

Aug. 7, 1923.

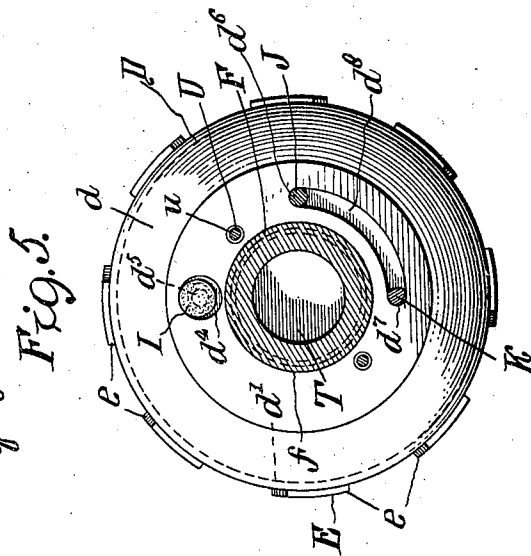
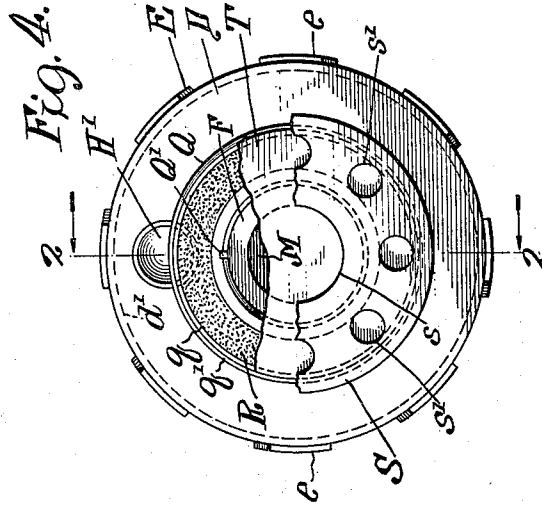
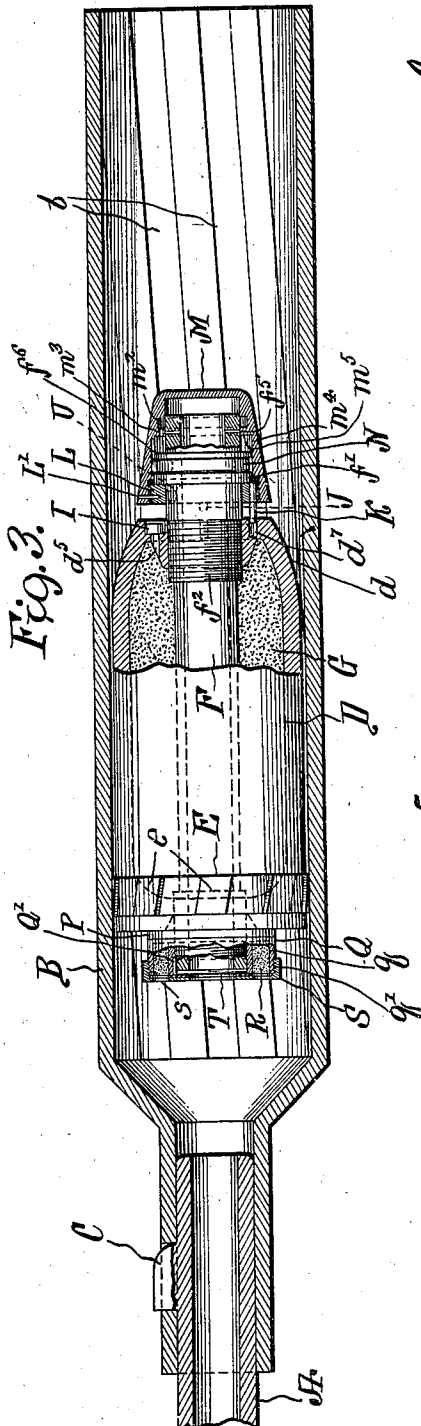
1,463,993

F. T. BURT

RIFLE GRENADE

Filed April 17, 1922

3 Sheets-Sheet 2



Inventor
Franklin T. Burt

by Wilkinson & Ginstad,
Attorneys

Aug. 7, 1923.

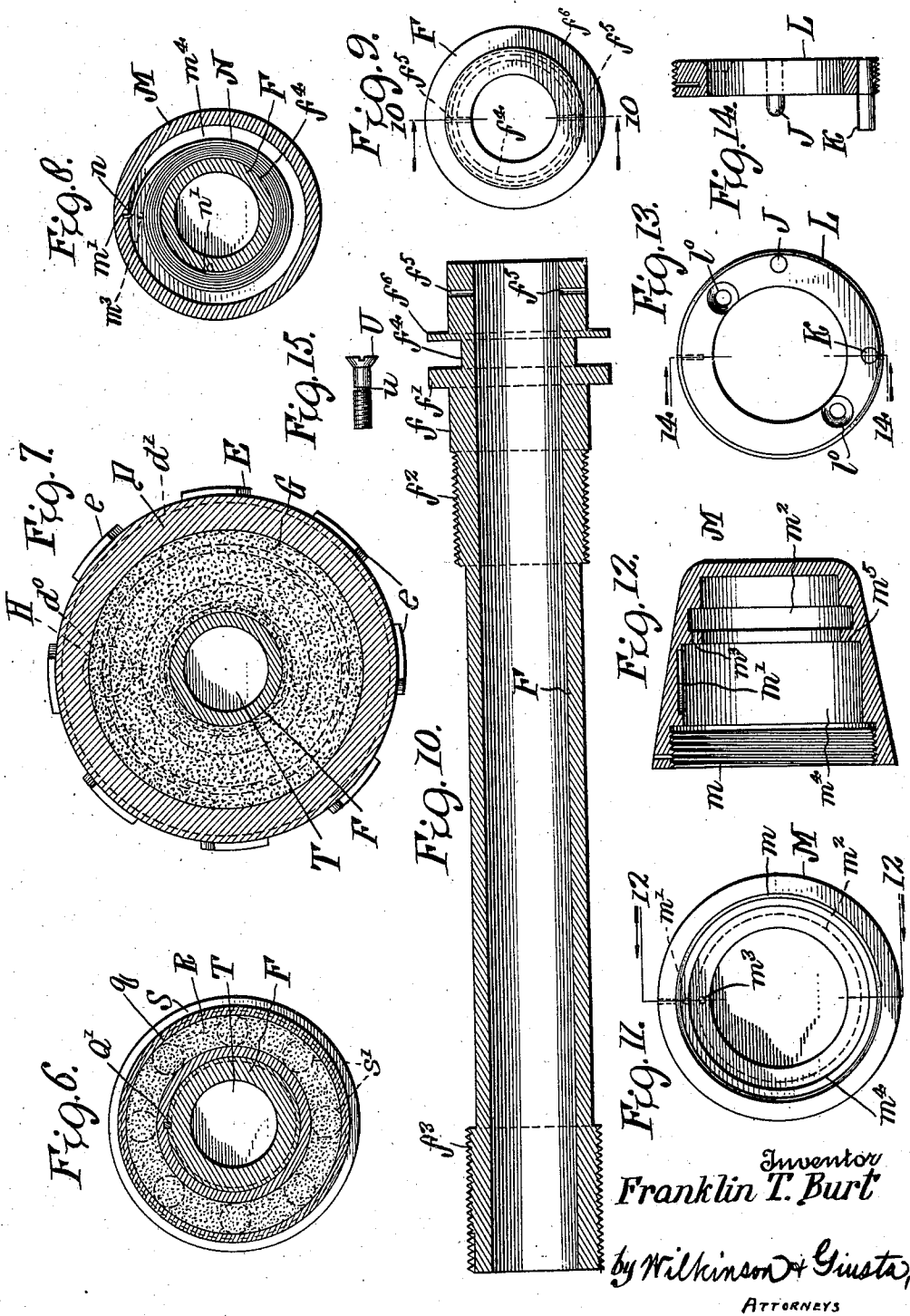
1,463,993

F. T. BURT

RIFLE GRENADE

Filed April 17, 1922

3 Sheets-Sheet 3



Inventor
Franklin T. Burt

by Wilkinson & Gustafson
ATTORNEYS

UNITED STATES PATENT OFFICE.

FRANKLIN THOMAS BURT, OF OMAHA, NEBRASKA.

RIFLE GRENADE.

Application filed April 17, 1922. Serial No. 553,445.

To all whom it may concern:

Be it known that I, FRANKLIN T. BURT, a citizen of the United States, residing at Omaha, in the county of Douglas and State of Nebraska, have invented certain new and useful Improvements in Rifle Grenades; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in rifle grenades intended primarily for use in projecting explosive grenades from rifles or other small arms where the trajectory is necessarily short, and where it is desirable to make the grenades especially sensitive to explosion upon impact, and in which it is essential that the grenade shall be as safe as practicable to those using the same.

The invention is not only intended to provide a safe and efficient grenade, but also a percussion fuse arrangement especially adapted for use in devices of the character described which will be both safe and efficient in use.

The rifle grenade is not used for demolition. It has little or no penetration. Its maximum effect is obtained by a burst near the ground or at the instant of impact. No practical time fuse exists which is suitable for the grenade and which will give it an air burst at suitable height above ground.

Present types of time fuses generally give a burst after the grenade has fallen and is lying on firm ground or partially buried in soft dirt or mud.

The mean path of fragments is radial. Whatever the shape of the grenade or whatever its position when lying at rest upon the ground it may be seen that the paths of fully 60% of the fragments either lead into the earth directly under or within a few inches of the grenade, or upwards at such an angle as to give no appreciable danger space.

In its final elements the path of the descending grenade in flight is, in general, nearly vertical. If the grenade is long bodied, falls point first, and bursts in the position of impact, the radial paths of the wall fragments will sweep the surface of impact effectively. This effect is claimed for the grenade that will be hereinafter described.

The percussion fuse, in general use, consists essentially of a comparatively small body which by its inertia arms the fuse due

to some acceleration of the greater mass of the shell, and which again functions when the greater mass is retarded upon impact. In this case both accelerations are great. Restraining mechanisms may be fairly relied upon to function only when the shell is fired. With the rifle grenade the accelerations are necessarily comparatively small, both on discharge and impact.

In my grenade the arming body is made light; it is directly acted upon by the propelling gases, and the shell itself lags relatively. Upon impact the light percussion head is retarded and the shell advances relatively. This permits of a fuse which arms or tends to arm only when fired, and which, when armed, becomes extremely sensitive, insuring a burst on loose dirt or soft mud.

A great objection to a special cartridge arises if, by accidental or ignorant substitution of a ball cartridge, probable injury to the user or friendly personnel results.

My grenade is intended to be ordinarily used with a special cartridge. If a ball cartridge is used no objection exists, as the ball passes on through the face of the percussion head. The grenade probably will be propelled from the piece, but its range will be shortened, due to the escape of the propelling gases.

My invention will be more fully understood after reference to the accompanying drawings in which like parts are indicated by similar reference symbols throughout the several views, and in which:—

Figure 1 is a side elevation of the complete grenade on an enlarged scale.

Figure 2 shows a longitudinal section through the grenade shown in Fig. 1, the section being along the line 2—2 of Fig. 4, and looking in the direction of the arrows.

Figure 3 is a sectional elevation, on a smaller scale, showing the muzzle end of the barrel of the small arm, with the grenade projector attached thereto in section, and the grenade in elevation therein; parts of the grenade being broken away, the broken being in the position it assumes after it has traveled part of the way through the projector, and after the percussion head has been moved to its forward position relative to the grenade.

Figure 4 is a rear elevation of the grenade as seen from the left of Figs. 1 and 2, parts being broken away.

Figure 5 shows a section along the line

5—5 of Fig. 2, and looking in the direction of the arrows.

Figure 6 shows a section along the line 6—6 of Fig. 2, and looking in the direction of the arrows.

Figure 7 shows a section along the line 7—7 of Fig. 2, and looking in the direction of the arrows.

Figure 8 is a section along the line 8—8 of Fig. 2, and looking forward, or in the direction of the arrows.

Figure 9 is a detail view showing the front end of the bullet tube.

Figure 10 is a central longitudinal section of the bullet tube, the section being along the line 10—10 of Fig. 9, and looking in the direction of the arrows.

Figure 11 is a detail showing the interior of the percussion head removed.

Figure 12 shows a section along the line 12—12 of Fig. 11, and looking in the direction of the arrows.

Figure 13 is a front elevation of the firing pin ring which also carries the guide pin.

Figure 14 shows a section along the line 14—14 of Fig. 13, and looking in the direction of the arrows, and

Figure 15 is a detail showing one of the weakened screws which are used to connect the firing pin ring to the body of the grenade, and which are broken when the grenade is projected.

Referring first to Figure 3, A represents the muzzle of the firearm to which the projector B is attached in any convenient way. A suitable bayonet joint, not shown, adapted to engage the front sight C would be effective for this purpose; but such joints being well known in the art will not be further described herein.

The projector B is preferably rifled as at b to engage the rifle band of the grenade, as will be hereinafter described.

The grenade comprises the hollow body portion D, which is preferably cylindrical throughout its major length and provided with the ogival head d . The rear part of the shell D is grooved, as at d' , to receive the rifling band E, which is preferably provided with the lands e to engage the grooves of the rifling b . The shell D is provided front and rear with internal screw threads d^2 and d^3 to engage, respectively, the screw threads f^2 and f^3 on the bullet tube F which projects through the shell D when the parts are in the assembled relation, and between the outer wall of which and the inner wall of the shell D the explosive G is placed.

This bullet tube extends longitudinally through the shell D and projects outward from each end thereof, for reasons that will be hereinafter more fully described.

The shell D is filled with explosive through the opening d^0 , which is normally

closed by the tapered steel plug H which is firmly held in place by seating under pressure and made further gas-tight by an expanded lead plug H', shown in Figs. 2 and 4. The front end of the shell is provided with a chamber d^4 , for a primer I, and with a passage d^5 for the flame from the primer.

The front end of the shell body D is provided also with two sockets d^6 and d^7 , see Figs. 1, 2 and 5, adapted to receive, respectively, the firing pin J and the guide pin K which is carried by the firing pin ring L. These two sockets d^6 and d^7 are set at a desired angle apart, for instance approximately 90° , and are connected together by a shallow arc-shaped groove d^8 , as shown most clearly in Fig. 5, which groove has its center coincident with the longitudinal axis of the grenade. The firing pin J is made somewhat shorter than the guide pin K so that the firing pin may pass out of said groove d^8 when the grenade is projected, but the free end of the guide pin will remain engaging in said groove, as will be hereinafter more fully described.

The firing pin ring L has a screw threaded engagement m with the percussion head M, and when the parts are assembled it is locked in said assembly by the pin L', see Fig. 2. The firing pin ring L is loosely mounted over the cylindrical portion f of the bullet tube F, and said ring is adapted to engage the annular flange f' of the bullet tube F after the grenade has been projected, so as to limit the forward travel of the percussion head and the parts carried thereby relative to the body of the grenade.

Forward of the flange f' the bullet tube is provided with a circumferential groove f^4 , in which is mounted the clock spring N, see Figs. 2 and 8, one end n of which spring is connected to the head M, and the other end n' is secured to the bullet tube F, as shown in Fig. 8. This spring is wound up or put under tension when the head M is screwed in place on the ring L, as will be hereinafter described. The end n of the spring N engages in the longitudinal groove m' in the head M, see Figs. 2, 8 and 12, so as to allow relative longitudinal movement of the cap and the spring.

In order to increase the efficiency of the device we provide gas ports f^5 , provided near the front end of the bullet tube F, which open into the annular chamber m^2 in the head M. These ports are closed when the percussion head is in the forward position as shown in Fig. 3. One or more similar ports m^3 are provided opening rearward from said annular channel m^2 , see Figs. 2, 11 and 12. The head M is bored cylindrically, as at m^4 , to permit the free sliding therein of the annular flange f' .

Mounted over the rear portion of the bullet tube F is the sealing ring P, made of lead

or other soft material, which is preferably tapered as at p to engage a tapered portion d^{10} on the shell body, as shown most clearly in Fig. 2. In rear of this I provide an auxiliary cartridge comprising a hollow ring Q, screwed on to the rear end of the bullet tube F and preferably keyed thereto as by the pin Q'. This auxiliary cartridge is provided with an annular groove q filled with explosive R, and the exterior of this ring Q is screw threaded, as at q' , to engage the screw cap S. This cap is provided with a central opening s , which registers with the bore of the bullet tube, and with a series of cylindrical openings s' which register with the auxiliary propelling charge R contained in the ring Q.

Mounted between the ring Q and the cap S is a disk T, of inflammable material such as celluloid, which is held firmly in place by the cap S and effectually seals the openings s and s' in the cap S. This disk may be coated with shellac or other suitable sealing material which will protect the auxiliary projecting charge from the atmosphere or from moisture.

When in the assembled relation the percussion head is securely held against longitudinal motion relative to the shell body by means of safety screws U, see Figs. 1, 2, 5 and 15, which are weakened as at u . These screws pass through holes l^0 in the firing pin ring L, and they are so constructed that the weakened portion of the screws will give way under the pressure of the powder gases when the blank cartridge is fired. When these screws are ruptured the percussion head will slip forward on the bullet tube F from the position indicated in Fig. 2 to the position indicated in Fig. 3.

In order to assemble the parts, the head of safety screws U are cut away slightly in the inner edge in order to ride freely over the part f of the bullet tube, and at the same time is locked against accidental unscrewing after assembly.

The operation of the device is as follows:

The small arm being loaded with a blank cartridge, having the butt of the piece resting on the ground, the grenade is dropped into the projector so that the lands on the rifling band will take in the grooves of the projector, and the grenade will fall of its own weight to the bottom of the projector. Now pull the trigger of the piece; the powder gases will break through the disk T and, entering the bullet tube, will tend to break the screws U at their reduced portions u , thus tearing the percussion head away from the body of the grenade and allowing the firing pin ring to slide forwards on the cylindrical portion of the bullet tube until it brings up against the flange f' . The parts will then be in the position shown in Fig. 3.

The forward movement of the firing pin

ring will disengage the firing pin J from its socket d^6 , and will also withdraw the guide pin K from its socket d^7 ; the firing pin being shorter than the guide pin will be free to pass over the front wall of the shell body D under the tension of the spring N, and the rear end of the guide pin remaining in the guide groove d^8 will swing from the position it originally occupies to that originally occupied by the firing pin, but in front of the socket d^6 ; when the further swinging movement of the ring L will be arrested by the guide pin K bringing up against the wall at the end of the guide slot d^8 .

The guide pin and firing pin have been so far withdrawn from their sockets that the guide pin no longer prevents the spring from turning the percussion head and ring toward the armed position, but does prevent the opposite rotation relative to the grenade as would be induced by the angular or rotational acceleration of the grenade and the inertia of the percussion head. These conditions hold until the grenade is completely expelled from the discharger. When free from the muzzle blast, the gases in the tube escape to the rear.

When, due to the drop in pressure against the percussion head, and the exterior head resistance of the air, the turning moment of the spring N exceeds the moment of frictional resistance between the ring L and the flange f^1 , the spring will turn the percussion head to and hold it in the armed position. This can never take place while the grenade is in the projector if the gas pressure is, or has been, great enough to break the safety screws.

The air resistance to rotation towards the armed position is neglected. Its effect if greater would be desirable, as tending to damp the spring action which, being positive, is here necessarily quick.

The gas ports f^5 and m^3 are provided to delay the spring action and also overcome the effect of the very abrupt fall in the pressure of the propelling gases, when the head resistance might cause the re-engagement of the guide pin in the safe position before the spring could turn the guide pin clear of its safety recess. The gases enter the annular chamber m^2 through the ports f^5 while the pressure in the projector and bullet tube is high. These ports are closed when the percussion head is in the forward position. The gas passing through the vent m^3 must escape by leakage around the bearing surfaces; thus the pressure in the annular chamber m^4 (Fig. 3) is momentarily prolonged even after the grenade has left the projector and the gases have escaped from the bullet tube. This pressure against the surface m^5 (Figs. 3 and 12) holds the percussion head forward. Arming is thus slightly delayed and made more certain.

The firing pin will now register with the primer I and the grenade will be armed. When the grenade strikes the surface of the ground, or any solid or semisolid substance, such as mud, soft earth, or the like, the percussion head will be driven backwards, causing the firing pin to deform the primer and explode the bursting charge G contained in the shell body D.

As will be seen, the percussion fuse is very safe until the grenade has been fired from the projector, and is well on its flight, when it becomes highly sensitive.

Since with such devices the projectile strikes substantially nose down, and since there is quite a large area of the nose of the percussion head, even the softest mud will cause the same to be driven back with sufficient force to explode the primer before the grenade has penetrated any material distance in the ground; and therefore the great majority of the fragments will be thrown radially in a zone almost parallel with the ground, and the damage zone will be very much larger than would occur if there had been any material penetration of the grenade into the ground, or lying upon the surface.

It will be noted that screwing the percussion head in place will automatically wind up the spring N, and that the forward pressure of the gases will tend to prevent the spring from turning the percussion head and the parts carried thereby until this pressure is released, so that the spring N will not operate to move the firing pin out of the safety position to the firing or armed position until after the pressure of the powder gases has been released, which will not take place until sometime after the grenade leaves the muzzle of the projectile.

The function of the auxiliary charge is important, as without it the range of the grenade is very short; its recoil is excessive considering the low muzzle velocity obtained; and the maximum powder pressure in the discharge is very high and drops very abruptly as the grenade travels along the bore of the discharger, and as the gases escape through the open bullet tube. So that, in spite of the fact that the discharges are made heavy they frequently rupture at the base, and stocks are broken due to the momentary high pressure at the instant the bullet enters the bullet tube.

Without the auxiliary charge, the pressure of the propelling gases will be a maximum at the instant the grenade begins to travel through the projector, and this pressure will fall rapidly, according to definite law, as the grenade moves forward. The function of the auxiliary charge is to evolve gases which pour out through the orifices S' (Fig. 4), as the grenade travels through

the projector. (The combustion of the smokeless powder being progressive—the time rate of combustion varying directly with the pressure). The auxiliary charge thus tends to produce uniform pressure and consequent uniform force of propulsion and uniform recoil stress, as the grenade moves through the projector.

It will be noted that should, through inadvertence a cartridge with a bullet be used instead of a blank cartridge, as might happen by accident or in the excitement of an engagement, the bullet will pass freely through the bullet tube and will also pass through the thin closed end of the percussion head, but the pressure of the powder gases will ordinarily still be sufficient to break the weakened portion of the screws U, and the device will operate as before; but, of course, the range will be shortened, due to loss of gas pressure.

While the auxiliary attachment applied to the base of the projectile may be conveniently supplied with the auxiliary propelling charge Q, as shown, this propelling charge may be omitted, if desired. In such case any frangible or destructible cap may be used to close the rear end of the bullet tube until such cap is destroyed by the powder gases, permitting said gases to act freely in the bullet tube and to break the joint between the percussion head and the body of the shell, as hereinbefore described and as shown more particularly in Fig. 3.

It will thus be seen that I provide a rifle grenade which may be safely used with an ordinary small arm, and which is highly sensitive to explosion on impact, but is safe during discharge from the piece and during its flight.

It will be obvious that various modifications might be made in the herein described device, and in the construction, combination and arrangement of parts which could be used without departing from the spirit of my invention; and I do not mean to limit the invention to such details except as particularly pointed out in the claims.

Having thus described my invention what I claim and desire to secure by Letters Patent of the United States is:—

1. In a grenade the combination with a hollow shell for the explosive provided with a guide groove in the front end thereof and also provided in its front end with a primer chamber and a passage from said chamber to the interior of the shell, of a primer mounted in said chamber, a bullet tube secured in and extending axially through said shell, a percussion head slidably mounted on the front end of said bullet tube, a clock spring under tension adapted to rotate said head relative to the shell body, a firing pin connected to said head, and a guide pin connected to said head and normally locking

said head against turning under the action of said spring, but releasing said head when said head is moved forwards, with means coacting with said guide pin for holding said head in the armed position.

2. In a grenade the combination with a hollow shell for the explosive provided with a guide groove in the front end thereof and also provided in its front end with a primer chamber and a passage from said chamber to the interior of the shell, of a primer mounted in said chamber, a bullet tube secured in and extending axially through said shell, a percussion head slidably mounted on the front end of said bullet tube, a clock spring under tension adapted to rotate said head relative to the shell body, a firing pin ring connected to said head, a firing pin, and a guide pin connected to said ring, said guide pin normally locking said head against turning under the action of said spring, but releasing said head when said head is moved forwards, with means coacting with said guide pin for holding said head in the armed position.

3. In a grenade the combination with a hollow shell for the explosive provided with a guide groove in the front end thereof and also provided in its front end with a primer chamber and a passage from said chamber to the interior of the shell, of a primer mounted in said chamber, a bullet tube secured in and extending axially through said shell, a percussion head slidably mounted on the front end of said bullet tube, a clock spring under tension adapted to rotate said head relative to the shell body, a firing pin connected to said head, a guide pin connected to said head and normally locking said head against turning under the action of said spring, but releasing said head when said head is moved forwards, with means coacting with said guide pin for holding said head in the armed position, a hollow ring provided with an auxiliary propelling charge secured to the rear protruding end of said bullet tube, and a frangible water proof plate covering the rear end of said bullet tube and covering also said auxiliary propelling charge.

4. In a grenade the combination with a hollow shell for the explosive provided with a guide groove in the front end thereof and also provided in its front end with a primer chamber and a passage from said chamber to the interior of the shell, of a primer mounted in said chamber, a bullet tube secured in and extending axially through said shell, a percussion head slidably mounted on the front end of said bullet tube, a clock spring under tension adapted to rotate said head relative to the shell body, a firing pin ring connected to said head, a firing pin, and a guide pin connected to said head and normally locking said head against turning

under the action of said spring, but releasing said head when said head is moved forwards, with means coacting with said guide pin for holding said head in the armed position, a hollow ring provided with an auxiliary propelling charge secured to the rear protruding end of said bullet tube, and a frangible water proof plate covering the rear end of said bullet tube and covering also said auxiliary propelling charge.

5. In a grenade for use with small arms the combination with a hollow shell for the explosive provided with a guide groove in the front end thereof and also provided in its front end with a primer chamber and a passage from said chamber to the interior of the shell, of a primer mounted in said chamber, a bullet tube secured in and extending axially through said shell, a hollow percussion head slidably mounted on the front end of said bullet tube, a frangible connection adapted to be severed by the powder gases from the small arm, a clock spring under tension mounted in said head and adapted to rotate said head relative to the shell body, a firing pin connected to said head, and a guide pin connected to said head and normally locking said head against turning under the action of said spring, but releasing said head when said head is moved forwards under the action of the powder gases, with means coacting with said guide pin for holding said head in the armed position.

6. In a grenade for use with small arms the combination with a hollow shell for the explosive provided with a guide groove in the front end thereof and also provided in its front end with a primer chamber and a passage from said chamber to the interior of the shell, of a primer mounted in said chamber, a bullet tube secured in and extending axially through said shell, a hollow percussion head slidably mounted on the front end of said bullet tube, a frangible connection adapted to be severed by the powder gases from the small arm, a clock spring under tension mounted in said head and adapted to rotate said head relative to the shell body, a firing pin ring connected to said head, a firing pin, and a guide pin connected to said ring, said guide pin normally locking said head against turning under the action of said spring, but releasing said head when said head is moved forwards under the action of the powder gases, with means coacting with said guide pin for holding said head in the armed position.

7. In a grenade for use with small arms the combination with a hollow shell for the explosive provided with a primer chamber and a passage from said chamber to the interior of the shell, of a primer mounted in said chamber, a bullet tube secured in and extending axially through said shell, a per-

5 cussion head slidably mounted on the front
end of said bullet tube, a frangible connection
between said percussion head and the
body of the shell, adapted to be severed by
the pressure of the powder gases from the
small arm, a firing pin connected to said
head, means for normally holding said firing
pin in the safety position, and means
controlled by the forward movement of the
10 percussion head, for causing said firing pin
to register with said primer.

8. In a grenade for use with small arms
the combination with a hollow shell for the
explosive provided with a primer chamber
and a passage from said chamber to the interior
of the shell, of a primer mounted in
said chamber, a bullet tube secured in and
extending axially through said shell, a percussion
head slidably mounted on the front
20 end of said bullet tube, a frangible connection
between said percussion head and the
body of the shell, adapted to be severed by
the pressure of the powder gases from the
small arm, a firing pin connected to said
head, means for normally holding said firing
pin in the safety position, and means controlled
by the forward movement of the percussion
head, for causing said firing pin to
30 register with said primer, said last mentioned
means comprising a clock spring under
tension connecting said head and said
tube, a firing pin carried by said head, and
a guide pin connected to said head and normally
locking said head against turning under
35 the action of said spring, but releasing
said head when said head is moved forwards,
with means coacting with said guide
pin for holding said head in the armed position.

40 9. In a grenade for use with small arms
the combination with a hollow shell for the
explosive provided with a primer chamber
and a passage from said chamber to the interior
of the shell, of a primer mounted in
said chamber, a bullet tube secured in and
extending axially through said shell, a percussion
head slidably mounted on the front
end of said bullet tube, a frangible connection
between said percussion head and the
50 body of the shell, adapted to be severed by
the pressure of the powder gases from the
small arm, a firing pin connected to said
head, means for normally holding said firing
pin in the safety position, and means controlled
by the forward movement of the percussion
head, for causing said firing pin to
55 register with said primer, with a hollow
ring provided with an auxiliary propelling
charge secured to the rear protruding end
of bullet tube, and a frangible waterproof
plate covering the rear end of said bullet
60 tube and covering also said auxiliary propelling
charge.

65 10. In a grenade for use with small arms
the combination with a hollow shell for the

explosive provided with a primer chamber
and a passage from said chamber to the interior
of the shell, of a primer mounted in
said chamber, a bullet tube secured in and
extending axially through said shell, a percussion
head slidably mounted on the front
end of said bullet tube, a frangible connection
between the said percussion head and
the body of the shell, adapted to be severed
by the pressure of the powder gases from the
small arm, a firing pin connected to said
head, means for normally holding said firing
pin in the safety position, and means
controlled by the forward movement of the
percussion head, for causing said firing pin
to register with said primer, said last mentioned
means comprising a clock spring under
tension connecting said head and said
tube, a firing pin carried by said head, and
a guide pin connected to said head and normally
locking said head against turning
under the action of said spring, but releasing
said head when said head is moved forwards,
with means coacting with said guide
pin for holding said head in the armed position,
with a hollow ring provided with an
auxiliary propelling charge secured to the
rear protruding end of said bullet tube, and
a frangible waterproof plate covering the
rear end of said bullet tube and covering
also said auxiliary propelling charge.

11. In a grenade the combination with a
hollow shell for the explosive provided with
a guide groove in the front end thereof and
also provided in its front end with a primer
chamber and a passage from said chamber
to the interior of the shell, of a primer
mounted in said chamber, a bullet tube secured
in and extending axially through said
shell, a hollow percussion head slidably
mounted on the front end of said bullet tube,
said tube being provided with gas ports
opening into said hollow head, a clock
spring under tension adapted to rotate said
head relative to the shell body, a firing pin
connected to said head, and a guide pin
connected to said head and normally locking
said head against turning under the
action of said spring, but releasing said
head when said head is moved forwards,
with means coacting with said guide pin for
holding said head in the armed position.

12. In a grenade the combination with a
hollow shell for the explosive provided with
a guide groove in the front end thereof and
also provided in its front end with a primer
chamber and a passage from said chamber
to the interior of the shell, of a primer
mounted in said chamber, a bullet tube secured
in and extending axially through said
shell, a hollow percussion head slidably
mounted on the front end of said bullet
tube, said tube being provided with gas ports
opening into said hollow head, a clock spring
under tension adapted to rotate said head

relative to the shell body, a firing pin ring connected to said head, a firing pin, and a guide pin connected to said ring, said guide pin normally locking said head against turning under the action of said spring, but releasing said head when said head is moved forwards, with means coacting with said guide pin for holding said head in the armed position.

13. In a grenade for use with small arms the combination with a hollow shell for the explosive provided with a guide groove in the front end thereof and also provided in its front end with a primer chamber and a passage from said chamber to the interior of the shell, of a primer mounted in said chamber, a bullet tube secured in and extending axially through said shell, a hollow percussion head slidably mounted on the front end of said bullet tube, weakened screws connecting said shell with said hollow head adapted to be severed by the powder gases from the small arm, a clock spring under tension mounted in said head and adapted to rotate said head relative to the shell body, a firing pin connected to said head, and a guide pin connected to said head and normally locking said head against turning under the action of said spring, but releasing said head when said head is moved forwards under the action of the powder gases, with means coacting with said guide pin for holding said head in the armed position.

14. In a grenade for use with small arms the combination with a hollow shell for the explosive provided with a guide groove in the front end thereof and also provided in its front end with a primer chamber and a passage from said chamber to the interior of the shell, of a primer mounted in said chamber, a bullet tube secured in and extending axially through said shell, a hollow percussion head slidably mounted on the front end of said bullet tube, weakened screws connecting said shell with said hollow head adapted to be severed by the powder gases from the small arm, a clock spring under tension mounted in said head and adapted to rotate said head relative to the shell body, a firing pin ring connected to said head, a firing pin, and a guide pin connected to said ring, said guide pin normally locking said head against turning under the action of said spring, but releasing said head when said head is moved forwards under the action of the powder gases, with means coacting with said guide pin for holding said head in the armed position.

15. In a grenade for use with small arms the combination with a hollow shell for the explosive provided with a primer chamber and a passage from said chamber to the interior of the shell, of a primer mounted in said chamber, a bullet tube secured in and extending axially through said shell, a per-

cussion head slidably mounted on the front end of said bullet tube, weakened screws connecting said percussion head and the body of the shell, adapted to be severed by the pressure of the powder gases from the small arm, a firing pin connected to said head, means for normally holding said firing pin in the safety position, and means controlled by the forward movement of the percussion head, for causing said firing pin to register with said primer.

16. In a grenade for use with small arms the combination with a hollow shell for the explosive provided with a primer chamber and a passage from said chamber to the interior of the shell, of a primer mounted in said chamber, a bullet tube secured in and extending axially through said shell, a percussion head slidably mounted on the front end of said bullet tube, weakened screws connecting said percussion head and the body of the shell, adapted to be severed by the pressure of the power gases from the small arm, a firing pin connected to said head, means for normally holding said firing pin in the safety position, and means controlled by the forward movement of the percussion head, for causing said firing pin to register with said primer, said last mentioned means comprising a clock spring under tension connecting said head and said tube, a firing pin carried by said head, and a guide pin connected to said head and normally locking said head against turning under the action of said spring, but releasing said head when said head is moved forwards, with means coacting with said guide pin for holding said head in the armed position.

17. In a grenade for use with small arms the combination with a hollow shell for the explosive provided with a guide groove in the front end thereof and also provided in its front end with a primer chamber and a passage from said chamber to the interior of the shell, of a primer mounted in said chamber, a bullet tube secured in and extending axially through said shell, a hollow percussion head slidably mounted on the front end of said bullet tube, the said tube being provided with gas ports opening into said hollow head, a frangible connection adapted to be severed by the powder gases from the small arm, a clock spring under tension mounted in said head and adapted to rotate said head relative to the shell body, a firing pin ring connected to said head, a firing pin, and a guide pin connected to said ring, said guide pin normally locking said head against turning under the action of said spring, but releasing said head when said head is moved forwards under the action of the powder gases, with means coacting with said guide pin for holding said head in the armed position.

18. In a grenade, adapted to be used with small arms, the combination with a hollow shell for the explosive, with means for arming the same on discharge and for exploding the same on impact, of a hollow ring provided with an auxiliary propelling charge secured to the rear end of the shell, and a destructible waterproof plate covering the rear end of said ring and the auxiliary propelling charge contained therein. 15
19. In a grenade, adapted to be used with small arms, the combination with a hollow shell for the explosive, with means for arming the same on discharge and for exploding the same on impact, of a hollow ring provided with an auxiliary propelling charge secured to the rear end of the shell, a celluloid plate covering the rear end of said ring and the auxiliary propelling charge contained therein, and a perforated cap holding said celluloid plate in place. 20

FRANKLIN THOMAS BURT.