No. 676,139. Patented June 11, 1901.

G. KLUMAK.

DISTANCE FUSE FOR PROJECTILES OR TORPEDOES.

(Application filed Feb. 15, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

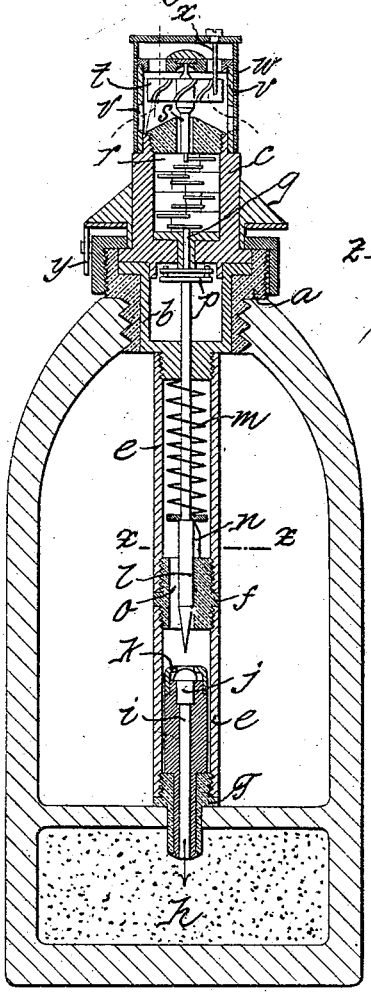


Fig. 2.

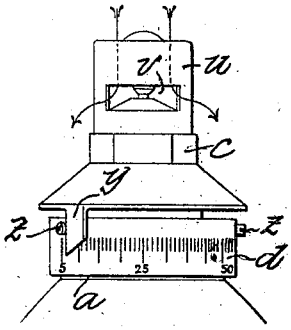
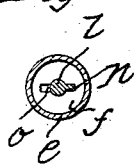


Fig. 3



Witnesses.
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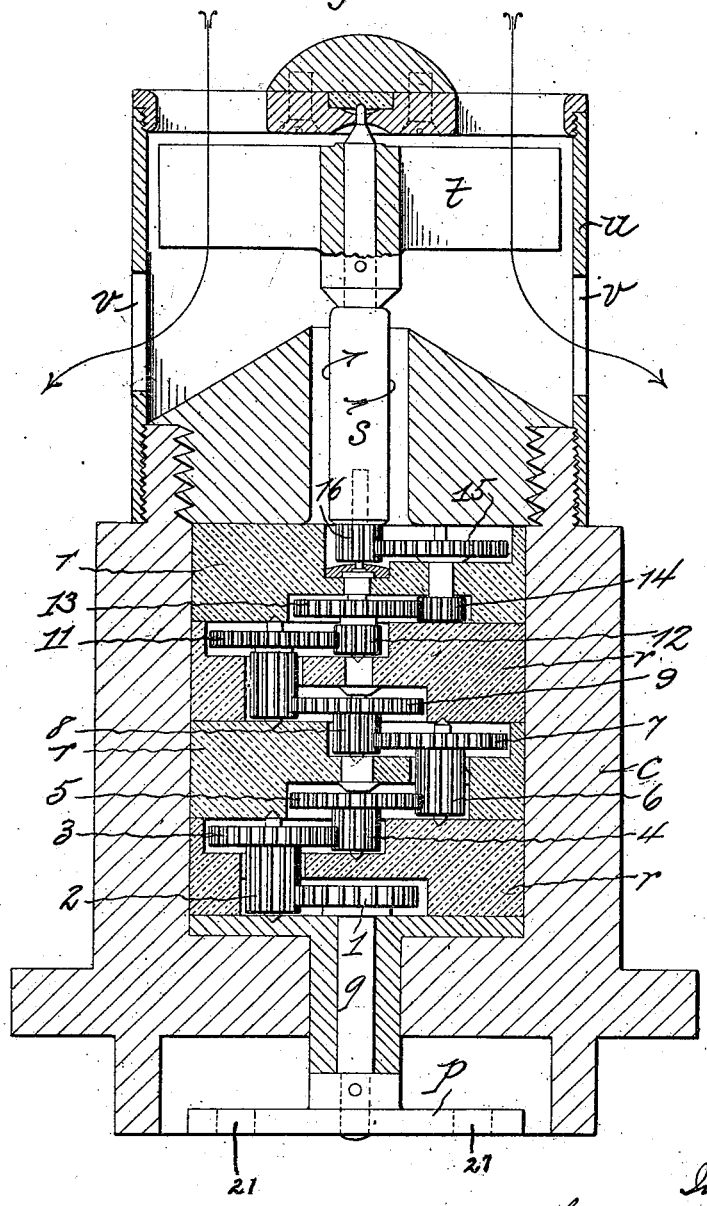
Fig. 4.



Witnesses:

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UNITED STATES PATENT OFFICE.

GÉZA KLUMAK, OF VIENNA, AUSTRIA-HUNGARY.

DISTANCE-FUSE FOR PROJECTILES OR TORPEDOES.

SPECIFICATION forming part of Letters Patent No. 676,139, dated June 11, 1901.

Application filed February 15, 1900. Serial No. 5,338. (No model.)

To all whom it may concern:

Be it known that I, GÉZA KLUMAK, a subject of the Emperor of Austria-Hungary, residing at Vienna, in the Province of Lower Austria, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in Distance-Fuses for Projectiles or Torpedoes; 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, reference being had to the accompanying drawings, and to letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to mechanically-operated distance-fuses in which the explosive projectile or torpedo is connected to a spindle which is rotated by a vane-wheel acted upon by the resistance of the air or water and which transmits such motion to a train of wheels for releasing after a given time the percussive firing-pin of the projectile.

Such distance-fuses as at present constructed do not fulfil the necessary conditions—namely, that the fuse shall effect the firing of the explosive charge in a perfectly reliable manner after having passed through the exact distance required. The cause of this is that, on the one hand, the vane-wheel and the mechanism actuated thereby are made too heavy or are so arranged that with the great speed of rotation of the vane-wheel a considerable braking action is produced in consequence of the frictional resistance, whereby the release of the firing-pin is retarded. On the other hand, the initial concussion to which the projectile is subjected on firing has a detrimental action upon either the firing-pin or the train of wheels or on the vane-wheel or on all of these combined, so that either the explosion occurs at the wrong time or locality or does not occur at all.

The present invention has for its object a distance-fuse in which these defects are obviated by arranging the percussive firing-pin in the continuation of the axis of the vane-wheel and in the center line between the train of wheels, which is arranged in stages symmetrically on each side of such center line, so as to distribute the masses uniformly. The percussion firing-pin is connected with such train by means of a coupling which can be automatically disengaged, so that it revolves both when setting the fuse to the required distance and when the vane-wheel rotates, at which time it bears with a lateral projection at its lower end upon a supporting-piece provided with a notch. The vane-wheel is made as light as possible and its spindle is carried in such manner that friction is reduced to a great extent. This arrangement allows of the use of a very strong spring for propelling the percussive firing-pin and insures a perfectly uniform motion of the train of wheels, while at the same time it reduces to a minimum the prejudicial action of the initial concussion.

The accompanying drawings show by way of example a distance-fuse constructed according to this invention (and which can also act as a percussive fuse) as applied to an explosive projectile.

Figure 1 shows a vertical section of the projectile with its fuse, the transmission mechanism being shown diagrammatically. Fig. 2 shows an external view of the mechanism for setting the fuse to the required distance. Fig. 3 is a cross-section on line X X, Fig. 1. Fig. 4 is an enlarged vertical section of the fuse mechanism, together with the vane-wheel.

The fuse consists of a screwed headpiece *a*, fixed in the projectile to be exploded, (grenade, shrapnel, torpedo, &c.,) in the enlarged upper end of which head are inserted the socket-pieces *b* and *c*, which are secured by the screw-cap *d*. The socket-piece *b* is fixed in the head *a*, while the upper socket-piece *c* can be rotated. To the socket *b* is screwed a tube *e*, formed in two parts, which are connected together by the perforated support *f* of the percussion-pin. The lower end of the tube *e* carries a perforated nozzle-piece *g*, which projects down into chamber *h*, containing the explosive charge, and in this nozzle-piece is introduced the firing-tube *i*, held in position by riveting over its lower end. In the upper end of the tube *i* is inserted the igniting-pellet *j*, which is held in position by a cap *k*. The threaded projection of the socket-piece *b* and the support *f* have the percussion-pin *l* passing through them, on which acts the propelling-spring *m*. When the latter is com-

ressed, the percussion-pin rests with its projection *n* upon the support *f*. This has a notch extending through it, Figs. 1 and 3, through which the projection *n* of the percussion-pin can pass when the pin *l* has been turned into the position in which *n* faces *o*, when the pin *l* will be thrown back by the spring against the igniting-pellet. The percussion-pin *l* is connected by a coupling *p*, comprising two disks, one of which (here shown as the lower one) carries two pins 20, that enter holes 21 in the other disk, that can be automatically disengaged with the spindle *q*, Figs. 1 and 4, of the rotating mechanism. This rotating mechanism, which is contained in the socket-piece *c*, consists of a series of toothed wheels 1 to 16, mounted between bearing-pieces *r*, as shown at Fig. 4. The first of such wheels 1 is fixed to the spindle *q* and the last, 16, upon the driving-spindle *s*. The latter carries the vane-wheel *t*, which during the flight of the projectile is rotated by the resisting medium, (air or water.) By means of the train of wheels 1 to 16 this rotation is transmitted in a greatly-retarded manner to the spindle *q* and percussion-pin in order that the release of the latter may be effected on reaching a predetermined point of the projectile's flight. The vane-wheel *t* is inclosed in a casing *u*, fixed to the socket-piece *c*, in which casing are formed openings *v*, through which the air or water escapes after having acted upon the vane-wheel. A cap *w*, secured by a bayonet-joint on the casing *u*, closes the access to the vane-wheel, in which cap is provided a pin *x*, that engages with the vane-wheel so as to prevent its rotation. For facilitating the accurate setting of the fuse the socket-piece *c* is formed polygonal externally for the reception of a spanner, and it is provided with a pointer *y*, the motion of which is limited by the stops *z*, Fig. 2, on the screw-cap *d*, which carries the setting-scale.

Normally the wing or projection *n* on the firing-pin *l* is seated on the face of the stop and guide sleeve *f* out of register with its slot *o*, and from what has been said it is obvious that said wing or projection may be brought into register with said slot by a complete or a fractional revolution of the firing-pin, the maximum revolution of the said firing-pin being determined by the abutment-pins *z* on graduated screw-cap *d*. If pointer *y* lies against the left-hand abutment-pin *z*, Fig. 2, the wing or projection *n* on the firing-pin *l* will lie on the lower side of the slot *o*, Fig. 3, so that a complete revolution of the firing-pin will be necessary to bring said wing into register with slot *o*, at which time the pointer *y* would lie against the right-hand abutment-pin *z*. Obviously by revolving sleeve *c* in the direction of rotation of the vane-spindle *s* the firing-pin is similarly revolved from the lower edge of slot *o*, Fig. 3, around toward its upper edge, thereby reducing to that extent the extent of rotation of the firing-pin necessary to bring its projection *n* into register with slot *o*, and consequently determining the time or the distance at which the projectile is to be exploded. During this adjustment or timing of the action of the firing-pin the whole clock-train and vane *t* are moved through the desired arc; but the vane *t* is held against independent rotation during such adjustment and while the shell or the like is stored by the stop-pin *x* on cap *w* to prevent accidental rotation of the vane and explosion of the shell. This cap and pin is removed before loading the projectile into the gun.

If the described distance-fuse is to be used as a percussion-fuse, the cap *w* is not removed, so that on the projectile striking the igniting-tube *i* is projected forward out of the nozzle *g* by the impact, causing the igniting-pellet *j* to strike against the firing-pin *l*. The same action will take place if the time or distance fuse mechanism should not act properly for releasing the firing-pin.

I claim—

1. The combination with a projectile, a percussion-primer arranged axially therein, a spring-propelled firing-pin in line with said primer and a locking device locking said pin against the action of its spring and adapted to release the pin when rotated; of a timing mechanism comprising a driving-spindle carrying a wind-driven vane and a train of transmitting-gearing balanced about the axis of the projectile and the last element thereof in line and detachably connected with the firing-pin, for the purpose set forth.

2. The combination with a projectile, a percussion-primer arranged axially therein, a spring-propelled firing-pin in line with said primer and a locking device locking said pin against the action of its spring and adapted to release the pin when rotated; of a timing-train of gearing comprising a driving-spindle in line with the firing-pin and carrying a wind-driven vane, a driving-pinion on said spindle, transmitting-pinions in line with the driving-pinion, the last of said pinions detachably connected with the firing-pin, and intermediate transmitting-gearing arranged alternately on opposite sides of the central pinions, for the purposes set forth.

3. The combination with a projectile provided with a time-train chamber in its head, a time-train of gearing therein balanced about the axis of the projectile, a filler for said chamber in which said time-train is arranged, a wind-driven vane for operating the time-train and a percussion-primer arranged axially in the projectile; of a firing-pin interposed between said primer and the time-train and rotatably and detachably connected with the latter, and a locking device locking said pin against the action of its spring and adapted to release said pin when rotated, substantially as and for the purpose set forth.

4. The combination with a projectile provided in its head with a chamber closed at one end, means for revolving said chamber,

a driving-spindle carrying a wind-driven vane at its outer end and a driving-pinion at its inner end within said chamber, said spindle arranged axially of the projectile, transmitting spindles and pinions in line with said driving-spindle, the spindle of the last of said transmitting-pinions extending through the bottom of the chamber, intermediate transmitting-gearing, arranged alternately on opposite sides of the axially-arranged pinions, and separate blocks filling said chamber having bearings for spindles of the transmitting-gearing and inclosing the same; of a spring-propelled percussion firing-pin in line with the driving-spindle and detachably connected with the spindle of the last of the series of transmitting-pinions, a primer in line with said firing-pin and a locking device for locking the pin against the stress of its spring and adapted to release said pin when the latter is rotated by the time-train, for the purpose set forth.

6. The combination with a projectile, a percussion and concussion primer arranged axially therein, a spring-propelled firing-pin in line with said primer and a locking device locking said firing-pin against the action of its spring and adapted to release said pin when rotated; of a timing-train of gearing comprising a driving-spindle carrying a wind-driven vane, spindles carrying transmitting-pinions, said driving and transmitting spindles in line with the firing-pin and the latter detachably connected with the spindle of the last of the series of transmitting-pinions, intermediate transmitting-gearing arranged alternately on opposite sides of the central transmitting-spindles and means for timing the train of gearing, for the purposes set forth.

8. The combination with a projectile, of a tube arranged axially therein, a primer at the inner end of said tube, spaced guide-sleeves in said tube, a firing-pin guided in said sleeves in line with the primer and provided with a wing *n*, the inner sleeve having a slot *o*, and a driving-spring abutting against the other guide, and a collar on said firing-pin; in combination with a movable casing carrying a pointer adapted to travel over a fixed scale, retarding-gearing mounted in the casing, an actuating-vane for said gearing, a separable connection between the gearing and firing-pin, and a locking device locking the vane and gearing against rotation independently of the casing, substantially as and for the purpose set forth.

7. The combination with the spring-actuated firing-pin provided with the wing *n*, its slotted guide and stop-sleeve *f*, a revoluble casing carrying a pointer *y*, a retarding transmitting-gearing therein, a driving-vane for said gearing and a separable connection between the latter and the firing-pin; of a fixed graduated scale over which the aforesaid pointer travels, a stop at either end of said scale, the latter and its stops arranged relatively to the slot in a guide-sleeve *f* as described, and means for temporarily locking the vane and mechanism driven thereby against rotation independently of their casing, substantially as and for the purpose set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

GÉZA KLUMAK.

Witnesses:
ALVESTO S. HOGUE,
AUGUST FUGGER.