(No Model.) 3 Sheets—Sheet 1.

J. C. THOMPSON.

FUSE FOR EXPLOSIVE PROJECTILES OR SHELLS.

No. 482,533. Patented Sept. 13, 1892.

Fig. 6.

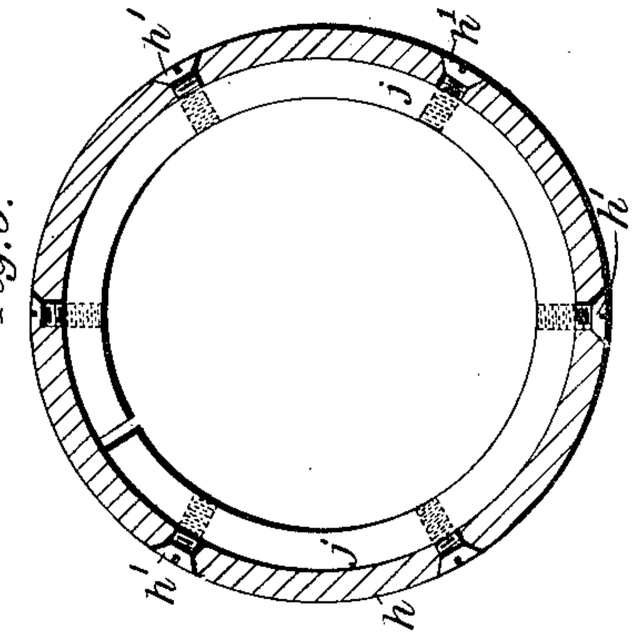


Fig. 3.

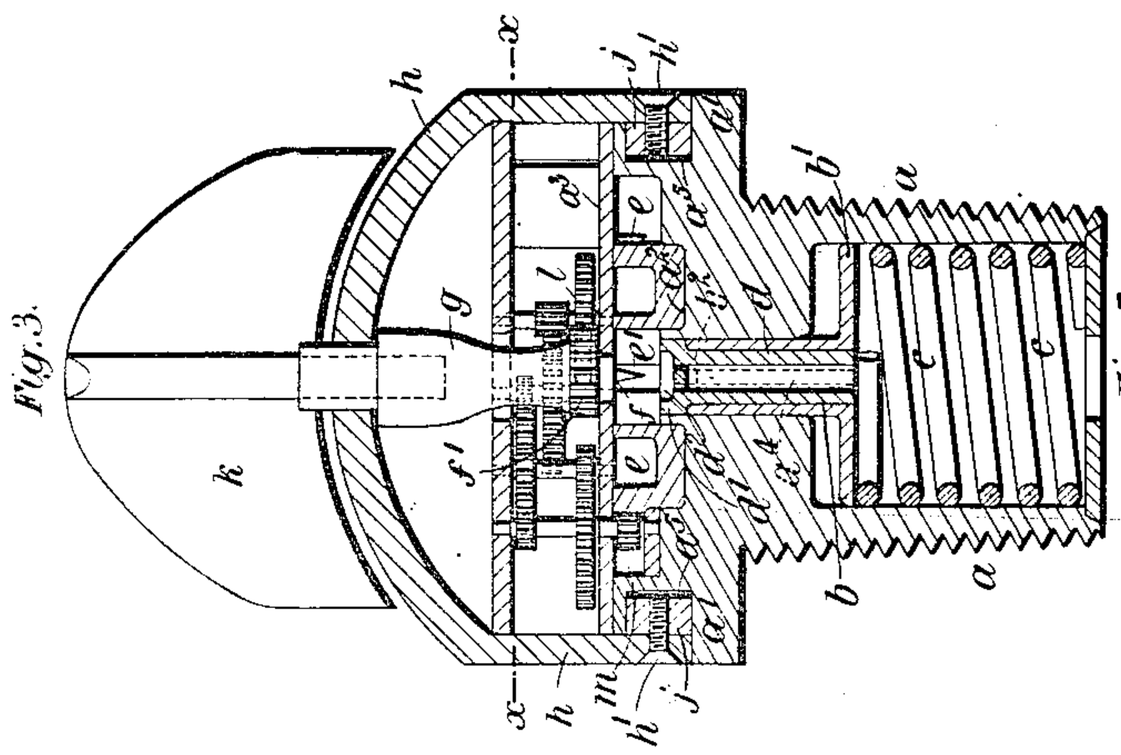


Fig. 5.

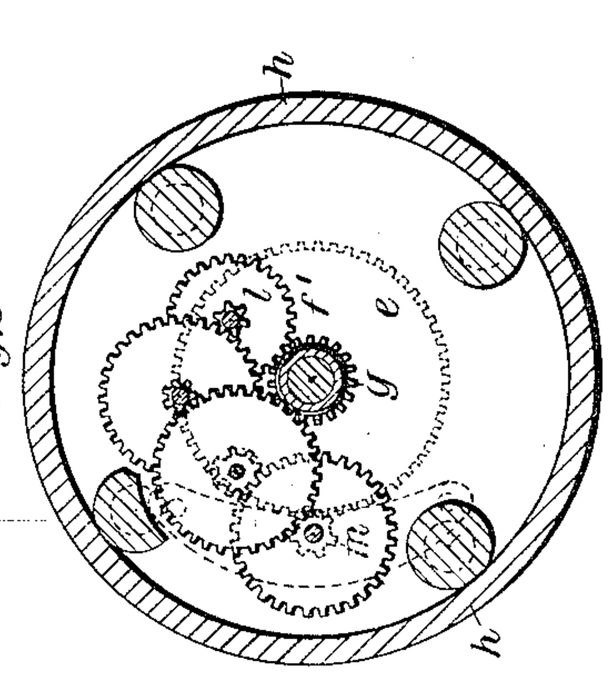


Fig. 2.

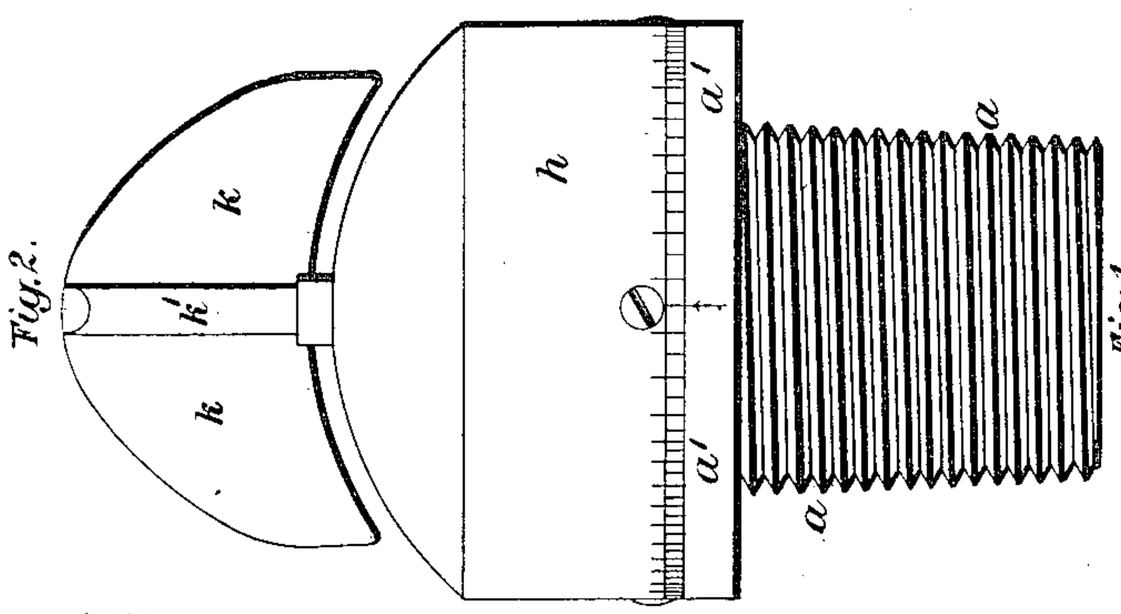
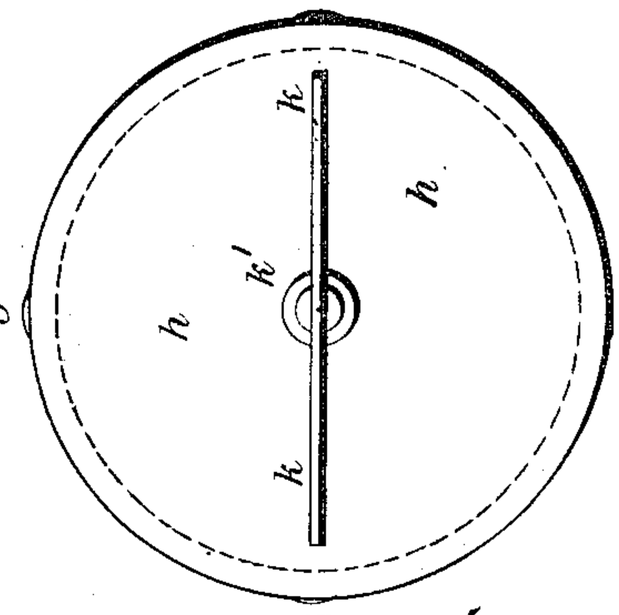


Fig. 1.



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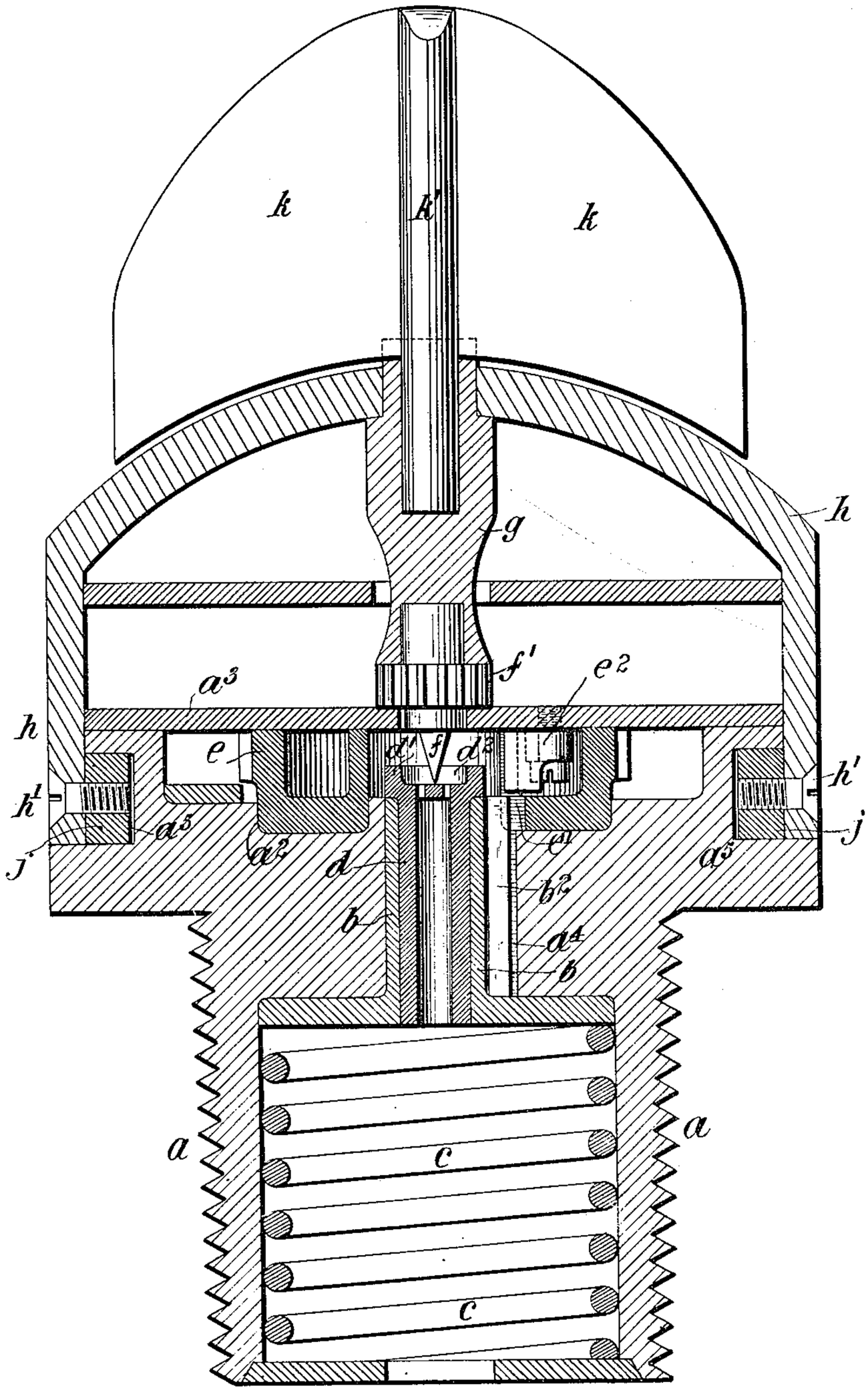
J. C. THOMPSON.

FUSE FOR EXPLOSIVE PROJECTILES OR SHELLS.

No. 482,533. Patented Sept. 13, 1892.

Fig. 4



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(No Model.) 3 Sheets—Sheet 3.

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Fig. 7.

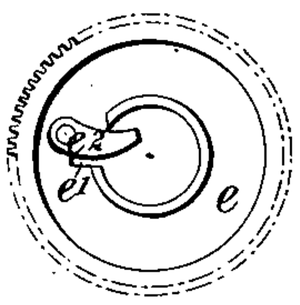


Fig. 8.

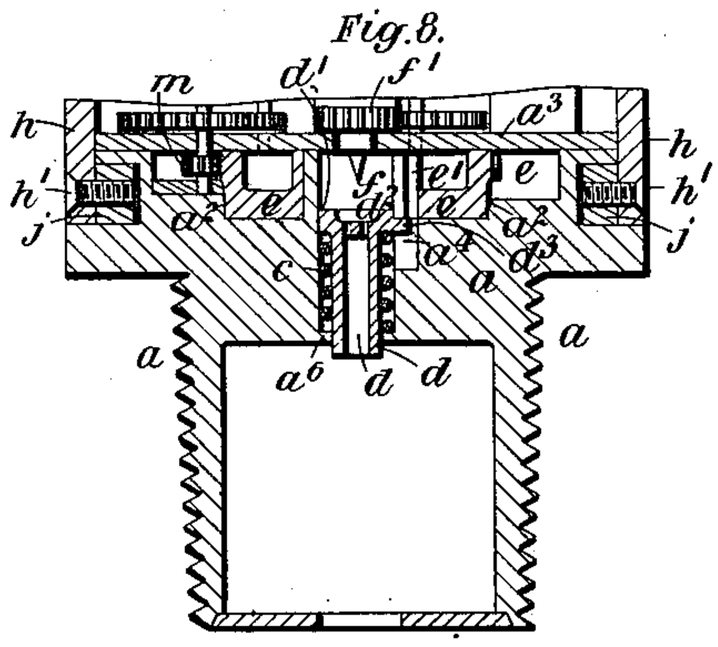


Fig. 11.

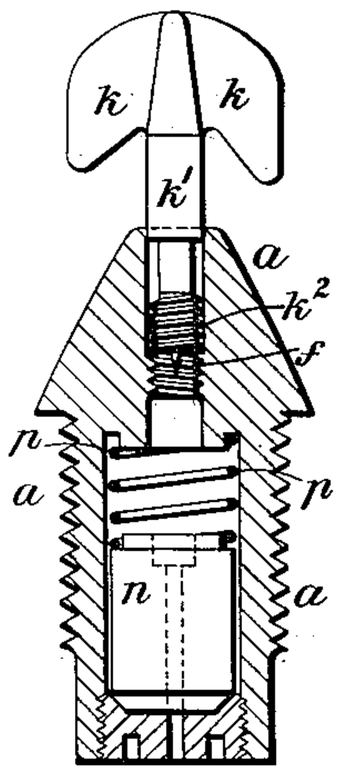


Fig. 9.

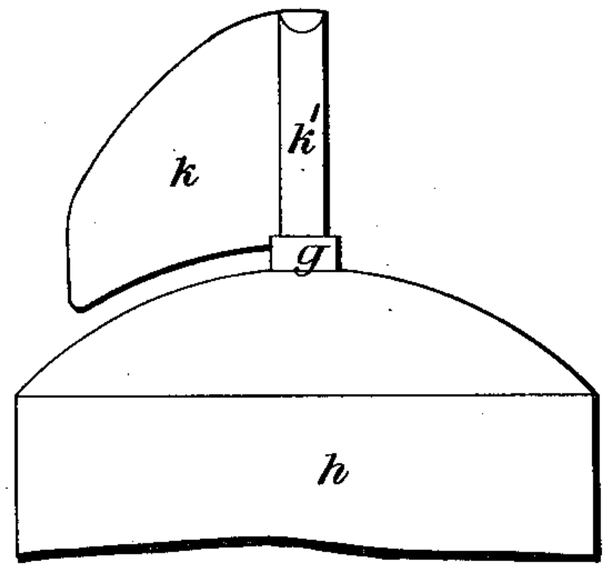


Fig. 12.

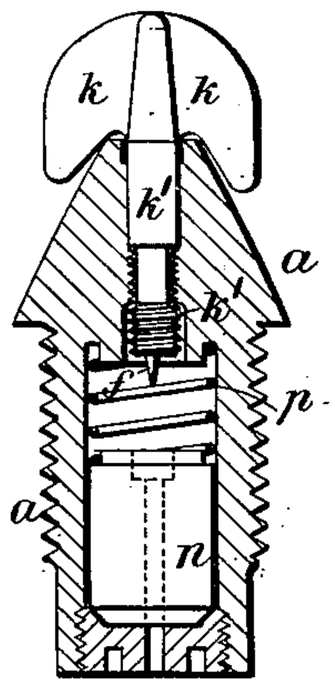


Fig. 10.

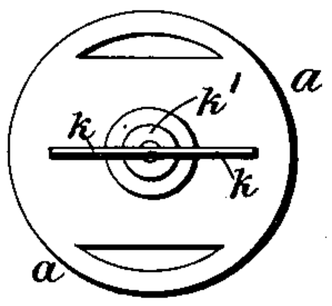
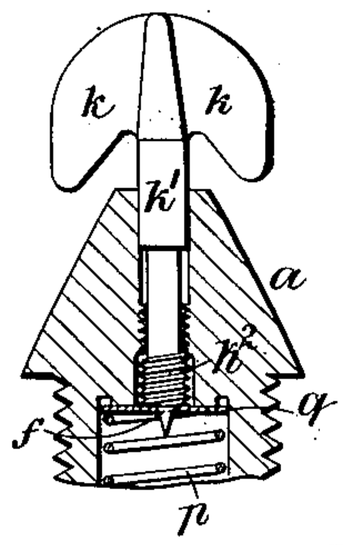


Fig. 13.



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UNITED STATES PATENT OFFICE.

JAMES COULTHRED THOMPSON, OF BROCKLEY, ENGLAND.

FUSE FOR EXPLOSIVE PROJECTILES OR SHELLS.

SPECIFICATION forming part of Letters Patent No. 482,533, dated September 13, 1892.

Application filed April 25, 1891. Serial No. 390,426. (No model.) Patented in England October 22, 1888, No. 15,159; in Belgium August 31, 1889, No. 87,423; in Italy October 29, 1889; in France November 11, 1889, No. 200,259; in Austria-Hungary January 31, 1890, and in Germany May 7, 1890, No. 51,931, and June 10, 1890, No. 52,366.

To all whom it may concern:

Be it known that I, JAMES COULTHRED THOMPSON, gentleman, a subject of the Queen of Great Britain, and a resident of Brockley, England, have invented new and useful Improvements in Fuses for Explosive Projectiles or Shells, (for which I have obtained patents in Great Britain, No. 15,159, dated October 22, 1888; in France, No. 200,259, dated November 11, 1889; in Belgium, No. 87,423, dated August 31, 1889; in Germany, No. 51,931, dated May 7, 1890, and No. 52,366, dated June 10, 1890; in Austria-Hungary, dated January 31, 1890, and in Italy, dated October 29, 1889,) of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to mechanical fuses for explosive projectiles or shells and comprises improvements which are applicable to both time or distance fuses and percussion-fuses. My improvements, moreover, afford the means for ascertaining the number of revolutions performed by a projectile or shell in its flight and the distance traversed by the said projectile or shell.

An important feature of my said invention is the employment of one or more blades or vanes which are to be applied to the fuse before the shell is inserted into a gun, and which, by reason of the resistance of the atmosphere, will not participate in the rotary motion imparted to the shell by the rifling of the gun. The motion of the shell relatively to the said vane or vanes is utilized for so adjusting parts of the fuse that the bursting of the shell will take place either at any desired moment after it has been fired from the gun or when it strikes or grazes an object.

I am aware that attempts have been made to construct fuses with blades or vanes which in the flight of the shell will rotate about the axis of the fuse for the purpose above specified; but these attempts have all, as far as I am aware, been unsuccessful. In my improved fuse, however, the blades or vanes are not intended to be rotated in the flight of the shell, but are so formed and arranged that the resistance of the air will prevent their rotation.

In one form of my improved fuse I employ a train of wheels, which is inclosed in the fuse-case and which when the shell is fired from a gun will rotate with the said shell and case about the axis or spindle of the vane or vanes, and thus cause the slow rotation of a disk or wheel. This disk or wheel is so formed and arranged that when turned or adjusted through any predetermined angle it will permit the discharge of the fuse and the consequent bursting of the shell.

In another form or modification of my said fuse I fix the needle or striker on the spindle of the vane or vanes, and I form on the said spindle screw-threads adapted to engage with corresponding screw-threads in the fuse-case, so that the rotation of the shell and fuse-case relatively to the vane or vanes will cause the screwing in of the said spindle, and thus move the needle or striker toward the primer or detonator, so as to permit the explosion of the primer or detonator when the shell strikes or grazes an object.

In the accompanying drawings, Figure 1 is a plan, Fig. 2 a side elevation, and Fig. 3 a longitudidal central section, of a combined time or distance and percussion fuse constructed according to my said invention, the parts being shown in the positions which they occupy relatively to each other when the fuse is ready for use. Fig. 4 is also a longitudinal central section, some of the parts being removed and the remaining parts being shown in the relative positions which they occupy when the plunger carrying the primer or detonator has been driven forward, as hereinafter described. Fig. 5 is a horizontal section on the line $x\,x$, Fig. 3. Fig. 6 is a plan, partly in horizontal section, showing the means, hereinafter described, for connecting the two parts of the fuse-case. Fig. 7 is a plan, partly in horizontal section, illustrating a detail of construction. Fig. 8 is a longitudinal central section illustrating another time or distance fuse constructed according to my said invention. Fig. 9 is a side elevation illustrating my improved fuse provided with a single blade or vane. Fig. 10 is a plan, and Fig. 11 a longitudinal central section, of a percussion-fuse constructed according to my said invention, the parts being shown in the relative positions which they oc-

cupy when the fuse is ready for use. Fig. 12 is also a longitudial central section of the said fuse, the parts being shown in the positions which they occupy during the flight of the projectile or shell in which the fuse is fitted. Fig. 13 is a similar view illustrating another modification of my percussion-fuse.

Like letters indicate corresponding parts throughout the drawings.

a is a chamber or casing, which is formed with a flange *a'* and with the usual external screw-thread for securing the fuse in the point or apex of a shell. *b* is a tube, which is fitted to slide to and fro in a hole in one end of the said casing *a* and which is provided with a flange *b'*, and is acted upon by a spring *c*, inclosed in the said casing. The said chamber or casing *a*, moreover, serves as the magazine of the fuse. The tube *b* has fitted to slide therein another tube or tubular plunger *d*, provided at one end with a flange *d'*, which bears against the corresponding end of the tube *b*. In the upper end of the tube or plunger *d* is a cavity d^2 for the reception of a suitable detonator or primer. A toothed wheel *e* is fitted to rotate in a recess a^2 in the upper or forward end of the casing *a* and is held in place by a plate a^3. This wheel *e* is formed with a slot *e'*, for the purpose hereinafter explained. The tube *b* is provided with a stud or projection b^2, which extends into a slot a^4 in the casing *a* and which bears against the under side of the wheel *e*, so that the spring *c* is kept suitably compressed, as shown. The needle or striker *f* is fixed in one end of a spindle *g*, the other end of which extends through an adjustable casing *h*, in which is firmly secured the aforesaid plate a^3. This casing is secured to the casing *a* in the following manner, so that it can be rotated relatively thereto—that is to say, the casing *a* is made with a circumferential groove or recess a^5, in which is inserted a split or divided ring *j*. The case *h* is firmly secured to this ring by means of screws *h'* or in any other convenient manner. In the outer end of the spindle *g* is fitted a spindle *k'*, on which are fixed the blades or vanes *k*, which are situated in the same plane as the axis of the fuse. The needle or striker *f* has formed therewith a pinion *f'*, which is geared with a toothed wheel *l*, forming part of a train of gearing, which also comprises a pinion *m*, geared with the toothed wheel *e*. The slot *e'* in the said toothed wheel is so arranged that when the said wheel is turned so as to bring this slot in line with the stud or projection b^2 on the tube *b* the said stud or projection can enter the slot, and the spring *c* will then react and drive the tubes *b d* forward, thus causing the explosion of the primer or detonator by striking it against the needle *f*. If the shell strike an object before the tube *b* is thus released, the tube or plunger *d*, which is capable of longitudinal movement within the tube *b*, will by its momentum and as the result of the shock imparted to the shell by meeting with an obstruction be driven forward and cause the explosion of the primer or detonator and the consequent bursting of the shell.

To prevent the forward movement of the plunger *d* before the tube *b* is released or an object encountered by the shell in its flight and a consequent premature explosion of the same, I employ a slightly-curved arm or detent e^2, Figs. 4 and 7, which is pivoted to the inner or under side of plate a^3 and which normally projects through the slot or opening *e'* in the annular flange of the toothed wheel *e* into the space between the end of the tube or plunger *d* and the plate a^3, preventing the plunger from driving the primer into contact with pin *f*. As soon as the shell begins its flight, however, the toothed wheel *e* is rotated relatively to the plate a^3, as above described, so that after the shell has made a few revolutions by reaso this movement the pivoted arm e^2 is drawn out of the slot *e'*, leaving the space above the plunger *d* clear for the forward movement of the latter upon the impact of the shell. By adjusting the wheel *e* by hand, so as to bring the slot *e'* a greater or less distance from the stud or projection b^2, the range of the shell or the time of discharge of the fuse after the projectile leaves the gun can be regulated, as required. This adjustment is effected by rotating the adjustable casing *h* relatively to the casing *a*. The casing *h* is provided with a graduated scale arranged to indicate revolutions or yards, as may be desired, and a suitable arrow head or pointer is provided upon the casing *a* for the purpose of indicating the time or distance for which the fuse is adjusted. When the fuse is properly adjusted and the shell is fired from a gun, the casings *a h* and the train of wheels carried thereby will rotate with the said shell. The spindle *g* and needle or striker *f* will, however, be held or restrained from rotation by the resistance of the air to rotary movement of the blades or vanes *k*. The aforesaid train of wheels will therefore be moved around the pinion *f'*, and will thus be caused to impart motion to the wheel *e*, which will be rotated at a comparatively low speed, thus bringing the slot *e'* into line with the stud or projection b^2 at the proper moment to permit the discharge of the fuse and the consequent bursting of the shell.

By employing suitable registering mechanism in connection with the aforesaid train of wheels I can provide for enabling the number of revolutions performed by the shell to be ascertained after the recovery of the shell. The pitch of the rifling of the gun being known, it follows that the distance traversed by the shell can also be ascertained.

In the modification of my invention shown in Fig. 8 the actuating-spring *c* is placed around the sliding tube or plunger *d* and bears at one end against the flange *d'* on the said tube and at its other end against an internal flange a^6 on the casing *a*. The tube or plunger *d* is provided with a stud or projec-

tion d^3, which extends into the slot a^4 and bears against the under side of the wheel e, so that when the said wheel is turned into the proper position the said stud or projection will enter the slot e' and the plunger d will be driven forward by the spring c, thus causing the explosion of the shell. In some cases I use only one blade or vane k, as shown in Fig. 9, for the purpose above specified.

In my improved percussion-fuse (shown in Figs. 10 to 12) the detonator is carried by a plunger n, arranged to slide to and fro within the casing a and acted upon by a spring p, which is also inclosed in the said casing and which holds or tends to hold the plunger n against the rear or lower end of the said casing. The spindle k', on which the blades or vanes k are mounted, is provided with a screw-threaded portion k^2 and has formed with it the needle or striker f. The screw-threaded portion k^2 of the said spindle k' fits into a correspondingly-screw-threaded hole in the casing a. The spindle k', with the blades k thereon, is partly screwed into the casing a, as shown in Fig. 11, before the shell is inserted into the gun. When the parts are in the position shown, the detonator cannot come in contact with the needle or striker. When, however, the shell is discharged from the gun, the rotation of the shell and the fuse-case relatively to the blades k and spindle k' causes the said spindle to enter the casing until it assumes the position therein shown in Fig. 12. Therefore when the shell strikes an object the plunger n will by its momentum be driven forward, and the detonator thus brought into impact with the needle or striker.

The spring p may, if desired, be dispensed with, as the screw-spindle is not to be inserted in the fuse-case until the shell is about to be inserted in the gun. Consequently the detonator cannot by any accident be caused to come in contact with the striker.

To more effectually insure the bursting of the shell upon the impact of the same against an object or upon the grazing of an object by the said shell, I sometimes make the spindle k', as in Fig. 13, of such length that when in the position shown it will project beyond the forward end of the casing a. In this case a disk q is provided for holding the striker away from the plunger until the shell strikes an object. It is obvious that when in the flight of the shell the blades or vanes k come in contact with any object the spindle k' and needle or striker f will be driven into the casing a, thus causing the explosion of the detonator. By this means I insure the bursting of the shell, whether the plunger n is or is not moved forward by its momentum.

It is obvious that the construction of my fuses can be further modified, if desired, without departing from the nature of my said invention.

What I claim is—

1. The combination, in a shell or projectile with a detonator or primer and a wheel or disk mounted on a part of the shell and restraining the detonator from action and provided with a slot or cut-away portion which when the wheel is turned through a given angle releases the detonator, of a spindle parallel to the axis of the shell, vanes on the same for preventing its rotation during the flight and rotation of the wheel, and gears intermediate to the spindle and the said wheel or disk, as set forth.

2. The combination, in a fuse, of a slotted toothed wheel, an exploding device held out of action thereby, a spindle provided with vanes for preventing its rotation during the flight of the shell, gears intermediate to the spindle and the toothed wheel, and a stop or arm interposed in the path of movement of the detonator of the exploding device adapted to be withdrawn by the movement of the toothed wheel relatively to the exploding device, as set forth.

3. The combination, with a shell or projectile, of a spindle parallel to the axis of said shell and provided with vanes for preventing its rotation during the flight of the shell, and a detonator or exploding device adapted to be ignited or operated for exploding the charge in the shell by a predetermined movement of the shell and the spindle relatively to each other, as set forth.

4. In a shell or projectile, the combination of the spindle provided with vanes for preventing its rotation during the flight of the shell, a train of gears carried by the shell and engaging with the spindle, a spring-actuated detonator adapted to be released by said train, and a primer carried by a movable part of the detonator adapted to be thrown forward and exploded by the impact of the wheel upon a body in its path, as set forth.

In testimony whereof I have hereunto signed my name in the presence of two subscribing witnesses.

JAMES COULTHRED THOMPSON,

Witnesses:

DAVID YOUNG,

A. B. CROFTS.