I. J. AND H. B. MARTIN.

FUSE FOR EXPLOSIVE SHELLS.

APPLICATION FILED JULY 16, 1917.

1,311,081. Patented July 22, 1919.

Fig. 1.

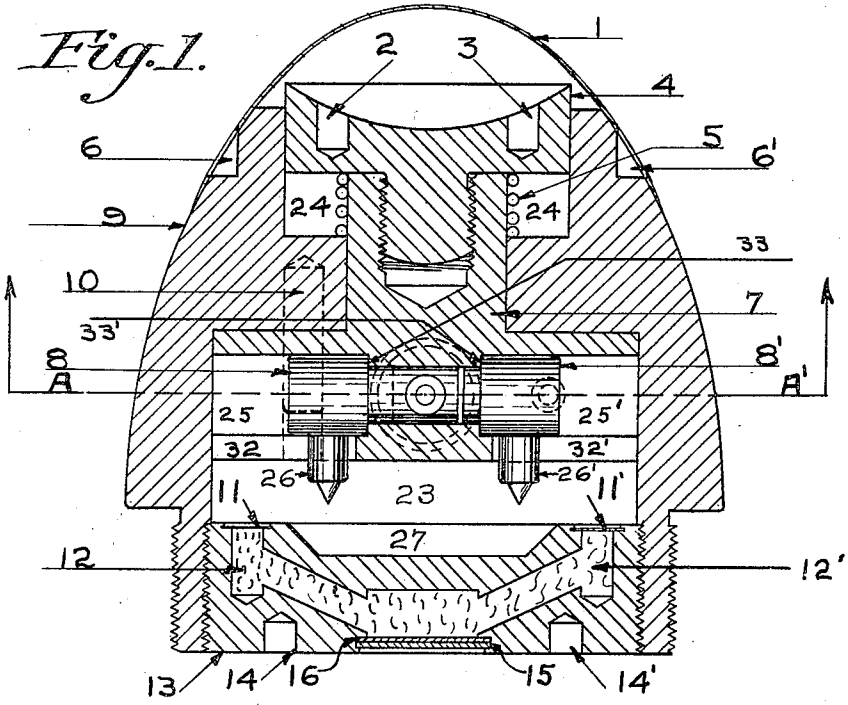
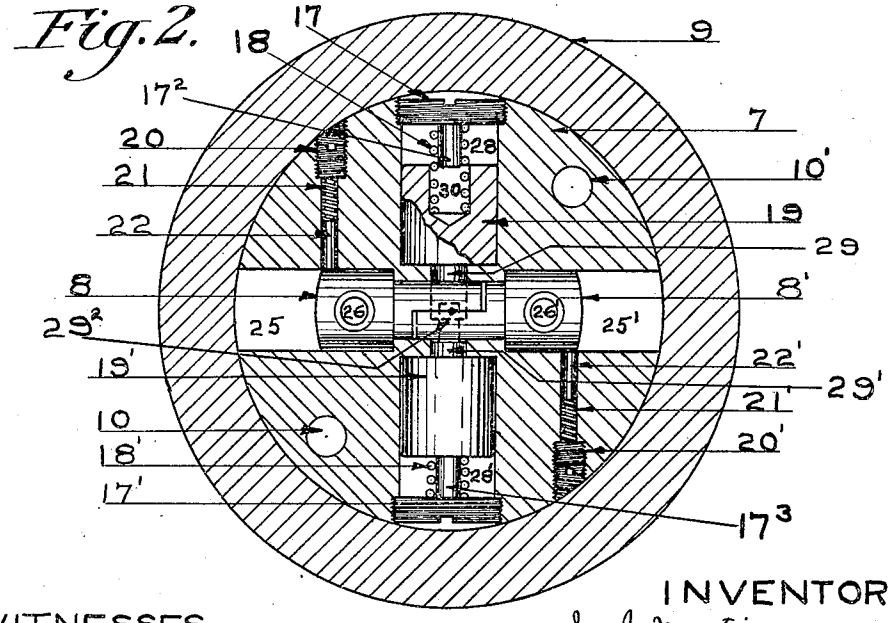


Fig. 2.



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FUSE FOR EXPLOSIVE SHELLS.

1,311,081. Specification of Letters Patent. **Patented July 22, 1919.**

Application filed July 16, 1917. Serial No. 180,814.

To all whom it may concern:

Be it known that we, IRA J. MARTIN and HOWARD B. MARTIN, citizens of the United States, residing at Pawtucket, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Fuses for Explosive Shells, of which the following is a specification.

Our invention relates to improvements in fuses for explosive shells and our purpose is to provide a fuse which is furnished with a safety device to prevent accidental explosion; which is adapted to explode by contact with anything offering very slight resistance when the shell is in flight, such as water, soft sand and the like; and in which the certainty of explosion is insured by a plurality of non-centric firing points.

The features of our invention are disclosed in the accompanying drawings, in which—

Figure 1 is a vertical section through the axis of the fuse.

Fig. 2 is a cross-section on the line A—A′ of Fig. 1.

In both the figures, 9 represents the fuse head, made preferably of metal, and approximately conoidal in shape.

The base of the head 9 is threaded, as shown, for introduction into the body of the explosive shell.

The front or top of the head containing the fuse is recessed, as shown at 24, said recess being cylindrical and fitted with a plunger member 4 which is capable of sliding readily in said cylindrical recess.

2 and 3 are holes for the introduction of a suitable wrench or spanner to facilitate the threaded engagement of the plunger member 4 with the lower plunger member 7 which carries the detonating device 8—8′, hereinafter described, 4 and 7 being screwed together and normally constituting a unit hereinafter termed "the plunger."

Within the recess 24, and surrounding the upper plunger member 4, is a spiral spring 5, which normally keeps the plunger in the position shown in the drawing.

The base of the head 9 is recessed as shown at 23 and the plunger 4—7 moves freely in the cylindrical recess 23. The member 7 is also provided with the cylindrical holes or runways 25—25′ in which are adapted to slide the cylindrical members 8—8′ carrying the two detonating points 26—26′ these being duplicated and acting simultaneously in order to insure explosion of the fulminate 11—11′ and for other purposes hereinafter shown.

11—11′ are percussion caps or primers in contact with the powder chamber 12—12′ and are adapted to be exploded by the points 26—26′ when the shell is fired and meets with some resistance by striking water or another obstacle.

13 is a plug at the base of the head, bored or recessed for the powder chambers 12—12′; and is screwed into the base of the head by means of the spanner holes 14—14′. The inner face of the plug 13 contains the depression 27, the use of which will be explained hereafter.

The cylindrical members 8—8′ are normally in the position shown in the figures, that is, at a point near the axis of the fuse, and at a position where the firing points 26—26′ are not in opposition with the percussion caps or primers 11—11′. These members 8—8′ are normally retained in the position shown in the figures by the device shown best in Fig. 2. In this figure 28—28′ are cylindrical chambers or runways situated on the base of the plunger member 7, the runways being at right angles to the runways 25—25′, and the axes of both sets of runways if projected would mutually bisect each other. In the runway 28—28′ are the members 19—19′ adapted to slide readily in said runways. The members 19—19′ terminate at their inner end in projecting studs 29—29′, the stud 29 retaining its full size throughout, while the stud 29′ is reduced in size at its extremity, as shown at 29^2, for the purpose of admitting said extremity into a depression bored in the end of 29, as shown by dotted lines in Fig. 2, so that when the members 19—19′ are at the bottom of the runway 28—28′ the projecting end of the stud 29^2 enters the depression in the stud 29 and engages the same. The outer ends of the runway 28—28′ are stopped by the screw plugs 17—17′, said plugs having the projections 17^2—17^3. The members 19—19′ are also bored out at their outer ends, leaving the space 30 therein, as shown in the sectional view of the member 19 in said Fig. 2. These spaces are for the purpose of receiving the projecting studs 17^2—17^3 of the plugs 17—17′ and the surrounding spiral spring 18—18′ which springs serve normally to keep the members 19—19′ at the inner end of the runways 28—28′.

The members 8—8′ carrying the firing points 26—26′ are also reduced in size at their inner ends forming shoulders 33—33′ (see Fig. 1), and one-half of each of these inner ends is cut away in a plane passing through the axis for a short distance, as seen in Fig. 2, so that these ends overlap and slide by each other, as shown.

Inasmuch as the projected axes of the members 8—8′ and 19—19′ intersect at the center of the fuse, and inasmuch as the studs 29—29′ engage each other, as shown and described, the inner ends of the members 8—8′ are bored so as to permit the passage through said perforations of the studs 29—29′.

In Fig. 2, 22—22′ are cylindrical plugs transversely sliding in runways bored in the plunger member 7 of the fuse, and 21—21′ are spiral springs bearing against said plugs 22—22′ at one end, the other end of said spiral springs being kept under tension by the screw plugs 20—20′. The opposite ends of the plugs 22—22′ rest normally against the surface of the sliding members 8—8′ but not so as to interfere with the movement thereof.

1, in Fig. 1, is a thin casing or envelop suitably attached to the head of the fuse, and may consist of any substance offering exceedingly small resistance, such as thin pasteboard, very thin copper, or other very light material. Indeed, no envelop at all is necessary, the only purpose in providing an envelop being the exclusion of dust; and the purpose of making this envelop so thin is that the plunger may be driven inward by the very slightest resistance, such as is provided when a shell strikes water or other resisting matter.

16, in Fig. 1, is a diaphragm of celluloid, or other thin inflammable material, and 15 is a washer holding same in place.

When the powder in the recesses 12—12′ is ignited, it communicates the flame through the celluloid diaphragm 16 to the charge in the body of the shell, not shown in the drawings.

As it is important that the plunger 4—7 should revolve together with the outer body 9 of the fuse, the pins 10—10′ are fixed in the body 9 and pass through perforations in 7 permitting longitudinal movement of the plunger within the body of the fuse but preventing independent rotation thereof.

6—6′ shown in Fig. 1, are spanner holes by which the fuse body 9 is screwed into the head of the explosive shell.

As the members 8—8′ slide centrifugally in the runway 25—25′, we have provided the device shown in 20, 21, 22 and in 20′, 21′, 22′ to operate for the purpose of holding 8—8′ in the position farthest from the center after they have once attained that position, as will be described hereafter.

The lower part of the plunger member 7 adjacent to the runways 25—25′ is slotted or cut away, said slots communicating with said runways, as shown at 32—32′, (Fig. 1) so as to permit the transverse sliding or passage therethrough of the firing points 26—26′.

The operation of our device is as follows:—

By virtue of the spiral springs 18—18′, the locking members 19—19′ are kept in engagement at the center of the fuse, and the members 8—8′ are locked in the position shown in Fig. 2 by the intersecting studs 29—29′. It is evident that so long as the members 8—8′ are in the position shown in the figures an explosion of the shell by accident is practically impossible, because in the position shown the firing points 26—26′, are not in opposition with the percussion caps or primers 11—11′, and if by any accident, or by a blow upon the end of the plunger 4—7 the latter with the firing points 26—26′ should be forcibly depressed no explosion would follow because the points would not be in opposition to the percussion caps or primers 11—11′, and even if by any accident either one of the members 19—19′ is set free, the other will hold the members 8—8′ so that they cannot move. When, however, the shell is fired from a rifled gun, the centrifugal force caused by the revolution of the shell will separate the locking members 19—19′. As soon as these members are separated, the members 8—8′, being released, are immediately operated upon by the same centrifugal force and move outwardly from the center until stopped by the inner wall of the fuse body 9 at which position the firing points 26—26′ are immediately opposite the percussion primers 11—11′. When this position is attained by the revolution of the shell, any opposition or obstruction, even the slightest, striking the thin envelop 1 of the head of the fuse will immediately rupture the same and cause such obstruction to strike against the plunger 4 immediately below the envelop 1.

The resisting power of the spring 5 is so slight that a very slight opposition or obstruction meeting the shell will cause the plunger to be forced inward, thus bringing the points 26—26′ in simultaneous engagement with the percussion caps or primers 11—11′ and exploding the shell.

In shells as heretofore made, it has been found in practice that if for any reason the shell ceases to revolve after firing, even though it did revolve when it left the mouth of the gun, an explosion will not always result because when the centrifugal force ceases to operate, the locking member is apt to return to its normal position and an obstruction will not under such circumstances

cause an explosion of the shell. With our invention, however, after the shell has once begun to revolve and the members 8—8′ are in a firing position they cannot return to normal or safe position because the pins 22—22′ are forced inward by the springs 21—21′ so that when the members 8—8′ have reached the firing position the pins 22—22′ drop behind the shoulders 33—33′ in the members 8—8′ so that said members cannot return to their original position but are retained in firing position, and any obstruction operating on the plunger 4—7 will explode the shell even though it has ceased to revolve.

So far as is known to these applicants, their invention is the first to embody a plurality of simultaneously operating firing points, and also the first in which the firing points are eccentric. The advantages of these two features are apparent:—The first feature doubles the certainty of explosion when the shell is fired; the second renders accidental explosion practically impossible. They also believe that prior to their invention no fuse for explosive shells has been known in which the firing point or points are centrifugally operated and are normally out of register with the percussion primer when the shell is at rest.

It is evident that some variation of a mechanical nature may be made from the exact construction shown in the drawing without affecting the principles of our invention. Thus the pin 10 instead of being fixed in the fuse body, may be fixed in the plunger and slide into the fuse body. Thus also instead of the single depression 27 in Fig. 1 for engaging and holding the firing points in case the plunger is accidentally forced inward, there may be one or more holes in the fuse base in which the firing points would fit and be held securely against centrifugal motion in case of such accidental movement of the plunger.

Having now described our invention, what we claim and desire to secure by Letters Patent is:—

1. A fuse for explosive shells consisting of an exterior body, a plunger movable axially therein by resistance applied at its outer end and having a transverse runway; and a plurality of centrifugally operated members slidably located in said runway, each of said members being provided with a firing point, substantially as described for the purposes specified.

2. A fuse for explosive shells consisting of an outer or containing body, a plunger movable axially therein and carrying at its inner end a plurality of centrifugally operated members; a plurality of simultaneously operating firing points fixed upon said members and a locking device for locking said members together when the shell is not revolving, substantially as specified.

3. A fuse for explosive shells consisting of a containing body; an axially sliding plunger located therein; a plurality of centrifugally operated sliding members carried by said plunger; a plurality of simultaneously operating firing points attached to said members and a centrifugally operated locking device consisting of two members sliding in suitable runways in said plunger, the interior end of one of said locking members being adapted to penetrate the interior end of the other of said locking members, each of said interior ends of said locking members piercing by means of suitable holes and securely locking the sliding members carrying the firing points aforesaid, and operating further when acted upon by centrifugal force to release said sliding members carrying said firing points, as specified and described.

4. In a fuse for explosive shells, an axially-movable plunger; a plurality of eccentric, simultaneously operating firing points; a plurality of centrifugally-operated members carrying said points and slidably contained in said plunger; and means for holding said points in a position of safety and preventing centrifugal movement thereof, in case of the accidental depression of said plunger, substantially as set forth.

5. In a fuse for explosive shells, a containing body; a plunger axially-movable therein and carying one or more centrifugally moving firing points; percussion primers corresponding in number to said firing points, said points being normally out of register with said primers and a base for said fuse located immediately opposite said firing point or points when the same are in a position of safety as shown in Fig. 1, said base containing a depression or depressions adapted to engage and retain said firing point or points and prevent centrifugal motion thereof in case of the accidental depression of said plunger, substantially as set forth.

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

IRA J. MARTIN.
HOWARD B. MARTIN.

Witnesses:
EDITH M. BROMLEY,
HENRIETTA F. STEVENS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."