No. 880,818. PATENTED MAR. 3, 1908.

J. PANGHER.

MECHANICAL TIME FUSE.

APPLICATION FILED AUG. 23, 1906.

3 SHEETS—SHEET 1.

Fig. 1.

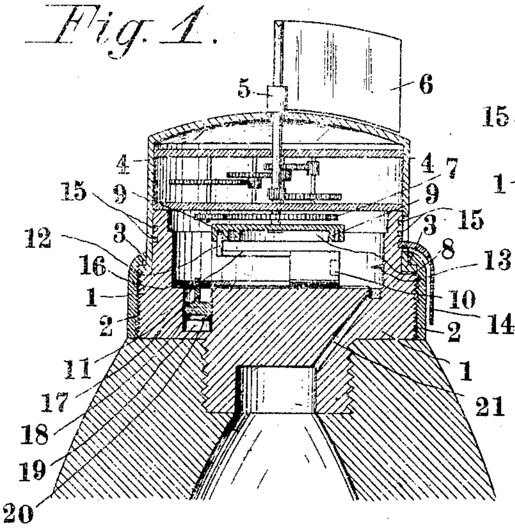


Fig. 3.

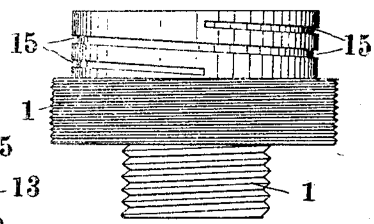


Fig. 4.

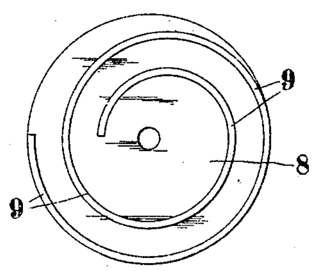


Fig. 2.

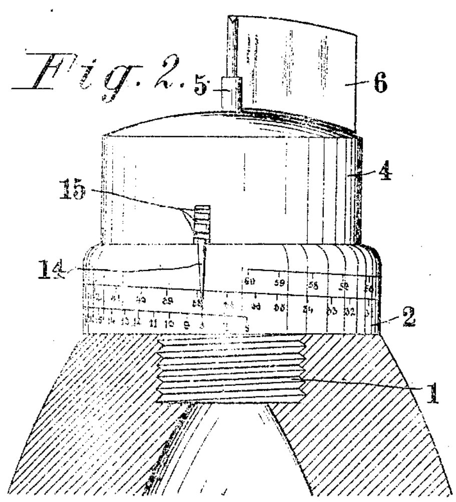


Fig. 5.

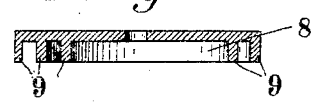
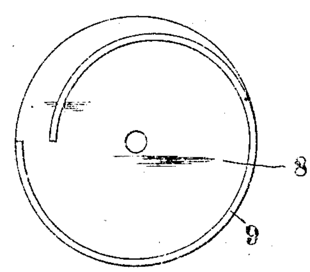


Fig. 6.



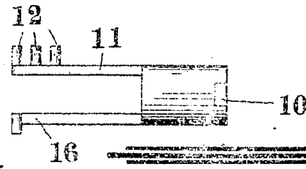


Fig. 7.

WITNESSES. INVENTOR.

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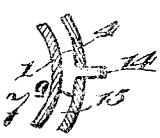

Fig. 7¹

by Hartman Lewis

Attorneys

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3 SHEETS—SHEET 2.

Fig. 8.

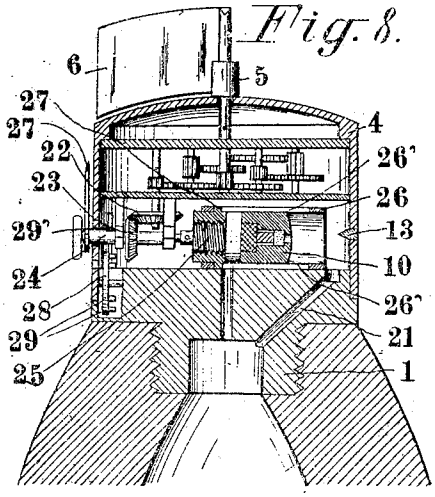


Fig. 13.

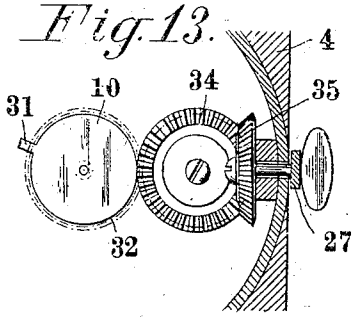


Fig. 12.

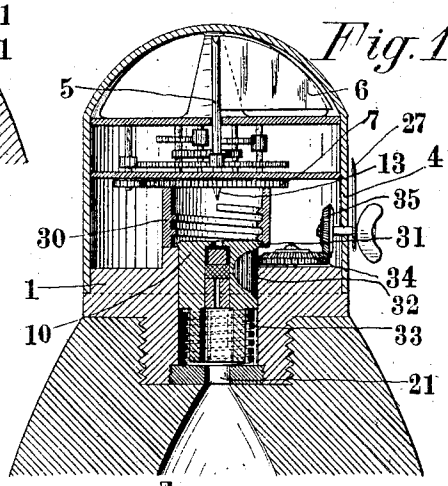
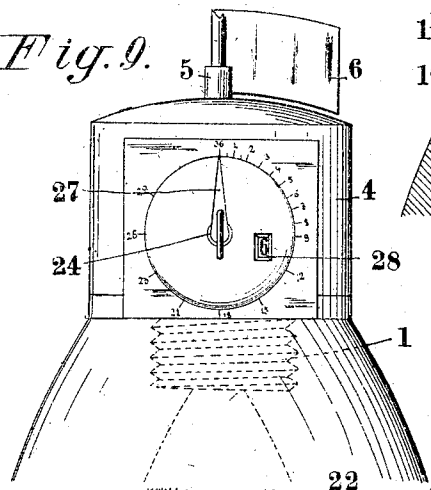


Fig. 9.



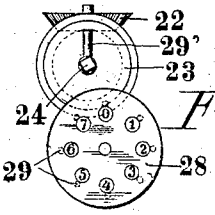
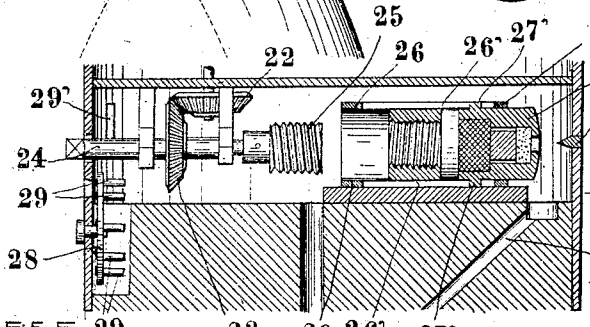


Fig. 11.

Fig. 10.



Witnesses.

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No. 880,818. PATENTED MAR. 3, 1908.

J. PANGHER.

MECHANICAL TIME FUSE.

APPLICATION FILED AUG. 23, 1906.

3 SHEETS—SHEET 3.

Fig. 14.

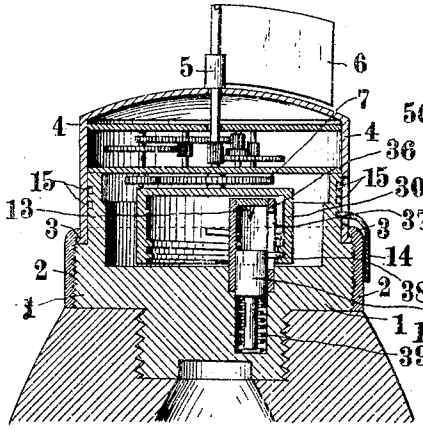


Fig. 16.

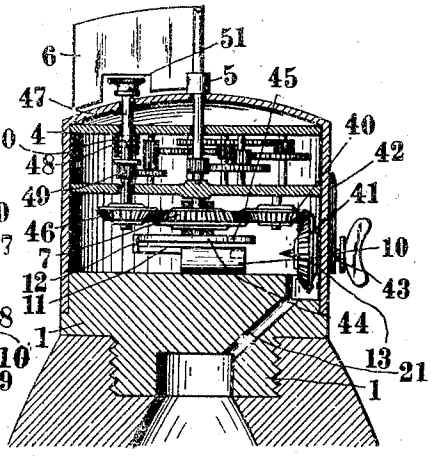


Fig. 15.

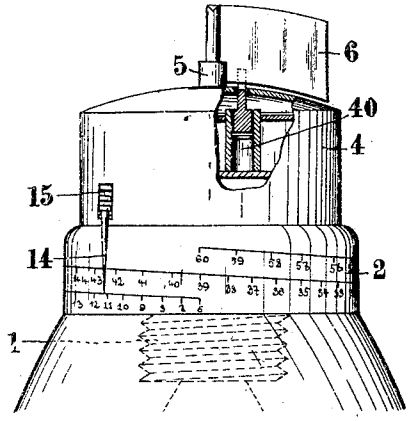


Fig. 17.

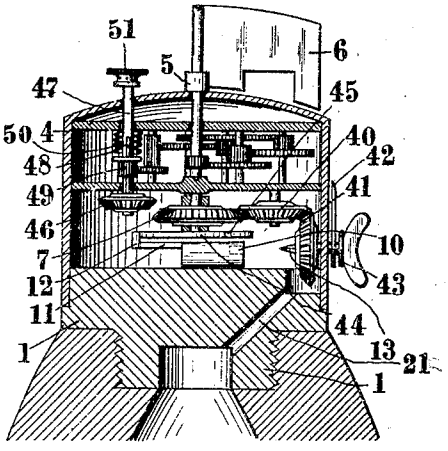
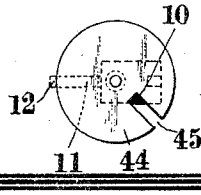


Fig. 18.



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UNITED STATES PATENT OFFICE.

JOSEF PANGHER, OF VIENNA, AUSTRIA-HUNGARY, ASSIGNOR TO EDUARD THOMAS, OF VIENNA, AUSTRIA-HUNGARY.

MECHANICAL TIME-FUSE.

No. 880,818. Specification of Letters Patent. Patented March 3, 1908.

Application filed August 23, 1906. Serial No. 331,749.

To all whom it may concern:

Be it known that I, JOSEF PANGHER, captain of the Imperial Royal Austro-Hungarian army, a subject of the Emperor of Austria-Hungary, residing at Vienna, in the Empire of Austria-Hungary, 17 Schelleingasse, have invented certain new and useful Improvements in Mechanical Time-Fuses, of which the following is a specification, reference being had therein to the accompanying drawing.

The mechanical time fuses hitherto generally used, have the drawback that their actual time of explosion so considerably differs from the time of explosions previously calculated, that their discrepancy is twice to three times larger than in burning fuses. This discrepancy of the moments of explosion, which considerably reduces the value of the fuses, is a necessary consequence of the construction of known fuses. In these fuses the rate of transmission of the gear is such, that, after a large number of revolutions of the projectile (for instance 2500), one single revolution (through 360°) of the last wheel of the gear, the so-called "setting" wheel, takes place. The longest circumference of the "setting" wheel on which the striker slides before it can spring forward, is comparatively small (about 30 mm.), so that the advance of the "setting" wheel at the commencing distances amounts to about 3—4°, or 0.3 mm., for each hundred yards, and even at the longest distances, rises only to 6—7° (0.6—0.7 mm.) for each hundred yards. This shows the difficulty of arranging on a small circumference such as is available on the "setting" wheel, a scale in which the increase of the distances from each 100 to 100 yards at total distances of 7,000, is to be taken into account. As much too small movements correspond to the said distances, an exact setting of the striker relatively to the setting wheel, cannot be obtained, and the considerable discrepancy taking place in practical use, is a necessary consequence of the inexact adjustment consequent thereupon. The fault inherent to the short length of the "setting" scale, cannot be obviated even by the scale being transferred to the circumference of the fuse body, which is about 150 mm. For even on such a scale, the real advance for each 100 yards, at the commencing distances, amounts to about 1 mm, and at the longer distances only 3 mm. for each 100 yards with the usual dimensions.

The present invention has for its object to allow the striker to slide on as large a circumference as possible, in order to avoid the considerable discrepancy of the explosion points, which is the necessary consequence of the small circumference of the setting wheel. To that end, the setting wheel is connected to a disk provided with a spiral guide for a projection of the striker, by means of which projection the striker is maintained in its cocked position until the projection slides off the end of the guide after having made several times the round of the setting disk, and strikes the striking pin. Instead of the setting disk, a screw nut could be arranged, with the screw thread of which would engage a tooth or screwthread secured to the striker, or a setting screw could be positively connected to the driving gear, the striker being provided with an inner screwthread, so as to form a nut for the setting screw.

Several constructions of apparatus embodying this invention are illustrated, by way of example, in the accompanying drawing.

Figures 1 and 2 show one construction of a time fuse in longitudinal section and elevation, and Figs. 3—7 and 7ª are detail views. Figs. 8 and 9 show a second construction in longitudinal section and side elevation. Fig. 10 illustrates on a large scale, a portion of said fuse, in position after the striker has been released, and Fig. 11 shows the counting mechanism for the said construction. Fig. 12 is a third construction, and Fig. 13 a detail view of the same. Fig. 14 illustrates a further modification of the mechanical time fuse, while Fig. 15 shows the method of securing the gear. Figs. 16 and 17 show another construction of the time fuse with different positions of the separate parts, and Fig. 18 is a detail view.

The fuse comprises a fuse body 1 to which is screwed a ring 2, of which the inwardly bent edge 3 surrounds the flange of the fuse cap 4, so that the said cap can rotate, but cannot shift longitudinally. In the upper part of the cap 4 is mounted the wheel gear, to the main spindle 5 of which are secured one or more blades 6. The main spindle 5

projects loosely through a perforation of the cap 4, that is to say, does not participate in the rotation of the projectile as the blade 6 owing to the resistance of the air, is held fast in its original position. Owing to the relative turning of the projectile and fuse relatively to the main spindle 5, the wheel gear is driven, and in that way, the setting wheel 7 which is the last wheel, is driven at the desired rate of transmission. The setting wheel 7 is made as large as possible and connected to a setting disk 8 provided with a spiral rib, ledge, guide groove 9 or the like.

On the bottom of the fuse body 1 rests the striker 10 with the detonator and carrying an arm 11 of which the upwardly bent end 12 engages with the spiral groove or guide ledge 9, so that the striker is held in its cocked position. The arm 11 may also be provided at one end with several projections 12 (Fig. 7) each of which engages with one guide of the spiral ledge 9, so as to insure better guidance for the striker 10. When the projectile is discharged, owing to its rotation, the wheel gear, and therefore the setting disk 8, are driven, and owing to their turning, the guide pin 12 of the striker will finally arrive at the end of the guide ledge 9. The striker 10 is then released and springs under the influence of centrifugal force, against the striking pin 13 secured to the body 1. If the guide pin 12 of the striker 10 is set at the front end of the spiral groove or guide ledge 9, then the setting disk 8 must make several revolutions before the striker 10 is released. The nearer the pin 12 is set to the end of the guide ledge 9, the smaller the revolution of the setting disk required for releasing the striker and the earlier will take place the action of the striker 10. The corresponding setting of the pin 12 of the striker 10, can be effected by turning the cover 4 of the casing. In order to set the fuse, the fuse body 1 is provided with a scale arranged along the screw-thread, in front of which moves an index or hand 14, the end of which engages with a helical groove 15 of the fuse body 1 (Figs. 1 and 3). The hand 14 projects through a slot of the cap 4, and therefore, when the cover is turned, it is also caused to move, and indicates the setting on the scale of the fuse body 1. In order to prevent accidental springing forward of the striker 10, the latter has a second arm 16 provided with a perforation with which engages a locking pin 17 thus preventing the striker from accidentally moving. The locking pin 17 is mounted on a block 18 of some material of high specific gravity, adjustably arranged in a hole 19 of the fuse body. The block 18 is held fast in its guide 19 by arranging in the latter a cylinder of thin sheet metal, of which the upper edge 20 is bent inwardly as a flange insuring against the downward movement of the block 18 under normal conditions. When, however, the projectile is fired, the block 18, owing to its inertia, causes the thin sheet metal cylinder to collapse so that the striker is released, and then held in its position only by the projection 12, guided in the ledge 9 of the setting disk 8, and is released after complete turning of the disk and springs forward against the striking pin 13. The detonator is exploded, and the flame passes through the conduit or channel 21 and explodes the bursting charge of the projectile. The spiral guide groove or ledge 9 may be provided as necessary with one (Fig. 6) or more convolutions (Fig. 4). The wheel gear is secured by a forked locking pin 40 (Fig. 15) the prongs of which surround the blade 6 and thus prevent it, and consequently the wheel gear and the cover, from turning, the release of the locking pin being effected by the shock of the powder gases against the projectile in well known manner.

In the construction shown in Figs. 8 to 11, the last wheel of the wheel gear is a bevel wheel 22, which by means of a bevel wheel 23, transmits the movement of the wheel gear to a spindle 24 on which is mounted a setting screw 25. The latter engages with the striker 10 provided with a tapped thread to engage the setting screw, the said striker, when moving, being guided in a sleeve 26, by means of projections 27′ engaging in slots 26′ in said sleeve. According as the screw is completely, or only partially screwed into the striker, the screwing out by the wheel gear will require more or less time and therefore the release of the striker and the detonation consequent on the resulting centrifugal action thereof will take place later or earlier. In order to enable the screw to be adjusted exactly, the spindle 24 is provided with a hand 27 moving along a scale on the cap 4 and indicating fractions of a revolution, the number of complete revolutions being indicated by a counting mechanism.

The counting disk 28 is provided, at the back, with a number of pins 29, Figs. 10 and 11, and at the front, with figures arranged at corresponding distances and indicating the number of revolutions. At each revolution of the spindle 24, a pin 29′ mounted on it, turns the counting disk 28 to a portion of a revolution, and the next figure appears through an opening of the scale plate in the cap (Fig. 9).

Instead of arranging the female or tapped screw-thread in the striker and using a setting screw, a nut 30 could be arranged on the setting wheel 7, as shown in Fig. 12. The striking pin 13 is secured to the setting wheel 7 and projects into the interior of the nut 30. The striker 10, arranged concentrically with the setting nut 30, is provided on its outer circumference with a projection

31 engaging with the screw-thread of the nut 30 or it may have a screw-thread and a toothed rim 32 (Fig. 13).

Owing to the operation of the wheel gear, the tooth 31 of the striker, after a number of revolutions of the nut 30 corresponding to the setting, arrives at the end of the screw-thread, whereupon owing to the action of a spring 33 controlling it, the striker is thrown against the striking pin. According as the striker 10 is screwed to a greater or less extent, its release and therefore the detonation will take place later or earlier, that is to say at a longer or shorter distance. For the purpose of correspondingly setting the striker 10, a bevel wheel 34 engages with the outer toothed rim 32 thereof, the said bevel wheel 34 being driven by a bevel wheel 35, on the spindle of which is mounted an index 27 moving along a scale for the purpose of indicating the position of the striker at the time.

Fig. 14 shows a construction similar to that shown in Fig. 12, but in the present construction the striker is arranged eccentrically of the nut 30 and guided in a tube 36 provided with a slot 37 through which projects a guide pin 38 arranged on the striker and engaging with the screw-thread on the inner surface of the nut 30. When the nut 30 is turned, owing to the action of the wheel gear, and the pin 38 of the striker comes to the end of the screw-thread, the striker is released and springs, under the action of the spring 39, against the striking pin and brings about the detonation. According as the striker is arranged at a higher or lower level, its release, and therefore the detonation will take place later or earlier. In order to set the striker 10 accordingly, the cap 4, together with the wheel gear and the setting nut 30, is turned, and the said turning is read on a scale by means of an index or hand 14, which, as well as the scale, is of exactly the same construction as in Fig. 2.

Various details of the time fuse may be modified without departing from the spirit of the invention, for instance, the counting mechanism 28, 29, 29′, used in the construction shown in Figs. 7 to 11 can be replaced by other known devices and the transmission of movement from the wheel gear to the spindle 24 carrying the setting disk 25 may also be effected in other ways than by bevel wheels; the blade 6 may also be arranged below a cover provided with recesses, as shown in Fig. 12.

In all the fuses described, the wheel gear is influenced by the setting of the fuse. This drawback is obviated in the construction shown in Figs. 16 to 18. This is effected by the last wheel of the wheel gear transmitting the movement of the wheel gear to the setting wheel, being secured to an adjustably mounted spindle. The setting wheel is positively connected by means of a wheel gear to a setting index which can be turned along a scale arranged on the outer surface of the casing. As the last wheel of the wheel gear can be brought out of engagement with the setting wheel, by longitudinally moving the spindle of the latter, the setting can be effected by operating the spindle of the index, without the wheel gear being affected.

The setting wheel 7 is positively connected by means of wheels 40, 41 to an index 42 in front of a scale arranged on the outer surface of the cap of the fuse. On the spindle 43 of the index is arranged the striking pin 13 against which the released centrifugally acting striker 10 hits to bring about ignition of the bursting charge of the projectile, the detonation flame passing through the channel 21. The release of the striker 10 takes place when its projection 12 springs into a radial recess 45 arranged in the disk 44. This will take place the later, the further the projection 12, in its initial position, is removed from the recess 45. The setting of the disk 44 is effected by operating the spindle 43 of the index.

In order to avoid influencing the wheel gear when setting the fuse, the last wheel 46 of the said wheel gear is secured to an adjustable spindle 47 which is normally held by means of a spring 48 in the position in which the wheel 46 engages with the setting wheel 7. The second wheel 49, mounted loose on the spindle 47 is positively connected to the spindle 47 by means of the latter's wedge-shaped projection 50 engaging with a corresponding groove of the wheel 49, so that the spindle 47 is caused to rotate when the wheel gear is rotated, but can be moved longitudinally without affecting the wheel gear. Before setting the fuse, the spindle 47 is pulled forwards, in opposition on the action of the spring 48 by means of a knob 51 at the end of the said spindle, so that the wheel 46 is disengaged from the setting wheel 7, and then the index spindle 43 is operated. After the disk 44 has been adjusted, the spindle 47 is released and returns, under the action of the spring 48, to its initial position in which the wheel 46 engages with the setting wheel 7. After the firing of the projectile, the wheel mechanism, and therefore the setting disk 44, are driven by the rotation of the said projectile. Owing to their turning the guide pin 12 of the striker is brought in front of the recess 45 and engages with it. The striker 10 is released and springs against the striking pin 13 secured to the index spindle 43, and the projectile is exploded.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:

1. In a mechanical time-fuse, the combination of a suitable supporting means for the

component parts, a movable striker, a firing device coöperative therewith, a rotary part having a helical contact-way adapted to be engaged by the striker and hold the same from engagement with the firing device, and means for rotating said rotary part and thus causing its contact-way to move out of engagement with the striker, whereby to release the striker, substantially as described.

2. In a mechanical time-fuse, the combination of a suitable supporting means for the component parts, a movable striker, a firing device coöperative therewith, a rotary part having a helical contact-way adapted to be engaged by the striker and hold the same from engagement with the firing device, means for rotating said rotary part and thus causing its contact-way to move out of engagement with the striker, whereby to release the striker, and means for setting the striker and said movable part relatively to each other, substantially as described.

3. In a mechanical time-fuse, the combination of a suitable supporting means for the component parts, a movable striker, a firing device coöperative therewith, a rotary part having a limited contact-way adapted to be engaged by the striker and hold the same from engagement with the firing device, an actuating device for said rotary part, disconnective connecting means between the actuating device and said rotary part, and a setting means operatively connected with said rotary part, substantially as described.

4. In a mechanical time-fuse, the combination of a suitable supporting means for the component parts, a movable striker, a firing device coöperative therewith, a rotary part having a limited contact way adapted to be engaged by the striker and hold the same from engagement with the firing device, an actuating device, gearing connecting said actuating device and the rotary part, means for disconnecting a portion of said gearing, and a setting mechanism operatively connected with said rotary part, substantially as described.

In testimony whereof I have affixed my signature in presence of two witnesses.

JOSEF PANGHER.

Witnesses:
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Mag. Korner.