W. MILLS.

GRENADE AND OTHER LIKE APPARATUS.

APPLICATION FILED JUNE 15, 1915.

1,178,092.

Patented Apr. 4, 1916.

2 SHEETS—SHEET 1.

Fig. 1.

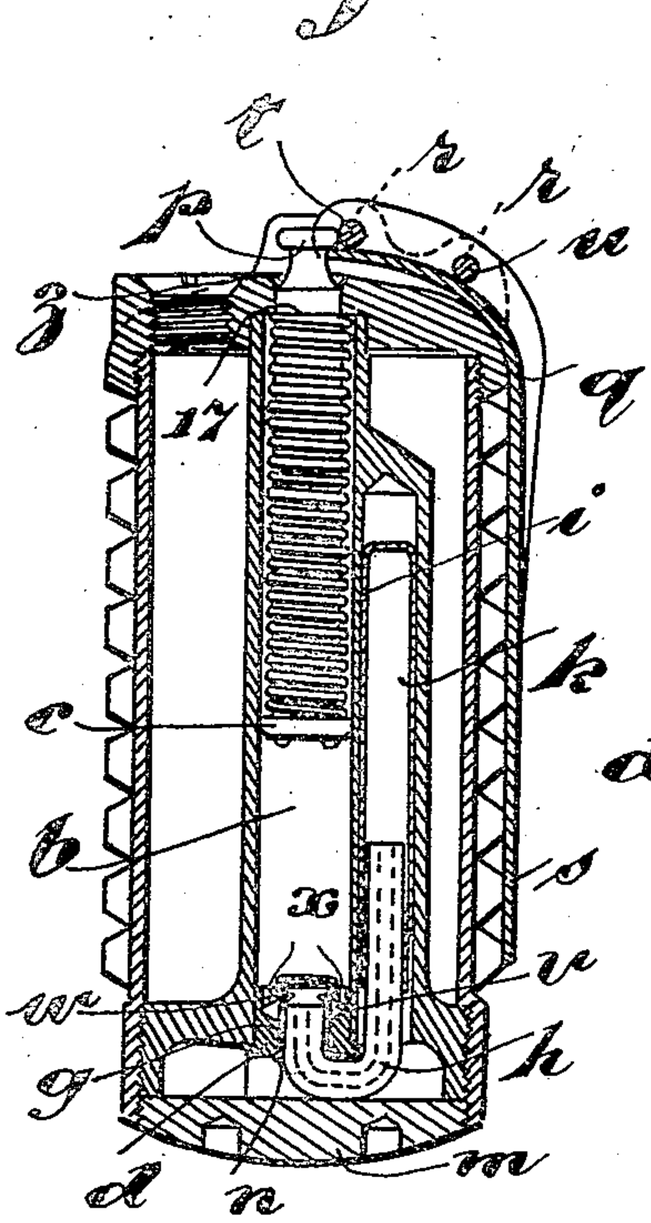


Fig. 2.

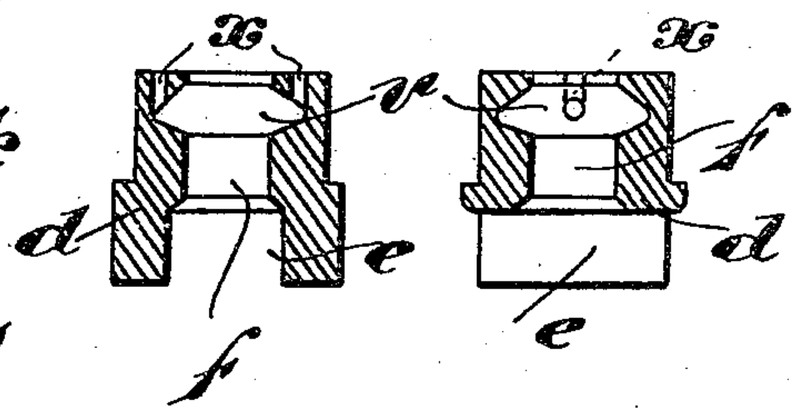


Fig. 3.

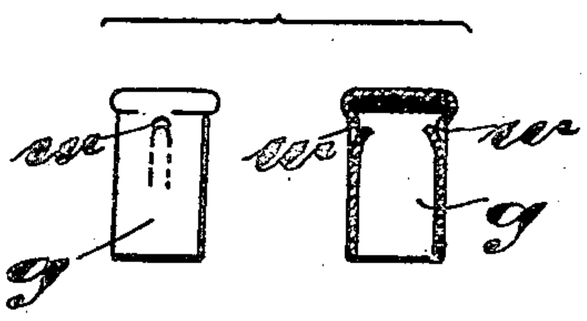
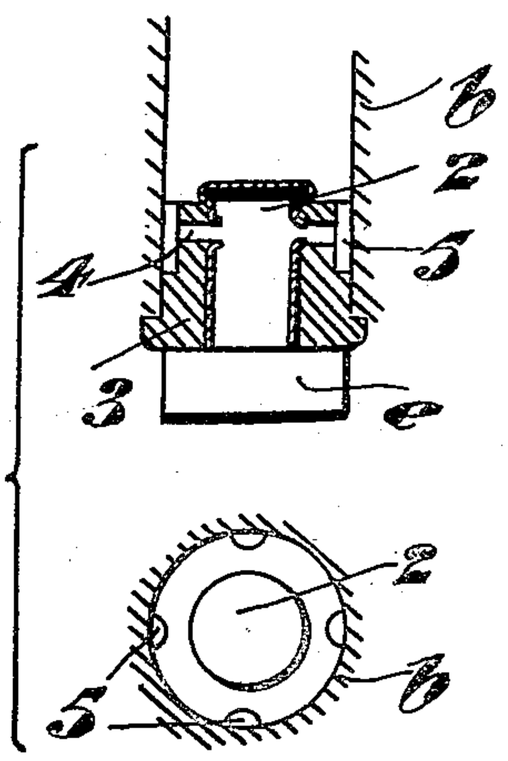


Fig. 4.



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2 SHEETS—SHEET 2.

Fig. 8.

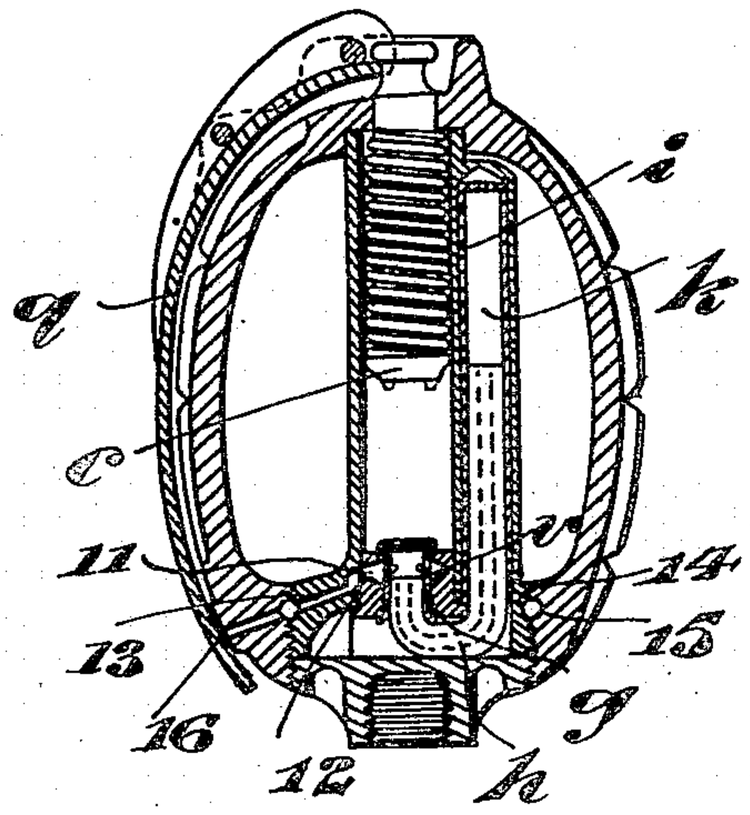


Fig. 6.

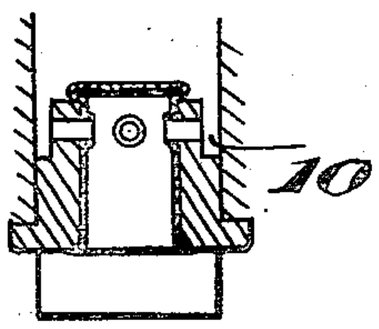


Fig. 5.

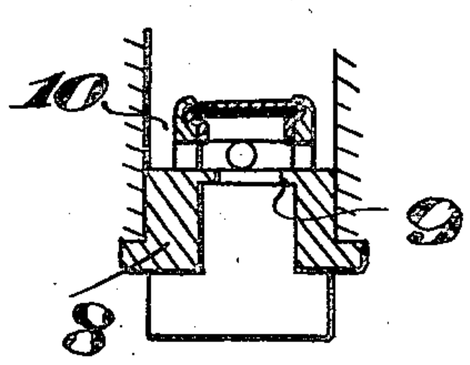
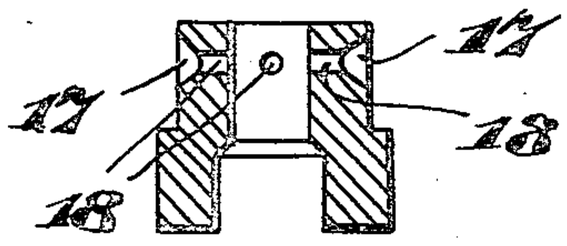


Fig. 7.



Inventor:-
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By:- J. Lingis Atty.

UNITED STATES PATENT OFFICE.

WILLIAM MILLS, OF BIRMINGHAM, ENGLAND.

GRENADE AND OTHER LIKE APPARATUS.

1,178,092. Specification of Letters Patent. Patented Apr. 4, 1916.

Application filed June 15, 1915. Serial No. 34,234.

To all whom it may concern:

Be it known that I, WILLIAM MILLS, a subject of the Kingdom of Great Britain, residing at Atlas Aluminium Works, Grove street, Birmingham, in the county of Warwick, England, engineer, have invented certain new and useful Improvements in Grenades and other like Apparatus, of which the following is a specification.

This invention comprises certain improvements in or relating to caps, fuses, and the like, for use in connection with grenades and the like apparatus.

In connection with a fuse adapted to be fired or ignited by a cap, and in which the extremity of the fuse is introduced into a housing or aperture in juxta-position with the cap, the latter, upon being fired, is liable to create a pressure between the cap and the fuse and to blow, or tend to blow, the fuse, or the end thereof, out of the aperture or housing, or to create a pressure which is liable to burst the fuse at a position outside of the aperture or housing, this involving the possibility that the fuse or the remaining part thereof does not burn or continue to burn. Such a pressure is also liable, in cases in which the fuse does burn, to shorten the period of burning of the fuse, as, for instance, by blowing through the interior of the latter. Thus the presence of this pressure is liable to result on the one hand in the detonator not being fired, and on the other hand in the detonator being fired too soon, in the first case with the result that the grenade does not explode, and in the second case with the result that considerable danger is involved in using the grenade.

According to the present invention, provision is incorporated for relieving the pressure in the vicinity of the cap, this having the advantage that the fuse is effectively relieved from this pressure bodily and internally, the products of combustion are enabled to escape and satisfactory ignition and burning of the fuse are thereby enabled to take place.

In carrying out the present invention I provide an air passage or air passages in the vicinity of the cap, which air passage or air passages are adapted to offer a means of escape for the gases, and products of combustion. I may furthermore make provision whereby while the vent according to the present invention is incorporated, this vent, before the grenade is used, is closed to thereby exclude moisture and the like from the interior of the grenade. The vent is adapted to be opened in the operation of throwing the grenade, either by hand or by a throwing appliance.

In order that this invention may be clearly understood and readily carried into practice, reference may be had to the appended explanatory two sheets of drawings, upon which:—

Figure 1 is a sectional elevation of a grenade incorporating one embodiment of the present invention. Fig. 2 illustrates separately, on an enlarged scale, the cap plug employed in the grenade shown in Fig. 1. Fig. 3 illustrates separately, and on an enlarged scale, the cap employed in the grenade shown in Fig. 1. Fig. 4 illustrates a combined cap and cap plug incorporating a modified embodiment of the present invention. Fig. 5 illustrates a combined cap and cap plug incorporating a further modified embodiment of the present invention. Fig. 6 illustrates a combined cap and cap plug incorporating a still further modified embodiment of the present invention. Fig. 7 illustrates a still further modified form of cap plug according to the present invention. Fig. 8 is a sectional elevation of a grenade incorporating an embodiment of my invention in which the vent is adapted to be opened in the operation of throwing the grenade.

In a convenient embodiment of the present invention, and describing its application to a grenade as described in my concurrent application aforementioned, in which the cap *g* is inserted within the one end of a separable and removable plug *d* having a central aperture or perforation *f* for the reception of such cap, and into the other extremity of which perforation the end of the time fuse *h* is introduced, I provide around the interior of such central perforation, and advantageously near the end of the plug at which the cap is inserted, an annular groove or recess *v*, and in the wall of the cylindrical part of the cap I provide one or more perforations *w* so that upon exploding the cap *g*, the gases and products of combustion are enabled to pass through this perforation, or these perforations *w*, into the annular channel *v*. The annular channel *v* is in communication with a longitudinal channel or channels, or with a transverse

channel or channels which offer communication with the atmosphere, or with the space in which the hammer or striker operates, or such channel *v* is otherwise in communication with a suitable means of egress for the gases, whereby the latter are enabled to escape without coming into contact with the charge. In the arrangement shown in Fig. 1, a perforation or perforations *x* are provided, and adapted to offer communication between the annular channel *v* and the interior of the housing *b* in which the spring-impelled striker *c* is adapted to operate. The striker *c* so fits within the housing *b* that it is readily possible for the gases to pass the striker and ascend the upper part of the housing in which the spring for impelling the striker is disposed, the gases being enabled to finally escape at the top of the housing. The fuse *h* offers communication between the cap *g* and the detonator *k*, and the detonator *k* is arranged within a housing *i*, the interior of which is isolated from the gases egressing by way of the annular space *v*. The cap plug *d* closes the lower extremity of the housing *b* and is retained in position by the closure member *m*. The cap plug *d* in which the venting means are provided thus constitutes a separable and removable anvil which is rigidly retained from axial movement in one direction by the housing *b*, and in the other direction by the closure member *m*. In cases in which a separable and removable anvil is employed, it may be secured by other means.

The hammer or striker *c* or the stem thereof is furnished with a head or annular flange *p* adapted to project out of the body of the grenade, and such head or flange is adapted to be engaged by the forked extremity of a lever *q* which lies upon the surface of the body of the grenade and extends a distance around the latter. Such lever *q* is adapted to be disposed between two elongated projections or flanges *r*, *r* upon the outer surface of the body, and at a point near to the head of the striker such flanges are furnished with slots or grooves adapted to form bearings for trunnions or projections *t* provided one on each side of the lever *q*. When the tail *s* of the lever *q* is retained against the outer surface of the body, the forked extremity on the other side of the trunnions engages with the head or flange *p* of the striker *c*, and retains it in its retracted condition. A pin *u* may be passed through the flanges between which the lever lies, such pin passing through the lever *q* or occupying a position above or outside of the lever to retain the latter in this position. When it is desired to use the grenade, the tail of the curved lever is retained against the body by hand, or by the throwing appliance, the pin is removed, the grenade is thrown, and upon the grenade being released by the hand, or throwing appliance, the lever *q*, by a pivotal movement, releases the striker, which latter fires the cap.

z is an annular groove which is provided around the upper part of the stem or striker *c*, this groove being conveniently formed partly in the body of the grenade, and partly in the striker, or wholly in either of these members, but being of such a character that it can be filled with wax or other sealing material, whereby after the grenade has been manufactured it can be sealed at this point around the striker to effectively exclude air, moisture, etc., from the interior of the grenade throughout the time which may elapse between the manufacture of the grenade and the time of using it.

If desired I may provide around the stem of the striker at 17 an annular sealing member, which is adapted to seal the joint between the stem of the striker and the surrounding part of the body of the grenade, this annular sealing member being retained in position by the spring by which the striker is operated.

When the striker is operated by the spring to strike the cap, the upper or outer end of the striker passes into the housing *b* thereby leaving the extremity thereof, which was previously sealed, open for the escape of gases which have passed the striker *c*, as aforedescribed. If desired, perforations or notches may be provided in the striker *c* to provide for the ready passage of the gases from the one side to the other thereof.

The cap *g* may be secured within the cap plug *d* in any suitable manner, as, for instance, in a manner described in my concurrent application by arranging arms or extensions *n*, *n* at the open end of the cylindrical wall of the cap, which arms or extensions *n*, *n* may be bent outwardly at right angles to lie within the transverse groove *e* which is provided in the plug *d* to accommodate the transverse part of the fuse.

It is desirable that the extremity of the fuse should not be disposed closely against the explosive part of the cap, so that a space may be left between the explosive part of the cap and the fuse, from which space the gases may escape by the venting provision according to the present invention. In order to provide for this space between the explosive part of the cap and the extremity of the fuse, I provide means for limiting the extent to which the fuse is introduced into the cylindrical portion of the cap. For this purpose the perforations *w* in this cylindrical portion of the cap may be formed by forcing inwardly tongues of metal cut from the cylindrical wall of the cap, which tongues of metal, by being bent inwardly, thereby provide the desired perforations *w*, and also form stops for the extremity of the fuse.

Fig. 4 illustrates an embodiment of the

invention in which provision for venting also constitutes provision for retaining the cap in position. In this case the cap 2 is furnished with a cylindrical wall projecting into the central perforation within the cap plug 3, and the cap plug is furnished with one or more transverse diametric perforations 4 which, at their extremities in the periphery of the cap plug, are in communication with the interior of the housing *b*, this being provided for by suitably grooving the periphery of the cap plug, as shown at 5. After the cap has been inserted in position, as shown in Fig. 4, with its cylindrical part extending beyond the diametric perforations 4, a punch is passed through the diametric perforation or perforations, and this punching operation has the result that the sheet metal of the cylindrical part of the cap is drawn or forced out of place in the manner illustrated, this displaced metal on one side of the cylindrical part of the cap being forced into the diametric perforation, so that the cap is thereby locked or secured in relation to the cap plug. After the punch has been withdrawn, the metal on the opposite wall of the cap is left projecting inwardly, and is thus enabled to act as a stop for the end of the fuse.

Instead of employing a cap of the type having a cylindrical portion, into which the end of the fuse is introduced, the invention may be utilized in connection with other types of caps. For instance, if it should be desired to use, in connection with a plug such as *d*, a cap having a short cylindrical extension, the cap plug may be furnished with an annular ridge or flange 6 as shown in Fig. 5 which, after the cap 7 has been inserted, may be contracted around or forced inwardly upon the head of the cap, to thereby retain the latter in its perforation, the head being suitably enlarged to rest upon the inner surface of the cap plug 8. In this case the end of the fuse may be introduced into the perforation in the cap plug, and suitable means are advantageously incorporated to appropriately space the end of the fuse from the explosive part of the cap. For this purpose the cap plug 8 may be furnished with an internal annular projection 9, or a series of projections which form a stop or stops for the extremity of the fuse. Between the cap and the annular projection 9, a series of perforations may be provided around the circumference of the cap plug and may offer communication with an annular space 10 provided by reducing the upper part of the cap plug, and this annular space 10 with the perforations thus constitute provision for relieving the pressure.

Fig. 6 illustrates a cap slightly differing from that shown in Fig. 1, and in which, instead of employing tongue portions to form stops for the fuse, holes are punched inwardly from both sides in the cylindrical part of the cap, the punching of these holes causing the sheet metal to be forced inwardly in the manner illustrated, in a manner whereby two, three, four or any suitable number of stops are furnished around the circumference for limiting the extent to which the end of the fuse can be inserted. The holes in the cap may occupy positions opposite to venting perforations in the cap plug, which latter may offer communication with an annular space around a reduced part of the plug, as described in connection with Fig. 5. In this embodiment, shown in Fig. 6, the cap may be retained in position in the cap plug by the method described in connection with Fig. 1.

Fig. 7 illustrates a cap plug slightly differing from that shown in Fig. 1, and in which the annular groove 17 is provided externally instead of internally in the wall of the plug. Lateral passages 18 are provided to offer communication between the annular groove 17 and the perforations in the cap or between the annular groove 17 and the space between a short cap such as shown in Fig. 5, and the end of the time fuse. Vertical grooves or perforations may be provided in the cap plug to offer communication between the annular groove 17 and the space in which the striker *c* works, or such annular groove 17 may be otherwise placed in communication with the atmosphere, as, for instance, by provision such as is hereinafter to be described with reference to Fig. 8.

Instead of making provision whereby the vent is obtained through the medium of the space in which the striker *c* works, such vent may be provided for independently of this space, for which purpose according to one arrangement the annular space *v* may, as shown in Fig. 8, be in communication through the medium of one or more lateral or radial passages 11 with a circumferential groove 12 provided in the part in which the cap plug fits, and which last-mentioned internal circumferential groove has one or more radial passages 13 extending to the atmosphere, this communication being through the medium of other male and female circumferential grooves 14, 15, such last-mentioned male and female circumferential grooves occurring between the housing by which the cap plug is carried, and the body of the grenade. These male and female grooves permit of the parts being assembled so that in any position of assemblage the means of escape for the gases are not obstructed. In this last arrangement I may carry the vent or air passage to the exterior of the grenade, but at a point underneath the external lever *g*, so that normally when such lever *g* is retaining the striker in its retracted position, the ingress extremity of the vent or air passage is effectively

closed, thereby satisfactorily excluding air, moisture, or the like. The lever *q* may if desired be provided for this purpose at its inner surface with a body of soft material 16 adapted to act as a valve which effectually closes the egress extremity of the vent. When throwing the grenade, upon releasing the latter the lever *q* at once moves away from the external surface of the grenade, uncovering the vent or air passage and immediately afterward the striker *c* comes into engagement with the cap, so that the vent is thereby automatically opened immediately prior to the striking of the cap, both the opening of the vent and the subsequent striking of the cap being brought about automatically in the operation of throwing the grenade.

What I claim as my invention and desire to secure by Letters Patent is:—

1. In a grenade or the like, the combination of a spring impelled striker, a chamber for said striker, an external member controlling said striker and adapted to be released by the hand or throwing apparatus in the act of throwing the grenade, said striker being adapted to explode a percussion cap by which a time fuse is fired, of means other than the opening provided for receiving the time fuse whereby that part of the fuse is vented which is in the vicinity of the percussion cap, said venting means opening exclusively into the striker chamber.

2. In a grenade or the like in combination, a spring impelled striker, an external member controlling said striker and adapted to be released by the hand or throwing appliance in the act of throwing the grenade, said striker being adapted to explode a percussion cap by which a time fuse is fired, of means for limiting the extent to which the time fuse can approach the cap in assembling the parts, and means for venting the space between the fuse and said explosive cap.

3. A grenade or the like comprising in combination, of means for exploding a cap to ignite a time fuse, and means for venting said cap, said venting means being normally sealed and the sealing being automatically broken in the act of throwing and immediately before the firing of the cap.

4. A grenade or the like comprising in combination an external member which is released by the hand or throwing appliance in the operation of throwing, means for exploding a cap to ignite a time fuse, and means for venting said cap, said external member when in its normal position closing the venting means.

5. A grenade or the like comprising in combination a spring impelled striker *c*, an external pivoted lever *q* controlling said striker and adapted to be released by the hand or throwing appliance in the act of throwing, a percussion cap *g*, a separable anvil carrying the same and into which the end of a time fuse is adapted to be assembled before such anvil is assembled in relation to the grenade, means for limiting the extent to which said fuse can be inserted in said anvil, and means for venting the interior of the anvil otherwise than by way of the opening in which the fuse is inserted, said venting means being in communication with the striker chamber.

6. In a grenade or the like, the combination of a spring impelled striker, a chamber for said striker, an external member controlling said striker and adapted to be released by the hand or throwing apparatus in the act of throwing the grenade, said striker being adapted to explode a percussion cap by which a time fuse is fired, and means other than the opening provided for receiving the time fuse whereby that part of the fuse is vented which is in the vicinity of the percussion cap, said venting means opening exclusively into the striker chamber, and means normally sealing said striker chamber, said sealing means being automatically broken by the operation of said striker.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

WILLIAM MILLS.

Witnesses:
ARTHUR H. BROWN,
CHARLES RIGBY.