Nov. 10, 1931. H. M. BRAYTON 1,830,924

MECHANICAL DELAY FUSE FOR DROP BOMBS

Filed Aug. 20, 1924 4 Sheets-Sheet 1

Fig. 1.

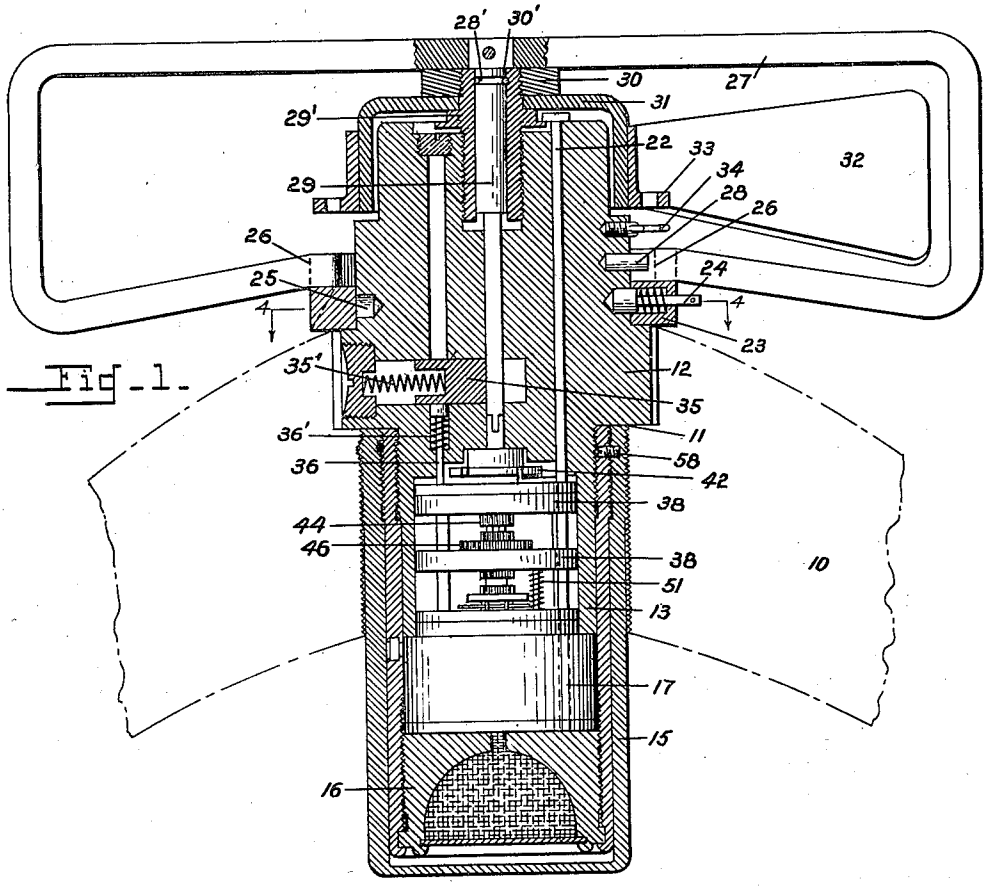
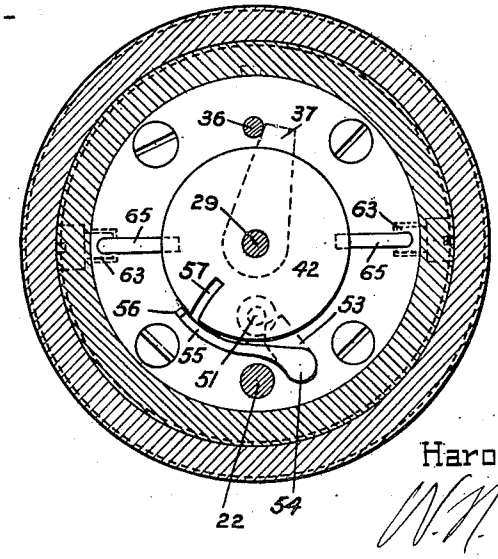


Fig. 5.



INVENTOR
Harold M. Brayton
W. N. Roach.
ATTORNEY

Nov. 10, 1931. H. M. BRAYTON 1,830,924

MECHANICAL DELAY FUSE FOR DROP BOMBS

Filed Aug. 20, 1924 4 Sheets-Sheet 2

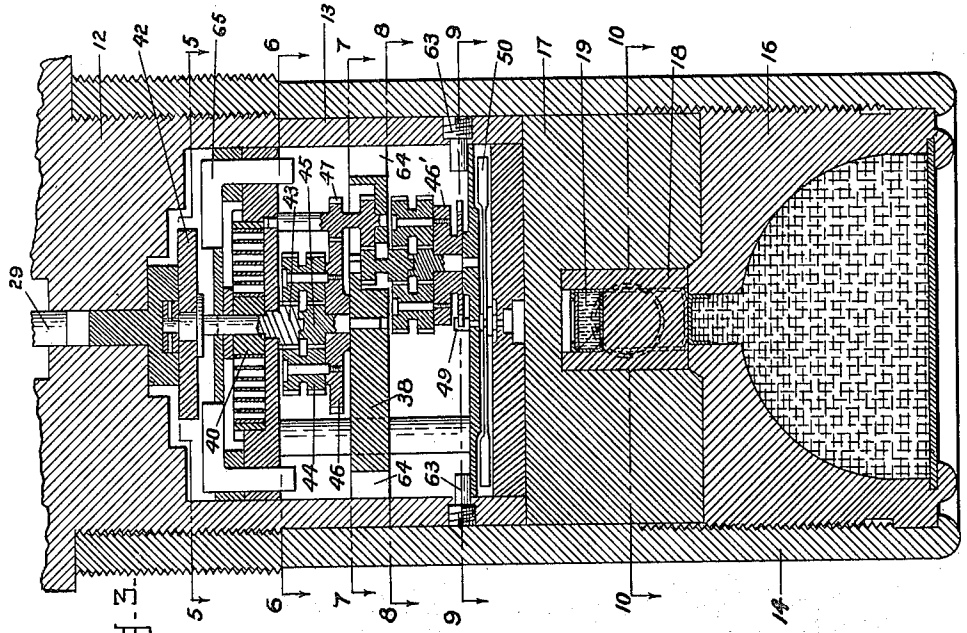


Fig. 2.

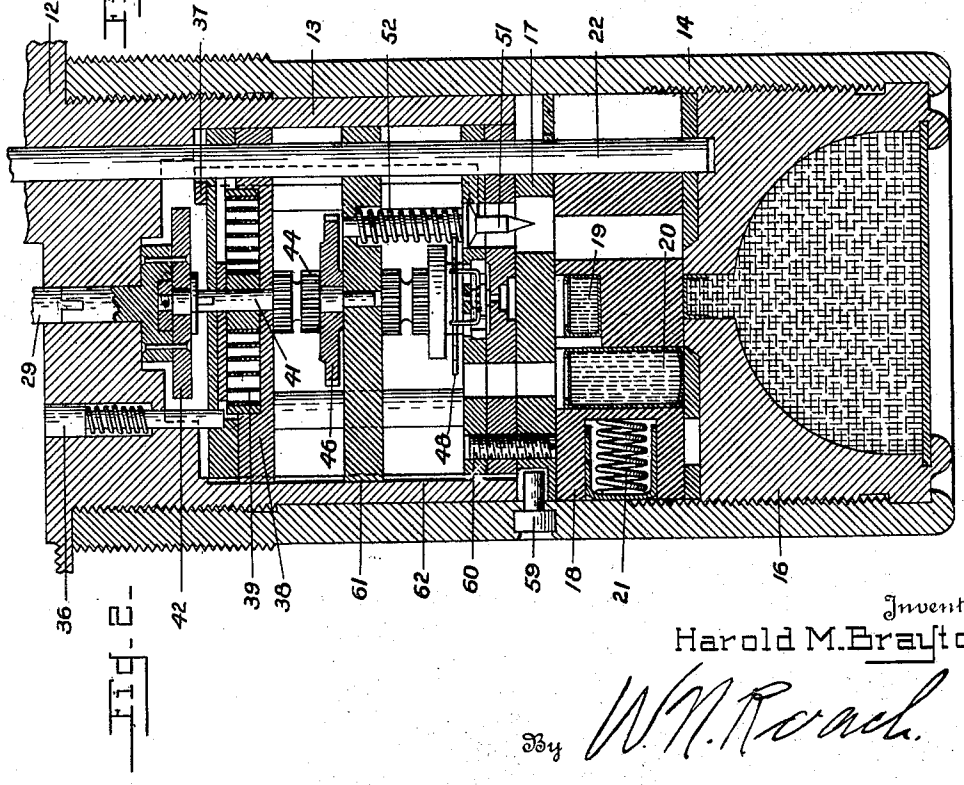


Fig. 2.

Inventor
Harold M. Brayton

By W. W. Roach.

Attorney

Nov. 10, 1931. H. M. BRAYTON 1,830,924

MECHANICAL DELAY FUSE FOR DROP BOMBS

Filed Aug. 20, 1924 4 Sheets-Sheet 3

Fig. 4.

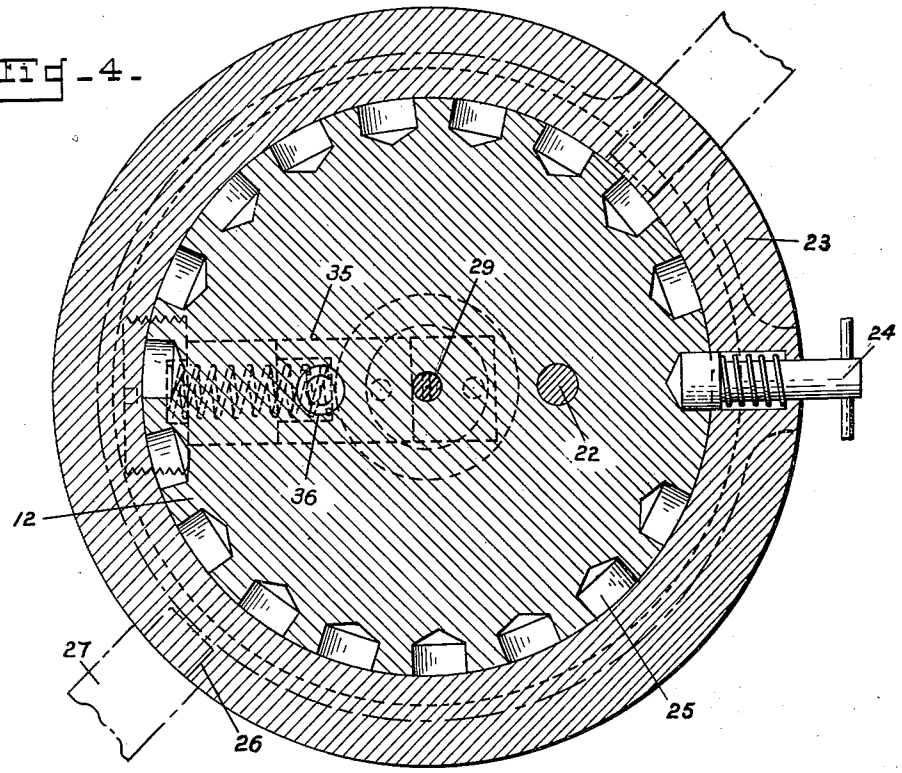
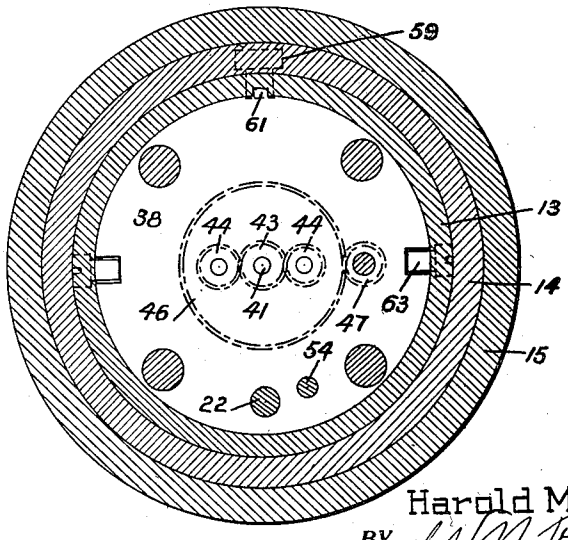


Fig. 6.



INVENTOR
Harold M. Brayton
BY W. M. Roach.
ATTORNEY

Nov. 10, 1931. H. M. BRAYTON 1,830,924

MECHANICAL DELAY FUSE FOR DROP BOMBS

Filed Aug. 20, 1924 4 Sheets-Sheet 4

Fig. 7.

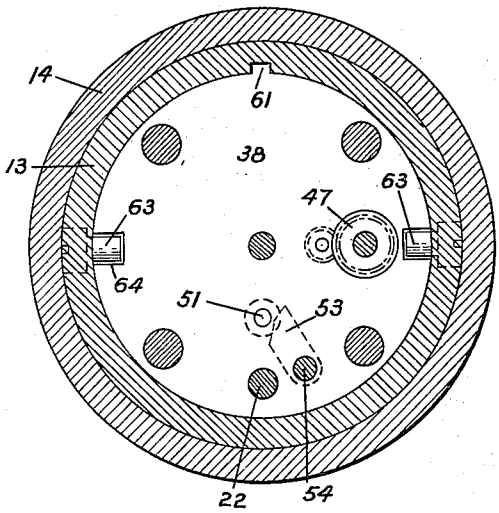


Fig. 8.

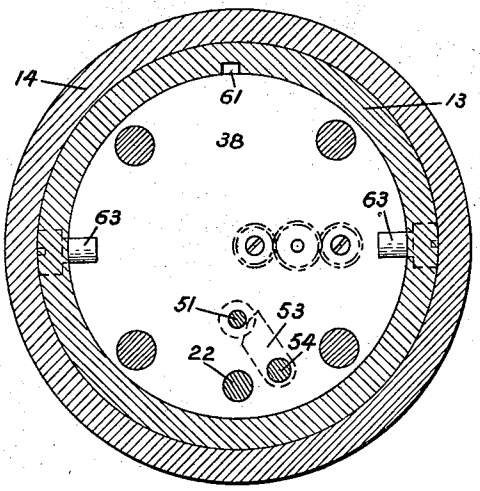


Fig. 9.

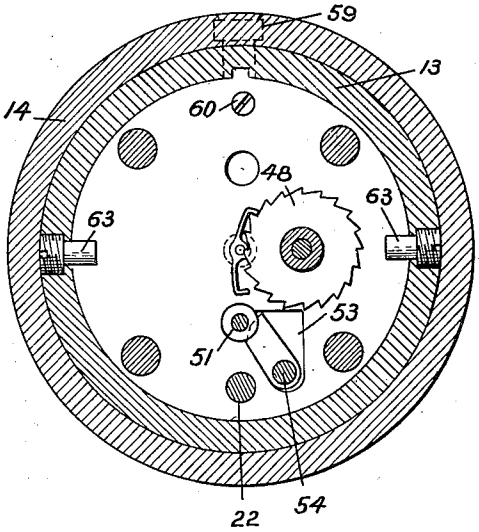
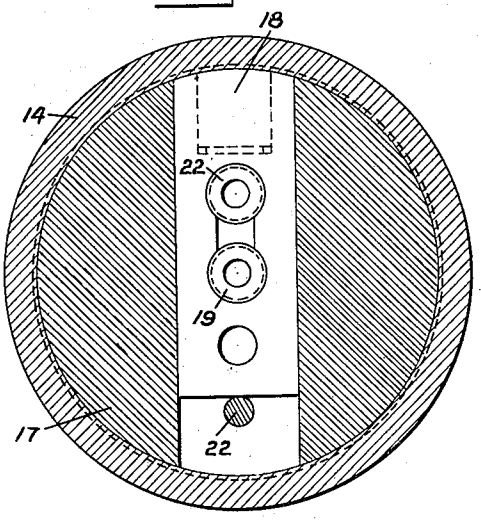


Fig. 10.



INVENTOR
Harold M. Brayton
BY W. N. Roach
ATTORNEY

Patented Nov. 10, 1931

1,830,924

UNITED STATES PATENT OFFICE

HAROLD M. BRAYTON, OF DOVER, NEW JERSEY, ASSIGNOR TO SECRETARY OF WAR OF THE UNITED STATES

MECHANICAL DELAY FUSE FOR DROP BOMBS

Application filed August 20, 1924. Serial No. 733,200.

(GRANTED UNDER THE ACT OF MARCH 3, 1883, AS AMENDED APRIL 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment to me of any royalty thereon.

The subject of this invention is a mechanical delay fuse for drop bombs.

The object of the present invention is the provision of a fuse for drop bombs, which may be set to explode the bomb at any desired time after it has been dropped. Quite naturally, when a bombing plane or squadron passes over a favorable target, the hostile troops in the immediate vicinity will seek shelter, thereby limiting the destructive force of the bomb to the demolition of property and equipment.

The fuse forming the subject of this invention may be set to function hours or days after impact, the exact time for the explosion of the apparently harmless bomb to occur for instance at some hour in the day when it is known that troops are entraining or detraining, or passing along a certain point on a road.

The fuse is so constructed that should the enemy attempt to unscrew it from the bomb for the purpose of rendering the bomb inoperative, immediate detonation of the bomb charge will result.

Safety in transportation and storage is obtained by arranging the starting mechanism and interrupting the explosive train so that the fuse cannot be armed until the bomb has been released from the plane. The setting mechanism may be readily adjusted to the required time after the bomb has been fused and placed in its carrier on the plane. The watch mechanism is placed within the body of the bomb and thus thoroughly protected against damage upon hard surface impact.

The running speed of the watch mechanism is controlled by a plurality of epicyclic gear trains by which it is possible to reduce the number of gears to a minimum.

To these and other ends, my invention consists in the construction, arrangement, and combination of elements, described hereinafter and pointed out in the claims forming a part of this specification.

A practical embodiment of my invention is illustrated in the accompanying drawings, in which,

Fig. 1 is a longitudinal sectional view of a fuse casing showing the timing mechanism in elevation;

Fig. 2 is an enlarged longitudinal sectional view of the timing mechanism;

Fig. 3 is a similar view taken at right angles to Fig. 2;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 1;

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 3; and

Figs. 6 to 10 are sectional views taken on correspondingly marked lines of Fig. 3.

Referring to the drawings by numerals of reference:

In carrying out the invention, the nose or tail of a bomb 10 is formed with a shouldered aperture 11 for the reception of the fuse.

The fuse comprises a cylindrical casing including a flanged head 12 seated in the shouldered aperture 11 and formed with a hollow extension 13 extending to the inside of the bomb. Secured to the head 12 and depending within the bomb is a fuse body 14 in the form of a tubular member which is enclosed in a fuse seat liner or thimble 15, all of said members being in threaded engagement with each other and the thimble threaded to the bomb and thoroughly secured in place to prevent unscrewing.

Stationarily carried in the lowermost end of the body is a booster casing 16 containing a booster charge while confined between the booster casing and the rim of the extension 13 is a cylindrical block 17 (see Fig. 2), in which is transversely mounted a slidable bolt 18 carrying a primer 19 and a detonator 20. The bolt is held in unarmed position against the tension of the spring 21 by means of a releasing rod 22, which extends from the top of the fuse head 12 to the booster casing 16. When in unarmed position, the primer and detonator will respectively be out of line with a firing pin 51 and the booster charge.

Embracing the exterior portion of the fuse head adjacent the bomb 10 is a setting ring 23 (Fig. 1) which carries a spring actuated

locking pin 24, engageable selectively in a plurality of drilled holes 25, spaced apart circumferentially of the head 12. The head is provided with graduations (not shown) corresponding to the holes 25 and representing intervals of time at which the watch mechanism may be set to function in causing an explosion of the bomb. In the construction shown, the fuse is capable of being set by two hour increments up to a miximum time of thirty six hours but the increments and the total may be changed as desired.

The setting ring 23 is L-shaped in cross-section, the upright wall being provided with opposite slots 26 for the reception of the free ends of a setting yoke 27, one of which extends beyond the wall to terminate adjacent the head so that after describing a complete circle, the yoke may be stopped by a pin 28 carried by the head. Rotation of the yoke turns a setting stem 29 disposed axially of the fuse and releasably connected to the setting disc 42.

The setting stem 29 passes through a hollow vane stem 29′, to which is secured by means of a nut 30 a hub 31 carrying a vane or vanes 32. The setting stem is formed with an annular groove 28′ which through a pin 30′ engaging therein and in the vane stem enables the setting stem to move longitudinally of the fuse during unscrewing of the vane stem without partaking of the rotary movement of the vanes. The vane assembly is normally locked to the fuse head by a cotter pin, passing through an ear 33 on the vane and an eye bolt 34 attached to the head.

When the bomb is assembled to the plane, the cotter pin is replaced by the usual safety wire which is associated with the bomb release apparatus and which is automatically removed when the bomb is released. The vane assembly on being free to rotate with respect to the fuse unscrews the vane stem from the head until the vane assembly and with it the yoke and setting stem fall free of the fuse. The vane stem during this movement engages the head of the releasing rod 22 and withdraws it a sufficient distance to permit the bolt 18 to be moved to armed position.

The setting stem on breaking connection with the setting disc enables the starting mechanism to function, by permitting a slider 35 to move laterally in the fuse head under the action of a spring 35′ whereby to free a starting bolt 36 which through its spring 36′ is disengaged from a starting arm 37.

The watch mechanism for the fuse is supported in a frame consisting of a series of suitably spaced plates 38 mounted in the hollow extension 13 of the fuse head and resting on the block 17.

The upper plate is hollowed and provided with a cover for enclosing a main spring 39 adapted when unwinding to rotate a hub 40 rigidly secured to the square-sided portion of a shaft 41, which in turn carries a setting disc 42.

The starting arm 37 of the main spring is held inoperative by the starting bolt 36, which extends through the cover of the upper plate to lie in the path of the starting arm and which releases the starting arm 37 when the slider 35 moves laterally of the fuse head.

The unwinding of the main spring is controlled by an upper and a lower epicyclic train, each of which gives a gear reduction of two hundred and twenty five to one.

The shaft 41 is formed with a pinion 43 for actuating two planet wheels 44 which are in mesh with a stationary base gear 45 rigidly mounted in the intermediate plate of the frame. As the planet gears are translated about the base gear they rotate a gear 46 to which they are secured and which meshes with a twin pinion 47 journaled in the top and intermediate plates and functioning to actuate the lower epicyclic train which is identical in principle with the upper train. The gear 46′ of the lower train is formed with an escapement wheel 48 which transmits its impulse through a pallet 49 to a balance 50 which is enclosed in the lower plate.

A firing pin 51 (see Figs. 2, 5 and 9) disposed in apertures in the intermediate and lower plates of the frame is embraced by a spring 52 which is held compressed by a cam plate 53 rigidly secured to the lower end of a shaft 54 which passes through the frame. The upper end of the shaft carries a curved arm 55 formed at its free end with an upstanding lug 56 which under the action of the firing pin spring and the cam 53 is constantly forced against the periphery of the setting disc 42 (as seen in Figs. 1 and 5). The setting disc 42, which makes one complete revolution in thirty six hours, is formed with a radial slot 57 which will be positioned opposite the lug 56 at the expiration of the time for which the fuse is set. When in this position, the firing pin spring which is constantly acting through the firing pin on the cam 53 will displace the cam with a resultant partial rotation of the shaft 54 and the lug 56 will snap into the slot 57, the firing pin being thereby released to prime the primer.

In order that the enemy may not be able to remove the fuse from the bomb after it has been dropped and before it has exploded, there is provided a mechanism which upon unscrewing of the fuse will immediately detonate the bomb charge.

The thimble 15 being thoroughly stabbed to the bomb and the fuse body being pinned to the thimble as at 58, only the fuse head 12 will be free to be unscrewed. However, the watch mechanism and its frame will be prevented from lifting with the head by reason

of a lateral pin 59 and a longitudinal pin 60, while constrained to rotate with the head by reason of the ribs 61 formed on the frame (see Figs. 2, 6, 7, 8, and 9) and engaging in a groove 62 in the extension 13 of the fuse head. The ribs also serve to guide stud pins 63 carried by the head through a slot 64 formed in the intermediate plate and into contact with L-shaped arms 65 movable longitudinally in the top plate of the frame.

The arms 65 are positioned with one branch extending underneath the setting disc 42 so that when lifted by the stud pins 63 they will also raise the setting disc. When the setting disc has been raised a distance equal to the vertical lug 56 on the arm 55, the firing pin spring will dislodge the cam 53 from the firing pin which will then be free to prime the primer.

During transportation and storage the fuse will be incapable of functioning by reason of the releasing rod 22, holding the primer 19 out of line with the firing pin 51 and also because the starting bolt 36 is securely held by the slider 35.

To set the fuse, the locking pin 24 is disengaged from the ring 23 and the yoke turned until the ring indicates the desired time on the graduated fuse head. As the yoke 27 is turned it rotates the setting disc 42 to position the radial slot 57 in said disc in proper relation to the lug 56 on the curved arm 55. The locking pin on being released engages one of the holes in the fuse head to prevent further rotation of the yoke and setting disc.

When released from the plane, the resulting rush of air sets the vanes in motion to unscrew the vane stem 29′ from the fuse. The vane assembly when falling free carries with it the setting stem 29, permitting movement of the slider 35 to free the starting bolt 36 and starting arm 37 and also withdrawing the releasing rod 22 so that the bolt 18 may line up the primer 19 with the firing pin and the detonator 20 with the booster.

The firing pin is held cocked until the radial slot 57 of the setting disc 42, at the end of a proper interval, is in position to permit the firing pin, through the action of its spring, to actuate the cam 53 when the firing pin is free to prime the primer.

While in the foregoing there has been illustrated and described such combination and arrangement of elements as constitute the preferred mebodiment of my invention, it is nevertheless desired to emphasize the fact that interpretation of the invention should only be conclusive when made in the light of the subjoined claims.

I claim:

1. A mechanical time fuse for bombs including a fuse head formed with a hollow extension, a tubular body secured to the extension, a booster casing secured to the innermost end of the body, a cylindrical block interposed between the booster casing and the rim of the extension, a bolt slidable transversely in the cylindrical block, a primer and detonator in said bolt, a frame disposed in the hollow extension, a watch mechanism carried by said frame, means for setting the watch mechanism, means for holding said mechanism inoperative, means for holding the bolt in unarmed position, and means operable during flight for releasing the watch mechanism and the bolt to functioning position.

2. A mechanical time fuse for bombs including a fuse head formed with a hollow extension, a tubular body secured to the extension, a booster casing secured to the innermost end of the body, a cylindrical block supported by the booster casing, a bolt slidable transversely in said cylindrical block, a primer in said bolt, means for releasably holding the bolt in unarmed position, a frame disposed in the hollow extension, a watch mechanism carried by said frame, and means for releasably holding the watch mechanism inoperative until the bomb is in flight.

3. A mechanical time fuse including a casing, a watch mechanism in the casing, a setting disc adapted to be rotated by said mechanism, a firing pin, means associated with the setting disc for releasably holding the firing pin in cocked position, a stem for setting the disc, a starting rod for normally holding the watch mechanism inoperative, a slider restrained by the setting stem for preventing release of the starting rod, a bolt movable transversely of the fuse, a primer and detonator carried by the bolt, a release rod for normally holding the bolt in unarmed position, and means operable during flight for releasing the slider to inoperative position and the bolt to armed position.

4. A mechanical time fuse including a casing, a watch mechanism in the casing, a setting disc adapted to be rotated by said mechanism, a firing pin, means associated with the setting disc for releasably holding the firing pin in cocked position, means for holding the watch mechanism inoperative, a bolt movable transversely of the fuse, a primer carried by the bolt, a release rod for normally holding the bolt in unarmed position, and means operable during flight for permitting the watch mechanism to function and the bolt to move to armed position.

5. A mechanical time fuse including a casing, a watch mechanism in the casing, a setting disc adapted to be rotated by said mechanism, a firing pin, means associated with the setting disc for releasably holding the firing pin in cocked position, a stem for setting the disc, a starting rod for normally holding the watch mechanism inoperative, a slider for preventing release of the starting rod, an element of an interrupted explosive train normally out of line with the firing pin, and

means operable during flight for releasing the slider to inoperative position and the explosive train to armed position.

6. A mechanical time fuse including a casing, a watch mechanism in the casing, a setting disc adapted to be rotated by said mechanism, a firing pin, means associated with the setting disc for releasably holding the firing pin in cocked position, means for holding the watch mechanism inoperative, an element of an interrupted explosive train normally out of line with the firing pin, and means operable during flight to release the watch mechanism holding means and to release the element of the explosive train to move to armed position.

7. A mechanical time fuse including a watch mechanism, a firing mechanism, a member for holding the watch mechanism inoperative associated therewith an element holding the firing mechanism unarmed, and means operable during flight to release the watch mechanism holding means and the firing mechanism holding element.

8. A mechanical time fuse including a casing, a watch mechanism in the casing, a starting arm for said mechanism, a rod engaging said arm for holding it against movement, a slider movable transversely in the casing for normally preventing disengagement of the rod, means for setting the watch mechanism, said means adapted to control the slider and means operable during flight for withdrawing the setting means to permit functioning of the watch mechanism.

9. A mechanical time fuse including a casing, a watch mechanism carried in the casing, a starting arm for said mechanism, a stem for setting the watch mechanism, said stem including means whereby it is withdrawn from the fuse during flight, and means controlled by the setting stem for releasably holding the starting arm.

10. A mechanical time fuse including a casing, a watch mechanism carried in the casing, means including a setting stem for normally holding the watch mechanism inoperative, and means rotated during flight to move the stem to release the watch mechanism.

11. A mechanical time fuse including a fuse head, a ring embracing the exterior portion of the head, a yoke engaging said ring, a setting disc, a stem connecting the disc and yoke whereby they may be rotated in unison independently of the fuse head, manually operable means carried by the ring for selectively locking the yoke in set position with respect to the head, a pin carried by the head for limiting movement of the yoke to one revolution, and means operable during flight for dislodging the yoke and stem from the fuse.

12. A mechanical time fuse including a fuse head, a ring embracing the exterior portion of the head, a setting disc, means associated with the ring for rotating the disc independently of the head, manually operable means carried by the ring for selectively locking the rotating means in set position with respect to the head, means for limiting said rotating means to one revolution, and means operable during flight for breaking connection between the setting disc and rotating means.

13. A mechanical time fuse including a fuse head, a setting disc within the fuse, means rotatable about the head for moving the disc to set position, means for selectively locking the rotating means in set position with respect to the head, and means operable during flight for breaking connection between the setting disc and the rotatable means.

14. A mechanical time fuse including a fuse head, a setting disc within the fuse, means rotatable about the head for moving the disc to set position, and means for selectively locking the rotating means in set position with respect to the head.

15. A mechanical time fuse including a head, a yoke rotatable about the head, a setting stem rotatable with the yoke, a hollow vane stem embracing the setting stem and threaded into the head, means operable during flight for unscrewing the vane stem from the head, and a connection between the vane stem and setting stem whereby the setting stem and yoke will be withdrawn from the head during the unscrewing of the vane stem.

16. A mechanical time fuse for projectiles including a body rigidly secured to the projectile, a head threaded within the body and freely unscrewable therefrom, a frame disposed in the head, said frame connected to the rigid body but freely rotatable with the head, a watch mechanism carried by the frame, a setting disc rotatable therewith, a firing pin, a connection between the disc and firing pin for holding the firing pin in cocked position, a pair of L-shaped arms supported by the frame and extending underneath the setting disc, and pins carried by the head and adapted on unscrewing of the head to lift the arms, and the setting disc whereby to release the firing pin.

17. A fuse for projectiles including a body rigidly secured to the projectile, a head threaded within the body, and freely unscrewable therefrom, a frame disposed in the head, said frame connected to the rigid body but freely rotatable with the head, a watch mechanism carried by the frame, a firing pin associated with the watch mechanism and adapted normally to be released after a predetermined interval of time, and means operable on unscrewing of the head for immediately releasing the firing pin.

18. A mechanical time fuse for projectiles, including a body rigidly secured to the pro-

jectile, a head threaded within the body and freely unscrewable therefrom, a frame disposed in the head, said frame connected to the rigid body but freely rotatable with the head, a watch mechanism carried by the frame, a setting disc rotatable with said mechanism and normally adapted after a predetermined interval of time to release a firing mechanism, and means operable on unscrewing of the head to move the setting disc longitudinally of the fuse to immediately release the firing mechanism.

19. A mechanical time fuse for projectiles including a body rigidly secured to the projectile, a head threaded within the body and freely unscrewable therefrom, a frame disposed in the head, said frame connected to the rigid body but freely rotatable with the head, and means operable on unscrewing the head for disorganizing a delay time mechanism to provide for immediate detonation.

20. A mechanical time fuse embodying a gear train, means for normally locking the gear train against movement, in normally unarmed explosive train, means for setting the gear train automatically released during flight to release the gear train locking means and the explosive train to armed position, and means actuated by the time train to initiate detonation of the explosive train.

HAROLD M. BRAYTON.