F. A. SUTTON.

TIME FUSE.

APPLICATION FILED OCT. 12, 1917.

1,385,759.

Patented July 26, 1921.

2 SHEETS—SHEET 1.

Fig. 1.

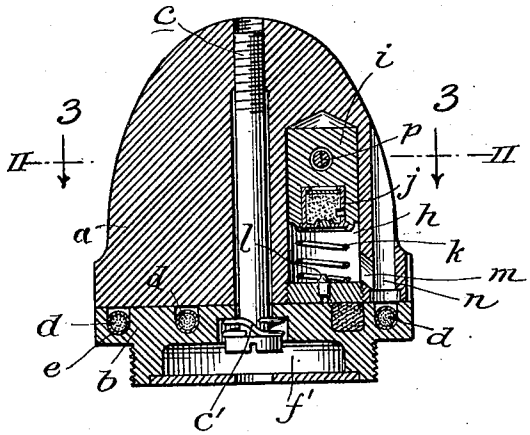


Fig. 4.

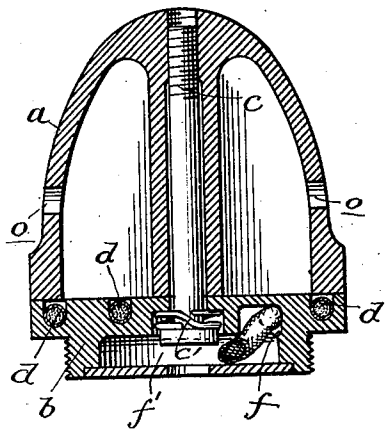


Fig. 2.

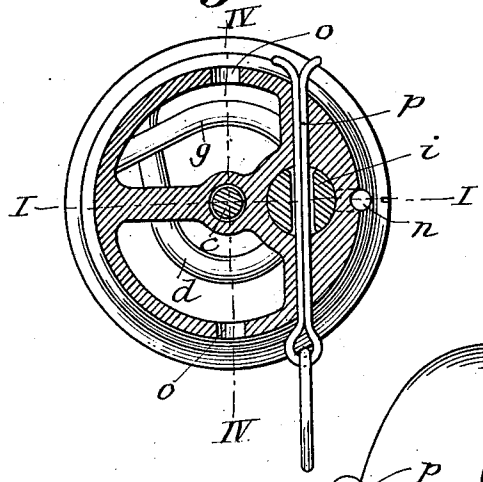
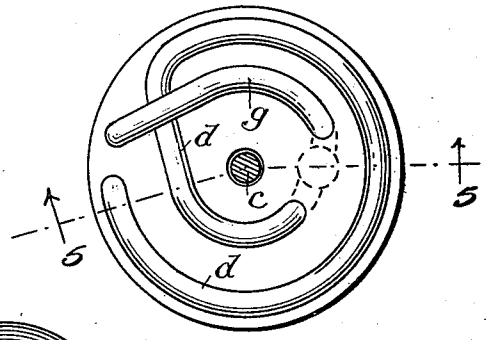


Fig. 3.



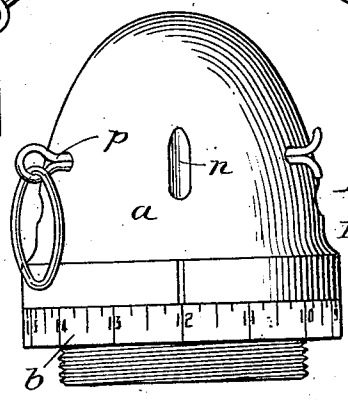


Fig. 5.

Witnesses

A. A. Lybrand

Inventor

Francis Arthur Sutton,

by Dodge and Dows.

Attorneys

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2 SHEETS—SHEET 2.

Fig. 6.

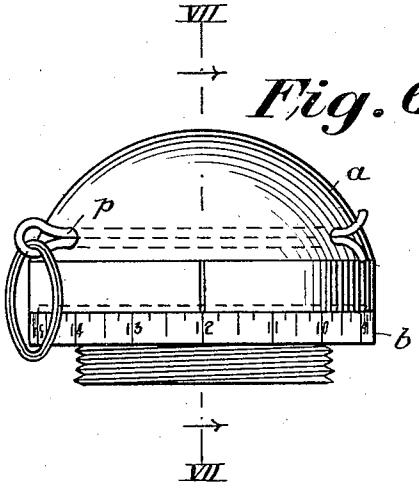


Fig. 7.

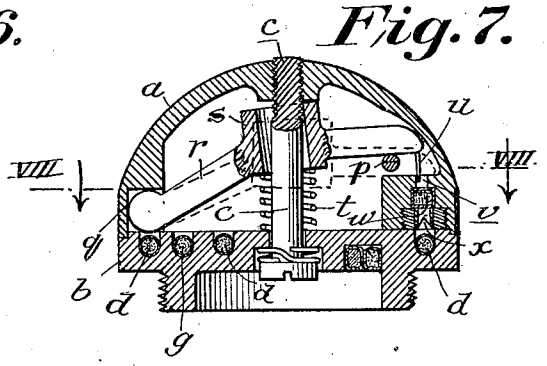


Fig. 9.

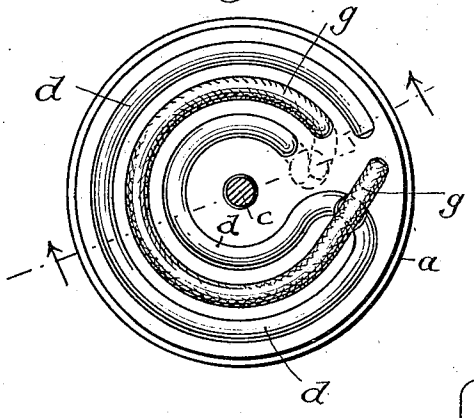
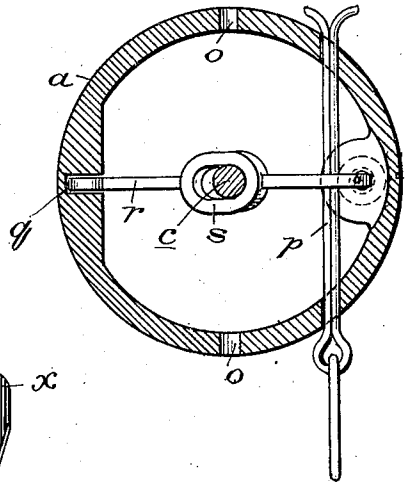


Fig. 8.



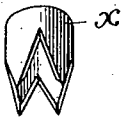


Fig. 11.

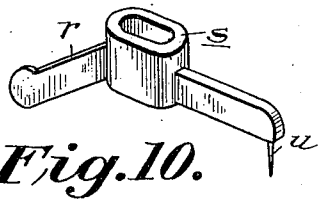


Fig. 10.

Inventor

Francis Arthur Sutton,

Witnesses

W. W. Lybrand

By Dodge and Sons

Attorneys.

UNITED STATES PATENT OFFICE.

FRANCIS ARTHUR SUTTON, OF LONDON, ENGLAND, ASSIGNOR TO CLARENCE C. WILLIAMS, ACTING CHIEF OF ORDNANCE, UNITED STATES ARMY, TRUSTEE.

TIME-FUSE.

1,385,759. Specification of Letters Patent. Patented July 26, 1921.

Application filed October 12, 1917. Serial No. 196,189.

To all whom it may concern:

Be it known that I, FRANCIS ARTHUR SUTTON, a subject of the King of England, residing at London, England, have invented a certain new and useful Improvement in Time-Fuses, of which the following is a specification.

The subject of the present invention is a time fuse suitable for the projectiles of trench mortars or other forms of shells which are required to explode at a predetermined time after leaving the gun.

The time fuse now in general use is expensive and it is necessary to employ special machinery in its production. In some forms of shells as, for instance, shrapnel, the cost and difficulty of manufacture are of less consequence than extreme accuracy in timing, but in other shells, such as the bombs thrown from trench mortars which can be used in great numbers, extreme accuracy of timing is not so important as facility of manufacture.

A fuse sometimes employed, which can be quickly and easily made and which at the same time possesses a time adjustment sufficiently accurate for all practical purposes, comprises a tube of soft metal, or its equivalent, containing the fuse material fitted near the firing cap in such a way that the latter may be adjusted lengthwise of the tube. On discharge of the gun the cap is ignited and ignites the fuse through a hole in the tube at any point determined by the position selected for placing the cap. The fuse is fitted to the shell or bomb so as to have its end in communication with the usual detonating appliances. The explosion may thus be timed by adjusting the position of the fulminating cap in accordance with the length of the fuse or material which it is desired shall be consumed before the detonating device in the bomb is reached. This fuse has, however, this disadvantage, viz., the envelop which incloses the fuse material is occasionally liable to choke the fuse when the bomb strikes the ground instead of allowing it to burn freely to the end, and if this happens the fuse is extinguished and there is no explosion.

According to my invention I employ a second fuse, preferably of the Bickford rubber type, crossing the first fuse, so as to be ignited thereby after it has burned some distance. This second fuse is timed to reach the detonator of the bomb a fraction of a second later than the first fuse if the latter burns freely to the end. In case, however, the first fuse is choked the second fuse will insure that an explosion takes place slightly later, but not sufficiently so to be of much consequence.

Two embodiments of the invention are shown in the annexed drawings as applied to the nose of a projectile which will contain the explosive material. In the drawings:

Figure 1 is a vertical sectional view, taken on the line I—I of Fig. 2;

Fig. 2 a transverse horizontal sectional view, taken on the line II—II, of Fig. 1;

Fig. 3 a plan view of the base plate containing the fuses;

Fig. 4 a vertical sectional view, the upper portion thereof being taken on the line IV—IV of Fig. 2, and the lower portion on the line 5—5 of Fig. 3;

Fig. 5 a side elevation of the fuse, with the safety pin in position;

Fig. 6 a side elevation of a modified form of fuse;

Fig. 7 a vertical sectional view, taken on the line VII—VII of Fig. 6;

Fig. 8 a horizontal sectional view, taken on the line VIII—VIII of Fig. 7;

Fig. 9 a top plan view of the base-plate containing the fuse;

Fig. 10 a perspective view of the hammer; and

Fig. 11 a like view of the punch which acts to perforate the fuse.

Referring first to the construction shown in Figs. 1 to 5 inclusive, *a* denotes a casting mounted on a base *b* and capable of being twisted or turned thereon in a radial direction. The casting *a* is attached to the base *b* by a screw *c*, a spring *c'* encircling the screw adjacent the head thereof and bearing against the head and the opposite wall of the base *b*. This arrangement holds the parts together while permitting a relative rotation of the members *a* and *b* for the purpose of adjustment.

The main fuse is denoted by *d* and may be said to comprise a tube of soft metal, or its equivalent, containing the requisite powder or other material which will burn. This tube lies in a groove or recess *e* formed in the base *b*. The major portion of the fuse is concentric with the axis of the structure and is arranged adjacent the edge of the base. From this circular portion the fuse

turns inwardly and is passed through a hole f which leads to a powder chamber f'. As the fuse d approaches this hole or opening it crosses a second fuse g, preferably of the Bickford rubber covered type, which also enters chamber f' through opening f (see Fig. 3) and which will insure the explosion of the bomb even if the melting of the metal tube of the fuse d should happen to extinguish the fuse on concussion with the ground.

Within the casting a is a chamber h in which is mounted a sliding block i. Said block contains a small cartridge j loaded with powder, which is slotted on its side, and is normally pressed upward by means of a light spring k against the end of the chamber h which is nearest the nose of the casting a. At the opposite end of the chamber is fixed a striker l. There is also, near the same end of the chamber, a laterally-extending aperture m leading into a hole n in the casting or head a, the latter hole being placed at a radius corresponding with that of the circular portion of the groove in which the fuse d lies. By inserting a tool in the hole n the fuse d may be pierced, and by turning the head or casting a on its base b the point of piercing may be selected at the desired distance from the end of the fuse d, so as to determine the length of that portion of the fuse which is to burn, and consequently the timing of the explosion.

The head or casting a is made hollow as far as possible, and is provided with holes o for admitting air to the interior thereof, thereby forming an air chamber in the fuse head and facilitating the burning of the fuse d.

As will be seen upon reference to Fig. 5, the head or casting a and the base b are graduated. In this instance the scale is formed upon the base and a mark upon the head, so that when the parts are relatively rotated the required timing of the fuse may be effected. When the parts have been adjusted for such timing, the fuse d is pierced through the hole n. This piercing may be done after the nose has been screwed onto the shell or bomb.

On being discharged from the gun or mortar, the rapid forward movement of the projectile will cause the block i, carrying the cartridge j, to retire against the pressure of the spring k and bring said cartridge against the fixed striker l. This causes the cartridge to ignite, and the flash passing through the slot in the cartridge shell and aperture m reaches the fuse d (which has been previously pierced) and ignites the same. The fuse d will certainly burn as far as the fuse g, thereby igniting the latter and insuring a time explosion through such fuse g, even if the fuse d itself should fail to reach the powder chamber.

For safety during transporting, etc., a pin p passing transversely through the block i, is provided, which pin, however, may be easily drawn out when the projectile is to be used.

The foregoing structure provides a time fuse which is readily manufactured and easily adjusted.

In Figs. 6 to 10 inclusive I have shown the same general arrangement of head and base, with two fuses, and the parts which are in common are similarly lettered. In this instance, however, instead of piercing the fuse before it is placed in the gun or mortar an automatic piercing device is employed. The inner face of the head or casting is slightly thickened at one side and a recess q is provided in which is seated the rounded end of a hammer or lever r. Said hammer extends transversely across the interior of the head or casting a and is provided with a centrally-disposed hub s having an elongated opening therein through which the screw c passes. A spring t surrounds the screw, the lower end of the spring bearing upon the upper face of the base b, while its opposite end takes against the under face of the lever or the hub thereof. This spring is light but is sufficient to normally hold the lever in its elevated position. At the free end the lever is provided with a pin u which stands in line with an opening v formed in the upper wall of a chambered portion of the head or casting a. Said chamber is designed to hold a fulminating cap w, which stands directly beneath the opening v and in line with the pin u, while a punch x (Fig. 11) underlies the fulminating cap and stands in line with the fuse d beneath the same. Said punch (as will be seen upon reference to Fig. 11) is provided with a series of prongs or knives, adapted, when forced downwardly through the explosion of the fulminating cap, to penetrate or puncture the fuse and permit the same to be lighted through the burning or explosion of the cap.

The head or casting a may, as in the other instance, be adjusted relatively to the base b so as to carry the cap and punch around over the fuse d in order to determine the portion of the fuse which is to be burned before the detonating charge is reached.

A safety pin p will be employed, as under the other construction, said pin passing through the head and underlying the free end of the hammer or lever r and holding it against accidental downward movement. Said pin is withdrawn prior to the placement of the shell in the gun or mortar, and upon the shell being projected from the gun the lever will set back against the spring t and the pin u will penetrate the fulminating cap w, and through its explosion cause the tube-like punch or cutter x to puncture the fuse and ignite the same.

The two fuses, to wit, the lead-covered one and that of the Bickford rubber covered type, are shown in a slightly different arrangement from that disclosed in Fig. 3, but they cross over each other as in the other instance and function in the same manner. The construction of the fuse shown in Figs. 6 to 10 is also relatively simple and may be cheaply manufactured and easily assembled.

It is to be understood that the mechanism shown in Figs. 6 to 11 inclusive may be employed where but a single fuse is present.

Having thus described my invention, what I claim is:

1. In a time fuse, a plurality of fuses crossing each other and leading to an explosive charge common to both; and means for igniting one of said fuses in advance of their point of crossing.

2. In a time fuse, a plurality of fuses contacting at a point in advance of their inner ends which terminate in an explosion chamber common to both; and means for igniting one of said fuses in advance of their point of contact.

3. In a time fuse, a sheathed fuse; a second fuse, said fuses contacting at at least one point in advance of their inner ends, which ends terminate in an explosion chamber common to both; and means for igniting the first-named fuse in advance of its point of contact with the second fuse.

4. In a time fuse, the combination of a fuse sheathed with a metal which will readily melt; a second fuse of the rubber covered type contacting with the first fuse in advance of their inner ends, which ends terminate in an explosion chamber common to both; and means for igniting the first-named fuse in advance of such point of contact.

5. In a time fuse, the combination of a head; a base; means for holding said parts together while permitting relative rotative adjustment; a plurality of fuses carried by the base, said fuses contacting at a point in advance of their inner ends, which ends terminate in an explosion chamber common to both; and means for igniting one of said fuses in advance of such point of contact.

6. In a time fuse, the combination of a base; a head mounted thereon for rotative adjustment; a fuse carried by said base and arranged with a portion thereof concentric with the axis of rotation of the head; a second fuse carried by the base, said fuses contacting at a point in advance of their inner ends, which ends terminate in an explosion chamber common to both; and means carried by the head for igniting the first-named fuse in advance of the point of contact of the same with the second fuse.

7. In a time fuse, the combination of a base, a head mounted thereon for rotative adjustment; a fuse carried by said base and arranged with a portion thereof concentric with the axis of rotation of the head; a second fuse carried by the base, said fuses contacting at a point in advance of their inner ends, which ends terminate in an explosion chamber common to both; and a percussion mechanism carried by the head and adapted to ignite the first-named fuse.

8. In a time fuse, the combination of a base; a head mounted thereon for rotative adjustment; a plurality of fuses crossing each other; a cutter carried by the head in line with one of said fuses; a fulminating device overlying said cutter; and a hammer arranged in line with the fulminating device and adapted, upon impact, to explode said device and thereby force the cutter into the fuse, rupturing the same and permitting ignition thereof.

9. In a time fuse, the combination of a base; a head mounted thereon for rotative adjustment; a fuse carried by said base; a tubular cutter carried by the head in line with said fuse; a fulminating cap overlying said cutter; and a spring sustained hammer adapted, upon impact, to puncture and detonate said cap and to thereby force the cutter into the fuse to rupture the same, and at the same time permitting the fuse to be ignited from said cap through the tubular cutter.

10. In a time fuse, the combination of a base; a head mounted thereon for rotative adjustment; a fuse carried by said base; a tubular cutter carried by the head and overlying the fuse; a fulminating cap overlying the cutter; a hammer pivotally mounted within the head; and a spring for normally holding the hammer in its elevated position.

11. In a time fuse, the combination of a base; a head mounted thereon for rotative adjustment; a fuse carried by said base and arranged within a portion thereof concentric with the axis of rotation of the head; a second fuse carried by the base, said fuses contacting at a point in advance of their inner ends; a tubular cutter carried by the head in line with said first-named fuse; a fulminating cap overlying said cutter; a lever pivotally mounted in the head, the free end of the lever overlying the cap; and a spring serving normally to hold the lever in its elevated position.

In testimony whereof, I have signed my name to this specification.

FRANCIS ARTHUR SUTTON.