E. FABER.

FUSE FOR PROJECTILES.

APPLICATION FILED JULY 3, 1913.

1,102,732.

Patented July 7, 1914.

2 SHEETS—SHEET 1.

Fig. 1.

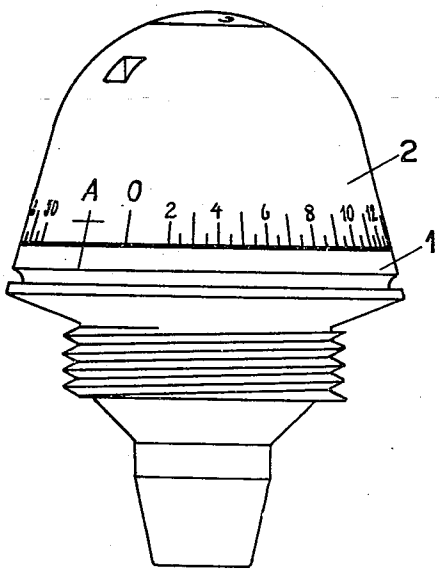


Fig. 2.

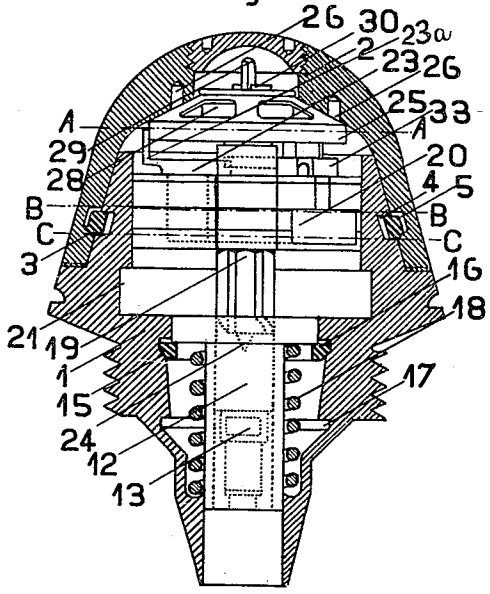


Fig. 3.

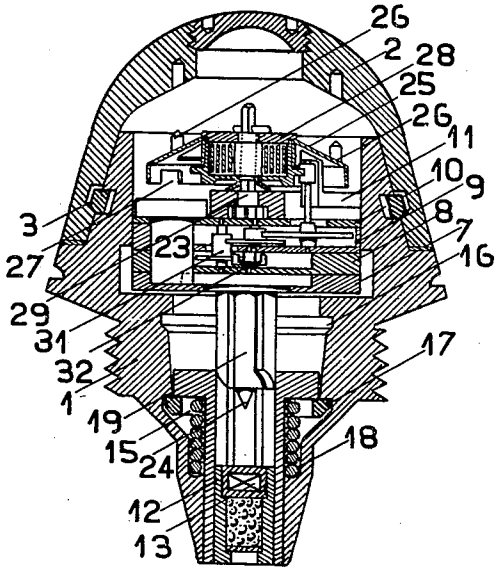
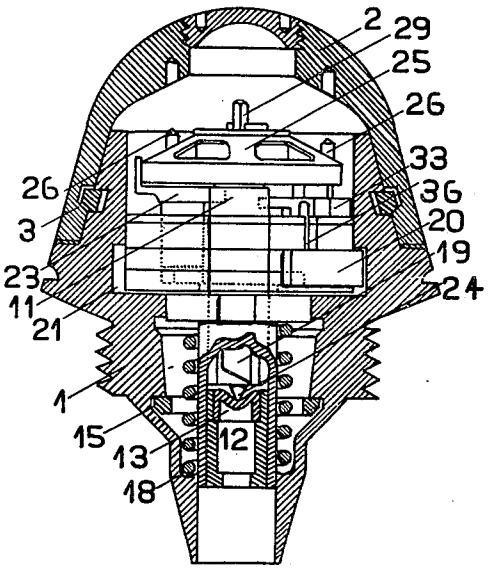


Fig. 4.



Witnesses
Fameelund
L. G. Anger

Inventor
Ernst Faber
by Thaussen
Attorney

E. FABER.

FUSE FOR PROJECTILES.

APPLICATION FILED JULY 3, 1913.

1,102,732.

Patented July 7, 1914.

2 SHEETS—SHEET 2.

Fig. 5.

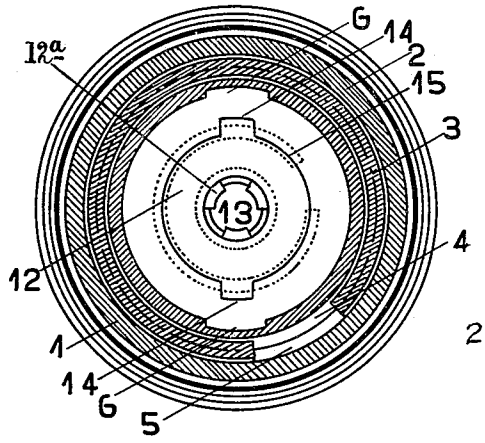


Fig. 6.

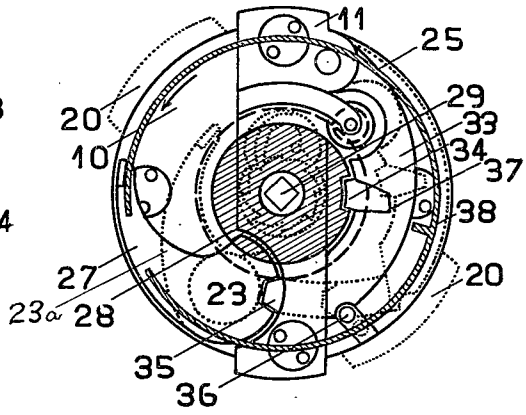


Fig. 7.

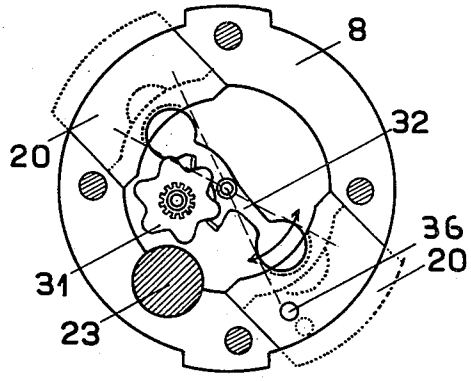
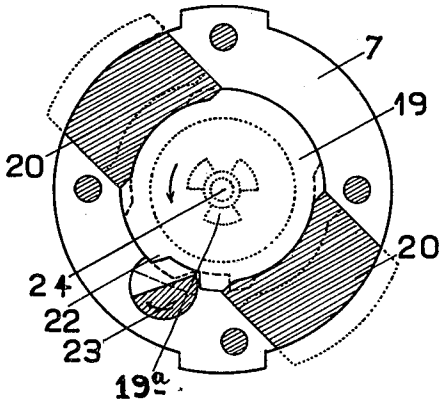


Fig. 8.



Witnesses
L. G. Anger

Inventor
Ernst Faber
by
Attorney

UNITED STATES PATENT OFFICE.

ERNST FABER, OF BERLIN, GERMANY.

FUSE FOR PROJECTILES.

1,102,732. Specification of Letters Patent. Patented July 7, 1914.

Application filed July 3, 1913. Serial No. 777,210.

To all whom it may concern:

Be it known that I, ERNST FABER, a subject of the German Emperor, residing at Berlin W. 30, in Germany, have invented a certain new and useful Improvement in Fuses for Projectiles, of which the following is a specification.

This invention relates to mechanical fuses for projectiles, in which a clockwork releases the actuating mechanism of the striker or detonator after a predetermined period, an alternative arrangement being provided whereby impact effects the release of the said mechanism by inertia.

My improved fuse is of the type in which the clockwork is axially movable and can recede, against a cushioning device, when the projectile is fired, so that the shock imparted to the clock mechanism is weakened.

The invention primarily consists in a combination of elements whereby the axial movement of the clockwork is used for performing various operations, namely, release of the spring-motor of the clock, disengagement of means locking the firing device, and compression of the spring whereby the firing device is actuated.

The invention also comprises, in combination with the above-mentioned arrangement, a special form of regulator for the clockwork, which will be described hereinafter.

An embodiment of the invention is shown in the accompanying drawing, in which—

Figure 1 is an elevation of the fuse. Fig. 2 a section through the fuse before discharge. Fig. 3 a section after discharge, and Fig. 4 a section after detonation. Fig. 5 is a cross section of the fuse, and Figs. 6, 7 and 8 are sections of the clockwork on the lines A—A, B—B, and C—C of Fig. 2, drawn to an enlarged scale.

The fuse essentially comprises a housing, clockwork, and the firing mechanism.

The housing itself consists of a casing 1 and a cap 2, the latter can be opened at the top, by unscrewing a portion of its wall, for the purpose of inserting a key for winding up the clockwork from the exterior. The casing 1 is connected to the cap 2 by an elastic ring 3, which fits into concentric grooves 4, 5 in the casing 1 and cap 2 respectively, and has a beveled rear or under surface, by means of which it retains the cap 2 on the casing 1 normally without preventing rotation of the cap. Normally the two grooves 4 and 5 do not exactly register with each other, but the cap can be forced more tightly onto the casing, so that the two grooves register, and then the elastic ring 4 expands in the channel formed by the grooves, and locks the cap on the casing, so as to prevent its rotation. The inertia of the cap, at the moment of discharge of the projectile, is sufficient to force the cap back in the manner described.

The clockwork is mounted in a frame formed of four plates 7, 8, 9, 10 and a bridge 11, and is axially movable in the casing 1, but it is prevented from rotating by the engagement of its frame with two vertical grooves 6 in the wall of the casing. The clockwork casing comprises the four plates 7, 8, 9, 10 and the bridge 11, and is held together by four screws.

The striker 12, is a tube which carries in its interior the primer 13 and is axially movable in the lower or rear end of the casing 1. This tube has a flange at the top provided with two lugs engaging in vertical guide grooves 14, as shown in Fig. 5, to prevent the tube from rotating in the casing. The striker 12 normally rests with its flange on an elastic brake-ring 15, which is disposed in a circular groove 16 in the casing 1, but can be forced out of this groove, and slide down a coned part of the casing wall. Another circular groove 17 is provided to receive the brake-ring 15 after it has been forced down in the manner referred to. A coiled spring 18 embraces the striker tube 12, and bears at its upper end against the flange of the tube, so that the latter is normally held in the position shown in Fig. 2, the ring 15 being then in the groove 16. Inside the upper end of the striker tube 12 there are three oblique abutments 12^a on which the hammer 19 rotatable in the clockwork frame normally rests, the said hammer being formed with correspondingly shaped abutments, as shown in Fig. 3. The several abutments are so positioned, that by rotation of the hammer the abutments thereon can be moved off the abutments in the tube 12, so that the tube can slide on to the hammer. The hammer terminates in a firing pin 24 and is normally prevented from rotating by two bolts 20, which are horizontally movable in the clockwork frame and engage lateral recesses in the upper end of the hammer as shown in Fig. 8. The casing 1 is so shaped, that when the clockwork is in its

normal, upper position (Fig. 2) the wall of the casing prevents the bolts from moving outward out of engagement with the hammer, but when the clockwork moves downward, a groove 21 in its wall enables the bolts to move outward and release the hammer. It will be seen that the spring 18 thrusts the oblique abutments in the striker tube 12 against the abutments on the hammer, and owing to the obliquity of the said abutments the thrust tends to rotate the hammer, and does rotate same when the bolts 20 are disengaged. The outward movement of the bolts, into the groove 21, not only releases the hammer, but also serves to lock the clockwork in its lower or rearward position in the casing 1, as shown in Fig. 4. The bolts 20 are not spring-pressed, but are moved outward by centrifugal force, due to rotation of the projectile about its axis. The rotation of the hammer, after disengagement of the bolts 20, is at first limited by a check pin 23 mounted in the clockwork frame so that it can rotate and also move upward, or forward, when the clockwork is in its lower or rearward position. A segment of the pin is cut away, at the lower end, as shown in Fig. 8, to form a shoulder or abutment, normally lying in the path of a shoulder 22 on the hammer (Fig. 8) so that while the pin is locked in a manner which will be described hereinafter, the rotation of the hammer is limited, as already mentioned, but when the pin is unlocked and free to rotate, or is moved axially, the said abutment moves out of the path of the shoulder 22, whereupon the hammer can continue its rotation until it is clear of the oblique abutments 12^a in the striker tube 12. The pin 23 has a curved arm 23^a with an upwardly directed extension, as indicated by dotted lines in Fig. 6, and the purpose of this will be described hereinafter.

The clockwork is provided with a rotatable drum 25, which I call the timing drum, and the circumference of which is close to the upward extension of the arm 23^a. The timing drum 25 is normally engaged with the cap 2 by two pins 26, so that it can be turned by turning the cap, but it is released from the cap when the clockwork with the drum moves rearward. The drum 25 is provided at its periphery with a gap 27, through which the upward extension of the arm 23^a can pass when the said gap is opposite the said extension. The drum 25 is frictionally engaged with the spring casing 28 of the clockwork so that it rotates with the spring casing, but can also be turned independently, for purposes of adjustment. The spring casing is carried by a spindle 29, to which it is fixed by a pin 30. The spindle 29 is mounted in the bridge 11, and is prevented from turning backward by a pawl engaging with a ratchet wheel. The spring casing 28 drives an escape wheel 31, by means of pinions and the said escape wheel has an outline in the form of a harmonic curve, whereby it is engaged with a weighted lever 32, the latter having two projections arranged so that when one of them is on the crest of a curve of the wheel the other is in a depression. Rotation of the escape wheel causes the lever 32 to oscillate, but the two bolts 20 have recesses at their inner edges, whereby they normally engage the ends of the lever 32, and thus lock same until they are thrown outward by centrifugal force. Pivoted to the bridge 11 is a safety lever 33, which engages with its nose 34 in a recess in the spring casing 28 and normally prevents rotation of the latter. The safety lever 33 has another nose 35, normally engaged with a recess in the pin 23, thus preventing the latter both from rotating and from moving forward. The lever 33 is normally locked by a stud 36 fixed to one of the bolts 20, but when the bolts 20 move outward, as hereinbefore described, the lever 33 is free to rock, under the influence of centrifugal force due to rotation of the projectile. The lever 33 is also provided with a nose 37, which, when the lever is moved as described, lies in the path of an abutment 38 on the drum 25. It will be seen that in the normal condition of the fuse the clockwork is held in its upper or forward position, by the spring 18, acting through the striker and hammer, the latter abutting against part of the clockwork frame. The safety lever 33, engaged with the spring casing, prevents rotation of the latter, and in addition the weighted lever 32, engaged with the bolts 20, locks the escape wheel. The bolts prevent rotation of the hammer, and the safety lever 33 prevents rotation of the pin 23. The cap 2 can be turned, together with the drum 25, with which it is engaged by means of the pins 26.

On the cap is marked a scale, as shown in Fig. 1, registering with a mark on the housing. It will be seen that by turning the cap, together with the drum 25, the distance of the gap 22 in the drum from the upward extension of the arm 23^a can be varied, so that by adjusting the cap I can regulate the time which the gap takes to reach the said extension when the drum 25 is rotated by the spring casing. Assuming that the fuse is to be used with time action, the cap is adjusted with one of the numerals on the scale registering with the mark on the housing 1, the numeral being selected according to range.

The action of the fuse is then as follows:—Immediately on discharge of the projectile the cap 2, receding slightly by inertia, is jammed tightly on the casing 1 and held fast by the ring 3, as already described. At the same time the clockwork

recedes by inertia compressing the spring 18 and forcing the ring 15 out of the groove 16 into the groove 17. This movement of the clockwork disengages the drum 25 from the cap 2. Centrifugal force throws the bolts 20 outward, into the groove 21, whereby these bolts lock the clockwork in its rearward position, and the bolts release the lever 32. The safety lever 33 is also moved by centrifugal force, and releases the pin 23 and the spring case. The latter then rotates, under the influence of the clock spring. The hammer 19, having been released by the bolts 20, receives a preliminary rotation owing to the thrust of the spring 18 on the striker 12, and by this means the shoulder 22 of the hammer is pressed against the flat part of the pin 23, and the arm 23^a is thrust against the drum 25. Meanwhile the hammer is still in engagement with the abutments 12^a of striker, but when the projectile has traveled the predetermined distance the gap 27 arrives opposite the extension of the arm 23^a. Then the shoulder 22 is able to impart further rotation to the pin 23, whereby the latter is moved out of the path of the said shoulder, and the hammer can rotate so that the abutments thereon are moved off the abutments 12^a. This enables the spring 18 to thrust the striker tube 12 forward, onto the hammer, so that the firing pin pierces the primer, and the projectile explodes.

If the cap is set at O, with the scale mark O in register with the mark on the casing 1, the arm 23^a enters the gap 27 practically as soon as the clockwork has receded and the projectile bursts a few yards from the muzzle of the gun. If the projectile is to burst on percussion the scale mark A is set to register with the mark on the casing 1. By this means the drum 25 is so adjusted that when the lever 33 is moved by centrifugal force, as described, its nose 37 engages the abutment 38 on the drum, and prevents rotation of the latter. The gap 27, is therefore, not moved into the path of the arm 23^a, and the pin 23 cannot turn sufficiently to allow the hammer to rotate out of engagement with the abutments 12^a, but when the projectile strikes the shock imparts axial movement to the said pin, and this enables the hammer to rotate and release the striker.

What I claim as my invention and desire to secure by Letters Patent of the United States is:—

1. In an ordnance projectile fuse the combination of a housing, a clockwork axially slidable in said housing, means whereby the movement of said clockwork is locked when the clockwork is in its forward position and unlocked when the clockwork is in its rearward position, automatic firing mechanism including a spring which is compressed by rearward movement of the clockwork, and regulatable means whereby said clockwork is enabled to release said detonator mechanism.

2. In an ordnance projectile fuse the combination of a housing having a rotatable cap, a clockwork axially slidable in said housing, means whereby the movement of said clockwork is locked when the clockwork is in its forward position and unlocked when the clockwork is in its rearward position, automatic firing mechanism, including a spring which is compressed by rearward movement of the clockwork, a device adjustable by rotation whereby said clockwork is enabled to release said firing mechanism, and means whereby the last mentioned device is engaged with said cap when the clockwork is in its forward position.

3. In an ordnance projectile fuse the combination of a housing, a clockwork axially slidable in said housing, means whereby the movement of said clockwork is locked when the clockwork is in its forward position and unlocked when the clockwork is in its rearward position, automatic firing mechanism including an actuating spring which is compressed by rearward movement of said clockwork, regulatable means whereby said clockwork is enabled to release said firing mechanism, and means actuatable by centrifugal force for retaining said clockwork in its rearward position.

4. In an ordnance projectile fuse the combination of a housing, a clockwork axially slidable in said housing, means whereby the movement of said clockwork is locked when the clockwork is in its forward position and unlocked when the clockwork is in its rearward position, automatic firing mechanism including a spring compressed by rearward movement of the clockwork, and regulatable means whereby said clock is enabled to release said firing mechanism, the means for locking the clockwork movement comprising a device which locks the spring casing and a device which locks the escapement.

5. In an ordnance projectile fuse the combination of a housing, a clockwork axially slidable in said housing, means whereby the movement of said clockwork is locked when the clockwork is in its forward position and unlocked when the clockwork is in its rearward position, automatic firing mechanism including a spring compressed by rearward movement of the clockwork, and regulatable means whereby said clockwork is enabled to release said firing mechanism, said clockwork having an escapement which comprises an escape wheel whereof the outline is a closed harmonic curve and a weighted rocking lever having projections whereby it is engaged with said wheel.

6. In an ordnance projectile fuse the combination of a housing a clockwork axially slidable in said housing, means whereby the

movement of said clockwork is locked when the clockwork is in its forward position and unlocked when the clockwork is in its rearward position, automatic firing mechanism including a spring compressed by rearward movement of said clockwork, and regulatable means whereby said clockwork is enabled to release said firing mechanism, said housing comprising a casing having an external groove, a rotatable cap fitting on said casing and having an internal groove, and an elastic ring engaging both said grooves and adapted to expand under centrifugal force and hold said cap tightly on said housing.

In witness whereof I have signed this specification in the presence of two witnesses.

ERNST FABER.

Witnesses:
WOLDEMAR HAUPT,
HENRY HASPER.