March 21, 1961 C. F. BROWN ET AL 2,975,711

ARMING MEANS FOR A FUZE

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FIG. 1.

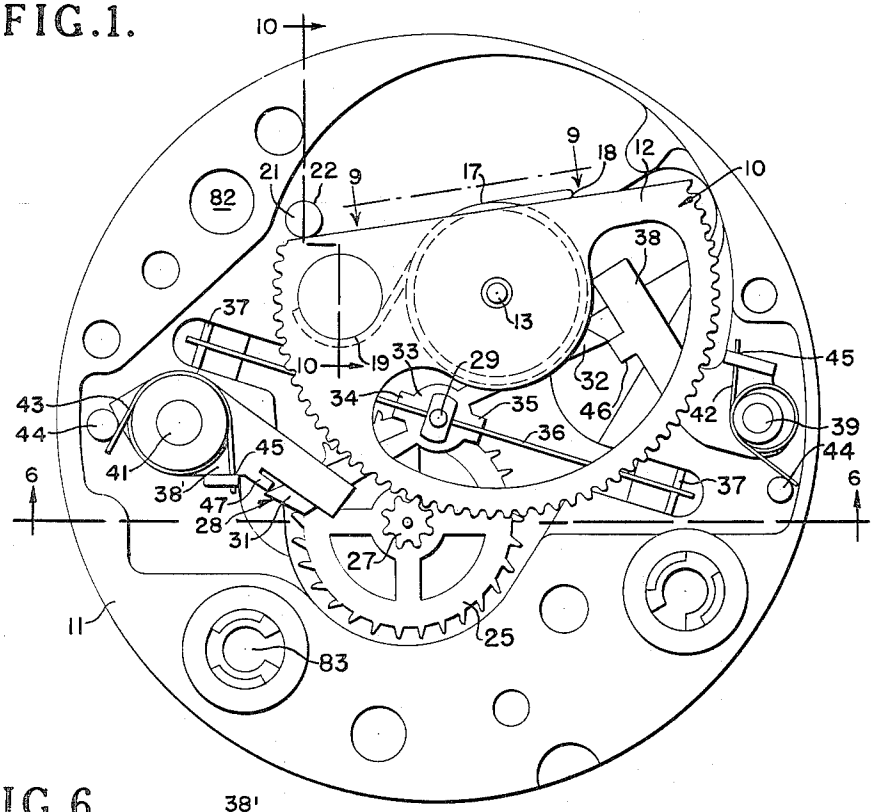
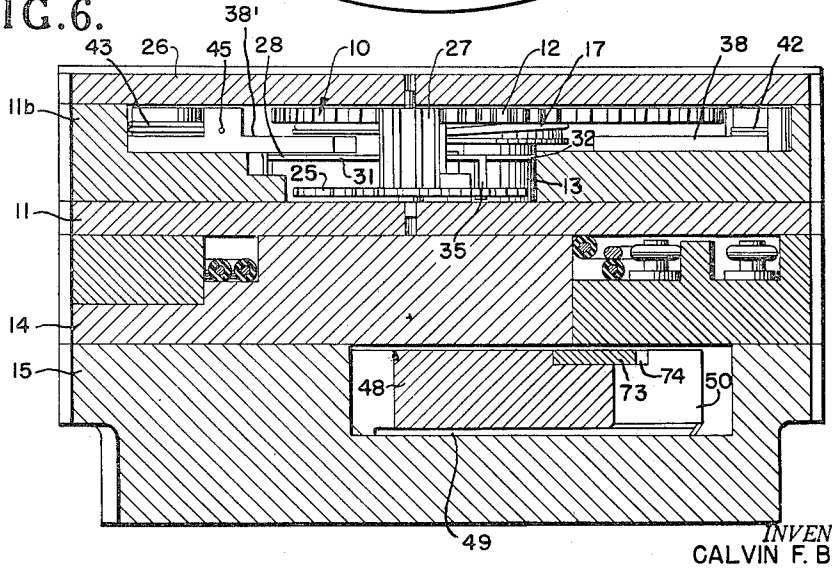


FIG. 6.



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FIG.2.

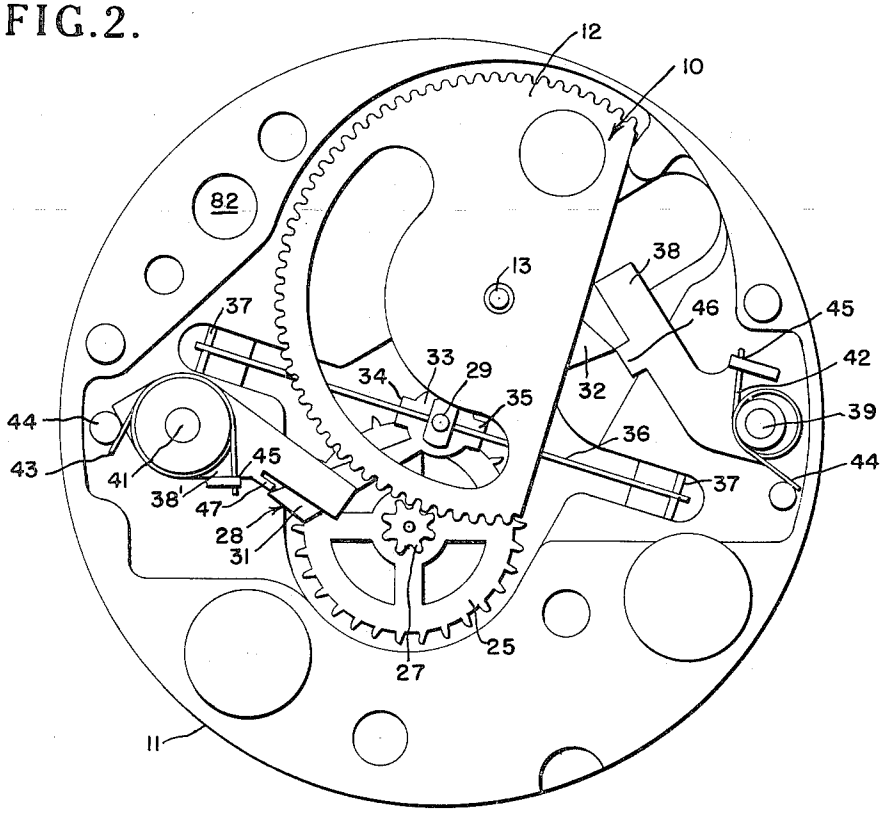


FIG.7.

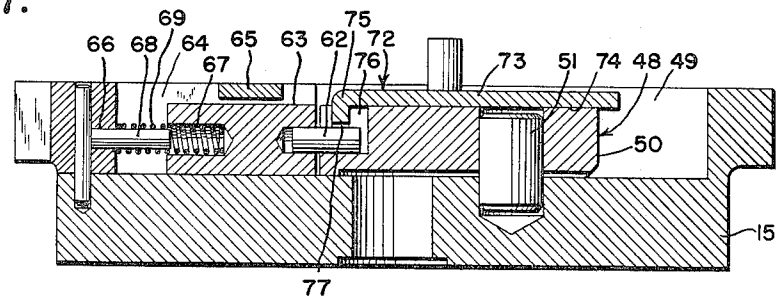


FIG.11.

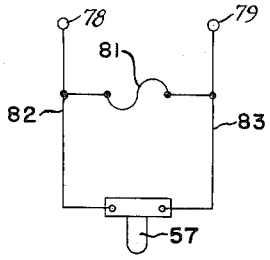
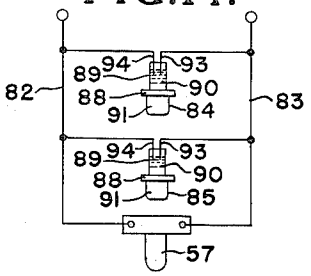


FIG.14.



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FIG.3.

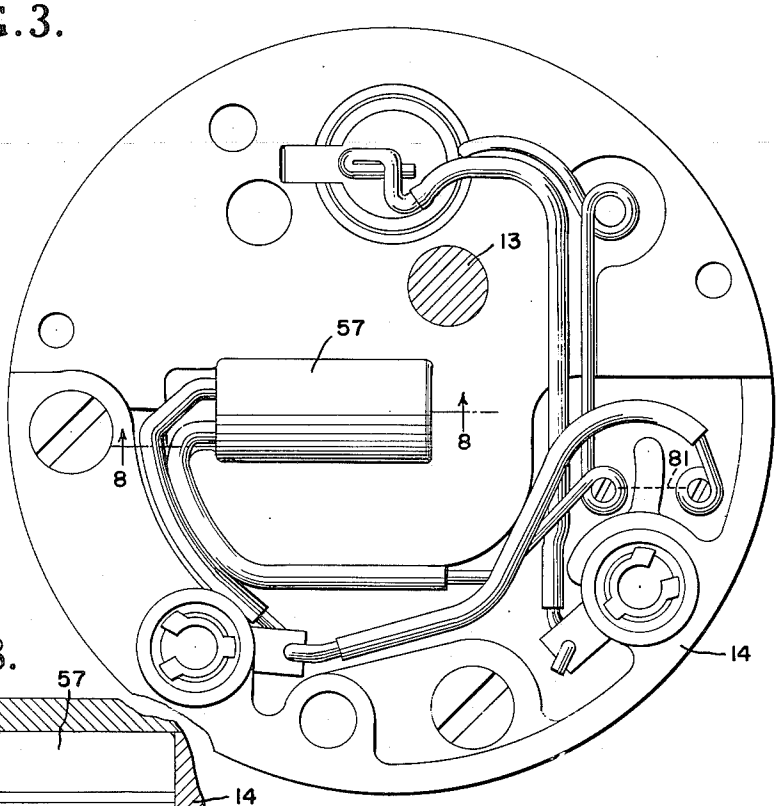


FIG.8.

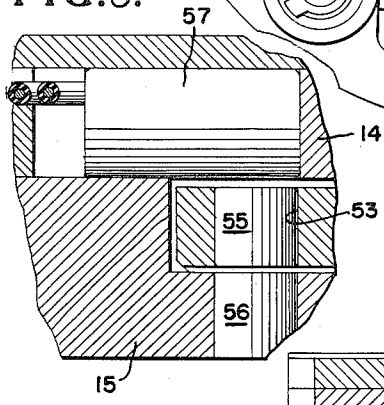
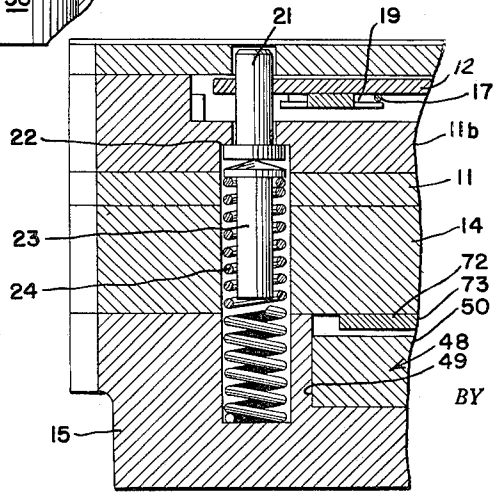


FIG.10.



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FIG.4.

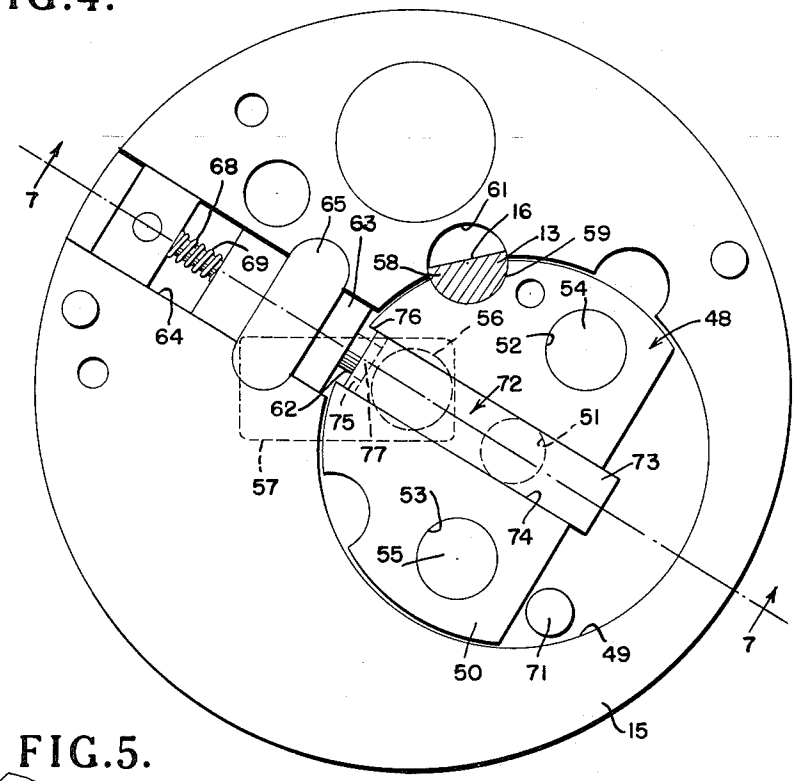


FIG.5.

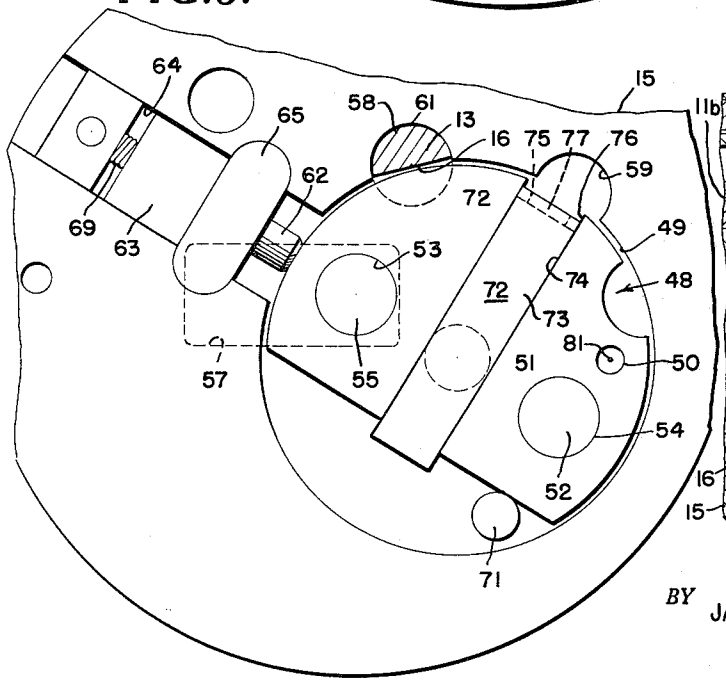
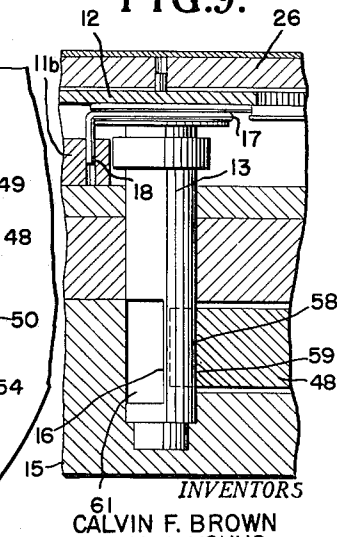


FIG.9.



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ARMING MEANS FOR A FUZE

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FIG.12.

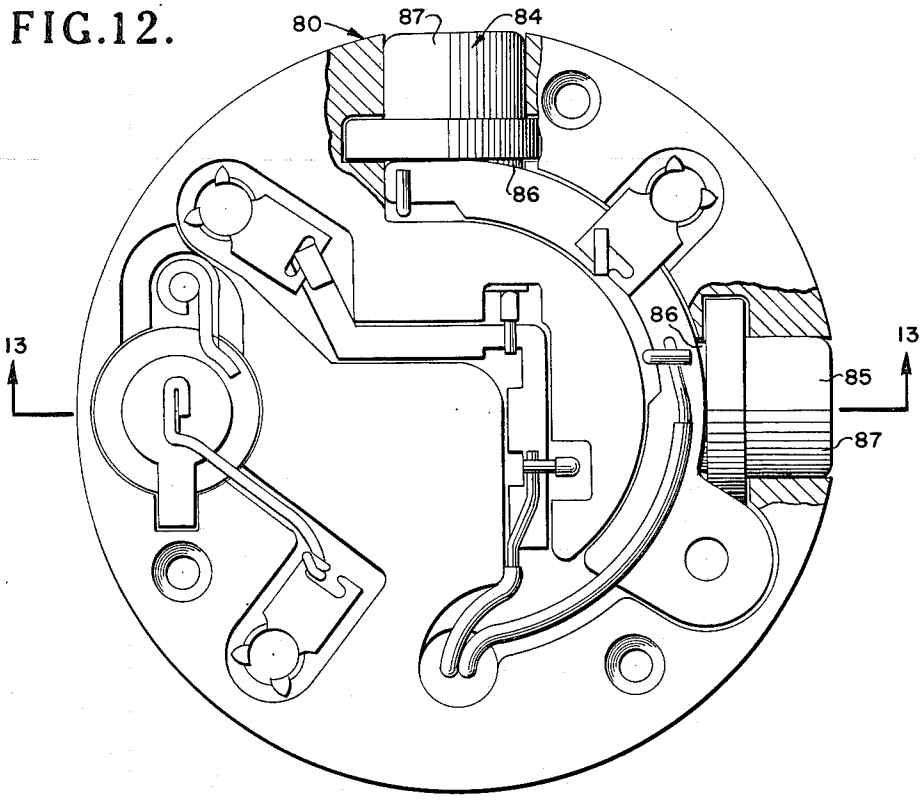
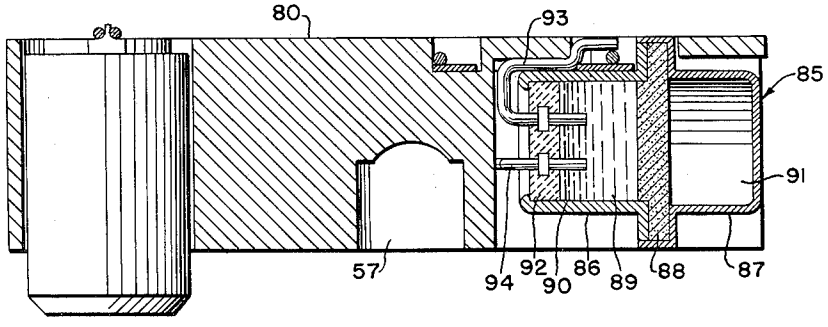


FIG.13.



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FIG.15.

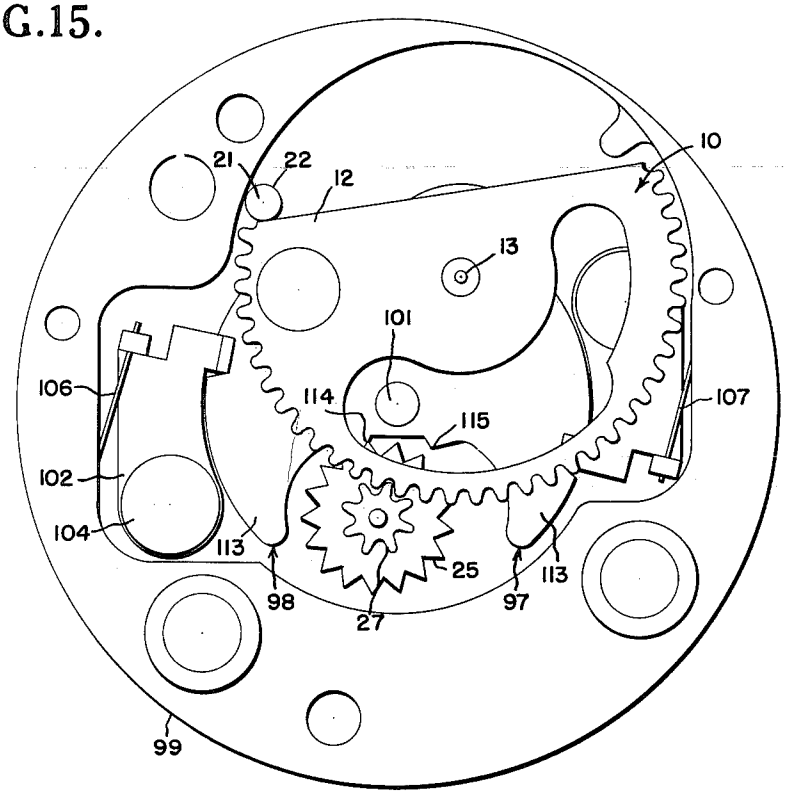
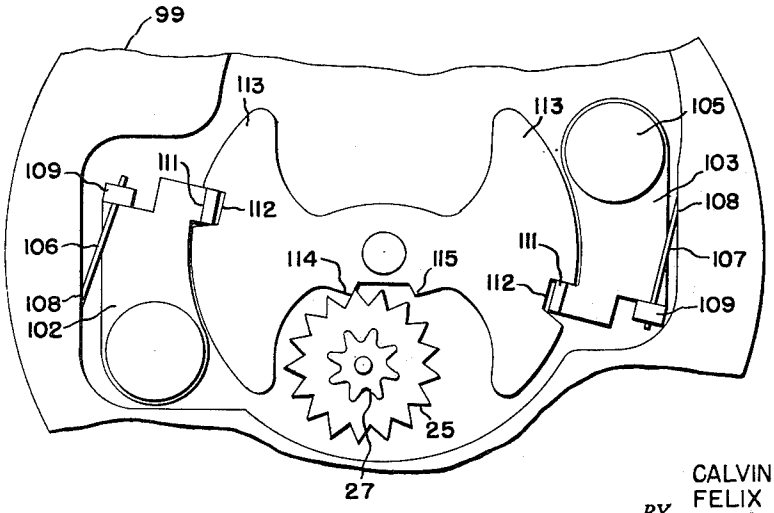


FIG.16.



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ARMING MEANS FOR A FUZE

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Filed July 16, 1952, Ser. No. 299,324

6 Claims. (Cl. 102—80)

(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

The present invention relates to a safety mechanism for a projectile fuze and more particularly to a combined safety, arming, and detonating means for use in a percussion type or a proximity type fuze, as the case may be.

Accordingly, the invention contemplates the provision of a new and improved device for a projectile fuze having means for maintaining the fuze in a safe condition during handling and transportation and to provide bore safety as the projectile is fired from a gun, and in which means controlled by an escapement mechanism is adapted to release a normally locked arming rotor for movement from an initial safe position to an armed position in response to centrifugal force when the normally locked escapement is released and operated for a predetermined period of time and in which a balance lever having a spring device attached thereto controls the frequency of the escapement under various centrifugal torques. More especially, the invention provides a device for the above described purposes which is economical to manufacture, compact in structure and efficient in operation wherein the arming rotor, which forms a carrier for the explosive means, forms a part of an explosive train between an electroresponsive primer and a lead-in charge, and which is initially disposed in a non-registering position to interrupt the explosive train, and thereafter when released in response to operation of the escapement mechanism moves by centrifugal force to a registering position. Thus the explosive means is brought into registration with the aforesaid primer and lead-in charge thereby to arm the projectile when a predetermined period of time has elapsed after the projectile has been fired from a gun and at a predetermined point along the trajectory.

An object of the present invention is the provision of a new and improved delayed arming device for use in a projectile in which arming thereof is prevented until the projectile is fired from a gun and travelled a predetermined distance along a trajectory.

Another object is the provision of an arming device in which means including an escapement mechanism releasably locking an arming member in an initial safe position and adapted to release the arming member for rotation to an armed position when the escapement mechanism has been set in operation and actuated for a predetermined period of time after the projectile has been fired from a gun and in which a centrifugally actuated detent is employed to prevent movement of the arming member to an arming position in response to a sudden shock received thereby.

Still another object is the provision of an arming device for a projectile in which means including an arming rotor maintains the projectile in a safe condition during handling and transportation and arming of the device will not occur until the projectile has been fired from a gun and traveled a predetermined distance from the muzzle thereof.

A still further object is the provision of an arming device having a normally shorted electroresponsive primer and a movable arming member for maintaining the device in a safe condition until the projectile is fired from a gun whereupon the primer is unshorted and the arming member is moved to an armed position in response to centrifugal force and in which means on a balance lever is employed to control the frequency of the escapement under various centrifugal torques.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

Fig. 1 is a plan view of a preferred embodiment of the device of the present invention with the cover plate removed and the device in an unarmed condition;

Fig. 2 is a view similar to Fig. 1 with the device in an armed condition;

Fig. 3 is a plan view of the primer support and the electrical wiring arrangement thereof;

Fig. 4 is a plan view of the arming rotor and the support therefor with the rotor in an unarmed condition;

Fig. 5 is a view similar to Fig. 4 with the arming rotor in an armed condition;

Fig. 6 is a sectional view taken on the line 6—6 of Fig. 1;

Fig. 7 is a sectional view taken on the line 7—7 of Fig. 4;

Fig. 8 is a sectional view taken on the line 8—8 of Fig. 3;

Fig. 9 is a sectional view taken on the line 9—9 of Fig. 1;

Fig. 10 is an enlarged sectional view taken on the line 10—10 of Fig. 1;

Fig. 11 is a view in diagrammatic form of an electrical circuit suitable for use with the device of Fig. 1;

Fig. 12 is a plan view of an alternative arrangement of the device of Fig. 1 partially broken away;

Fig. 13 is an enlarged fragmentary sectional view taken on the line 13—13 of Fig. 12;

Fig. 14 is a view in diagrammatic form of an electrical circuit suitable for use with the device of Fig. 12;

Fig. 15 is a plan view of another arrangement of the device with the cover plate removed and the device in an unarmed condition; and,

Fig. 16 is a view of the clutter arrangement employed with the device of Fig. 15.

Referring now to the drawings wherein like reference characters designate like parts throughout the several views and more particularly to Fig. 1, the numeral 10 generally indicates an escapement mechanism mounted on a block or support 11 and comprising a segmental spur gear 12 keyed to a shaft 13. The shaft extends through corresponding openings or bores formed in the supports 11 and 14 and journaled in a support 15 for rotative movement, the shaft 13 being provided with a cutaway or recessed portion 16, the purpose of which will be more clearly apparent as the description proceeds. A torsional spring 17 is disposed about the shaft 13 having one end secured to the block 11*b* as at 18, the other end thereof being secured to the normally locked gear 12 as at 19.

As more clearly shown on Fig. 10 movement of the gear 12 is prevented by a detent 21 slideably supported within a bore 22 formed in the member 11*b*, the detent 21 being maintained in locking engagement with the gear by a spring actuated plunger 23 disposed in complementary bores formed in the supports 14 and 15, the

plunger and spring being respectively indicated by the reference characters 23 and 24. It will be understood, however, that when the projectile is fired from a gun, the resulting setback force causes the detent 21 and plunger 23 to move rearwardly against the action of the spring 24 and thus the gear is released for rotation in response to the action of spring 17.

An escape wheel 25 is rotatably supported in the member 11 and cover plate 26, Fig. 6, and keyed thereto is a pinion 27 in engagement with the spur gear 12 and driven thereby. A balance lever generally designated by the numeral 28 is pivotally mounted between the member 11 and the cover plate 26 as by a shaft 29 and comprises a pair of arms 31 and 32 diverging oppositely from a centrally disposed base plate 33, the base plate being provided with a pair of pallets 34 and 35 for successively engaging the teeth on the escapement wheel 25 thereby to regulate the speed of rotation of the escapement mechanism and thus delay arming of the fuze. Secured centrally to the shaft 29 of the balance lever is a biasing spring 36, each end portion of the spring being anchored to the casing by a lug 37, Fig. 1, the spring being adapted to control the frequency of the escapement under various centrifugal torques.

As more clearly shown on Fig. 1 a pair of diametrically disposed locking detents 38 and 38' are pivotally mounted on the support 11*b* as at 39 and 41, the detents being urged into locking engagement with the arms 31 and 32 of the balance member respectively by a pair of torsional springs 42 and 43. The free ends of each spring is secured to the member 11*b* as at 44 and to the detents 38 and 38' as at 45. By this arrangement lugs or bills 46 and 47 formed on the detents respectively are urged into locking engagement with arms 31 and 32 and thus the balance member is maintained in a locked position until the projectile has been fired from a gun and the speed of rotation thereof has reached a predetermined value. When this occurs the detents 38 and 38' are moved to a release position, Fig. 2, and the balance member is set in operation, it being understood, however, that while the driving means 12 is released in response to setback force, the balance member will not be set in motion thereby until the detents are moved to a release position in response to centrifugal force whereupon delayed arming of the device is accomplished.

As shown on Fig. 4 the arming rotor generally indicated by the reference character 48 is rotatably supported in a recess 49 formed in the support 15 and comprising a segmental body portion 50 pivotally mounted as at 51 and having a pair of diametrically disposed bores 52 and 53. The bore 52 has a weight 54 arranged therein, composed of any material suitable for the purpose such, for example, as lead or the like, the bore 53 having a detonator 55 disposed therein adapted to be brought in registration with a lead-in charge 56 arranged within the support 15 and an electroresponsive primer 57 disposed within the member 14, Figs. 3 and 8. The arming rotor is locked in an initial safe position by a web 58 bordering on the recessed portion 16 of the shaft 13 and normally disposed within an arcuate recess 59 formed in the arming rotor 48, it being understood, however, that when the gear 12 has been released in the aforesaid manner and rotated for a predetermined period of time the web 58 is moved out of engagement with the recess 59, Figs. 4 and 9, and into a complementary recess 61 formed in the member 15 thereby releasing the arming rotor for rotation by centrifugal force during the flight of the projectile.

As most clearly shown on Fig. 7 additional locking means are provided for the arming rotor comprising a detent 62 formed integrally with a mass 63 slideably arranged within a slot 64 arranged within the member 15, the mass being maintained within the slot by a member 65. Secured to the support 15 as at 66, Fig. 7, and extending into a bore 67 formed in the mass 63 is a shaft 68. Surrounding the shaft 68 is a spring 69 having one end in engagement with the support 15 and the other end thereof in engagement with the mass 63 and thus by this arrangement the detent is maintained in locking engagement with the arming rotor and will remain in locking engagement therewith until the speed of rotation of the projectile has reached a predetermined value whereupon centrifugal force will cause outward movement of the mass and thus the detent thereon will be moved out of locking engagement with the rotor. When this occurs the arming rotor is moved from an initial safe position to an armed position in response to centrifugal force, Figs. 5 and 8, with the primer 57, detonator 55 and lead-in charge 56 in alignment with each other and the arming rotor in engagement with a stop pin 71.

As more clearly shown on Fig. 7, a safety latch generally indicated by the numeral 72 is provided for preventing movement of the arming rotor to an armed position in response to a sudden shock received thereby such, for example, as when the projectile is accidentally dropped on a hard surface during handling and in service should the aforesaid shock be sufficient to cause the detent 62 to be moved out of engagement with the arming rotor. The latch comprises member 73 slideably arranged within a groove 74 formed in the upper surface of the arming rotor and having a bill or slider 75 thereon bent at a right angle with respect to the member 73 and disposed in a recess 76 formed in the arming rotor. The member 72 is arranged in alignment with the slot 64 in member 15 and the bill 75 is provided with a bifurcated portion 77 adapted to straddle the detent 62 and thus provide movement of the member 72 with respect to the detent 62. By this arrangement it will be apparent that should the projectile receive a sudden shock in the aforesaid manner and the mass 63 is moved sufficiently thereby to cause the detent 62 thereon to move out of locking engagement with the arming rotor, locking of the rotor will be accomplished by the latch 72 as the latch moves into slot 64 in the support 15 whereupon premature arming of the rotor is prevented although the detent 62 has been moved to a release position in response to the shock. However, when the projectile is fired from a gun, centrifugal force will move the mass 63 sufficiently to cause the detent 62 thereon to move out of locking engagement with the arming rotor and concurrently therewith such force will cause the latch member to remain in a release position, Figs. 4 and 7, with the bill 75 in recess 76 of the arming rotor and thus permitting free rotation of the arming rotor to an armed position in response to centrifugal force as the arming member is released by detent 62. It will be understood, however, that such action will not occur until the escapement mechanism has been in operation for a predetermined period of time sufficient to cause the locking shaft 13 thereof to be rotated to a release position as heretofore set forth.

In view of the foregoing it will be understood that a new and improved arming and safety device has been devised for use in an electrically controlled fuze wherein the electroresponsive primer thereof may be fired by a source of energy generated as the missile strikes a target or by electrical interaction involving proximity of the target and rate of approach of the fuze to the target as the case may be. With particular reference to Fig. 11 an electrical circuit arrangement suitable for use with the device of the present invention is shown, however, it will be understood that, if desired, this arrangement may be employed with any suitable electrically controlled fuze system and instrumentalities such, for example, as the type adapted to function by electrical interaction involving closeness of the target, and rate of approach of the missile to the target thereby to explode the missile near the target, or the type in which means responsive to impact of the projectile with the target generates sufficient voltage to function the primer and explode the

missile upon impact of the missile with the target. The aforesaid control systems may be connected to terminals 78 and 79, Fig. 11.

Furthermore, in Figs. 3 and 11, it will be noted that the primer 57 is normally shorted by a fine wire 81 connected across conductors 82 and 83 whereupon the primer will remain shorted until the wire is severed by mechanical means such, for example, as an inertia actuated mass or plunger adapted to be forcibly driven thereagainst with sufficient force to sever the wire in response to setback force as the projectile is fired from a gun or when the wire 81 is fused in response to an electrical impulse received thereby from a suitable source such, for example, as a storage battery or a normally charged condenser, the fusing of the wire occurring as the projectile is fired from a gun or when the projectile has traveled a short distance therebeyond.

In the arrangement of Fig. 12, a pair of mercury switches generally indicated by the reference characters 84 and 85 are employed for delayed arming, the switches being disposed in a pair of recesses respectively formed in the support 80. The switches are identical in structure and thus with reference to Fig. 13 wherein one of the switches is shown in section, it will be seen that the switches comprise a pair of envelopes 86 and 87 having sealed therebetween a porous diaphragm 88, a pair of chambers 89 and 91, chamber 89 having a quantity of mercury 90 sealed therein between the porous diaphragm 88 and a plug 92 composed of any material suitable for the purpose such, for example, as glass or the like. A pair of electrical terminals 93 and 94 are secured to the plug 92 in any suitable manner such, for example, as by being molded therein, the aforesaid terminals extending into the chamber 89 and having the end portions thereof disposed within the mercury 90. By this arrangement an electrical circuit may be maintained through the terminals 93 and 94. However, in response to the spinning of the switch, or accelerating the switch in a direction so as to cause the mercury 90 to be forced against and through the diaphragm 88 as a result of centrifugal force, the mercury will flow from chamber 89 through the diaphragm and into chamber 91 thereby gradually emptying the chamber 89 sufficiently to lower the mercury level below the contact members 93 and 94. When this occurs the electrical circuit through the mercury switch which initially passed from member 93 through the body of mercury 90 and thence through member 94 is broken or interrupted.

In the aforesaid arrangement and with reference to the electrical circuit arrangement as shown in Fig. 14, it will be noted that the primer 57 is normally shorted by the pair of mercury switches 84 and 85 connected across conductors 82 and 83 and remains shorted until the projectile has been fired from a gun and traveled a predetermined distance from the muzzle thereof, it being understood, however, that in response to the spin of the projectile the mercury in chamber 89 is forcibly urged through the diaphragm 88 and into chamber 91 and thus the quantity of mercury in chamber 89 is reduced sufficiently to prevent bridging of the contacts 93 and 94 thereby.

When this occurs the firing circuit to the primer is rendered effective and the projectile is in condition to be fired either by an electrical impulse received upon impact of the projectile with the target or in response to electrical interaction involving closeness of the target and rate of approach of the projectile to the target. It will be understood that the mercury switch arrangement may be employed with any suitable arming arrangement such, for example, as the type of arming arrangement shown on Fig. 1.

Referring to Fig. 15 there is shown a clutter type escapement generally indicated by the reference character 97 and comprising a normally locked clutter member 98 supported on the bottom plate 11 by a shaft 101 for oscillatory movement. The member 98 is locked by a pair of diametrically disposed detents 102 and 103 pivotally mounted on the bottom plate 11 as at 104 and 105, the detents being urged into locking engagement with the member 98 by a pair of springs 106 and 107. One end of spring 106 is arranged in abutting engagement with the casing 99 as at 108, the other end thereof being secured to the detent 102 as at 109. In like manner spring 107 has one end in abutting engagement with the casing 99, the other end thereof being secured to the detent 103 as at 109. Each detent has formed thereon a locking lug 111 normally arranged in a pair of diametrically disposed notches 112 formed in the enlarged end portions 113 of the member 98 respectively. By the aforesaid arrangement the lugs 111 are maintained in engagement with the notches 112 by the springs 106 and 107 and thus movement of the member 98 is prevented until the projectile has been fired from a gun and the speed of rotation thereof increases to a predetermined value.

When this occurs the lugs 111 are moved sufficiently in response to centrifugal force to be disengaged from the notches 112 thereby releasing the member for oscillatory movement. Such movement is controlled by a pair of pallets 114 and 115 formed on the member 98 as the aforesaid pallets intermittently engage the tooth escapement wheel 25 and thus the wheel is adapted to be advanced one tooth upon one oscillation of the clutter member. By the aforesaid arrangement and in response to retardation of the escapement mechanism by the clutter arrangement, delayed arming of the device is accomplished, it being understood, however, that arming thereof will not occur until the sector gear 12 has completed its cycle of rotation and the shaft 13 is moved to a release position.

The operation of the alternative embodiment of Fig. 15 is probably clear from the previous description, but will nevertheless be additionally explained briefly.

As the projectile is fired from a gun the spring loaded detent 21 is actuated to a release position in response to setback force. When this occurs the detent 21 is moved sufficiently in response to the setback force to become disengaged from the sector gear 12 thereby releasing the gear for rotation. As the spin of the projectile increases the spring loaded detents 102 and 103 which normally engage and lock the clutter member 98 move to a release position in response to centrifugal force thereby releasing the clutter member for oscillatory movement. It will be noted that the clutter is positioned centrally with respect to the axis of rotation of the projectile. By this arrangement the clutter is free of varying centrifugal effects when oscillating under spin conditions of the projectile. It will be understood that oscillation of the clutter member is initiated by the spring driving arrangement when the sector gear 12 thereof is released in response to setback and the clutter member 98 is released in response to centrifugal force, however, the period of oscillation of the clutter mass is partially dependent on inertial forces. Additional driving power is derived through the action of centrifugal force on the center of gravity of the sector gear for the reason that the sector is positioned in such a manner as to produce a driving movement, it being understood that this component of total drive increases with sector rotation. As the projectile travels along its trajectory the escapement mechanism runs for a predetermined period of time, the mechanism being driven in response to the elastic force of the spring and centrifugal force. In view of the foregoing, it will be apparent that when a predetermined period of time has elapsed after the mechanism is set in motion the cycle of operation will be completed. When this occurs the arming shaft 13 on the sector gear is moved to a release position whereupon the arming rotor is released thereby and rotated from an initial safe position to an armed position in response to centrifugal force.

The structure and operation of the driving and arming means employed with the clutter type escapement is identical to that shown and described in connection with the device of Fig. 1, therefore, further detailed description thereof is deemed superfluous.

In view of the foregoing it will be apparent that a new and improved fuze has been devised for use in an ordnance missile wherein the fuze is maintained in a safe position during handling, transportation and as the projectile is fired from a gun and during the travel thereof through the bore of the gun, and in which means responsive to setback force releases the normally locked driving device for rotation. Furthermore, the device provides a normally locked escapement mechanism operatively connected to the driving means and released in response to centrifugal force for delaying the movement of the arming shaft to a release position, and in which locking means on the arming shaft maintains the arming rotor in an initial safe position until the driving device has been rotated for a predetermined period of time and the arming shaft thereon has been moved to a release position whereupon the arming rotor is released and moved from the initial safe position to an armed position in response to centrifugal force, and in which a normally shorted firing circuit is rendered effective as the projectile is fired from a gun or when the arming rotor is moved to an armed position.

Furthermore, while the invention has been described in detail with respect to an electrically controlled projectile, it will be understood that the device may be advantageously employed, if desired, with a point detonating projectile wherein the primer therefor will be fired in response to a voltage developed therein as the missile strikes a target, or in response to an electrical impulse received thereby from a suitable source of electrical energy arranged within the projectile and controlled by an impact responsive device whereupon a firing circuit to the primer is completed as the impact response device is actuated upon impact of the missile with the target.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed as new and desired to be secured by Letters Patent in the United States is:

1. A delay arming and safety mechanism for a projectile comprising a casing, normally locked arming means mounted in said casing for centrifugally actuated movement from an unarmed to an armed position when released, means including a normally locked spring actuated driving device rotatably supported within said casing for releasing said arming means when said driving device has been rotated a predetermined amount, means arranged within said casing and movable in response to setback force as the projectile is fired for releasing said driving device for rotation, balance means in engagement with and driven by said driving device, normally locked escapement means associated with said balance means for regulating the same and thereby controlling the speed of rotation of said driving means to a release position, locking means pivotally mounted on said casing in engagement with said escapement means for releasing said escapement means as the locking means is moved out of engagement therewith in response to centrifugal force, means slideably arranged within the casing in locking engagement with said arming means for maintaining the arming means in said unarmed position and adapted to release said arming means to an armed position when the speed of rotation of the projectile has reached a predetermined value, and means slideably arranged within said arming means and adapted to be moved into locking engagement with the casing in response to a sudden shock received thereby for preventing premature arming of the arming means.

2. A delay arming and safety mechanism for a projectile comprising a casing, a normally locked arming rotor rotatably supported in said casing for movement from an unarmed to an armed position in response to centrifugal force when released, means including a normally locked spring actuated driving gear rotatably supported within said casing for releasing said arming rotor when said driving gear has been rotated a predetermined amount, a plunger slideably arranged within said casing for releasably locking said driving gear and adapted to release said gear for rotation when the plunger is moved a predetermined amount in response to setback force as the projectile is fired from a gun, an escape wheel rotatably supported on said casing, a pinion secured to said wheel in engagement with said driving gear and driven thereby for rotating said wheel, a normally locked balance member pivotally mounted on said casing, escapement means on said balance member in engagement with said wheel for regulating the same and controlling the speed of rotation of the driving gear to a release position, a pair of pawls pivotally mounted on said casing in engagement with said balance member for releasing said balance member as the pawls are moved out of engagement therewith in response to centrifugal force, means slideably arranged within the casing in locking engagement with said arming rotor for maintaining the arming rotor in said unarmed position until the speed of rotation of the projectile has reached a predetermined value, and a latch member slideably arranged on said arming rotor and adapted to be moved into locking engagement with the casing in response to a sudden shock received thereby for preventing premature arming of the arming rotor.

3. A delay arming and safety mechanism for a projectile comprising a casing, a normally locked arming rotor pivotally mounted on said casing for centrifugally actuated movement from an unarmed to an armed position when released, means including a normally locked spring actuated driving device rotatably supported within said casing for releasing said arming rotor when said driving device has been rotated a predetermined amount, locking means arranged within said casing and movable in response to setback force for releasing said driving device as the projectile is fired from a gun, a driven member operatively connected to said driving device and driven thereby, normally locked escapement means associated with said driven member for regulating the speed of rotation of said driving device to a release position, means pivotally mounted on the casing in engagement with said escapement means for releasing said escapement means as the pivoted means is actuated to a release position in response to centrifugal force, a centrifugally actuated latch member movably arranged in the casing for maintaining the arming rotor in said unarmed position until the speed of rotation of the projectile has reached a predetermined value, a primer disposed within said casing, a lead-in charge arranged within the casing in alignment with and in spaced relation with respect to said primer, a detonator disposed within said arming rotor for providing a continuous explosive train from said detonator to said lead-in charge when the rotor is in said armed position, and means disposed within said rotor and movable into locking engagement with the casing in response to a sudden shock received thereby for preventing movement of the arming rotor to said armed position prematurely.

4. A delay arming and safety mechanism for a projectile comprising a casing, a normally locked arming rotor rotatably supported in said casing for movement from an unarmed to an armed position in response to centrifugal force when released, means including a normally locked spring actuated driving gear rotatably supported within said casing for releasing said arming rotor when said driving gear has been rotated a predetermined amount, means including a spring urged plunger slideably arranged within said casing for releasably locking said driving gear and for releasing said gear for rotation when the

plunger is moved a predetermined amount in response to setback force as the projectile is fired from a gun, an escape wheel rotatably supported within said casing, a pinion secured to said wheel in engagement with said driving gear and driven thereby for rotating said wheel, a normally locked balance member pivotally mounted on said casing, escapement means on said balance member in engagement with said wheel for regulating the same thereby to control the speed of rotation of the driving gear to a release position, a pair of spring urged pawls pivotally mounted on said casing in engagement with said balance member for releasing said balance member as the pawls are moved out of engagement therewith in response to centrifugal force, spring means secured centrally to said balance member and having the free ends thereof secured to said casing for controlling the frequency of said escapement means in response to a variation in centrifugal torque, means including a mass slideably arranged within the casing in locking engagement with said arming rotor and actuated by the speed of rotation of the projectile for maintaining the arming rotor in said unarmed position until said speed of rotation has reached a predetermined value sufficient to cause the mass to be moved out of engagement with said rotor, a latch member slideably arranged on said arming rotor and having a detent formed thereon normally out of engagement with the casing and adapted to be moved into locking engagement therewith in response to a sudden shock received thereby for preventing movement of the arming rotor to said armed position prematurely, a primer disposed within the casing, and a detonator arranged within said arming rotor normally out of alignment with said primer and adapted to be brought into alignment therewith when the arming rotor has been moved to said armed position.

5. A delay arming and safety mechanism for a projectile comprising a casing, a normally locked arming rotor rotatably supported within said casing for movement from an unarmed to an armed position in response to centrifugal force when released, a shaft rotatably supported within said casing and disposed within said arming rotor for locking the arming rotor in said unarmed position until the shaft has been rotated to a released position, a normally locked spring actuated driving gear secured to said shaft for rotating the shaft to said release position, means including a spring urged plunger slideably arranged within said casing for releasably locking said driving gear and for releasing said gear when the plunger is moved a predetermined amount in response to setback force as the projectile is fired from a gun, an escape wheel rotatably supported within said casing, a pinion secured to said wheel in engagement with said driving gear and driven thereby for rotating said wheel, a normally locked balance member pivotally mounted on the casing, escapement means on said balance member in engagement with said wheel for regulating the same thereby to control the speed of rotation of the driving gear and the movement of the shaft to a release position, a pair of spring urged pawls pivotally mounted on said casing in engagement with said balance member for releasing said balance member as the pawls are moved out of engagement therewith in response to centrifugal force, a spring secured centrally to said balance member and having the free ends thereof attached to said casing for controlling the frequency of said escapement means in response to variations in centrifugal torque thereon, a mass slideably arranged within the casing and actuated in response to centrifugal force, a detent formed on said mass in locking engagement with said arming rotor for maintaining the arming rotor in said unarmed position until the mass has been moved a sufficient amount by said force to cause the detent to be disengaged from the arming rotor, a latch member slideably arranged on the arming rotor, a bill on said latch member normally out of engagement with the casing and adapted to be moved into locking engagement therewith when said latch member is moved a predetermined amount in response to a sudden shock received thereby for preventing movement of the arming rotor to said armed position prematurely, a primer disposed within the casing, and a detonator arranged within the arming rotor normally out of alignment with said primer for movement into alignment therewith as the arming rotor is moved to said armed position.

6. A delay arming and safety mechanism for a projectile comprising a casing, a normally locked arming rotor rotatably supported within said casing for movement from an unarmed to an armed position in response to centrifugal force when released, a shaft rotatably supported within said casing, means forming a part of said shaft and disposed within said arming rotor for locking the arming rotor in said unarmed position until the shaft has been rotated a predetermined amount to a released position, a normally locked spring actuated driving gear secured to said shaft for rotating the shaft said predetermined amount to said release position, a detent slideably arranged within said casing for releasably locking the driving gear thereto and adapted to release the driving gear for rotation when the detent is moved a predetermined amount in response to setback force as the projectile is fired from a gun, a spring disposed within the casing in engagement with said detent for maintaining the detent in locking engagement with said driving gear until the projectile is fired from said gun, means including a detent in locking engagement with said arming rotor for maintaining the arming rotor in said unarmed position until the detent has been moved out of engagement with the arming rotor in response to centrifugal force, a latch slideably arranged on the arming rotor, a locking device on said latch normally out of engagement with the casing and adapted to be moved into locking engagement therewith as the latch is moved in response to a sudden shock received thereby for preventing movement of the arming rotor to said armed position prematurely, a primer disposed within the casing, and a detonator arranged within the arming rotor normally out of alignment with said primer for movement into alignment therewith as the arming rotor is moved to said armed position.

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