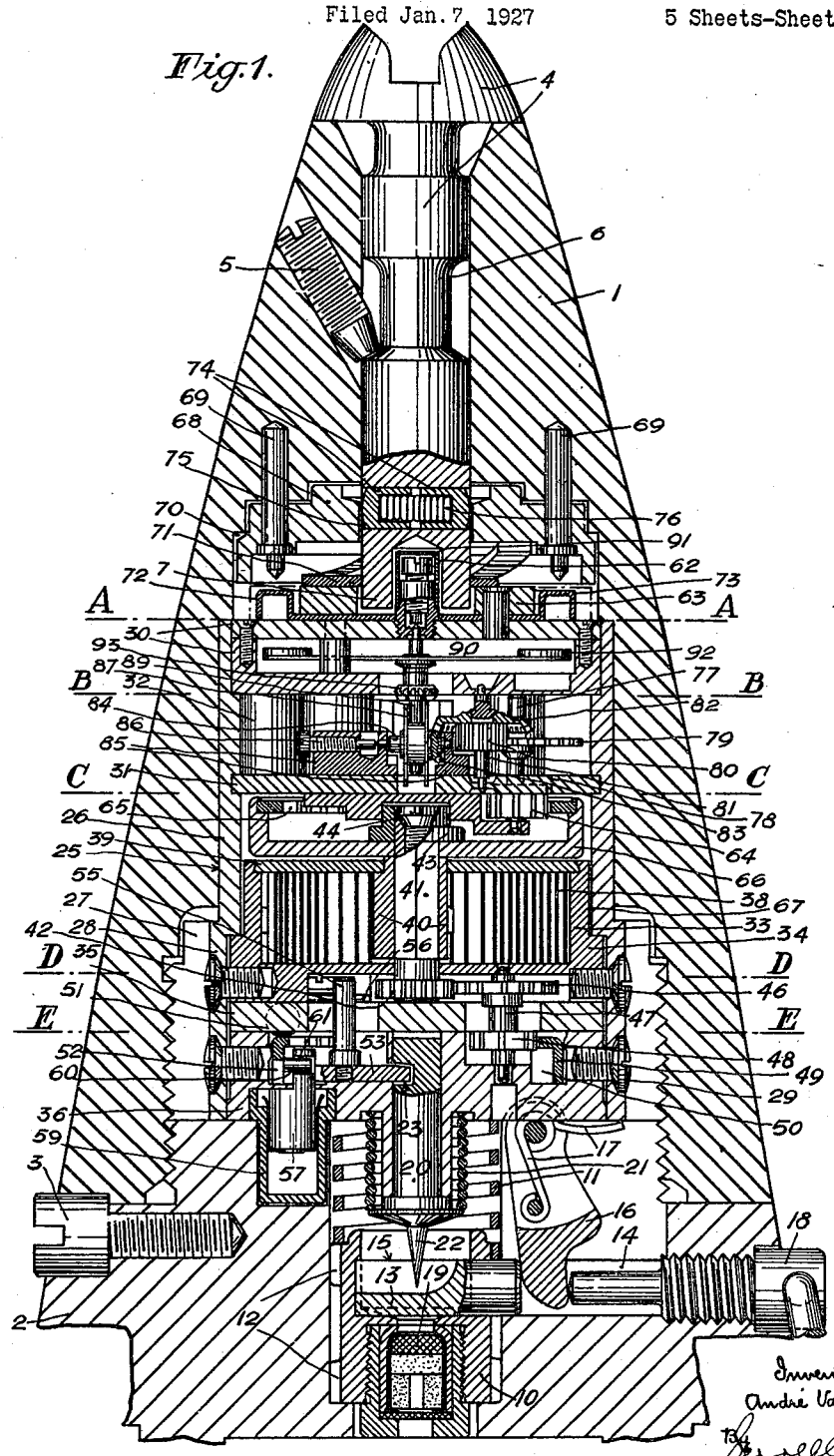
April 10, 1928. 1,665,899

A. VARAUD

MECHANICAL FUSE FOR ARTILLERY PROJECTILES

Filed Jan. 7, 1927 5 Sheets-Sheet 1

Fig. 1.



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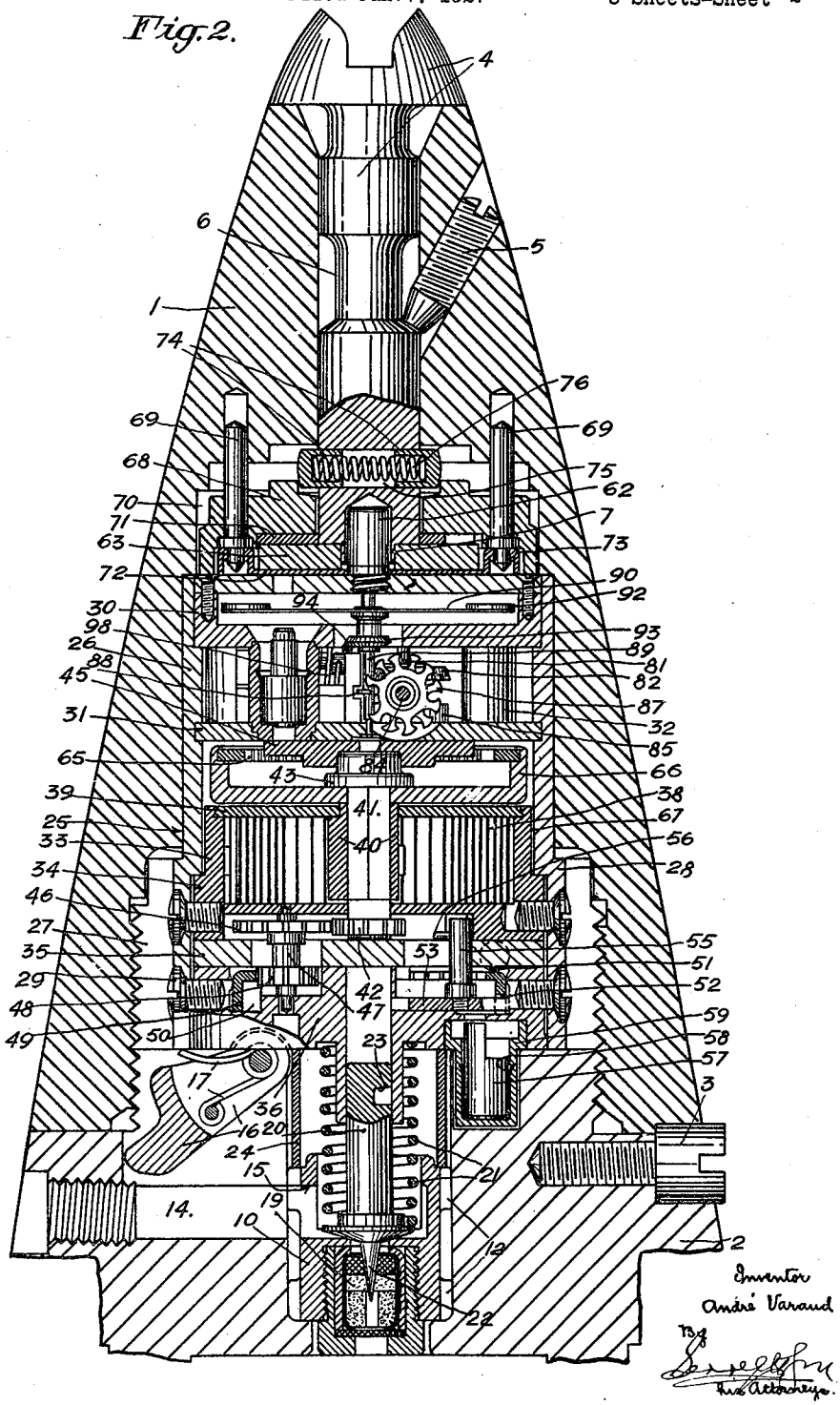
April 10, 1928. 1,665,899

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MECHANICAL FUSE FOR ARTILLERY PROJECTILES

Filed Jan. 7, 1927 5 Sheets-Sheet 2

Fig. 2.



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April 10, 1928. 1,665,899

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MECHANICAL FUSE FOR ARTILLERY PROJECTILES

Filed Jan. 7, 1927 5 Sheets-Sheet 3

Fig. 3.

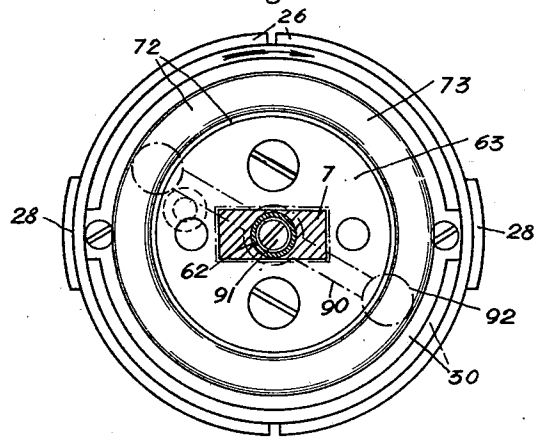


Fig. 4.

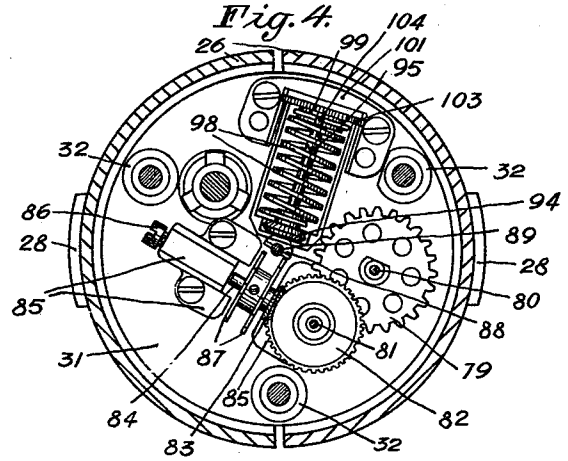
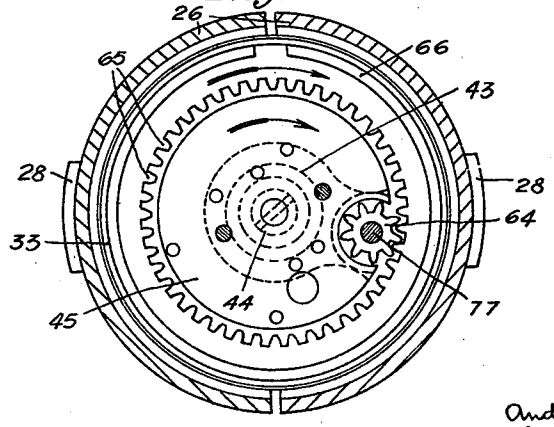


Fig. 5.



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MECHANICAL FUSE FOR ARTILLERY PROJECTILES

Filed Jan. 7. 1927 5 Sheets-Sheet 4

Fig. 6.

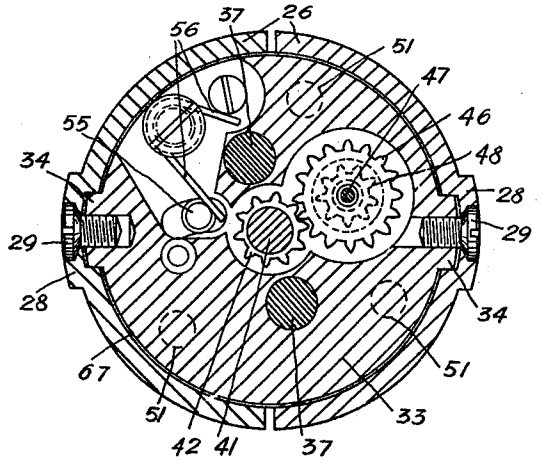
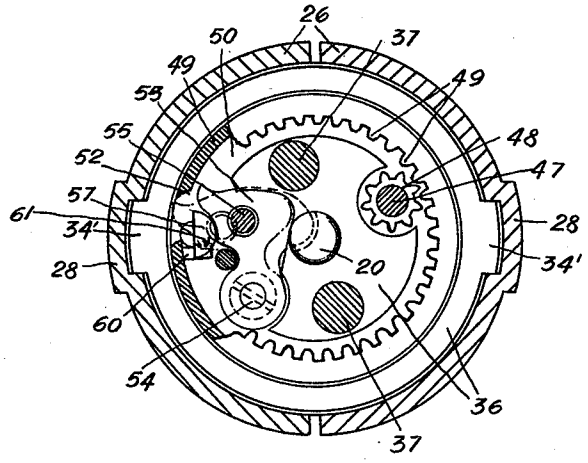


Fig. 7.



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MECHANICAL FUSE FOR ARTILLERY PROJECTILES

Filed Jan. 7, 1927 5 Sheets-Sheet 5

Fig. 8.

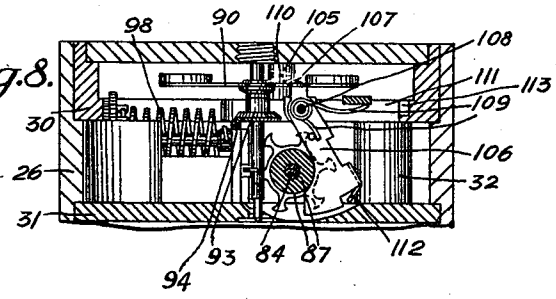


Fig. 9.

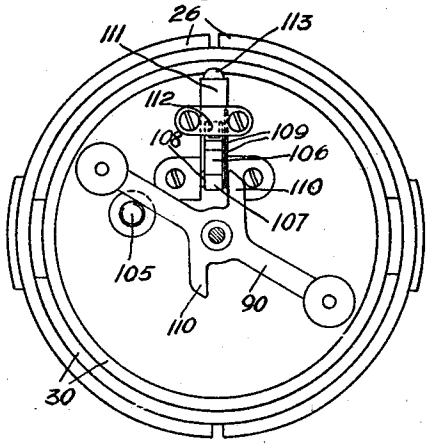
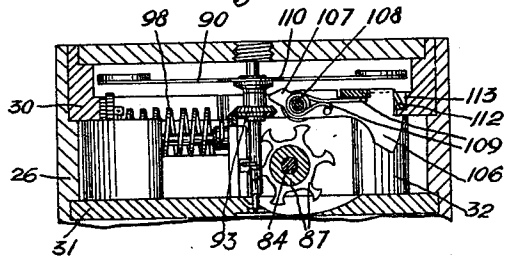


Fig. 10.



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Patented Apr. 10, 1928. 1,665,899

UNITED STATES PATENT OFFICE.

ANDRÉ VARAUD, OF GENEVA, SWITZERLAND.

MECHANICAL FUSE FOR ARTILLERY PROJECTILES.

Application filed January 7, 1927, Serial No. 159,530, and in Switzerland January 16, 1926.

The invention concerns mechanical fuses for artillery projectiles of the type in which the release of a striker device is controlled by a rotary member whose angular position can be set or adjusted prior to firing and which is driven during the flight of the projectile by a spring operated clockwork in a direction opposite to its setting.

The invention more particularly refers to fuses of the kind in which the driving motor of the clockwork is constituted by a barrel shaft accommodated in the axis of the fuse in such a manner that it may describe several revolutions in one direction, for effecting before firing simultaneously the winding and the setting of the fuse, and in the inverse direction, during the trajectory, under the action of the power spring, for driving the rotary member controlling the release of the striker member and for transmitting the driving power to a regulating device of the clockwork with a dead-beat escapement and spiral balance.

The fuse according to this invention is essentially characterized by the fact that the frame, housing the different movable members of the clockwork is composed of at least two parts, a fixed one containing the power spring which is rendered integral with the body of the fuse, and a movable one, which prior to firing may be angularly displaced with regard to the other part in order to effect simultaneously the winding of the power spring, the setting or adjusting of the time of ignition of the charge of the projectile, and further by the fact that means operating by inertia, are provided for rendering the movable part of the frame integral with the fixed part during the complete trajectory of the projectile.

The attached drawing shows, by way of example, one form in which this new mechanical fuse can be executed and fitted respectively to a double-acting explosive shell (Fig. 1) and to a single-acting explosive shell, more especially designed for firing against aeroplanes (Fig. 2).

Figure 1 is an axial section representing this form in the position just after machining, that is before firing.

Figure 2 is an axial section, turned round by 180 degrees in ratio to Figure 1, showing said form adapted to the single-acting explosive shell. The position indicated is that of fuse when detonation would occur.

Figure 3 is a cross-section on the line A—A of Figure 1, on upper plate of clockwork frame, showing how the key is to drive a movable part of said frame. In this figure a dotted line also indicates the fuse balance accommodated within the upper plate of said movable part of frame.

Figure 4 is a cross-section on the line B—B of Figure 1, under the upper plate of clock-work frame, showing, in plan view, the regulating device.

Figure 5 is a cross-section on the line C—C of Figure 1, under a middle plate of clock-work frame, showing how the movable part of said frame carries along, while revolving, the fuse driving shaft.

Figure 6 is a cross-section on the line D—D of Figure 1, under the clock-work barrel, showing how the fuse driving shaft carries along an auxiliary shaft for regulating the firing time of the projectile.

Figure 7 is a cross-section on the line E—E of Figure 1, under a steel plate set between the barrel and the bottom of clockwork frame, showing a plan view of the controlling device for releasing the striker.

Figure 8 is a section on the axis of the fuse of another working form of the device for starting the balance.

Figure 9 is a plan view showing the position of the balance prior to firing.

Figure 10 is a similar plan view showing the device in its operative position and the position which the balance will take at the departure of the projectile and which it conserves during the complete duration of the linear acceleration.

Referring to the attached drawing, it will be seen (Figures 1 and 2), that the cylindrical body of the fuse is composed of two parts 1 and 2, screwed on each other. The periphery of lower part 2 shows a steady-pin 3, the head whereof slightly protrudes beyond the shell, for angularly fixing the latter on to a timing apparatus.

Axially mounted in cap 1 of the fuse, so as to be freely rotatable, is a key 4, which a slanting screw 5, co-operating with the conical bottom of a recess 6 in the cylindrical body, prevents from axial displacement. Said key is provided, at the end opposite

to its driving slot, with a transversal head 7 (Figure 3), the function whereof is hereinafter described.

Whether shell be single or double acting, the detonating device is housed within a cylindrical cavity formed in the axis of body 2 of the fuse.

In the first case (Figure 1), said detonating device includes a primer plunger 10, subjected to the action of a spring 11, tending to keep the plunger downward in the bottom of its location, said plunger being provided, on its periphery, with air-gaps 12; a safety stay-bolt 13, constituted by a small cylindrical piston, operating in a radial groove 14 and normally kept engaged with a cross bore 15 of primer plunger 10 by means of a lever 16 subjected to the action of a spring 17 and held in its operative position, till firing, by a pin 18; a primer 19, screwed into the axis of plunger 10 and a striker 20, slidingly mounted within a guide located in the axis of the fuse. Said striker is subjected to the action of a percussion spring 21, resting, on the one side, under the bottom of the clock-work frame, and on the other side, against a flange provided on striker head. The said striker head is ended by the percussion point 22 normally engaged within a transverse countersink in the stay bolt 13. Close to its upper end, this striker is also provided with a lateral notch 23, the function whereof is hereinafter described.

In the second case (Figure 2) the primer plunger 10, instead of being elastically kept within the bottom of its location by a spring, is permanently fastened therein by a stay-bolt ring 24.

In the axis of fuse cap 1, above the striker, there is a bore having a cylindrical portion 25 wherein is mounted a casing 26 containing the clock-work movement. The bore is provided at its lower end with two mortises 27, diametrically opposite to each other, within which are made to fit two projections or tenons 28 of the casing 26, so as to render this casing jointly connected with the fuse body in the angular direction. This casing is in two semi-cylindrical parts rigidly connected by means of screws 29 diametrically opposite to one another, screwed into pieces constituting the barrel and the bottom of the clockwork frame respectively, which pieces are hereafter described. 30 and 31 indicate two plates the diameters whereof are slightly greater than the inner diameter of casing 26 so as to freely rotate within two corresponding circular countersinks of said casing. The upper plate 30 is hollow so as to provide accommodation for the fuse balance. These two plates 30, 31 are jointly connected by three pillars 32, so as to form together a solid block capable of revolving within casing 26. The power spring of the clock-work is located in a drumshaped barrel 33, fitted with two lugs 34 and fixed within the casing at a certain distance below the lower plate 31; 35 shows a steel stiffening disk with two similar lugs (Figure 6) resting on a bottom disk 36, also fitted with two lugs 34, which constitutes the bottom of the casing (Figure 7). The lugs 34 of drum 33 and the lugs on disks 35 and 36 are diametrically opposite to one another and superposed so as to jointly engage, as a single piece, within two corresponding mortises, diametrically opposite to each other and located inside the lower part of casing so as to face the projections or tenons 28. The screws 29 go through openings drilled into said projections or tenons 28 and extend into the periphery of the bottom of the drum 33 and the bottom-disk 36, respectively. The barrel 33 and the two disks 35 and 36 are also rigidly fastened together by means of two strong pins 37 (Figures 6 and 7). Thus it will be seen that the frame for the clock-work movement is entirely housed within casing 26 and that it is composed of two parts: the one, movable within said casing and constituted by the two plates 30, 31, the other fixed, jointly connected with the casing and formed by the three superposed disks 33, 25 and 36.

The power spring 38 of clock-work movement is lodged within a cylindrical cavity provided in drum 33 and closed with a barrel cover 39. The outer end of said spring is fastened by its usual bridle to drum 33 so that the bridle will be sunk into a corresponding hollow in the internal wall of barrel while the spring is loose. The inner end of the spring is secured to a collet 40 mounted on a square portion of a central arbor 41 accommodated in the axis of the casing. This arbor serves, in the first place, for winding up the spring 38 by means of a winding mechanism hereafter described and, in the second place, for transmitting the motive power, on the one side, by means of a pinion 42 to the organs of the clock-work controlling the action of the fuse striker and, on the other side, to the clockwork regulating device, the different gears whereof are inserted between plates 30 and 31. The arbor 41 pivots by its lower end while resting on the center of the steel disk 35 whereas, by its upper end which carries a gudgeon 43 fixed thereon with a screw 44, it pivots in the center of a support 45 which constitutes a bearing for the same. This support 45 is fixed under the lower plate 31. Arbor 41 is provided, at the rear end, thereof, with the pinion 42 meshing with an intermediate wheel 46 fastened to a small shaft 47 pivoting, on the one side, in the bottom of drum 33 and, on the other side, in the bottom disk 36. This shaft 47, which serves to transmit the motive power to the controlling device releasing the striker during the flight and to adjust the

firing time of the charge in the projectile prior to departure, also carries a pinion 48, in constant mesh with the inner teeth of a crown 49, freely rotating within a circular countersink 50, provided in the bottom disk 36.

In openings of the steel disk 35 are located three balls 51 (Figure 6) whereon the upper face of crown 49 can roll. In the edge of the crown projecting parallel to the axis of the fuse is provided a notch 52, wherein the nose of a stopping lever 53 of the striker is made to engage when said striker is released (Figure 2). This lever 53 may pivot around a shouldered screw 54, screwed thereon through the bottom-disk 36, so as to move out of notch 23 of the striker just when notch 52 faces the lever nose. The operating surfaces of lever 53 and of notch 23, which co-operate in keeping the striker bolted till detonation occurs, are slightly slanting, so as to make unlocking of bolt easier. The lever 53 carries a perpendicular pin 55, against the free extremity whereof operates a spring 56, located within a countersink in bottom of drum 33, for the purpose of counteracting the action of the percussion spring 21. Said spring 56 normally tends to keep lever 53 resting against the inertia pin 57, integral with a clutch spring 58 which automatically moves away under the action of inertia when the projectile is fired and said spring 56 also causes the nose of lever 53 to penetrate within notch 52 when pin 57 has moved off and when said notch 52 happens to face the lever nose. The pin 57, fitted with spring 58, operates in a cylinder 59, fixed under the bottom disk 36, and enters a cylindrical countersink formed in body 2 of the fuse.

The crown 49 presents a lug 60 radially projecting towards the center thereof. Said lug is normally kept engaged (Figure 1), within a corresponding notch 61 of the inertia pin 57 so as to prevent, on the one hand, crown 49 from moving clockwise and, on the other hand, to prevent the pin 57 from prematurely moving off before timing of fuse has been performed; for example if the shell happens to drop down while being handled.

As long as pin 57 is in its operative position (that is during the whole time of transport, handling and loading of the shell), said lug 60, while remaining in notch 61 of pin 57, prevents the crown 49 from rotating in a clockwise direction and, consequently impedes every accidental release of striker 20. The inertia pin 57 however, does not prevent the crown 49 from rotating in a counterclockwise direction by 335 degrees or so, when it is desired to adjust the firing time of the charge in projectile, namely to time the fuse. Said timing is performed while power spring 38 is being wound up with the aid of the key 4 by turning the same clockwise with a timing apparatus at the angle required to secure the firing range desired. By turning the key 4, the lower end whereof is guided by an axial cylindrical tenon 62, fixed in the cover of the upper plate 30, the movable frame 30, 31 is driven with the aid of a transverse head-stud 7 and a mortised plate 63, fastened on the cover of the hollow plate 30, so as to co-operate with stud 7 of the key. The movable frame 30, 31 then describes, in a clockwise direction, the same angle as key 4 while frictionally revolving within the two inside grooves located in the upper part of the casing 26.

In the bearing 45, fixed under the plate 31, is mounted a pinion 64, which constitutes the first rotating member of the gear-train in the clock-work movement. Said pinion—as it is the case for the whole gear-train—is prevented from revolving until firing time (as hereinafter described) and is in constant mesh with the inner teeth 65 of a disk 66 in the casing 26, between the lower plate 31 and the cover 39 of the drum and squeezed, on a square portion of the driving shaft 41, between the gudgeon 43 and the collet 40. Because of this construction, the driving shaft 41 remains coupled with the movable frame 30, 31 as long as the pinion 64 is prevented from rotating. Thus, when the movable frame 30, 31 is driven by means of key 4, the central shaft 41 is made to revolve in a clockwise direction, which has, on the one hand, the effect of winding up the power spring 38 and, on the other hand, simultaneously of turning counterclockwise the crown 49 controlling the device releasing the striker through gears 42, 46, 48.

The winding position of power spring and of timing thus imparted to the fuse, through difference between the movable part and the fixed part of the clock-work frame, is maintained between the moment of timing the projectiles and the moment of firing the latter, through friction of the plates 30, 31 within grooves of casing 26. Said friction is secured, on mounting up the frame in the casing, so as to remain constant, due to a space 67, existing between the fixed part 33, 35, 36 of the frame, and the casing 26—except at bottom of bottom 36—said space being sufficient for allowing both halves of casing to be properly tightened on the movable part 30, 31 of frame, with the aid of screws 29.

On firing, the movable frame 30, 31, integral with the key 4, is immobilized in the casing 26 as soon as inertia begins to prove effectual (through a device hereinafter described) whereas, simultaneously, the gear train of the clock-work movement and, consequently, also the pinion 64, are released (through a device hereinafter described). Under the action of power spring 38, the

shaft 41 starts revolving counter-clockwise driving, on the one hand, the whole gear-train through crown 65 and, on the other hand, the crown 49 through gears 42, 46 and 48, during the complete trajectory of the projectile, the frame 30, 31, previously movable, as well as key 4, remaining all that time integral with fuse body 1, 2.

Hence, the crown 49 resumes the initial position it occupied prior to timing, that is its position just after machining, but, at that very moment, the pin 57, having withdrawn, through inertia, on projectile being fired, is no longer in the path of lug 60, and besides, the power derived from the power spring still driving the shaft 41 and the crown 49, the latter keeps rotating in a clockwise direction until notch 52 thereof exactly faces the nose of bolting lever 53. Under the action of spring 56 and of the centrifugal force produced by axial revolution of the projectile, the lever 53 instantly revolves in a counter-clockwise direction through an angle sufficient for permitting its complete withdrawl from the notch 23 of striker 20, thus causing said striker to be instantaneously released. To make sure that on firing, the adjustment of the fuse is not likely to be destroyed, and to keep the movable frame 30, 31 integral with the fuse body during the complete trajectory, there is employed a plunger-ring 68 provided with four steel points 69. Said ring is mounted around the key 4, axially movable within a circular countersink 70 in the ogive of the fuse. This ring is normally kept in the bottom of said countersink by a flat spring with cut blades 71 (Figure 1), resting on the mortised plate 63. Between said plate and the hollow plate 30 is fixed an embossed disk 72 presenting a hollow circular edge 73 facing the steel points 69. When the projectile is fired, the plunger-ring crushes down, through inertia, the cut blades of spring 71, while the steel points 69 are driven into the edge 73 (Figure 2) thus integrating the movable frame 30, 31 with the ogive 1 of the fuse body.

In order to prevent the plunger-ring 68 from going up again, should rebounding occur on firing, there are two centrifugal bolts 74, slidingly mounted within a transverse bore 75 in key 4 and subjected to the action of a spring 76, said action being added to and combined with that of the centrifugal force. These bolts are held in their inoperative positions (Figure 1) by the ring 68 until the projectile is fired. On firing said bolts move off and are made to take up the position shown in Figure 2, namely, the position required for preventing the ring 68 from sliding upwards.

The pinion 64 being in constant mesh with the inner teeth 65 of the disk 66, keyed on the driving shaft, is carried at the lower end of a small shaft 77 pivoting, on the one side, within the upper plate 30 and, on the other side, within bearing 45. 78 indicates a circular countersink provided in the plate 31 securing free passage for pinion 64 when the apparatus is being mounted. Said shaft 77 carries, above the lower plate 31, a wheel 79 operating a pinion 80 made integral with a bevel wheel 82 operating a small bevel pinion 83 carried by a small shaft 84 revolving in a bearing 85 composed of two parts. In said bearing is fastened an end-piece screw 86, acting upon one end of shaft 84. In the middle of this shaft is fixed a double escape wheel 87, which co-operates with a sector-shaped pallet 88 fixed on the shaft of rod 89 of the balance 90.

The rod 89 pivots axially in relation to the fuse, between the cover of the plate 30 and the plate 31. The lower end of said rod revolves in plate 31, whereas the upper end thereof is made to bear against the extremity of an end-piece screw 91, located in the tenon 62 guiding the key 4. The rod 89 carries, at the upper end thereof, the balance 90 which presents two paddles projecting beyond each other. Each paddle is constituted by a thin flexible metallic blade, the free extremity whereof is fitted with a small weight 92 in the form of a disk.

The verge of balance 89 carries, between the balance and the pallet 88, a bevel pinion 93 which meshes with a second bevel pinion 94 keyed at one end of a small radial shaft 95, pivoting on the one side, in a bridge 96 and, on the other side, in another bridge 100, hereinafter described. Behind the bevel pinion 94, said shaft 95 is provided with a portion 97, the diameter of which is larger and wherein is fixed one end of the cylindrical balance spring 98. The other end of said spring is fastened to a split ring 99 adjustable in angular position on a cylindrical shoulder 100, formed by a stud 101, screwed on plate 31. Said ring 99 presents a cylindrical projection whereon is frictionally mounted a split ring 103, acting as regulator and fitted with a stud 104 crossed by the last spire of the spiral.

The detonation device, in the first case of a double-acting shell (Figure 1) operates as follows:

Prior to firing, any ill-timed percussion of primer 19 is made impossible through the safety stay-bolt 13, accommodated between primer 19 and point 22 of striker, which stay-bolt is kept in this operative position by a lever 16 and a pin 18. On removing the latter, when firing, said stay-bolt 13 is maintained in its operative position as long as the action of linear acceleration is superior to that of angular acceleration, that is at least during the complete passage through the gun-bore, the lever 16 being then kept, by the force of inertia, strongly applied

against the stay-bolt 13. Thus, any untimely function of striker is rendered impossible, the point 22 of said striker merely penetrating into the bottom of the countersink stay-bolt 13.

Normally, on leaving the gun and as soon as linear acceleration is completed, the lever 16 and stay-bolt 13 move off under the action of the centrifugal force, thus liberating the percussion members 19 and 20, which are then ready to perform their functions.

While normally operating as a time-shell, the latter bursts on release of striker 20, the point 22 whereof is made to pierce the primer 19, tightly kept within its location by the spring 11 (Figure 2), during the whole trajectory. However on percussion firing, the primer-plunger 10 is projected forward, at the moment of impact and in the usual manner, on the point 22 of the striker, this against the action of spring 11.

In the case of the single-acting shell (Figure 2), everything is performed as in the preceding instance except that any axial displacement of the primer-plunger is made impossible through the fixed stay-bolt 24, which means that the shell can only operate as a time-shell.

In this working form the balance 90, prior to firing, is arrested in its cocked position by a pin 105 (Figures 8 and 9) which by inertia is withdrawn in any known manner at the moment of firing.

The device is composed of an oscillating lever 106 having a nose 107 and a pivot 108. This lever is subjected to the action of a spring 109 which tends to hold it in its operative position, its free end then coming to bear on the hub of the escapement wheel 87. The balance 90 has a short arm 110 which at the moment of firing comes to bear against the nose 107 of lever 106, after the inertia pin 105 has been withdrawn.

Since during the whole duration of the linear acceleration the effect of inertia acting on the lever 106 is much greater than the action of the centrifugal force, the said lever will be arrested in the position as represented in Figure 10.

Thus the balance 90 remains immobilized by the nose 107 as long as the linear acceleration continues, that is say during the complete passage of the projectile through the bore of the cannon and a few meters in addition after having left the gun.

However, as soon as the linear acceleration ceases, the lever 106 rotates on its pivot 108 under the action of the centrifugal force and takes a position in which it is retained within a countersink 111 of the regulator frame by means of a small spring 112 which at the end of the stroke of the lever 106 enters a cavity 113 in the countersink 111.

The nose 107 is at that time out of the way of the course of the balance 90, which therefore may describe its first oscillation under the action of its spiral spring 98 to which it is mechanically connected by the angle gear 94.

In order that the center of gravity remains in the axis of the fuse, another arm 110 is provided for symmetric to the first one.

The plane of oscillations of the lever 106 might be directed so that when the lever is withdrawn, it gives to the balance an impulse facilitating its start.

I claim as my invention:

1. In a mechanical fuse for artillery projectiles of the type in which the power member of the clockwork is constituted by a barrel shaft arranged in the axis of the fuse in such a manner as to describe several revolutions, in one direction for effecting, prior to firing, simultaneously the winding and the setting or adjusting of the fuse, and in the inverse direction and during the trajectory under the action of the power spring and for driving the rotary member controlling the release of the striker member, and also for transmitting the driving power to a regulating device of the clockwork with a dead-beat escapement and a spiral balance, in combination a frame, for housing the different movable members of the clockwork, said frame being composed of at least two parts, one of them being a fixed one and containing the power spring, said fixed part being integral with the fuse body, and a movable one adapted to become, prior to firing, displaced angularly with regard to the fixed part, for effecting simultaneously the winding of the power spring and the adjusting of the time of ignition of the projectile charge, means being provided, which, in function of the inertia, are adapted to render, during the complete trajectory, this movable part of the frame integral with the said fixed part.

2. A fuse as per claim 1, in which an oscillating safety member is arranged in such a manner, that the power of inertia generated by the linear acceleration of the projectile is used for preventing, in spite of the centrifugal force, its oscillation during the passing of the projectile through the bore of the gun, the center of gravitation of said member being outside of the axis of rotation of the projectile, in order to have the member to oscillate as soon as the linear acceleration has reached its end, that is after the projectile has left the bore of the gun, the said oscillation being used for causing the release of the regulating balance of the fuse.

3. A fuse as per claim 1 in which means are provided for preventing any axial displacement of one part of the clockwork frame with regard to the other part and for holding the two frame parts a certain interval apart from one another for lodging one

of the rotary members of the clockwork in said interval.

4. A fuse as per claim 1, in which means are provided for maintaining the movable part of the frame coupled with the barrel shaft of the fuse until the moment of firing.

5. A fuse as per claim 1 in which the movable part of the frame houses the gear train and the regulating device of the clock work and is angularly displaced prior to firing by means of a key disposed in the axis of the fuse in the point of the latter.

6. A fuse as per claim 1, in which the barrel shaft constituting the power member carries on its top portion a crown wheel with inner teeth in constant mesh with a pinion of the gear-train which, as well as all the other wheels of said gear train, is held immobilized until firing the projectile, but which participates in the rotation of the movable part of the frame in such a manner as to serve, prior to firing, for causing the barrel shaft to partake in said rotation.

7. A fuse as per claim 1, in which means are provided for preventing the balance of the regulating device from rotating respectively until the moment of the departure of the projectile and until the acceleration has come to an end, in order to immobilize during all this time the wheels of the gear train by means of the escapement wheel adjusted in its inoperative position in the course of manufacture and in order to allow, prior to firing, the crown with inner teeth and carried by the barrel shaft to be rotated too when the movable frame part is rotated by the pinion in constant mesh with the same.

8. A fuse as per claim 1, in which steel points are provided, mounted as to be axially movable in the body of the fuse above the movable part of the frame, in such a manner as to allow them to penetrate by the effect of inertia at the moment of firing in the top surface of said movable part so as to render it integral with the body of the fuse.

9. A fuse as per claim 1, in which the fixed part of the frame houses the barrel and the device controlling the release of the striker member and is fixed to the bottom of a cylindrical cylinder composed of at least two parts and within the top part of which the movable part of the frame may rotate frictionally.

10. A fuse as per claim 1, in which steel points are provided, mounted so as to be axially movable in the body of the fuse above the movable part of the frame in such a manner as to allow them to penetrate by the effect of inertia at the moment of firing in the top surface of said movable part so as to render it integral with the body of the fuse, the said steel points being carried by a plunger mounted slidingly in an axial bore of the body of the fuse above the movable part of the frame, at least one centrifugal member being provided which is adapted to thereupon place itself behind said plunger for the purpose of immobilizing it in its operative position during the complete trajectory of the projectile.

11. A fuse as per claim 1 in which an oscillating safety member is arranged in such a manner that the power of inertia generated by the linear acceleration of the projectile is used for preventing, in spite of the centrifugal force, its oscillation during the passing of the projectile through the bore of the gun, the center of gravitation of said member being outside of the axis of rotation of the projectile in order to have the member to oscillate as soon as the linear acceleration has reached its end, that is after the projectile has left the bore of the gun, the said oscillation being used for causing the release of the regulating balance of the fuse, the said oscillating safety member being constituted by a lever which may rotate in a plane parallel to the axis of rotation of the projectile, said lever being arrested during the entire duration of the linear acceleration in such a position as to prevent any displacement of a centrifugal bolt protruding between the striker and the primer.

12. A fuse as per claim 1, in which an oscillating safety member is arranged in such a manner that the power of inertia generated by the linear acceleration of the projectile is used for preventing, in spite of the centrifugal force, its oscillation during the passing of the projectile through the bore of the gun, the center of gravitation of said member being outside of the axis of rotation of the projectile in order to have the member to oscillate as soon as the linear acceleration has reached its end, that is after the projectile has left the bore of the gun, the said oscillation being used for causing the release of the regulating balance of the fuse, the said oscillating safety member being constituted by a lever which may rotate in a plane parallel to the axis of rotation of the projectile, said lever being arrested during the entire duration of the linear acceleration in such a position as to prevent any displacement of a centrifugal bolt protruding between the striker and the primer, and in which the said centrifugal bolt is constituted by a pin the gravity center of which is eccentric with regard to the axis of rotation of the projectile and which is susceptible to be displaced in a radial slot, said pin having on the one part a longitudinal notch, into which may penetrate the point of the striker, and on the other part, a cylindrical cavity with a widened border into which the point of the striker is wedged in the case of some accidental function of

the latter in the bore of the gun, so that the said bolt will definitely become immobilized in its active position.

13. A fuse as per claim 1, in which means are provided for preventing any axial displacement of one part of the clockwork frame with regard to the other part and for holding the two frame parts a certain interval apart from one another for lodging one of the rotary members of the clockwork in said interval, the said means being constituted by separating members fixed on the one hand to one of the two-part frame and connected on the other hand to the other part of said frame, in such a manner as to hold the separated part at a certain interval from the other and to prevent any relative axial motion between the two parts whereas it is possible for the movable part to become, prior to firing, angularly displaced with regard to the said fixed frame part.

14. A fuse as per claim 1, in which an oscillating safety member is arranged in such a manner, that the power of inertia generated by the linear acceleration of the projectile is used, in spite of the centrifugal force, its oscillation during the passing of the projectile through the bore of the gun, the center of gravitation of said member being outside of the axis of rotation of the projectile, in order to have the member to oscillate as soon as the linear acceleration has reached its end, that is after the projectile has left the bore of the gun, the said oscillation being used for causing the release of the striker member from the action of said oscillating safety member.

15. A fuse as per claim 1 in which an oscillating safety member is arranged in such a manner that the power of inertia generated by the linear acceleration of the projectile is used for preventing, in spite of the centrifugal force, its oscillation during the passing of the projectile through the bore of the gun, the center of gravitation of said member being outside of the axis of rotation of the projectile in order to have the member to oscillate as soon as the linear acceleration has reached its end, that is after the projectile has left the bore of the gun, the said oscillation being used for releasing the striker member from the action of the said safety member, the said oscillating safety member being constituted by a lever which may rotate in a plane parallel to the axis of rotation of the projectile, said lever being arrested during the entire duration of the linear acceleration in such a position as to prevent any displacement of a centrifugal bolt protruding between the striker and the primer.

16. A fuse as per claim 1, in which an oscillating safety member is arranged in such a manner that the power of inertia generated by the linear acceleration of the projectile is used for preventing, in spite of the centrifugal force, its oscillation during the passing of the projectile through the bore of the gun, the center of gravitation of said member being outside of the axis of rotation of the projectile in order to have the member to oscillate as soon as the linear acceleration has reached its end, that is after the projectile has left the bore of the gun, the said oscillation being used for releasing the striker member from the action of the said safety member, the said oscillating safety member being constituted by a lever which may rotate in a plane parallel to the axis of rotation of the projectile, said lever being arrested during the entire duration of the linear acceleration in such a position as to prevent any displacement of a centrifugal bolt protruding between the striker and the primer, and in which the said centrifugal bolt is constituted by a pin the gravity center of which is eccentric with regard to the axis of rotation of the projectile and which is susceptible to be displaced in a radial slot, said pin having on the one part a longitudinal notch, into which may penetrate the point of the striker, and on the other part, a cylindrical cavity with a widened border into which the point of the striker is wedged in the case of some accidental function of the latter in the bore of the gun, so that the said bolt will definitely become immobilized in its active position.

In testimony whereof I affix my signature.

ANDRÉ VARAUD.