Dec. 10, 1946. R. W. BRITTON 2,412,387

AERIAL MINE

Filed Dec. 2, 1941 2 Sheets-Sheet 1

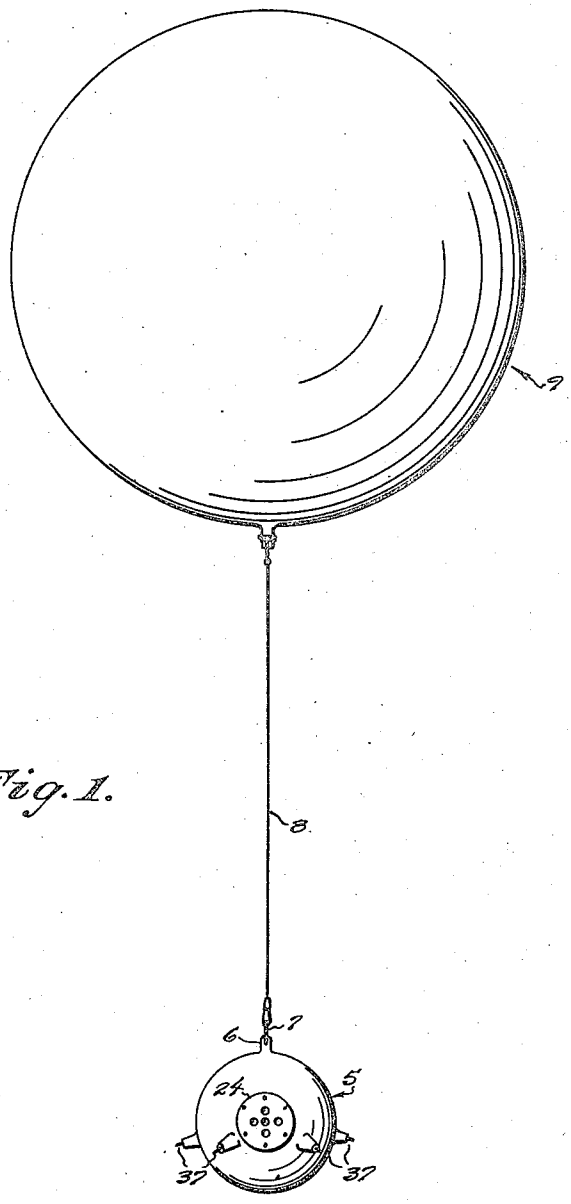


Fig. 1.

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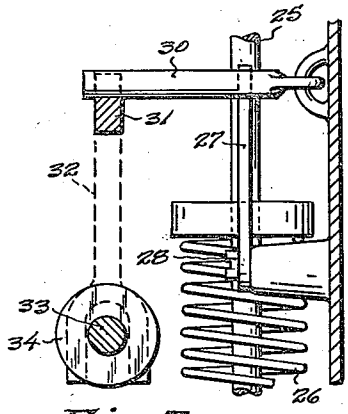


Fig. 3.

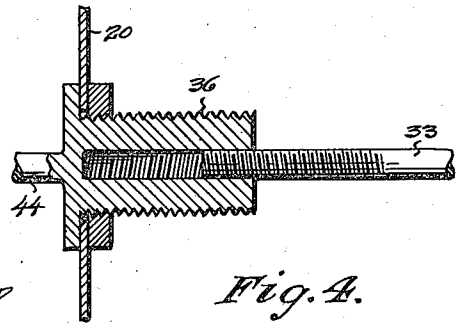


Fig. 4.

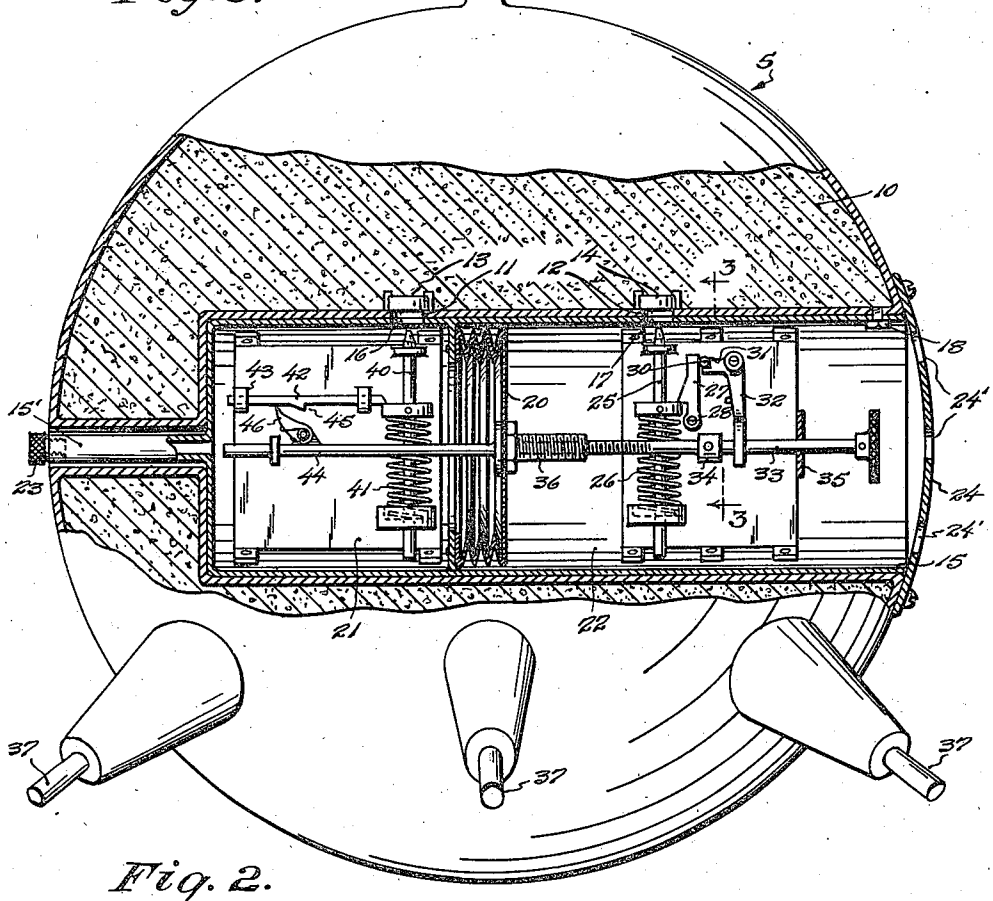


Fig. 2.

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UNITED STATES PATENT OFFICE

2,412,387

AERIAL MINE

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4 Claims. (Cl. 102—9)

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This invention relates to the art of aerial defense, and for its general object aims to provide a balloon-carried bomb device capable of being sent aloft either by civilian or military ground crews into the path of an attacking wave of hostile planes.

It is a more particular object of the invention to provide an aerial mine of this nature capable of being exploded automatically in response to the rise of the mine to a predetermined and selectively variable height.

It is a still further and particular object to provide an aerial mine in which the bomb charge is exploded by the force of impact of an attacking plane.

It is a still further object of the invention, looking to the safety of the ground forces, to provide means for exploding the bomb charge in the event of the mine losing altitude as a result of the escape of gas from the supporting balloon.

Other objects and advantages, with the foregoing, will become apparent in the course of the following detailed description and claims, the invention consisting in the novel construction and in the adaptation and combination of parts hereinafter described and claimed.

In the drawings:

Figure 1 is an elevational view representing the now preferred embodiment of the invention as the same appears in the air.

Fig. 2 is a view taken to an enlarged scale and illustrating the bomb device partly in elevation and partly in longitudinal vertical section, the supporting balloon being deleted.

Fig. 3 is a fragmentary transverse vertical section taken to a scale enlarged from that of Fig. 2 and on line 3—3 of the latter to detail the pressure-controlled trip mechanism for exploding the bomb charge; and

Fig. 4 is a fragmentary longitudinal vertical section detailing the adjustment arrangement by means of which I am enabled to set the bomb for effecting an operation of the trip mechanism at a selected height.

Referring to said drawings, the bomb proper is denoted generally by the numeral 5 and has in its periphery a hanger-lug 6 fitted with a ring 7 through which is received a suspension cable 8 from a balloon 9, the balloon having a governed displacement sufficient to elevate the suspended bomb to a height necessary for the interception of attacking planes.

The bomb part of the mine is or may be of a spherical form carrying a suitable explosive load 10, and is provided centrally with a cylindrical

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chamber occupying a diametrical position and which is open at one end and at the other end is exposed to the atmosphere by an axial duct, and in the wall of said chamber at longitudinally spaced intervals are openings 11 and 12 over which are applied percussion caps 13 and 14 functional to the explosives 10. Removably fitted in said bomb chamber is a shell or casing member 15, and formed in the wall of this casing are openings 16 and 17 spaced in correspondence with the openings 11 and 12 and held in registration with the latter by a set screw 18. Between the registering openings—which is to say the openings 11—16 and the openings 12—17—the casing is divided longitudinally by a diaphragm 20 to define separated cells at opposite ends thereof. Designated by 21, the inner of such cells is supplied with air through a neck extension 15' on which is fitted a knurled cap 23 for trapping the admitted air at ground-level pressure. The other or outer cell is designated by 22 and is of a variable-pressure nature in that the same is closed only by a protective cover 24 vented as at 24'.

In such latter or variable-pressure cell 22 is a spring-loaded firing pin 25 functional to the percussion cap 14 and arranged to explode the latter automatically in response to a rise of the aerial mine to a predetermined height. The spring for the pin is denoted by 26, and as a means for normally holding such spring under compression I employ a catch 27 fulcrumed as at 28 and held in forward latching position by a hinged finger 30 abutting the back wall of the catch at the free end of the latter. Detailed in Fig. 3, it will be seen that said finger is set by lodging its free end in the notched extremity of one arm 31 of a bell-crank, and the other arm 32 of the bell-crank serves as a trigger and is forked to straddle a stem 33 having thereon a tripping collar 34. Said stem, which is attached to the diaphragm, finds a slide bearing in a cross-piece 35, and for adjustment purposes has its root end threaded to work in the threaded bore of a hub attachment 36 of the diaphragm.

It is believed to be clear from the foregoing that the expansion of the trapped air within the cell 21 caused by a lessening of the air pressure within the exposed cell 22 as the balloon-carried mine rises to a higher altitude causes the shifting collar 34 to trip the trigger arm 32 and fire the percussion cap 14 coincident with the arrival of the bomb at a height predeterminately governed by the adjustment of the stem 33. It will of course be understood that such automatic detonating system may be rendered inoperative

through the instrumentality of threading the stem into the attachment 36 to the forward limit of its adjustment, in order thereby to locate the collar 34 such that its travel upon reaching the balloon's ceiling level will be short of contact with the trigger arm 32. The end object of so fixing the parts is to permit the bombs to be sent aloft in advance of the arrival overhead of an attacking wave of hostile planes, in consequence laying a field of aerial mines which, in their release, are regulated as to buoyancy characteristic of the balloons to have the mines occupy aerial levels within which the attacking planes will be expected to operate. Employed in this manner it is obvious that the pressure-differential method of firing the bomb charges is not applicable, and that detonation must be accomplished either by contact of the enemy plane with the bomb, or by other suitable means of control. I have illustrated the bombs as having contact-detonating spine processes 37 formed thereon, and it would seem as an adjunct to or in lieu of such detonating spines that radio waves might be advantageously employed to actuate receiving sets carried by the aerial mines or, as another form of control, that the mines be equipped with a clock mechanism functioning to detonate the bomb charges upon the expiration of a predetermined time interval. While not illustrated in the drawings, it may be further mentioned that the efficiency of the mine from the standpoint of direct-contact firing would be augmented by having the suspension ring 7 bear against a detonating trigger normally held in inoperative position by a spring arranged to be overpowered by the force of a sudden tug upon the suspension cable 8, such for example as would occur upon contact of a plane with the balloon 9 as distinguished from the suspended bomb.

To here bring out the import of the provision for exploding the aerial mine automatically in response to the latter's rise to an adjustable predetermined height, appreciation must be had of the technique of mass bombing as it is now carried out. The procedure, on the part of the attacking force, is to send waves of heavy bombing planes over the target and, customarily, to have these said planes travel a level path at a given altitude for some period of time prior to the actual release of the bomb load, the purpose of this level flight being to facilitate a sighting of the target by the plane's bombardier. In using the present invention as a defense against this said level-bombing attack, it is only necessary that the ground forces be enabled to determine the altitude of the approaching enemy planes—and this information can be accurately transmitted from a high-altitude observation plane as well as by cross-checking ground instruments—and a multiplicity of the described aerial bombs are then released, having been first set to the determined altitude for their explosion action. Given a large-scale bombing attack by enemy planes, it is, moreover, quite feasible to release a score of the aerial bombs set for one altitude, another score for another altitude, and still other scores of aerial bombs for still another altitude or altitudes, creating a barrier of exploding bombs substantially blanketing a given range of altitude lying in the path of the bombing planes. It is not intended or necessarily expected that more than a few of the exploding aerial bombs will destroy attacking planes by direct contact, but the flying shrapnel becomes

a distinct weapon separate and apart from the concussive force, and is especially effective against enemy personnel. Used either alone or in conjunction with anti-aircraft fire of ground guns, losses of enemy planes can be expected to be quite high with casualties much more severe than has been heretofore experienced, and sufficient in fact to perhaps largely eliminate "level-run" bombing as an effective medium of attack, losses considered.

Describing now the structure which is employed for exploding the bomb charge automatically upon a loss of altitude, there is provided within the constant-pressure cell 21 a spring-loaded firing pin 40 functional to the percussion cap 13 and having its spring 41 held under compression by the lip of a bar 42 slidable longitudinally in bearings 43. The bar lies in paralleling relation to a stem 44 which projects axially of the cell from the rear face of the diaphragm, and formed on the bar is a ratchet tooth 45. Carried by the stem in complement to the ratchet tooth is a pawl 46, the arrangement being one in which the pawl tracks freely over the tooth in the expanding forward travel of the diaphragm but abuts the ratchet face to retract the bar and release the firing pin 40 in response to a contractive return travel of the diaphragm.

The invention and the manner of its usage is believed to be apparent from the foregoing detailed description of the illustrated embodiment. It is my intention that all forms of construction and variation in detail coming within the scope of the hereto annexed claims are to be considered as comprehended by the invention.

What I claim is:

1. In an aerial mine, and in combination with a balloon adapted to be released at ground level: a bomb carried by the balloon containing an explosive charge and providing mechanism operatively associated with the charge for exploding the latter, said mechanism comprising a normally inactive firing pin supported in functional relation to the charge, a spring applied as a powering load for the firing pin, displaceable locking means for releasably holding said spring under a compression set, means normally inactive to but movable into engagement with said locking means for displacing the latter from its spring-holding position, and means governed by atmospheric pressure and made responsive to a rise of the balloon-suspended bomb to a predetermined height for causing the last-named means to act upon the locking means and displace the same from its spring-holding position.

2. In an aerial mine: the combination of a balloon adapted to be released at ground level; and a bomb carried thereby containing an explosive charge and providing mechanism for firing said charge, said firing mechanism comprising a firing pin supported in functional relation to the charge, a spring for powering said pin to fire the charge, displaceable locking means arranged to engage said spring and releasably hold the same in a loaded condition, means normally inactive to but movable into engagement with said locking means for displacing the latter from its spring-holding position, and devices operatively associated with said locking means and made responsive upon a rise of the balloon-carried bomb to a predetermined height above its point of release to displace said locking means from its said spring-holding position and permit the spring to assert its power in energizing the firing pin.

3. Structure according to claim 2 in which there is provided a second firing mechanism functional to the charge and acting to explode the latter in the event of the bomb rising to a given height short of the elevation required to operate the first-named firing mechanism and then descending a distance less than the extent of rise.

4. In an areial mine, and in combination with a balloon adapted to be released at ground level: a bomb suspended from the balloon and containing an explosive charge; bomb-carried means functional to said charge and made responsive to changing atmospheric pressures for exploding said charge upon a rise of the balloon-carried bomb to a predetermined height assumed to place the bomb in the flight path of enemy planes; and bomb-carried means also functional to said charge and made responsive to changing atmospheric pressures for exploding said charge at a lower level below said assumed flight path but elevated a predetermined distance above the ground point of release, said last-named means being made active only by a descending movement of the bomb from a height above the explosive level last mentioned.

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