F. CONRAD AND C. AALBORG.

HAND GRENADE.

APPLICATION FILED OCT. 3, 1917.

1,304,544.

Patented May 27, 1919.

2 SHEETS—SHEET 1.

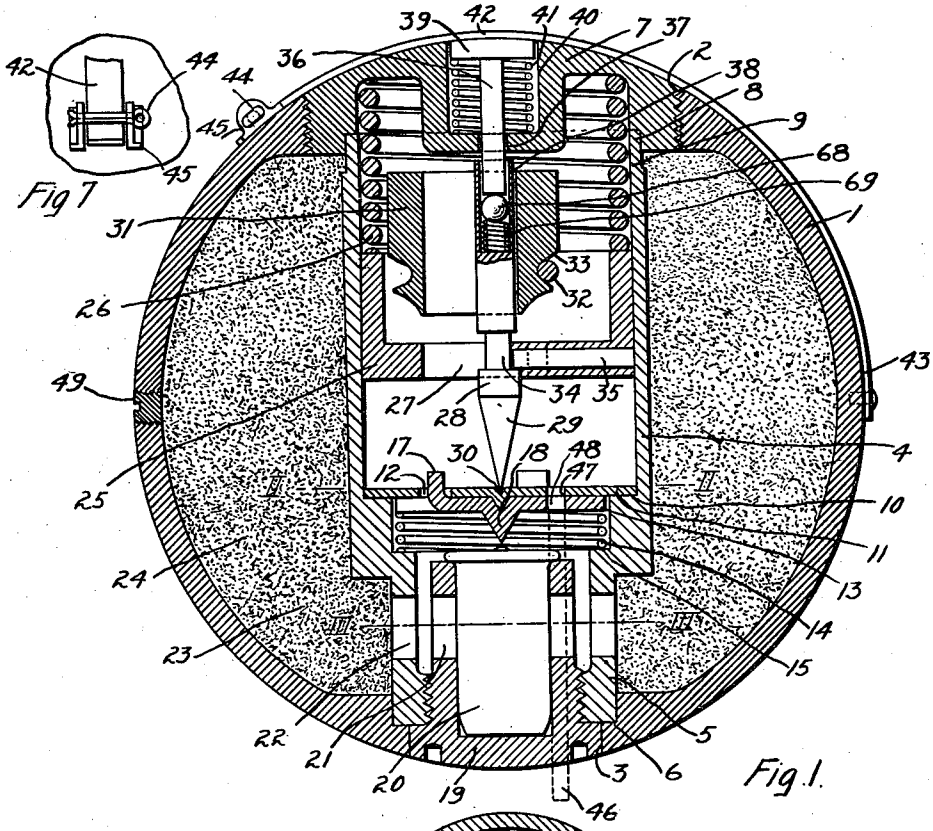


Fig 1.

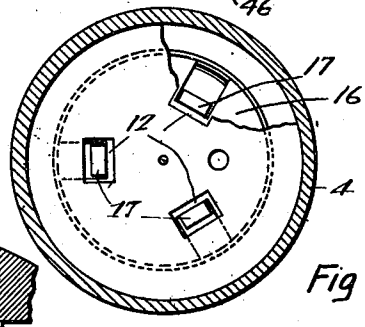


Fig 2

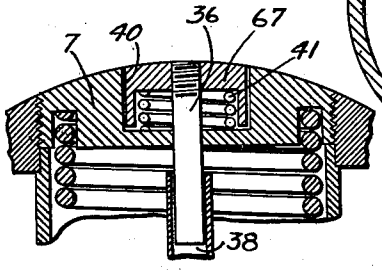


Fig. 6.

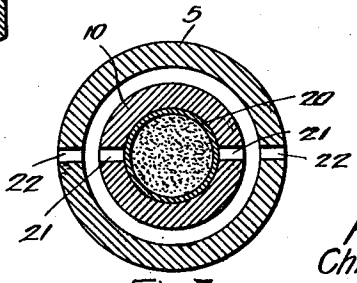


Fig 3

Fig 7

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2 SHEETS—SHEET 2.

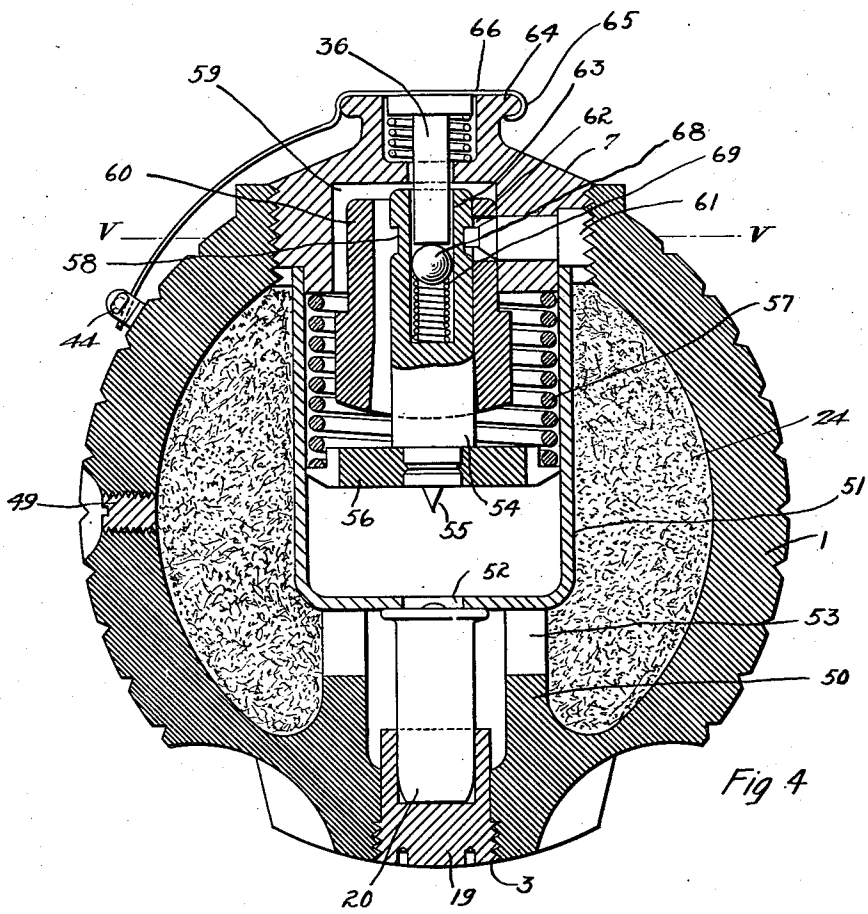


Fig 4

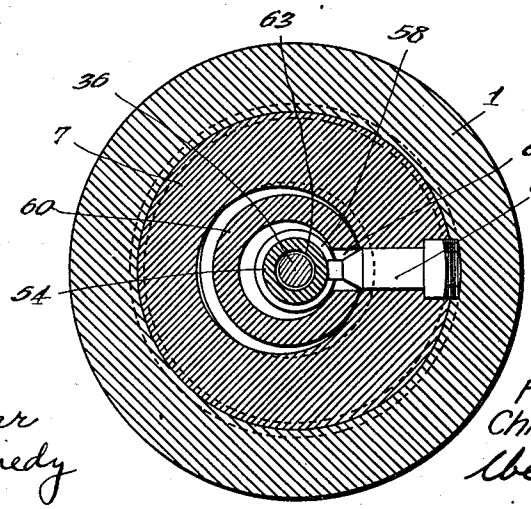


Fig 5

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UNITED STATES PATENT OFFICE.

FRANK CONRAD, OF PITTSBURGH, AND CHRISTIAN AALBORG, OF WILKINSBURG, PENNSYLVANIA, ASSIGNORS TO WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

HAND-GRENADE.

1,304,544. Specification of Letters Patent. Patented May 27, 1919.

Application filed October 3, 1917. Serial No. 194,444.

To all whom it may concern:

Be it known that we, FRANK CONRAD, a citizen of the United States, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, and CHRISTIAN AALBORG, a citizen of the United States, and a resident of Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Hand-Grenades, of which the following is a specification.

Our invention relates to hand-grenades, and it has for its object to provide a hand-grenade comprising a relatively small number of easily manufactured parts that may be conveniently assembled.

Another object of our invention is to provide a hand-grenade which is adapted to explode upon impact with any other body, regardless of the portion of its external surface which makes impact with such body.

In the accompanying drawing, Figure 1 is a transverse sectional view of a hand-grenade embodying our invention; Fig. 2 is a sectional view along the line II—II of Fig. 1; Fig. 3 is a sectional view along the line III—III of Fig. 1; Fig. 4 is a view similar to Fig. 1 showing a modification of my invention; Fig. 5 is a sectional view along the line V—V of Fig. 4; Fig. 6 is a fragmentary view, showing a modification of certain of the parts shown in Figs. 1 and 4, and Fig. 7 is a detail view.

Referring to Fig. 1, the grenade comprises a hollow spherical casing or shell 1 that is provided with substantially circular coaxial openings 2 and 3. A hollow cylindrical sleeve 4 is located within the casing 1 and is provided with a reduced portion 5 that rests in an annular seat 6 which surrounds the opening 3. The sleeve 4 is held within the casing 1 by a cap 7 that is in threaded engagement with the walls of the opening 2. The lower face of the cap 7 is provided with an annular seat 8 within which is located a reduced portion 9 of the sleeve 4.

The sleeve 4 is provided, at a point intermediate its ends, with a shoulder 10 upon which is seated a plate 11 that is provided with a plurality of evenly spaced openings 12. A firing plate 13 is located below the plate 11 and is normally maintained in engagement therewith by a spring 14 that is located between it and a shoulder 15 with which the sleeve 4 is provided. The firing plate 13 is provided with a plurality of upwardly projecting lugs 17 which register with, and project through, the openings 12 in the plate 11 and with a centrally located and downwardly projecting pin 18. The reduced portion 5 of the sleeve 4 is internally threaded to receive a cartridge holder 19 upon which is mounted a detonating cartridge 20. The cartridge 20 is preferably of the center-fire type and its top is located adjacent to, and spaced from, the pin 18. The walls of the reduced portion 5 and of the cartridge holder 19 may be provided with alined openings 21 and 22, respectively, which constitute ignition passages between the cartridge 20 and an explosive mixture 24 that fills the space between the casing 1 and the sleeve 4. If the walls of the portion 5 and the cartridge holder are reasonably thin, the openings 21 and 22 may be omitted.

A striking member 25 is slidably mounted within the sleeve 4 and is biased toward the firing plate 13 by a helical spring 26 that is located between the rim of the striking member 25 and the cap 7. The member 25 is provided with an eccentrically disposed opening 27 within which is located a latching member, here shown as a spindle 28. The spindle 28 is provided, at its lower end, with a tapered portion 29, the point of which is seated in a depression 30 in the plate 11 that registers with the depression in the firing plate 13. A hollow cylindrical weight 31 is pivotally mounted within the striking member 25 upon a pin 32 that is seated within an external groove 33. The spindle 28 is provided with a reduced portion 34 above the tapered portion 29 that is partially located within the opening 27. A pin 35 is located at one side of the opening 27 and engages the shoulder on the spindle 28 that is formed by the reduced portion 34, thus maintaining the striking member 25 out of engagement with the lugs 17 of the firing plate 13. A safety pin 36 extends through an opening 37 in the cap 7 and projects into a recess 38 in the spindle 28. The pin 36 serves to hold the spindle 28 coaxially with respect to the sleeve 4. The pin 36 is provided with a head 39 that is located within a recess 40 provided in the cap 7. The pin 36 is adapted to be forced out of the recess

38 by a spring 41 that is located between the head 39 and bottom of the recess 40. The pin 36 is adapted to be retained in the recess 40 by a strap 42 that is secured, at one end, to the outside of the casing by welding or other suitable means, as shown at 43. The strap 42 is preferably composed of inherently resilient material, such, for example, as spring steel. The other end of the strap 42 is held against the surface of the casing at a point adjacent to the safety pin 36 by a cotter pin 44 coacting with a lug 45 that is secured to the shell 1. The strap 42 is adapted to hold the safety pin 36 in position as long as the cotter pin 44 engages the end thereof. When the cotter pin 44 is withdrawn, the strap 42 springs away from the surface of the shell 1, as it tends to straighten out, and allows the safety pin 36 to leave the recess 40.

It will be noted that the recess 38 in the spindle 28 is of greater diameter than the opening 37 in the cap 7. A ball 68 is located in the recess 38 and a spring 69 is interposed between the ball and the bottom of the recess. So long as the safety pin 36 is held in position, the ball 68 is depressed, as indicated in the drawing, but when the safety pin is withdrawn, the spring 69 will force the ball 68 partially into the opening 37. In this position, the ball 68 can be displaced only by distinct shocks and not by any gyratory motion, such as might be imparted to the hand-grenade as it leaves the thrower, which increases the factor of safety against displacement of the spindle 28 before the hand-grenade reaches its objective.

The above described ball and spring structure was not invented by us, but is set forth and claimed in the copending application of H. P. Davis, Serial No. 203,534, filed November 23, 1917, and assigned to the Westinghouse Electric and Manufacturing Company.

In assembling the parts of a hand-grenade constructed in accordance with our invention, the sleeve 4 is provided with the parts 11, 13 and 14, as indicated in Fig. 1, and is then inserted in the shell 1, with its bottom resting on the seat 6. The member 25 is then placed within the sleeve 4, with its bottom resting on the lugs 17, after which the spindle 28 is inserted through the opening 27 and its point seated in the depression 30. The spring 26 is then placed within the sleeve 4, with its bottom turn resting against the rim of the member 25. The cap 7 is then placed over the end of the spring 26 and is screwed into the opening 2, at the same time, compressing the spring. The spring 41 is then placed in the recess 40 and the safety pin 36 is inserted in the recess 38, after manipulating the shell 1 to cause the opening 37 and the recess 38 to register with each other, it being, of course, understood that the spring 69 and the ball 68 are already located in the recess 38. The pin 36 is then secured in position by the strap 42. A rod 46 (shown in dotted lines) is then inserted into alined openings 47 and 48 that are provided in the firing plate 13 and the stationary plate 11, respectively. Pressure is then applied to the rod 46 to force the member 25 upwardly against the pressure of the spring 26 until the pin 35 engages the shoulder at the lower end of the reduced portion 34 of the spindle 28, thus latching the member 25 in position. The shell 1 may be filled with explosive material 24 through a suitable opening in its side that may be closed by a screw plug 49, after the filling operation is completed, as indicated, after which the grenade may be shipped without danger of premature explosion. In case the openings 21 and 22 are provided, the latter may be closed either interiorly or exteriorly, by any suitable thin material, before introducing the explosive material 24.

When it is desired to use the grenade, the cartridge holder 19, having the cartridge 20 seated therein, is screwed into the reduced portion 5 of the sleeve 4. The grenade is then ready to be thrown but it is obvious that the member 25 cannot be released so long as the safety pin 36 maintains the spindle 28 in coaxial relation with the sleeve 4. Just prior to throwing the grenade, the thrower grasps the shell 1, with his hand extending around the band 42, and then removes the cotter pin 44. The grenade is then thrown and, as it leaves the hand, the strap 42 springs outwardly and allows the spring 41 to force the safety pin 36 out of the recess 40. Since the pivotally mounted weight 31 is in unstable equilibrium, when the flight of the grenade is arrested from any cause whatsoever, the shock resulting from the impact throws the weight 31 in some direction about the pin 32 and disengages the spindle 28 from the pin 35. It will be noted that, if the shock causes the weight 31 to move in a direction away from the pin 35, the portion of the weight 31 above the pivot 32 will move in a counterclockwise direction to engage the spindle 28 and force it off the pin 35. If, however, the shock causes the weight 31 to move in a direction toward the pin 35, a portion of the weight below the pivot pin 32 will move in a clockwise direction to engage the spindle 28 and force it off the pin 35. The striking member 25 is then forced, by the spring, to strike the lugs 17 of the firing plate 13 a hammer blow, thus forcing the firing pin 18 against the detonating cartridge 20. The burning gases resulting from the explosion of the detonating cartridge 20 pass through the openings 21 and 22 and ignite the explosive mixture 24, whereby the casing 1 is shattered with destructive effects, or, if the

openings 21 and 22 are omitted, the explosion of the cartridge will shatter the adjacent wall and ignite the explosive material 24 in a like manner.

In the modification shown in Fig. 4, the casing or shell 1 is provided with an inwardly projecting flange 50. A cup-shaped member 51, preferably composed of relatively light pressed metal, is supported by the flange 50 and is held within the casing 1 by the cap 7. The bottom of the member 51 is provided with a centrally located opening 52 and the opening 3 in the shell 1 is internally threaded to receive a holder 19 upon which is mounted a detonating cartridge 20. The cartridge 20 is preferably of the center-fire type, with its firing portion located immediately under the opening 52. The upper portion of the flange 50 may be provided with openings 53 which communicate with the chamber in which is located the explosive mixtures 24, or if the portion 50 is made comparatively thin and in reasonably close proximity to the cartridge 20, the openings 53 may be omitted, inasmuch as the force exerted by the explosion of the cartridge charge will be sufficient to shatter the part 50 and, consequently, to ignite the material within the shell 1. If the openings 53 are provided, they may be covered by any suitable thin material in order to prevent the explosive material from escaping therethrough.

A striking member, comprising a pin 54 and a disk 56, is located within the member 51 and is provided, at its lower end, with a firing pin 55 which is adapted to enter the opening 52. The striking member is biased toward the cartridge 20 by a spiral spring 57 that is located between the disk 56 and the cap 7. The pin 54 is further provided with a groove 58 which is located within an eccentrically disposed recess 59 in the cap 7. A hollow cylindrical weight 60 surrounds the pin 54 and is also partially located in the recess 59. A pin 61 projects from the wall of the recess 59 through an opening 62 in the weight 60 and engages the groove 58 of the pin 54, thus maintaining the striking member in its retracted position. The projecting portion of the pin 61 is preferably of frusto-conical form, for a purpose that will hereinafter be described. A safety pin 36 projects into a recess 63 that is provided in the pin 54 and serves to hold the pin coaxially with respect to the member 51. The cap 7 is provided with a laterally extending annular flange 64 which is engaged by the bent-over portion 65 of a strap 66, the other end of which is secured to the casing 1, in the same manner as the strap 42 of Fig. 1. When the cotter pin 44 is withdrawn, the strap 66 springs away from the casing and the portion 65 is disengaged from the flange 64.

The assembly of the parts shown in Fig. 4 is substantially the same as described with reference to Fig. 1, the disk 56 being forced inwardly against the action of the spring 57 until the end of the pin 61 engages the groove 58 of the pin 51. The weight 60 is adapted to disengage the striking member from the pin 61 in substantially the manner described with reference to the structure shown in Fig 1. On account of the conical form of the locking end of the pin 61, any shock that tends to move the weight 60 in substantally the direction of the axis of the pin 54, as well as in other directions, will cause it to move along the conical surface of the pin and so release the striking member. The grenade is thus sure to be exploded by an impact which tends to move the weight 60 in any direction whatsoever.

In the modification shown in Fig. 6, the safety pin 36 is provided with a hollow cylindrical cap 67, the outer surface of which makes a close fit with the walls of the recess 40. As the cylindrical surfaces are in close engagement, there will be dash-pot action as the spring 41 forces the cap outwardly, thereby allowing an appreciable time to elapse before the safety pin 36 is entirely withdrawn from the recess 38. The dash-pot action may be increased by treating the engaging surfaces with some suitable material to increase the adhesion therebetween. With such a modification, the strap 39 may be dispensed with. By this modification, the factor of safety against premature explosion of the hand-grenade is increased, as the dash-pot action insures that the grenade will be a considerable distance away from the thrower before the safety pin is withdrawn.

While we have shown our invention in several simple and preferred forms, it is not so limited but is susceptible of various other modifications within the scope of the appended claims.

We claim as our invention:

1. A hand-grenade comprising a casing, a percussive striking means located within said casing, means for normally latching said striking means in a retracted position and a cylindrical weight having a single point of support from which it is bodily unseated to release said striking means when movement of the grenade is arrested by impact.

2. A hand-grenade comprising a casing, a percussive striking means located within said casing, means for holding said striking means normally in a retracted position and a tripping member supported in unstable equilibrium and bodily displaceable to release said striking means when movement of the grenade is arrested by impact.

3. In a hand-grenade, the combination with a percussive firing device comprising a

striking member and means for latching said member in a retracted position, of a tripping member supported in unstable equilibrium at a single point adjacent to said latching means and being bodily displaced when the grenade is arrested by impact.

4. In a hand-grenade, the combination with a percussive firing device comprising a striking member and means for latching said member in a retracted position, of a tripping member supported at a single point adjacent to said striking member and being unseated and bodily displaced to release said striking member when the grenade is arrested by impact.

5. In a hand-grenade, the combination with a percussive firing device comprising a striking member and means for maintaining said member in a spring stressed position, of a tripping member supported at a single point adjacent to said maintaining means and being bodily displaceable to release said striking member when movement of the grenade is arrested by impact.

6. In a hand-grenade, the combination with a percussive firing device comprising a striking member, a pivotally mounted latching member for maintaining said striking member in a spring stressed position, of a tripping member having a single support at one side from which it is bodily displaced to shift said latching member upon its pivot to release said striking member.

7. In a hand-grenade, the combination with a percussive firing device comprising a striking member, a pivotally mounted latching member for maintaining said striking member in a spring stressed position, of a tripping member having a single support at one side and being so related to said latching member that movement thereof in any direction on or from its support shifts said latching member upon its pivot to release said striking member.

8. In a hand-grenade, the combination with a percussive firing device comprising a spring, a striking member, a pivotally mounted latching pin for maintaining said striking member in a spring-compressing position, of a tripping member surrounding said latching pin and loosely supported at one side of said pin, whereby movement of said member in any direction shifts said latching pin upon its pivot to release said striking member.

9. A percussive firing device for a hand-grenade comprising a sleeve, a stationary plate located intermediate the ends of the sleeve, a firing member biased toward said plate and having portions projecting therethrough, a striking member located within said sleeve, means for holding said striking member in a retracted position and means for forcing said striking member against the projecting portions of said firing member when released.

10. A percussive firing device for a hand-grenade comprising a sleeve, a stationary plate located intermediate the ends of the sleeve, a firing member biased toward said plate and having portions projecting therethrough, a striking member located within said sleeve, means for forcing said striking member against the projecting portions of said firing member, and a latching member for normally holding said striking member out of engagement with said firing member.

11. A percussive firing means for a hand-grenade comprising a sleeve, a stationary plate located intermediate the ends of the sleeve, a firing member biased toward said plate and having portions projecting therethrough, a striking member located within said sleeve, means for forcing said striking member against the projecting portions of said firing member and a pivotally mounted latching member located within said sleeve for normally holding said striking member out of engagement with said firing member.

12. A percussive firing means for a hand-grenade comprising a cylindrical sleeve, a stationary plate located intermediate the ends of the sleeve, a firing member biased toward said plate and having portions projecting therethrough, a striking member located within said sleeve, means for forcing said striking member against the projecting portions of said firing member and a pivotally mounted latching member coaxial with the sleeve for normally holding said striking member out of engagement with said firing member.

13. A percussive firing means for a hand-grenade comprising a cylindrical sleeve, a stationary plate located intermediate the ends of the sleeve, a firing member biased toward said plate and having portions projecting therethrough, a striking member located within said sleeve, means for forcing said striking member against the projecting portions of said firing member and a pivotally mounted latching member coaxial with the sleeve for normally holding said striking member out of engagement with said firing member, the said latching member being adapted to release said striking member when moved upon its pivot.

14. A percussive firing means for a hand-grenade comprising a cylindrical sleeve, a stationary plate located intermediate the ends of the sleeve, a firing member biased toward said plate and having portions projecting therethrough, a striking member located within said sleeve, means for forcing said striking member against the projecting portions of said firing member, a pivotally mounted latching member coaxial with the sleeve for normally holding said striking

member out of engagement with said firing member, and a safety member for maintaining the latching member in coaxial relation with said sleeve.

15. A percussive firing means for a hand-grenade comprising a cylindrical sleeve, a stationary plate located intermediate the ends of the sleeve, a firing member biased toward said plate and having portions projecting therethrough, a striking member located within said sleeve, means for forcing said striking member against the projecting portions of said firing member, a pivotally mounted latching member coaxial with the sleeve for normally holding said striking member out of engagement with said firing member, and a safety member for maintaining the latching member in coaxial relation to the sleeve, the said safety member being adapted to be withdrawn from said latching member with a retarded action.

16. A percussive firing means for a hand-grenade comprising a cylindrical sleeve, a stationary plate located intermediate the ends of the sleeve, a firing member biased toward said plate and having portions projecting therethrough, a striking member located within said sleeve, means for forcing said striking member against the projecting portions of said firing member, a pivotally mounted locking member coaxial with the sleeve for normally holding said striking member out of engagement with said firing member, and a safety member for maintaining the locking member in coaxial relation to the sleeve, the said safety member being adapted to be withdrawn from said locking member with a dash-pot action.

In testimony whereof, we have hereunto subscribed our names this 14th day of Sept., 1917.

FRANK CONRAD.
CHRISTIAN AALBORG.