nipple e having an axial passage e^1 leading from the front end thereof to the percussion-primer m. Adapted to be screwed on said coupling e is an elongated nose h, provided with an axial passage h^1 for the reception of a compression firing-pin a, having an enlarged portion a^1 at the forward end of the shank thereof, said enlarged portion terminating in a head a^2. The nose h is provided at its forward end with a longitudinally-extending recess a^3, in which said enlarged portion a^1 is slidable. The shank of said firing pin a is provided with a shear pin a^4, toward its forward end, which extends transversely therethrough and through the nose h.

The firing-pin a may be held in safe position in any suitable manner and by any suitable means. The following described exemplary means are shown in the drawings:

Adjacent the head a^2 and surrounding the enlarged portion a^1 of the shank of the firing-pin a are two half rings d, d. These rings are held in operative position by a thin spring metal strip f wound first around the enlarged portion a^1 and then around the half rings d, d, the outer end of the strip being provided with a weight or knob o. The strip f is wound in such a direction that angular acceleration in the bore of the gun, due to the twist of the riflings, will maintain the strip wound tightly about the half rings; but, after the projectile carrying the fuse has left the bore of the gun, centrifugal force will unwind the strip, thus releasing the rings d, d, and rendering the fuse operative upon impact.

In Fig. 5, I have shown a screw cap L screwed on the nipple e, after the nose has been removed. The screw cap thus closes the end of the fuse and prevents entrance of dirt and moisture to the passage leading to the primer m.

Having thus fully described the construction of my fuse and the relative position of the structural parts, it is thought that the operation will be apparent, but, briefly stated, it is as follows:

When used as a combined instantaneous percussion and time detonating fuse, the fuse is used in connection with the nose h, and, for this purpose, the nose is screwed on the nipple e of the fuse-stock. Fig. 1 shows the position of the parts before the shell carrying the fuse leaves the gun. In this position, the firing-pin a is held in safe position, while the projectile is passing through the gun, by the strip f cooperating with the rings d, d to hold the head a^2 of the firing pin in spaced relation with the forward end

of the nose h. Upon leaving the bore of the gun, centrifugal force will operate to unwind the strip f, thus releasing the rings d, d, which, together with the strip, thereupon fall away from the firing pin, thus unlocking the same, as shown in Fig. 2. Upon firing the gun, the concussion-plunger r moves rearward, by "set-back" or inertia, thus bringing the primer carried by said plunger into contact with the firing-pin c^{10}, whereupon the flash passes from the front end of the chamber, in which said plunger moves, through the flash-passage b to the slow burning powder-train b^2 and b^3 leading to the explosive-magazine c^7. These trains are usually set prior to firing for a given length of time of burning when it is desired to obtain an air burst. Should the fuse come in contact with an object, however, before the expiration of the set time, the sensitive percussion element will explode the shell. Upon impact of the shell with an object, the parts of the fuse assume the position shown in Fig. 3, from which it will be noticed that the shear pin a^4 has been severed, and the compression firing-pin a has been driven rearward into the primer m, and the primer thus being fired, the loose powder-train in the passage p leading to the magazine is thereupon exploded, exploding the detonator k, which, in turn, causes a detonation of the booster charge in the tube c^1.

Should it be desired to have the fuse act as a time fuse, only, the nose h, with the firing pin a may be removed and the fuse then used without said nose and pin. The cup L may be advantageously used to prevent the primer m from being fired on impact. Assuming that the nose has been removed, the operation of the fuse, as a time fuse, is as follows:

The concussion-plunger r is normally retained by the split ring s in the manner hereinbefore described. Upon firing the gun, said plunger moves under the influence of "set-back" or inertia, and fires the primer g by contact therewith of the pin c^{10}. The primer, in turn, ignites the time train b^2 and b^3. When the time train has reached the magazine charge in the chamber c_7, this charge is ignited, which explodes the detonator r and the booster c^1, as before described.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

In a combined time and percussion-detonating fuse, the combination, with a concussion-plunger, carrying a primer, and a stationary firing pin cooperating with said primer, of a percussion-primer disposed in front of said first mentioned primer, and a nose detachably secured to the front end of said fuse and carrying a firing pin cooperating with said percussion primer.

JOHN H. WOODBERRY.