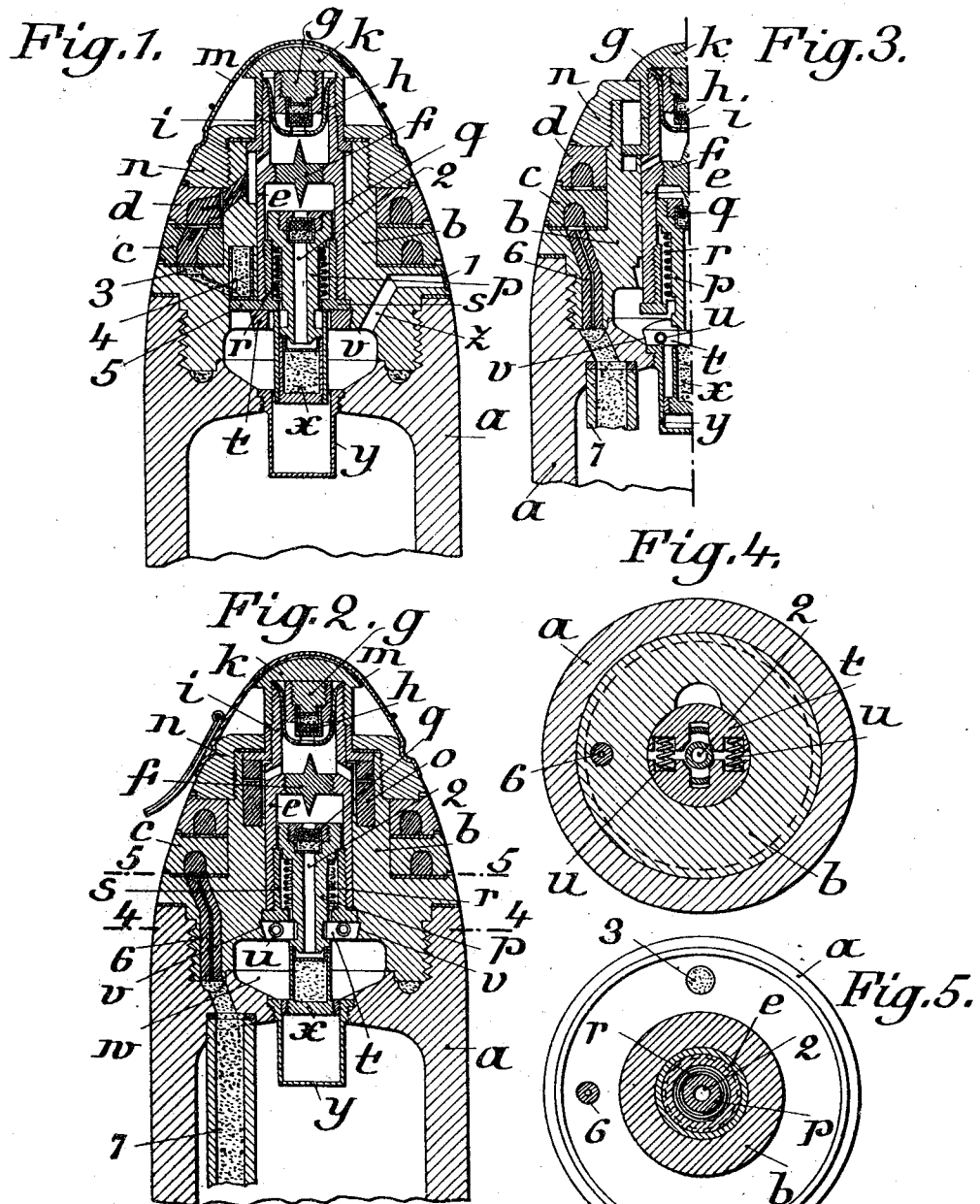


K. VÖLLER.
COMBINATION FUSE FOR ARTILLERY PROJECTILES.
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WITNESSES

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COMBINATION-FUSE FOR ARTILLERY-PROJECTILES.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, KARL VÖLLER, engineer, a subject of the German Emperor, residing at Dusseldorf, 12 Scharnhorst-
5 strasse, Germany, have invented certain new and useful Improvements in Combination-Fuses for Artillery-Projectiles; and I do hereby declare the following to be a full,
10 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.

The action of the ordinary combination fuse on impact depends on the fact, that a
15 plunger, in consequence of its momentum, shoots forward relatively to the body of the projectile, which is retarded or completely stopped in consequence of the impact. This causes the primer to be pierced by the firing
20 pin and detonated. The force, with which the plunger is moved relatively to the body of the projectile, depends upon the difference in the speeds of these two bodies. It is greatest if the impact entirely destroys the
25 motion of the projectile.

When targets are aimed at, which do not offer the necessary resistance, for example air-ships and particularly the fabric of
30 balloons or the covering of flying machines, the projectile would be so little delayed in its movement, that an ignition in the passage of the shot through the covering would very seldom happen. For this reason the inertia
35 of the plunger has not been utilized to fire the charge of projectiles intended for shooting at air-ships. The plunger has instead been driven forward on impact by the force
40 of a spring. The impact only releases a restraining device, which allows the force of the spring to come into action.

According to my invention the explosion of the projectile will be effected by the release of a plunger, which release is capable
45 of being brought about in either of two ways, first, by impact, and secondly, by timed ignition, the latter occurring in the absence of the former.

The accompanying drawings illustrate a form of construction of the combination
50 fuse according to my invention.

Figures 1 and 2 are longitudinal sections, at right angles to each other, of the front

part of the projectile with the parts in the positions they occupy before impact. Fig. 3 is a section similar to Fig. 2 with the parts
55 in the positions they assume after impact. Fig. 4 is a cross section at the line 4-4, Fig. 2. Fig. 5 is a cross section at the line 5-5, Fig. 2.

The ignition member *b* is screwed into 60 the front part of the projectile case *a*, which latter incloses the bursting charge. In the ignition member *b* there is a longitudinally movable sleeve *c* the axis whereof coincides with the axis of the projectile. A firing 65 pin *f* is shown as screwed into this sleeve, and as having forwardly and rearwardly projecting points. A plunger *g* carrying a detonator *h* is loosely arranged within the fore part of the sleeve, and is loosely held 70 by the slight restraining influence of a plate spring *i*, the ends of which are placed in engagement with the rounded end of the sleeve. This plunger has a tendency, when
75 the projectile is in flight, to move back relatively to the projectile as a whole. As the spring *i* is not very strong in its resistance it allows the plunger to so move, so that the detonator *h* will strike against the forwardly projecting portion of pin *f*, the 80 spring *i* being displaced by the rearward movement of the plunger. By the engagement with the firing pin *f* the detonator *h* is exploded, and this explosion is transferred to two powder charges *o* and also to 85 the powder in two known relatively adjustable timing rings *c*, *d*, which latter are set in the manner usual with timing fuses.

The outer end of sleeve *c* is closed by the pointed end of the projectile, and when the 90 latter is being transported this end is covered by a removable cap *m*. Any displacement of the sleeve *c* in the forward direction is prevented by an inclosing nut *n*. Within the rearward end of sleeve *c* is located a spring-impelled plunger *p* carrying at its forward end a primer or detonator 95 *q*. This plunger is normally under the influence of a coiled spring *r*, the tendency of which is to drive the detonator *q* against 100 the rearwardly projecting portion of firing pin *f*. This spring *r* is initially compressed between a shoulder of the plunger and the end flange of sleeve bushing *s*.

The sleeve *e* is normally retained in its forwardly projecting position (Fig. 1) by cooperating retaining plates *t* and these plates, according to the means shown, are also relied upon to hold plunger *p* in its retracted position, with spring *r* under tension. The two plates *t* are disposed transversely to the axis of the projectile and are set within a recess in the inner end of the ignition member *b*. They are normally held against the cone shaped surface *v* of their recess by the outward pressure of two coiled springs *u*.

The release of plunger *p* is brought about by the axial displacement of sleeve *e*. This is designed to be effected, in the first instance, by point *k* of the projectile striking the target, but is also capable of being accomplished, secondarily, through the ignition of the powder in the timing rings. This displacement of sleeve *e* causes the plates *t* to slide over the conical wall *v* of their retaining recess, overcoming thereby the tension of springs *u*. The sensitiveness of the combination fuse when impact occurs can, in consequence, be adjusted to suit the targets. As soon as these retaining plates *t* have been moved out of their recess, they are forced by springs *u* out of engagement with plunger *p*, and will thereupon fall into a chamber *w* which is partly formed by the projectile case and partly by the ignition member. Within this chamber *w* is the detonator *x* for igniting the bursting charge, and it remains in this chamber until by the rearward displacement of sleeve *e* it is moved into position for firing, that is, is moved into a box *y* which extends into the bursting charge. It is not possible for the charge to be fired by an explosion of the detonator *x* while the latter is located within chamber *w*, since an exit channel *z* is provided for the gases as a means of safety. This channel is normally closed by a cover 1 which is easily removed by the pressure of the gases.

In consequence of the release of the plunger from the retaining influence of plates *t*, the pressure of spring *r* acting on the plunger will project the latter forward and cause the detonator *q* to strike the rearwardly projecting portion of firing pin *f* (Fig. 3). The flame passes through aperture 2, extending longitudinally through the plunger, to the primer *x*, through the detonation of which box *y* is pierced, and the charge ignited.

Inasmuch as the fuse is mainly intended for projectiles to be fired against airships, it is the purpose of my invention to provide for bringing about the explosion through the instrumentality of a time-fuse, the explosion in this manner being effected in case the target is missed or there is no impact sufficient to effect the displacement of sleeve

e. If such additional means be not employed, a projectile missing the target might be detonated on impact with the ground, resulting in unintentional injury. Hence from the circular compartment wherein timing ring *c* is located, an aperture 3, (Figs. 1 and 5) leads to an explosion box 4 which is located on an extension 5 of the sleeve bushing *s*. When this box 4 is exploded the pressure of the explosion on extension 5 is sufficient to unseat the retaining plates *t*, thereby allowing a relative movement between sleeve *e* and plunger *p*. In other words, the sleeve is longitudinally displaced, the plunger impelled forward, and the combustible charge detonated, as a result of the explosion of box 4, the action being the same as that which follows impact.

From the circular chamber of the charging ring *c* a channel 6 (Figs. 2-5) also leads through the ignition tube 7 to a chamber at the base of the combustion parts, not shown in the drawing, and completely separated from the charge, which serves to show the path of the projectile.

The operation of my combination fuse will be readily understood from what has been said. When the gun is fired the powder gases give a very strong impulse to the shot. As the resistance offered by spring *i* is overcome by the plunger *q*, the detonator *h* is exploded by contact with firing pin *f* and this explosion is transferred both to powder charges *o* and also to the powder contained in timing rings *c*, *d*. Until the powder charges *o* are ignited they aid plates *t* in supporting head *k* and sleeve *e* in their forward positions. After the powder charges *o* burn, and the shot strikes against the target the sleeve *e* is pushed rearwardly, thereby displacing retaining plates *t* and plunger *p*, allowing the shot to be exploded through detonators *q* and *x*. Should the shot not meet the target or there be insufficient impact, the flame of the burning powder in timing rings *c*, *d*, upon reaching the powder channel 3 will ignite the explosion charge in the box 4, resulting in the displacement of sleeve *e* in the same manner as if the shot had struck the target. It is manifest that the rings *c*, *d*, must be so timed that the explosion of box 4 takes place only in the event of the shot having failed to contact with the target.

I claim as my invention:—

1. A fuse for projectiles comprising a detonating plunger, a longitudinally-movable member, means for allowing the plunger to effect an explosion when the member is moved by impact, and means for effecting such latter movement in the event of the member not being moved by impact.

2. A fuse for projectiles comprising a spring-impelled detonating plunger, a longitudinally movable member, means nor-

5 mally restraining the plunger and designed to be released when the member is moved by impact, and means for effecting such latter movement in the event of the member not being moved by impact.

10 3. A fuse for projectiles comprising a spring-impelled detonating plunger, a longitudinally movable member, means normally restraining the plunger and holding said member in its normal position, such means being rendered inoperative when the member is moved by impact, and means for effecting such latter movement in the event of the member not being moved by impact.

15 4. A fuse for projectiles comprising a detonating plunger, a longitudinally movable member, means for allowing the plunger to effect an explosion when the member is moved by impact, and timing means for effecting such latter movement in the event of the member not being moved by impact.

20 5. A fuse for projectiles comprising a spring-impelled detonating plunger, a longitudinally movable member, means normally restraining the plunger and designed to be released when the member is moved by impact, and timing means for effecting such latter movement in the event of the member not being moved by impact.

30 6. A fuse for projectiles comprising a spring-impelled detonating plunger, a longitudinally movable member, means normally restraining the plunger and holding said member in its normal position, such means being rendered inoperative when the member is moved by impact, timing means for effecting such latter movement in the event of the member not being moved by impact.

40 7. A fuse for projectiles comprising a spring-impelled detonating plunger, a longitudinally-movable sleeve normally extending from the projectile, means for normally holding the sleeve extended and the plunger retracted, such means comprising retaining members which are designed to be displaced when the sleeve is moved by impact, and means for effecting such latter movement in

the event of the sleeve not being moved by impact. 50

8. A fuse for projectiles comprising a spring-impelled detonating plunger, a longitudinally-movable sleeve normally extending from the projectile, means for normally holding the sleeve extended and the plunger 55 retracted, such means comprising spring pressed members designed to be displaced when the sleeve is moved by impact, and means for effecting such latter movement in event of the sleeve not being moved by 60 impact.

9. A fuse for projectiles comprising a spring impelled detonating plunger, a longitudinally-movable sleeve normally extending 65 from the projectile, means for normally holding the sleeve extended and the plunger retracted, such means comprising retaining members which are designed to be displaced when the sleeve is moved by impact, an initially-acting detonator, and time controlled explosion means for moving said 70 sleeve in the event of its not being moved by impact, said explosion means being ignited by said initially-acting detonator.

10. A fuse for projectiles comprising a 75 spring-impelled detonating plunger, a longitudinally-movable sleeve normally extending from the projectile, means for normally holding the sleeve extended and the plunger retracted, such means comprising retaining 80 members which are designed to be displaced when the sleeve is moved by impact, an initially-acting detonator, a time controlled explosion means for moving said sleeve in the event of its not being moved by impact, 85 and a powder charge intermediate said initially-acting detonator and said explosion means.

In testimony whereof, I have signed this specification in the presence of two subscrib- 90 ing witnesses.

KARL VÖLLER. [L. s.]

Witnesses:

FRZ. TACK,

C. SIMONSEN.