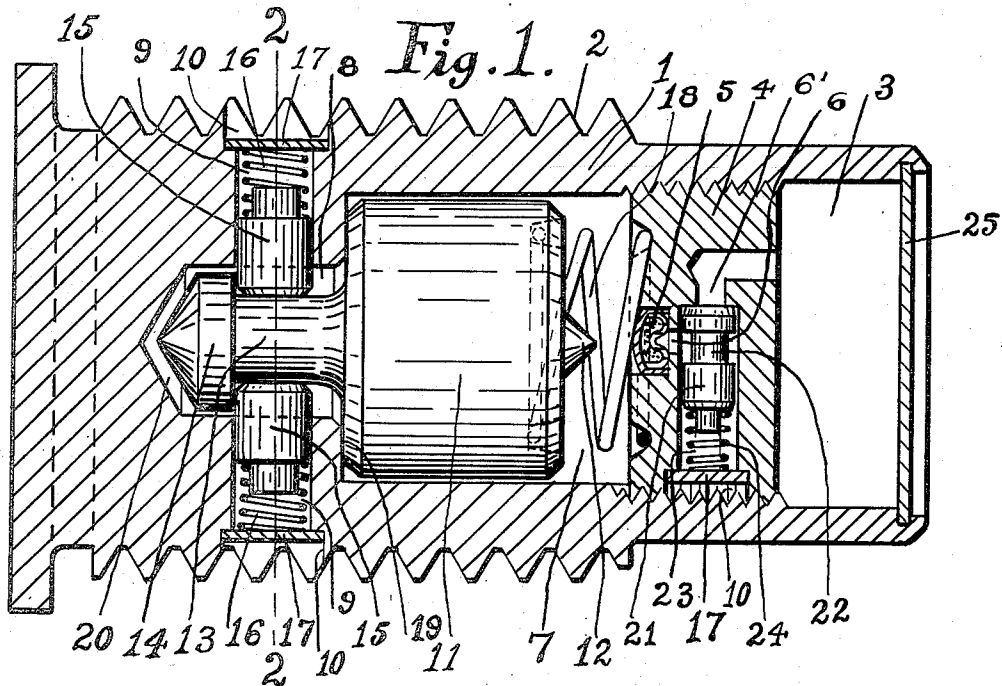
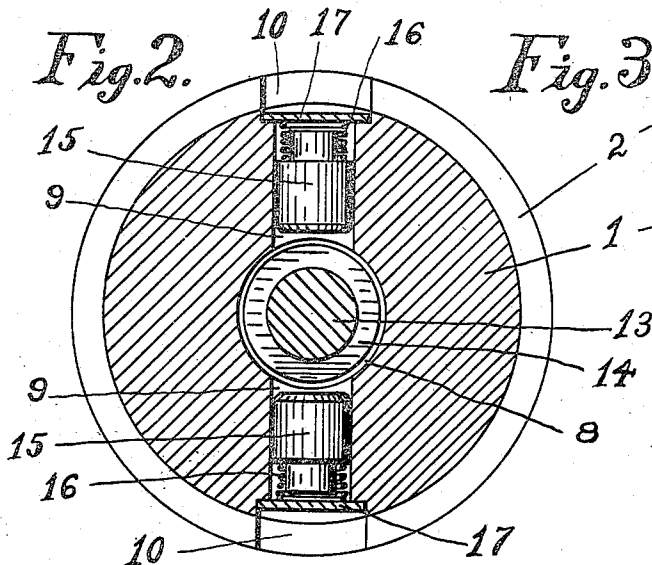


E. GATHMANN.
PERCUSSION FUSE FOR EXPLOSIVE SHELLS.
APPLICATION FILED OCT. 16, 1917.

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Patented Mar. 4, 1919.



WITNESS:

Fig. 4.

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PERCUSSION-FUSE FOR EXPLOSIVE SHELLS.

1,296,281.

Specification of Letters Patent.

Patented Mar. 4, 1919.

Application filed October 16, 1917. Serial No. 196,788.

To all whom it may concern:

Be it known that I, EMIL GATHMANN, a citizen of the United States, residing in the city of Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Percussion-Fuses for Explosive Shells, of which the following is a specification.

This invention relates to improvements in percussion fuses, and has for its object the prevention of premature or accidental explosion of the shell to which the fuse is fitted, while at the same time providing means for the prompt operation and firing of the fuse when fitted to a shell fired from a rifle gun, upon impact of said shell with a target of even light or medium resistance to penetration by the shells.

This invention primarily relates to fuses of the type known to those skilled in the art as "centrifugal arming," and is similar in basic principles to that shown in U. S. Patent No. 672,826, granted jointly to Louis and Emil Gathmann on April 23rd, 1901.

In the present invention I have greatly simplified and cheapened the construction of the fuse without sacrificing any of the safety features or efficiency of the fuses as a prime exploder for the shell. I have also adapted the construction so that the same may be employed in the United States standard sizes of fuse stock for medium and large caliber shells without any increase in the weight or size of the fuses over that at the present time adopted as a service standard.

In the accompanying drawings Figure 1 is a longitudinal section of a fuse stock with my improved type of firing hammer or exploder and the restraining detents shown in elevation. Fig. 2 is a section on line 2—2 of Fig. 1 with the detents shown in elevation. Fig. 3 is an elevation of a fragmentary portion of the fuse stock. Fig. 4 is a side elevation of the securing plate or disk for the detents or valves before same is secured in its seat.

In said figures, 1 represents the stock of the fuse and 2 the threaded portion thereof for securing the fuse within the base portion of the shell. A cavity 3 is provided at the forward end of the fuse in which is placed the booster or magazine charge of explosive material in the usual manner of fuses of this type. To the rear of this cavity is placed a threaded diaphragm or plug 4,

containing the primer or ignition cap 5, and a communicating passage 6 from said ignition cap to the magazine chamber. To the rear of the said diaphragm 4 is located the firing hammer chamber 7, which at its rearward end has a contracted portion 8. At right angles to the longitudinal axis of said contracted portion 8 are detent chambers 9, these being enlarged at their upper ends as shown at 10. A firing or ignition hammer or plunger 11 is placed within the chamber 7, said firing hammer being provided with a firing point 12 at its forward end and a contracted neck portion 13 at its rearward end, the contracted neck portion having a collar 14 at its rearward end. Detents or lock bolts 15 are located within the detent chamber 9 and forced downwardly against the contracted neck portion 13 of the firing hammer 11 by means of springs or the like devices 16, said springs being given suitable compression by means of detent chamber covers or disks 17, which are firmly secured by friction or other means in the enlarged portion 10 of the upper ends of the detent chamber. A creep or retaining spring 18 is placed in the chamber 7 to normally locate the firing hammer 11 in the rearward portion of the chamber 7, so that same is engaged with the shoulder 19, a clearance space 20 being provided between the rear end of the contracted chamber 8 and the enlarged portion 14 of the contracted stem 13 so that bearing does not take place at this point between the hammer and the stock of the fuse. The diaphragm 4 is provided with a valve 21, which normally closes the vent or communicating passage 6, the said valve being kept in the closed position, by means of a spiral spring or like device 24. The valve 21 has an annular recessed portion 22 and is normally located in chamber 23 so that this recess 22 is directly over and opening into the vent 6; the gases due to any premature explosion of cap 5 will thus discharge into the said recess 22 and thence into the valve chamber 23, the gases being prevented from entering vent 6¹ by reason of the sealing action of the head of the valve 21 against the shoulder in the bottom of the valve chamber 23, as clearly shown in Fig. 1 of the drawing.

The spring 24 is kept under suitable tension by means of a plate or disk 17, firmly seated in an enlarged portion 10 of the valve chamber 23, the said valve chamber 23, as

previously stated, connecting with the vents 6 and 6¹, the vent 6¹ being in a different plane from the vent 6, as shown in the drawings. A cover plate or disk 25 is provided to close the chamber 3 in the usual manner, well known to those familiar with the art.

Describing now the operation of my percussion fuse, the fuse being assembled as shown, is mounted by threads 2, preferably within the base portion of the shell, the shell being loaded with explosive material. When the shell has cleared the rifled gun from which it was fired it has attained a rapid whirling motion about its longitudinal axis, due to the rifling of the barrel of the gun, and by reason of such revolving motion, centrifugal action or force is generated and the detents 15 and valve 21 will be thrown radially outward and held in such outward position by the said centrifugal force during the flight or trajectory of the shell. The firing hammer or exploder 11 will thus be free to move forward upon any impact of the projectile with a resisting target, as the enlarged portion 14 of the reduced neck-like stem 13 of the hammer 11 will not meet any obstructions tending to retard said forward or axial motion of the plunger, excepting the light action of the creep spring 18, which is readily overcome by the inertia of the hammer upon impact even with very light targets. During the first shock of discharge of the projectile the inertia of the plunger, as well as that of the detent and valve, as shown in Fig. 1, will keep these various elements in a locked or normal position, but during the flight of the projectile or immediately after leaving the bore of the gun the detents will assume the position as shown in Fig. 2. When the projectile strikes a target the firing point 12 of the firing hammer 11 will impact against the detonator or primer cap 5, and cause the same to explode, and the vent 6 and 6¹ being then open and clear, the explosive material contained in the magazine chamber 3 will likewise be exploded, this magazine charge in turn igniting and exploding the bursting charge of the shell.

In the construction as shown the detent chambers run at approximately right angles through the threaded portion of the stock of the fuse and are cylindrical in shape, as shown in Fig. 3, as are likewise the enlarged portions or recess 10 of the detent chamber. In order to obtain a firm seating of the cover plates 17 in an economical manner and without the use of any considerable space, the plates are preferably shaped as shown in Fig. 4 (17^a) so that the plates will enter freely within the portion 10 of said detent chamber 9, and upon being pressed flat, or practically so, as shown in Figs. 1 and 2, the plates are enlarged in diameter

and a close fitting friction fit is readily obtained between the edges of said plate 17 and the side walls of the said recess 10.

The spring tension holding the detents and valve should be such that there will be ample reserve force in case of accidental misplacement of said detents due to accidental drop of the shell from practically any height within reason, but should be of such resiliency that they will readily open due to the rapid rotary motion imparted by the shell and contained fuse stock by the rifling action of the gun when the shell is fired from same. Tests have been made with these fuses and show that they are absolutely safe upon being dropped as high as 65 ft. and impacting on heavy plates, and that they will arm in a gun when fitted to a projectile discharged with a velocity between 2,000 and 3,000 ft. seconds. Obviously, some of the features of construction may be modified, as I have described a fuse stock which is mainly suitable for being fitted to the projectile at its base end. The same elements might, however, be applied to a fuse fitted to other portions of the projectile, for instance, at the nose or front end, or I might leave out the valve mechanism in the anvil disk and use the ordinary straight type of vent in the anvil disk or any other detonating or primer cap holding device.

What I claim is:

1. In a percussion fuse adapted to be carried by an explosive projectile, a chambered fuse stock, in combination with a relatively fixed anvil therein, a primer secured on one side of said anvil, a firing hammer, means for normally holding said hammer out of contact with the primer, an axial vent extending from the said primer into the valve chamber, a radially inclined vent communicating from an end portion of the valve chamber to a booster chamber, and a valve within said valve chamber normally interposed between said axial and radially inclined vents, said valve being arranged to open a passage between the said vents upon projection of a projectile carrying the said percussion fuse from a cannon.

2. In a percussion fuse adapted to be carried by an explosive projectile, a chambered fuse stock, in combination with a relatively fixed anvil therein, a primer secured on one end of said anvil, a firing hammer, means for normally holding said hammer out of contact with the primer, an axial vent extending from the said primer into an annular passage in a valve chamber, a radially inclined vent communicating from an end portion of said valve chamber to a booster charge chamber, and a valve within said valve chamber normally interposed between said axial and radially inclined vents, and adapted to obdurate the flow of flame or

gases in case of a premature explosion of said primer, said valve being arranged to open a passage between said vents upon projection of a projectile carrying the said percussion fuse from a cannon.

3. In a percussion fuse adapted to be carried by an explosive projectile, a chambered fuse stock, in combination with a relatively fixed anvil therein, a primer secured on one side of said anvil, a firing hammer, means for normally holding said hammer out of contact with the primer, an axial vent extending from said primer into the valve chamber, a radially inclined vent communicating from an end portion of the valve chamber to a booster charge chamber, and a valve within said chamber normally interposed between said axial and radially inclined vents, said valve being arranged to open a passage between said vents upon rapid axial rotation of a projectile carrying the said percussion fuses.

4. In a percussion fuse adapted to be carried by an explosive projectile, a chambered fuse stock, in combination with a relatively fixed anvil therein, a primer secured on one side of said anvil, a firing hammer, means for normally holding said hammer out of contact with the primer, an axial vent extending from said primer toward a valve chamber, a relatively inclined vent commu-

nicating from an end portion of the valve chamber to a booster charge chamber, and a valve within said chamber normally interposed between said axial and relatively inclined vents, said valve being arranged to open a passage between said vents upon rapid axial rotation of a projectile carrying said percussion fuses.

5. In a percussion fuse adapted to be carried by an explosive projectile, a chambered fuse stock, in combination with a relatively fixed anvil therein, a primary ignition cap secured on one side of said anvil, a firing hammer, means for normally holding said hammer out of contact with the primary ignition cap, an axial vent extending from said primary ignition cap toward a valve chamber, and a valve within said chamber normally interposed between said axial vent and a vent communicating with a primary booster charge chamber, the axes of said vent communicating with the booster charge chamber being relatively inclined to the cross sectional diameter of the said valve chamber, the said valve being arranged to open a passage between said vents upon projection of a projectile carrying the said percussion fuse from a gun.

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

EMIL GATHMANN.