H. WILSON & M. A. LYNCH.

FUSE FOR EXPLOSIVE PROJECTILES.

APPLICATION FILED AUG. 23, 1904.

972,425. **Patented Oct. 11, 1910.**

Fig. 1.

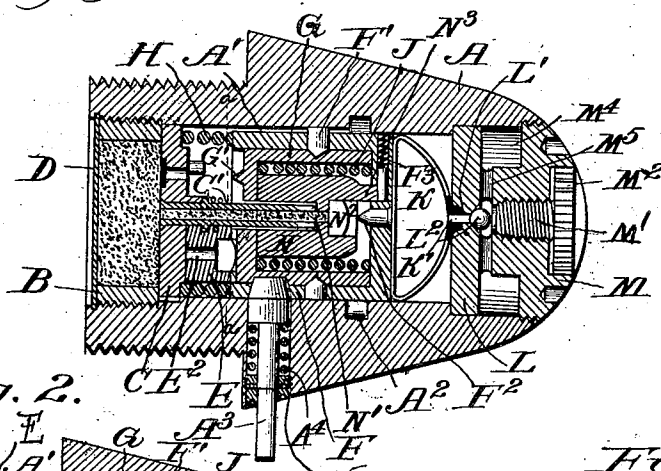


Fig. 2.

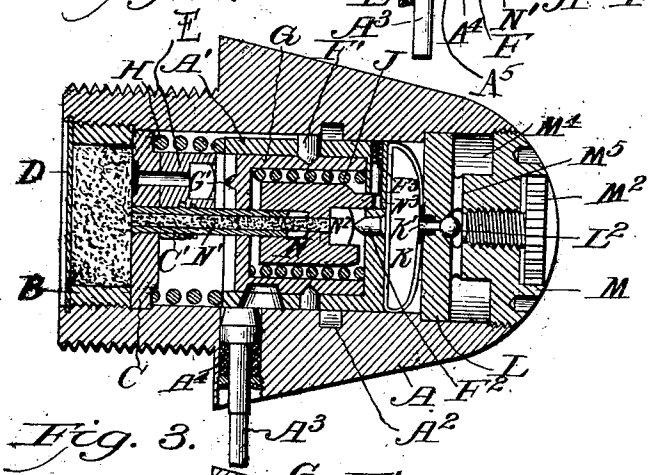


Fig. 3.

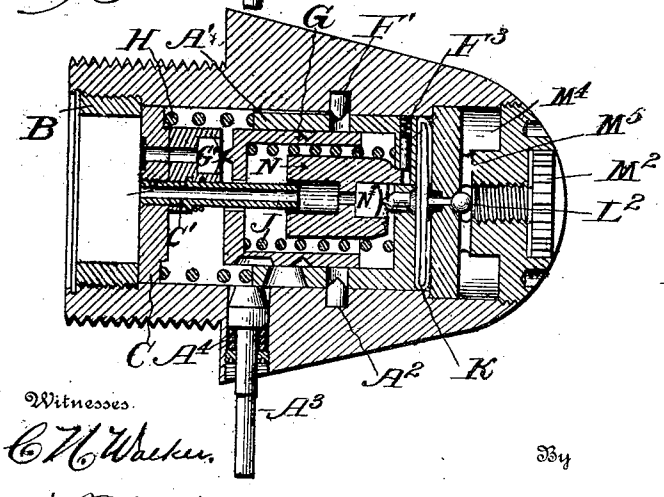


Fig. 4.

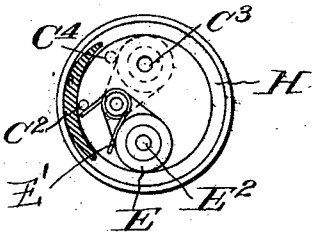
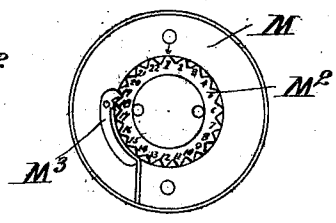


Fig. 5.



Witnesses.

C. M. Wacker.

J. F. Walker.

Inventors.

Harry Wilson and

Michael A. Lynch

By Henry T. Bright

Attorney

UNITED STATES PATENT OFFICE.

HARRY WILSON AND MICHAEL A. LYNCH, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNORS TO BETHLEHEM STEEL COMPANY, OF SOUTH BETHLEHEM, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

FUSE FOR EXPLOSIVE PROJECTILES.

972,425. Specification of Letters Patent. Patented Oct. 11, 1910.

Application filed August 23, 1904. Serial No. 221,872.

To all whom it may concern:

Be it known that we, HARRY WILSON and MICHAEL A. LYNCH, citizens of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Fuses for Explosive Projectiles, of which the following is a specification.

Our invention relates to that class of fuses generally known as "combination-fuses" in which the detonation is accomplished either by the firing of a time-fuse or upon impact of the projectile or shell.

The invention consists in combining with the time-fuse a percussion-fuse for detonating the explosive charge of the projectile upon impact; and the invention also consists of the novel construction, arrangement and combination of the various parts, as will be hereinafter described and pointed out in the claims.

The object of the invention is to produce a simple and effective combination-fuse which when placed in a projectile will allow such projectile to be handled with absolute safety and yet insure when the gun is fired certain detonation of the explosive charge at a predetermined time or upon impact of the projectile against a target or other object.

Other objects of the invention will become apparent upon a more detailed description thereof.

In the drawings, Figure 1 is a longitudinal sectional view of our improved combination-fuse, the several parts being represented in their normal or safe position; Fig. 2 is a like view showing the position assumed by the several parts preceding the detonation of the time-fuse; Fig. 3 is a like view showing the position of the several parts upon detonation of the time-fuse. Fig. 4 is a transverse section on the line *a*—*a* of Fig. 1 looking rearwardly; the primer support E being shown in armed position in dotted lines and Fig. 5 is a front end view of the fuse.

In the several figures A indicates the fuse casing which in this particular instance constitutes the nose of the projectile, although the fuse may be constructed independently of the projectile and inserted therein by means of the usual threaded casing. A threaded annular ring B is inserted in the rear of the fuse casing and secures in place a disk C carrying centrally thereof a tubular arm C^1 which extends through the disk C. A wad or thin disk D is secured between the ring B and the body of the shell and the space between the ring B, disk C and wad D is filled with powder to form the magazine of the fuse. A primer support E is pivoted to the arm C^1 and a spring E^1 tends to rotate said support to the position shown in Figs. 2 and 3 and in the dotted lines in Fig. 4; the free ends of said spring bearing respectively against the pin C^2 on the disk C and the primer support. A hole E^2 in the primer support registers with a hole C^3 in the disk C leading to the magazine when the parts assume their armed position (see Figs. 2 and 3). Mounted in the fuse body A is a hollow casing F carrying therein a hollow firing-pin G which is provided with a firing point G^1 situated off center. The firing pin G has its closed end counterbored so as to receive a portion of the primer support E for the purpose of holding said support in the position shown in Fig. 1 against the tension of the spring E^1. A spring H is mounted in the fuse body so as to press against the disk C and the casing F in opposite directions, while another spring J is mounted in the firing pin G so as to press against the closed end of the firing pin and the closed end of the casing F. The casing F and firing pin G are normally held together so as to move in unison in one direction by the bolts F^1 which pass through the casing and engage the firing-pin with their conical point. The bolts F^1 have their outer ends resting in longitudinal channels A^1 in the fuse casing; the outer ends of said channels terminating in the recesses A^2.

A liquid speed governor is utilized to control the rapidity of the movement of the casing F under the influence of the spring H. Said governor comprises a reservoir K for liquid constructed of any suitable material preferably thin pliable metal or stout rubber and is mounted between the closed end of the casing F and a disk L which is held in the fuse casing by a plug M. An opening K^1 in the reservoir registers with a central hole L^1 in the disk L and a suitable valve L^2 is seated over the hole L^1 to regu-

late the flow of liquid from the reservoir when the same is under pressure. The escapement of the liquid from the reservoir is controlled by the valve L^2 through the medium of the threaded screw M^1 in the plug M. Said screw is provided with an enlarged toothed head M^2, which is adapted to be held from movement by engagement with the pawl M^3 mounted on the plug M. A receiving reservoir M^4 is formed by the annular counterbore of the plug M and is adapted to connect with the reservoir K through the run-out M^5 when the valve L^2 is open. It will be apparent that the valve L^2 can be readily adjusted for any desired escapement of the liquid from the reservoir through the medium of the screw M^1.

To hold the casing F against premature movement when the valve L^2 is open we provide a spring actuated bolt A^3 mounted in the casing A. Said bolt normally has its inner end resting in registering apertures in the casing F and the firing-pin G. A spring A^4 holds the bolt A^3 in normal position by engagement with the inner end of the bolt and the nut A^5 screwed into the fuse casing. The outer end of the bolt is extended beyond the fuse casing a distance equal to the greatest diameter of the shell, whereby any tendency of said bolt to move due to centrifugal force before the shell leaves the gun is prevented.

Having fully described the structure of that portion of our invention relating to the time-fuse we will now recite its operation, which is as follows: Before the shell is placed in the gun the valve L^2 is set through the medium of the screw M^1 to permit a desired escapement of liquid from the reservoir K. The desired escapement in each instance is such as will permit the casing F to move under the influence of the spring H a distance sufficient to bring the bolts F^1 into register with the recesses A^2 and thereby release the firing pin G to the influence of the spring J at a predetermined moment. Assuming therefore that the valve L^2 is set for a desired escapement of liquid from the reservoir and the various parts are in the position shown in Fig. 1. Immediately the shell is fired from the gun centrifugal force due to the rotation of the shell causes the bolt A^3 to fly outwardly and release the casing F to the influence of the spring H. Said casing will then move forward carrying with it the firing-pin G until the bolts F^1 register with the recesses A^2, when said bolts will fly into said recesses owing to the combined influence of centrifugal force and the resulting cam action between their inner ends and the firing-pin G, and thereby release the firing-pin G to the immediate influence of the spring J which will result in said firing-pin moving rearwardly and detonating the primer and exploding the magazine. Said primer has in the meantime assumed the position shown in Fig. 2 owing to the disengagement of the primer support from the firing-pin because of the forward movement of the firing pin G in conjunction with the casing F under the influence of the spring H and the combined action of the spring E^1 and centrifugal force. The exact position of the primer support E shown in Fig. 2 is determined by engagement of the support with the stop pin C^4 on the disk C. It will thus be apparent that to produce a detonation of the fuse at a predetermined time it is only necessary to allow such an escapement of the liquid from the reservoir K as will permit the casing F to move a sufficient distance to release the firing pin G at a given moment.

We embody the percussion feature in our fuse by the employment of a plunger N mounted on the arm C^1 of the disk C and having a central powder chamber N^1 leading from the primer N^2 to the powder chamber in the arm C^1. A firing point F^2 is mounted centrally of the closed end of the casing F for contact with the primer N^2 on impact. The plunger is normally held from forward movement by the projecting shoulder N^3 which engages with the centrifugally operated locking bolt F^3 mounted in the casing F. It will thus be apparent that under normal conditions the plunger N is held against forward movement by engagement with the bolt F^3 but when the shell is fired from the gun centrifugal force causes the bolt F^3 to move outwardly and the plunger is then free to move forward upon impact and cause the primer N^2 to contact with the firing point F^2. When it is desired to utilize our invention as a percussion fuse the escape of liquid from the reservoir K is entirely cut off and the time-fuse thereby rendered inoperative.

We claim:

1. In a fuse the combination of a fuse casing, a primer, a detonator adapted to be automatically moved in one direction upon discharge and means operating at a predetermined point in said movement to move the detonator in the opposite direction.

2. In a fuse the combination of a fuse casing, a primer, a detonator adapted to be automatically moved in one direction upon discharge, means for controlling the rapidity of said movement and means operating at a predetermined point in said movement of the detonator to move same in the opposite direction.

3. In a fuse the combination of a fuse casing, a detonator and a primer normally out of alinement and alined with each other during flight of the projectile and automatic means operating at a predetermined time to move said detonator into contact with the primer.

4. In a fuse the combination of a fuse casing, a primer, a detonator normally locked against movement toward the primer, means constantly tending to contact the detonator with the primer, means for automatically moving the detonator in one direction upon discharge and means operating at a predetermined point in said movement to release the detonator.

5. In a fuse the combination of a fuse casing, a detonator, a primer normally out of alinement with said detonator and alined therewith during flight of the projectile and automatic means operating at a predetermined time to move said detonator into contact with the primer.

6. In a fuse, the combination of a fuse casing, a primer, primer-exploding means carrying a detonating element and adapted to be moved in one direction during flight of the projectile and means operating upon a predetermined movement of the primer-exploding means to move the detonating element in the opposite direction.

7. In a fuse, the combination of a fuse casing, a primer, primer-exploding means carrying a detonating element and adapted to be automatically moved in one direction during flight of the projectile and means operating upon a predetermined movement of the primer-exploding means to move the detonating element in the opposite direction.

8. In a fuse the combination of a fuse casing, a primer, primer-exploding means carrying a detonator, said primer-exploding means and detonating element being adapted to be moved in unison in one direction during flight, means operating at a predetermined point in said movement to move the detonating element in the opposite direction and means for controlling the rapidity of the united movement of the primer-exploding means and detonating element.

9. In a fuse, the combination of a fuse casing, a primer, primer-exploding means carrying a detonating element and adapted to be moved in one direction to release the detonating element and means for thereupon moving the detonating element in the opposite direction.

10. In a fuse, the combination of a fuse casing, a primer, primer-exploding means carrying a detonating element and adapted to be moved in one direction during flight, means operating at a predetermined point in said movement to force the detonating element in the opposite direction and means for controlling the rapidity of said movement of the primer-exploding means.

11. In a fuse the combination of a fuse casing, a primer, a detonator normally locked against movement, means operative upon flight of the projectile for moving the detonator in one direction and means operating at a predetermined point in said movement for thereupon forcing the detonator in the opposite direction to strike the primer.

12. In a fuse the combination of a casing, a primer, a detonator, automatically released means normally locking said detonator inactive, means for moving the detonator when released in one direction and means operating at a predetermined point in said movement to move the detonator in the opposite direction to explode the primer.

13. In a fuse the combination of a fuse casing, a primer, a detonator, automatically released means normally locking said detonator inactive, means for moving the detonator when released in one direction, means for controlling the rapidity of such movement and means operating at a predetermined point in said movement whereby said detonator is moved in the opposite direction to explode the primer.

14. In a fuse the combination of a fuse casing, a primer, a detonator, a centrifugally released locking bolt normally holding the detonator against movement and having its outer end coincident with the surface of the projectile at its greatest diameter, means operative upon flight of the projectile to move the detonator in one direction and means operating at a predetermined point in said movement for thereupon forcing the detonator in the opposite direction to strike the primer.

15. In a combined time and percussion fuse the combination of a fuse casing, a firing mechanism consisting of a primer, a detonator, means normally operative upon flight of the projectile for moving the detonator in one direction and means normally operating at a predetermined point in said movement for thereupon forcing the detonator in the opposite direction, means for positively locking the said firing mechanism against movement during flight and a second firing mechanism consisting of a plunger, firing pin, a second primer and centrifugally released securing means normally holding said second primer and firing pin from contact whereby said first firing mechanism is rendered inoperative and said second firing mechanism is rendered operative upon impact.

16. In a fuse, the combination of a fuse casing, a primer, primer-exploding means adapted to be automatically moved in one direction after discharge and means operating upon a predetermined movement of the primer-exploding means to move same in the opposite direction.

In testimony whereof we affix our signatures in presence of two witnesses.

HARRY WILSON.
MICHAEL A. LYNCH.

Witnesses:
CLARENCE F. DONOHOE,
HENRY T. BRIGHT.