Aug. 24, 1943. F. E. FIRING 2,327,414

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Filed Oct. 15, 1938 3 Sheets-Sheet 1

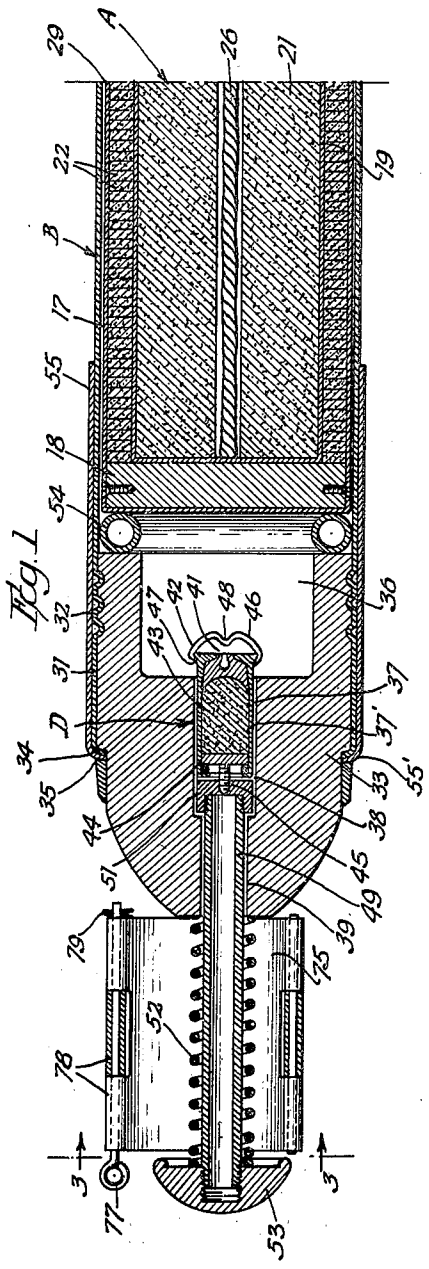


Fig. 1

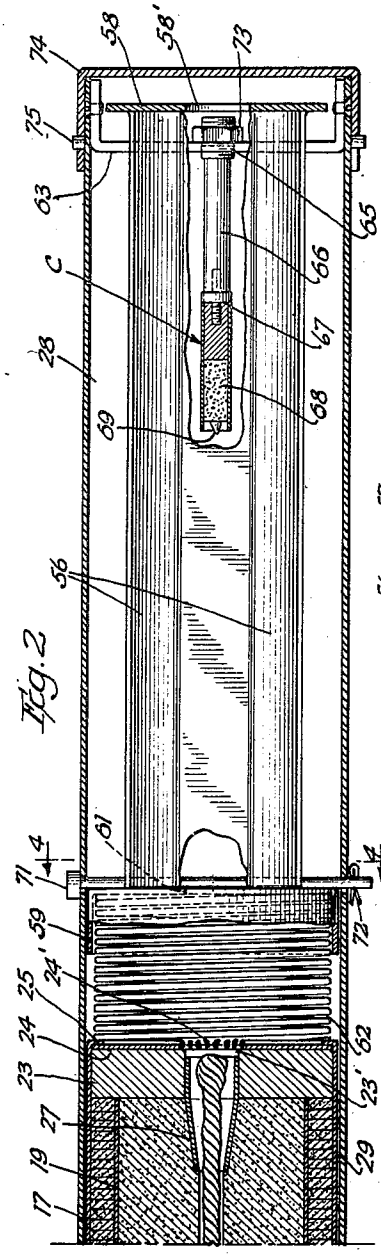


Fig. 2

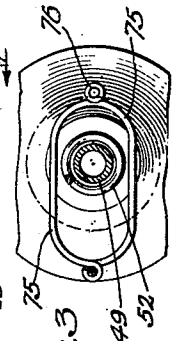


Fig. 3

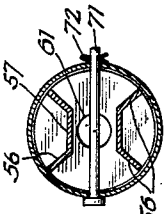


Fig. 4

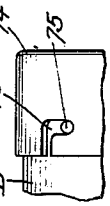


Fig. 5

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Fig. 6

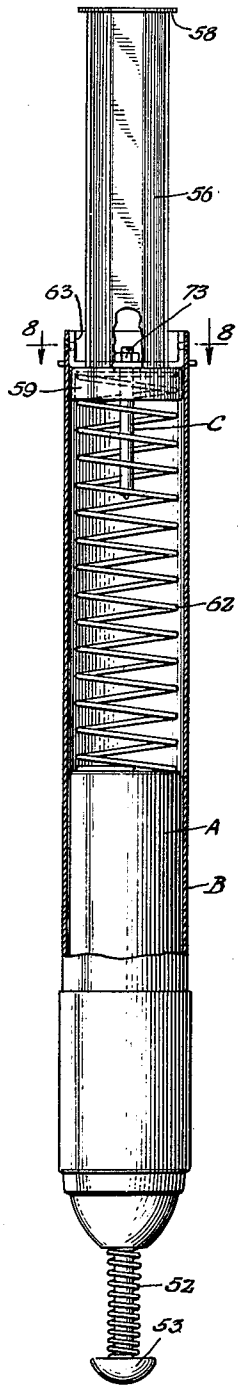


Fig. 7

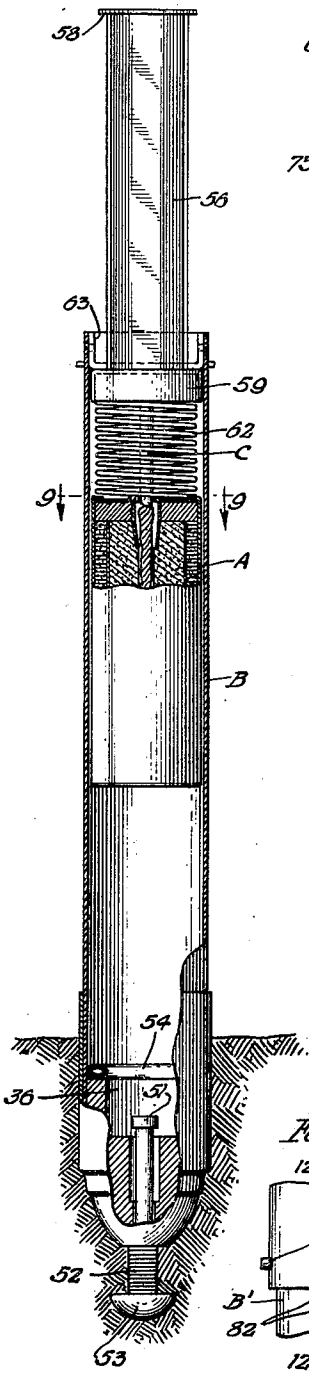


Fig. 8

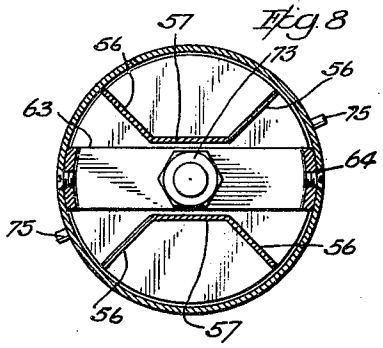


Fig. 9

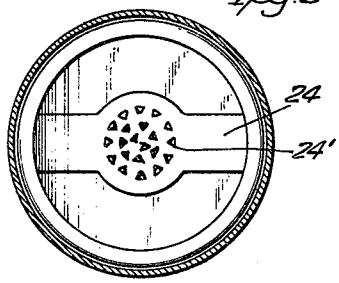


Fig. 10

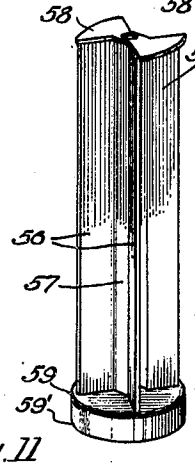


Fig. 12

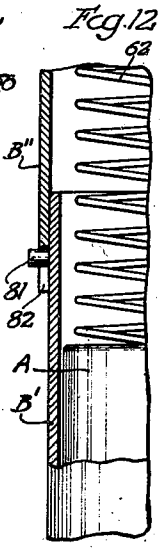
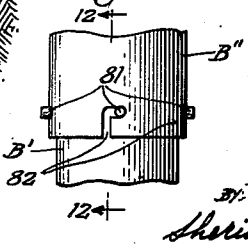


Fig. 11



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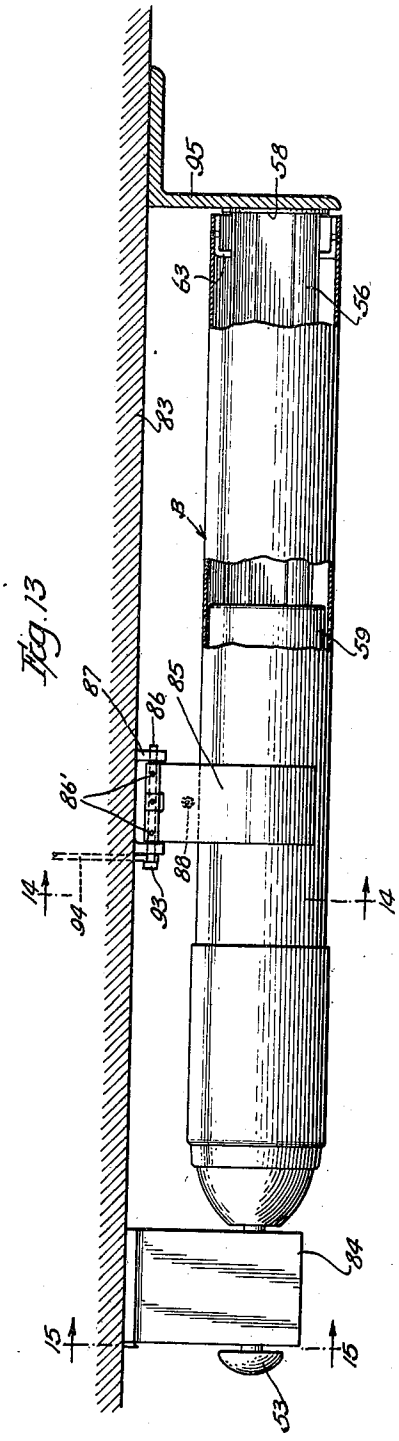


Fig. 13

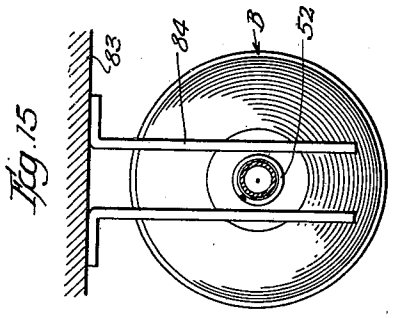


Fig. 15

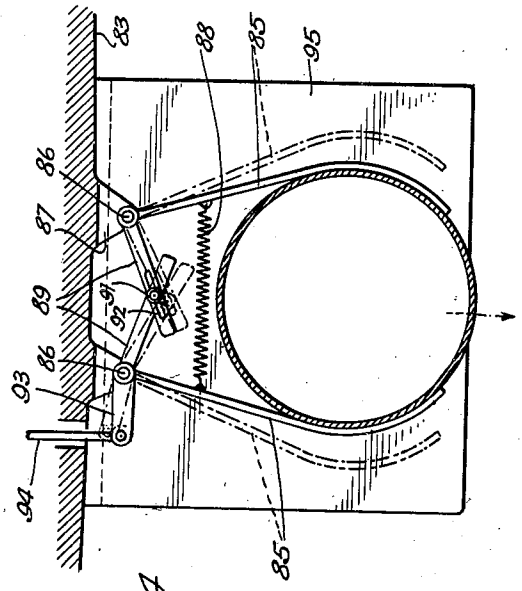


Fig. 14

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Patented Aug. 24, 1943 2,327,414

UNITED STATES PATENT OFFICE

2,327,414

BOMB

Fritz E. Firing, Chicago, Ill., assignor to Munitions, Incorporated, Chicago, Ill., a corporation of Illinois

Application October 15, 1938, Serial No. 235,135

6 Claims. (Cl. 102—2)

This invention relates to bombs and has for a general object the provision of an aero-infantry bomb adapted to cover a greater area and to cover that area more effectively than is possible with known aero-infantry bombs.

Another object of the invention is the provision of an aero-infantry bomb which upon impact is propelled upwardly so that thereafter the force of explosion is dispersed laterally at an effective elevation.

A further object of the invention is the provision of bomb-guiding means for aero-infantry bombs which is normally, during storage and suspension, concealed and protected and which, when released from its suspending rack, is automatically moved outwardly into guiding position whereby to direct the forward or impact end of the bomb downwardly.

Another object of the invention is the provision in an aero-infantry bomb of means for separating or spacing the main explosion charge or bomb proper from its detonator or igniter during storage, suspension and the fall through the air of the bomb whereby to minimize the danger of explosion during storage and suspension and render the bomb safer and to minimize ineffective explosions such as those occurring before impact.

The invention has as another object the provision in an aero-infantry bomb of bomb-guiding means for separating and spacing the main explosion charge or bomb proper from its detonator or igniter during storage and suspension of the bomb, the bomb-guiding means being automatically movable from its separating position into bomb-guiding position upon release of the bomb from its suspension rack.

A further object of the invention is the provision of a bomb housing of tubular construction for slidably receiving therein the main charge or bomb proper in spaced relation with its detonator or igniter and for carrying a propelling charge dischargeable upon impact for bringing the main explosion charge or bomb proper and its detonator or igniter into cooperative relationship.

Included among the other objects of the invention are to provide an aero-infantry bomb which is of simple construction, which can be manufactured economically and which can be manufactured, stored and transported with a maximum of safety; to provide such a bomb that can be assembled with the main charge or bomb proper in its housing at any time before or after it is brought to the place of use; to provide various safety devices which may be removed after the bombs are suspended in the aeroplane racks and thereafter replaced to permit removal of the bombs from the aeroplane racks, if not used, with a minimum of danger in so handling them; and to provide the novel elements and combinations hereinafter disclosed and claimed and as illustrated in the accompanying drawings, wherein:

Fig. 1 is a longitudinal cross section of the forward or nose end, and Fig. 2 is a similar section of the rear end of a loaded aero-infantry bomb embodying the features of the invention;

Fig. 3 is a fragmentary cross section taken substantially along the lines 3—3 of Fig. 1 and shows an end view of a removable safety member for preventing discharge of the propelling charge during transportation and storage of the loaded bomb;

Fig. 4 is a cross sectional view taken substantially along the lines 4—4 of Fig. 2 on a smaller scale and shows a safety device for maintaining the main explosion charge or bomb proper in spaced relation with its detonator or igniter;

Fig. 5 is a side view of a portion of the rear end of the bomb housing showing the removable closure member and the means for removably holding it in place;

Fig. 6 is an upright view partially in section showing the parts of my novel bomb in their relative positions during descent;

Fig. 7 is an upright view partially in cross section showing the parts of my novel bomb in their relative positions immediately after impact;

Fig. 8 is a cross sectional view of the novel bomb taken substantially along the lines 8—8 of Fig. 6 and at a different scale;

Fig. 9 is a cross sectional view of the novel bomb taken substantially along the lines 9—9 of Fig. 7 and at a different scale;

Fig. 10 is a top perspective view of one form of novel bomb-guiding means suitable for use in the bomb illustrated in the preceding figures;

Fig. 11 is a fragmentary view showing a two-part housing as a possible modification of the housing shown in the preceding figures with means for releasably locking the two parts of the housing together;

Fig. 12 is a cross sectional view taken substantially along the lines 12—12 of Fig. 11 and drawn at a different scale;

Fig. 13 is a more or less diagrammatic view partially in cross section illustrative of the means for releasably suspending the novel bomb from an aeroplane;

Fig. 14 is a cross section taken substantially along the lines 14—14 of Fig. 13; and

Fig. 15 is a cross section taken substantially along the lines 15—15 of Fig. 13.

Illustrative of the invention, the drawings show a main charge or bomb proper A of the well known shrapnel type arranged in a suitable casing B between its detonator or igniter C in the rear end of the casing B and a propelling charge or bomb D in the forward or nose end of the casing B. Although the invention is not limited to the shrapnel type of bomb proper and although that bomb A itself forms no part of the present invention, it might be well here to point out by way of explanation that the illustrated shrapnel type of bomb proper comprises a suitable canister 17 made of metal and carrying a spacer 18 of wood secured therein at one end thereof by screws or other suitable securing means as shown in Fig. 1. Adjacent the spacer 18 within the canister 17 is a metal container 19 of smaller external diameter than the internal diameter of the canister for carrying a charge of high explosive 21 and for providing a space between the peripheral walls of the canister 17 and the container 19 to accommodate shrapnel slugs or pellets 22 which are usually embedded in rosin or other suitable compound for holding them in place. The end of the canister 17 opposite the spacer 18 is closed by a wooden spacer 23 adjacent the end of the container 19 and a metal disc or plate 24 held in place by an internal flange 25 provided usually by forming the end of the peripheral canister wall inwardly as shown best in Fig. 2. The explosive charge 21 has embedded therein a suitable fuse or primer cord 26 which extends throughout the length of the charge of explosive and which has its rear end in a metal tube 27 that is fitted at one end in an aperture 23' in the spacer 23 with its other end extending outside thereof and into the charge of explosive as shown in Fig. 2. The aperture 23' registers with a plurality of perforations or indentations 24' formed in the disc 24 to facilitate igniting the fuse or primer cord 26 from outside of the main charge or bomb proper.

The casing B comprises a tubular member or, as shown in Figs. 11 and 12, tubular members B' and B'' of metal and of sufficient length to provide a compartment or chamber 28 carrying the detonator or igniter C, a compartment or chamber 29 for carrying the main charge or bomb proper A in spaced relation with its detonator or igniter C, and a compartment or chamber 31 for carrying the propelling charge or bomb D for propelling the bomb proper A within and along the casing B into cooperative relationship with its detonator or igniter C.

The chamber 31 is at the forward or nose end of the casing B and has secured therein by deformations 32 in the walls of the casing or other suitable securing means an insert or plug 33 of wood which has an end portion extending outside of the casing B of smaller diameter than the portion inside the casing, providing a shoulder 34 engaged behind an internal end flange 35 of the casing B for cooperating with the securing means 32 to hold the insert 33 in the end of the casing. The outer end of the insert 33 is preferably rounded as shown in Fig. 1 and its inner end is recessed centrally to provide a firing or explosion chamber 36 for a propelling cartridge or bomb 37 which is slidably receivable in a bore or passage 38 communicating at one end with the chamber 36 and at its opposite end with a bore or passage 39 leading forwardly therefrom through the forward or outer end of the insert 33.

The propelling cartridge 37 includes a jacket preferably of metal as shown at 37' carrying a percussion cap 41 in an end having an external flange 42 and containing a suitable propelling charge 43 which is clamped in the jacket 37' between the percussion cap 41, and suitable retaining means including a disc of wood 44 carrying a screw 45 extending outside of the jacket 37' for attaching the cartridge to means for causing a striker to strike and explode the percussion cap 41 when the bomb is dropped.

The striker is shown best in Fig. 1 and as there illustrated comprises a cap-shaped member 46 of spring brass or bronze having an internal peripheral flange 47 slidably engageable about the jacket 37' forwardly of its external flange 42 and having a pointed plunger portion 48 made by indenting the central portion of the cap-shaped member in registration with the percussion cap 41. The striker is thus loosely and slidably attached to the cartridge and may be forced therealong toward the forward end to cause the plunger 48 to strike and explode the percussion cap 41 whereby to ignite or explode the charge 43 of the cartridge.

The means for causing the striker to explode the percussion cap is shown in Figs. 1, 6 and 7 and comprises a tubular plunger 49 slidably arranged in the passage 39 with its inner end extending into the passage 38 and carrying thereon a coupling member 51 in the passage 38 and threaded or otherwise suitably secured to the inner end of the tubular member 49 and to the screw 45. The tubular member 49 extends forwardly outside of the passage 39 and is encircled by a coil spring 52 arranged thereabout between the outer reduced end of the wooden insert 33 and a rounded nose or cap member 53 threadably or otherwise attached to the outer end of the tubular member.

A ring-shaped member 54 of lead tubing is arranged in the casing B between the chambers 29 and 31 or between the inner ends of the canister 17 and the wooden insert 33 to provide a shock-absorbing action for the main charge or bomb proper A upon impact of the novel bomb when it is dropped and to be deformed as shown in Fig. 7 upon such impact for making a seal internally with the peripheral wall of the casing B between the chamber 17 and the explosion chamber 36. If desired, a reenforcing metal sleeve 55 may be arranged over the forward end of the casing B and provided with an internal end flange 55' engaging forwardly of and about the casing flange 35 for reenforcing the casing against the forces of impact and the explosion of the cartridge 37.

In use, the cartridge 37 is fired when upon impact of the nose member 53 with the target or terrain, the tubular member 49 is moved inwardly of the insert 33 against the force of the spring 52 to move the cartridge 37 and its striker 46 upwardly against the lower end of the canister 17. The resulting explosion of the cartridge 37 in the sealed explosion chamber 36 propels the main charge or bomb A upwardly in the tubular casing B to bring the main charge into cooperative relationship with its detonator or igniter C. For normally maintaining the main charge or bomb proper A within the tubular casing 28 in spaced relation with the igniter or detonator C, I may employ various means.

Preferably, however, I employ bomb-guiding means adapted normally to be concealed within the chamber 23 of the casing B but automatically movable outside thereof into bomb-guiding position when the bomb is dropped or released from its rack on an aeroplane.

Illustrative of the novel bomb-guiding means just referred to, Figs. 2, 4, 6, 7, 8 and 10 show a form which is at present preferred. As therein illustrated, a pair of thin metal strips are bent or otherwise formed along spaced longitudinal lines to provide outwardly diverging guiding vanes 56 and a central or intermediate portion 57 between the vanes 56 of each such metal strip. The pair of metal strips are carried with their intermediate portions 57 in spaced relation between a segmental disc or plate 58 welded or otherwise suitably secured at the upper ends of the metal plates and having a central aperture 58' communicating with the space between the intermediate portions 57 for a purpose presently to be described, and a base member 59 having an annular depending skirt 59' and a central aperture 61 communicating with the space between the intermediate portions 57 of the guiding vanes 56 and welded or otherwise suitably secured to the lower ends of the pair of metal strips.

The bomb-guiding means is slidably receivable in the chamber 23 of the tubular casing B and is inserted therein after the main charge or bomb proper A has been placed therein and moved forwardly against the ring-shaped lead tube 54 and after a coil spring 62 has been arranged between the rear end of the main charge A and the cup-shaped base member 59.

A substantially U-shaped bracket 63 is inserted between the spaced intermediate portions 57 of the guiding vanes 56 and is then moved into the rear end of the casing B where it is secured by screws or other suitable securing means 64 as shown in Figs. 2 and 8. This bracket 63 is provided with a threaded central aperture registering with the apertures 53' and 61. The central aperture is adapted threadably as shown at 65 (Fig. 2) to receive the outer end of a tubular holder 66 for the detonator or igniter C which may be any suitable cartridge secured as shown at 67 to the inner end of the holder 66 and containing a suitable charge which may be ignited by a percussion cap 69 for igniting the fuse 26 when the main charge A is propelled inwardly within and along the casing B by explosion of the propelling cartridge 37 into cooperating relationship with the igniter or detonator C.

Before the igniter or detonator C is thus attached to the bracket 63, the bomb-guiding vanes 56 are moved into the casing B against the action of the spring 62 by the application of force against the segmental disc or plate 58 until that plate 58 is inside of the chamber 23 whereupon a safety pin 71 is inserted through aligned apertures in the tubular casing B, the pin 71 passing between the intermediate portions 57 of the bomb-guiding means and engaging the cup-shaped base member 59 at the side thereof opposite the spring 62 whereby releasably to hold the guiding means in the casing B against the thus compressed spring 62. If desired, a cotter key or pin 72 may be associated with the pin 71 to guard against its accidental removal. With the guiding means arranged within the chamber 23, the assembled holder 67 and cartridge 68 is inserted through the aperture 58' of the plate 58 and moved into the chamber between the intermediate portions 57 of the bomb-guiding means through the threaded aperture in the the bracket 63. The holding means 66 is then threadably attached to the bracket and a lock nut 73 is employed on the threaded outer end of the holder 66 to prevent the igniter C from working loose in its mounting. When so assembled, the percussion cap 69 of the igniter C is in alignment with the aperture 61 in the crown of the cup-shaped base member 59 and with the perforations 24' in the plate 24 so that when the main charge or bomb proper A is propelled by explosion of the propelling cartridge 37 rearwardly within the casing B, the perforated portion of the plate 24 will strike and explode the percussion cap 69 of the detonator or igniter C. The resulting discharge of the detonating or igniting cartridge 68 will be transmitted through the perforations 24' to the primer cord or fuse 26 of the main charge or bomb proper A.

With the novel bomb so assembled, a cap-shaped closure member 74 is employed to fit over the rear end of the casing B and may be secured in place by any suitable means such as a plurality of lugs 75 on the casing and cooperating bayonet slots 75' in the peripheral wall of the closure member 74 (see Figs. 2 and 5). In addition to the safety pin 71, a safety attachment is employed as shown in Figs. 1 and 3 to prevent accidental discharge of the bomb and this safety attachment is arranged to guard against the accidental explosion of the propelling cartridge 37 by releasably dogging or locking the tube 49 and the nose member 53 in their outer positions. One such safety member which I have found suitable comprises a pair of plates 75 which are bowed or dished, and hinged as at 76 along one margin thereof to permit swinging or closing them about the spring 52 and the tubular member 49 between the outer end of the insert 33 and the nose member 53, and which are releasably held in that closed position by a pin 77 passing through staggered tubes 78 made by rolling or otherwise forming the marginal portions of the plates 75 opposite the hinge 76 back upon themselves. The pin 77 may be releasably held in this locking position by a cotter key 79 or other suitable means as shown in Fig. 1.

If desired, as already mentioned, the tubular casing B may, as shown in Figs. 11 and 12, be divided into the telescoping casings B' and B'' just rearwardly of the rear end of the main charge or bomb proper A. The telescoping ends of the two casing members releasably are secured together by a plurality of pins or lugs 81 on the casing member B' and cooperating bayonet slots 82 in the casing member B'' as an added safety measure. In such a construction, loading the main charge or bomb proper A into the casing B' is facilitated and may be accomplished after the bomb has been transported to the vicinity of its intended use.

In use or operation, the novel bomb is releasably secured to an aircraft by any suitable means generally known as a bomb rack which, as shown in Figs. 13, 14 and 15 wherein the aircraft is diagrammatically illustrated at 83, includes a pair of forward brackets 84 secured to a convenient portion of the aircraft 83 and spaced apart sufficiently to receive therebetween the spring 52 encircling the tubular member 49 and to prevent the tubular member 49 from being moved inwardly toward firing position when the bomb is in the rack. Spaced rearwardly from the brackets 84, such a rack includes a pair of clamps 85 each

of which is fixed on a pivoting pin 86 as indicated at 86' to rotate with the pin on a lug 87 or other member of the aircraft 83 and which are urged toward clamping position by a spring 88 secured at its opposite ends to the clamps 85. Fixed on each pivot pin 86 inwardly extending arms 89 are slidably secured together by a pin 91 fastened through apertures in the inner ends of the arms 89. One of those apertures is elongated as shown at 92 to accommodate the relatively lateral components of movements of the pin 91 made by the arms 89 during clamping and unclamping of the bomb into the rack and for limiting the extent of the clamping and unclamping movements of the clamp members 85. For opening the clamps 85 to release the bomb, one of the pivot pins 86 has fixed thereon a crank arm 93, the outer end of which is connected to a suitable link member 94 for rotating the pin 86 in a direction to move the clamps 85 in an unclamping direction. A rear bracket 95 forms a part of the illustrated rack and serves as an abutment for the mutilated disc or plate 58 to hold the bomb-guiding means inside of its tubular casing until the bomb is released or dropped.

In placing the bomb in the rack just described, the rear end closure member 74 is first removed. The safety pin 71 prevents the bomb-guiding means from being forced out of the open end of the casing by the spring 62 when this is done. The safety attachment comprising the plates 75 is removed from the forward end of the bomb. The bomb is then arranged in the rack as shown in Fig. 13 before the cotter key 72 is removed and the safety pin 71 removed. When the safety pin 71 is removed, the spring 62 urges the bomb-guiding means rearwardly to move the segmental disc or plate 58 into engagement with the rear bracket 95.

When the bomb is released as by pulling upwardly on the link 94, the bomb drops by gravity from the rack and the spring 62 urges the bomb-guiding means outwardly to the position shown in Fig. 6. The bomb-guiding means cooperates with the weight distribution of the bomb itself to "nose" the bomb downwardly or to direct its forward or nose end downwardly to assure that the force of impact when the bomb falls will be directed upwardly against the nose member 53.

When the bomb thus strikes the target or the earth as shown in Fig. 7, the forward end, depending upon the nature of the terrain, is more or less embedded in the ground and the force of impact is transmitted upwardly through the nose member 53 against the action of the spring 52 to move the cartridge 37 upwardly and to strike the striker 42 against the lower or forward end of the canister 17 causing the explosion of the cartridge 37. The force of impact also flattens the lead tube 54 as shown in Fig. 7 to seal the explosion chamber 36 whereby the rapidly expanding gases caused by the explosion of the cartridge urge the main charge or bomb proper A upwardly or rearwardly within and along the tubular casing B, or, if the two-part housing is employed, B', the spring 62 being of insufficient strength to prevent such movement of the main charge or bomb proper A when it is so propelled by the explosion of the propelling cartridge 37. In that manner the main charge or bomb proper A is moved upwardly some distance above the ground in the bomb casing and during such movement, the disc or plate 24 at the rear end of the main charge strikes the percussion cap 69 which explodes the detonator or igniter C causing it to discharge through the perforations 24' in the plate 24 and to ignite the fuse or primer cord 26 which ignites the charge 21 of the main charge or bomb proper A. The resulting explosion thus occurs when the main charge or bomb proper is at some distance above the ground so that the force of the explosion is spread laterally to burst the tubular housing B and to spread at an effective elevation the shrapnel pellets or slugs 22 or whatever load the bomb carries.

If it is desired to remove the bomb from its rack, the safety pin 71 may be inserted before removal of the bomb so as to lock the main charge or bomb proper in its position in the casing spaced from its igniter or detonator C whereby to guard against accidental explosion.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction, and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

Having thus described the invention, what I claim as new and desire to cover by Letters Patent is:

1. A bomb comprising a casing, a main explosive charge, and an igniter therefor, fixed relative to said main explosive charge and spaced rearwardly therefrom in said casing, propelling means forwardly of said main explosive charge for moving said main explosive charge rearwardly toward said igniter within said casing, including actuating means for said propelling means operable upon impact of the bomb when dropped, yieldable means for yieldably holding the main explosive charge in spaced relation forwardly of said igniter within said casing before actuation of said propelling means, and for yielding when said propelling means is actuated to permit said propelling means to move said main explosive charge rearwardly into cooperative relationship with said igniter, and means for firing said igniter to discharge said main explosive charge when the latter is moved by said propelling means into cooperative relationship with said igniter.

2. A bomb comprising a casing, an igniter fixed in the upper end of said casing, a main explosive charge normally spaced from said igniter in said casing and movable upwardly therein into cooperative relationship with said igniter, bomb guiding means releasably held in said casing, means including a spring for automatically moving said bomb guiding means out of said casing into guiding position at the upper end of said casing when the bomb is dropped, said bomb guiding means cooperating with its moving means to space said igniter and said main explosive charge apart in said casing before the bomb is dropped, said spring yieldably holding said igniter and said main explosive charge in spaced relation when said bomb guiding means is moved to its guiding position, and impact controlled means in said casing for moving said main explosive charge within said casing against the action of said spring upwardly into cooperative relationship with said igniter.

3. A bomb comprising a casing, an igniter in the upper end of said casing, a main explosive charge normally spaced from said igniter in said casing and movable upwardly therein into cooperative relationship with said igniter, bomb

guiding means releasably held in said casing and normally enclosed and concealed therein, automatic means for moving said bomb guiding means out of said casing into guiding position when the bomb is dropped, and impact-controlled means in said casing for moving said main explosive charge within said casing upwardly into cooperative relationship with said igniter.

4. A bomb comprising a casing, an igniter in the upper end of said casing, a main charge normally spaced from said igniter in said casing and movable upwardly into cooperative relationship with said igniter, impact-controlled means in said casing for moving said main charge within said casing upwardly into cooperative relationship with said igniter, bomb guiding means releasably held in said casing, mounting means for said bomb guiding means for normally holding said bomb guiding means between said main charge and said igniter whereby to space them apart, and automatic means for moving said bomb guiding means out of said casing into guiding position when the bomb is dropped.

5. A bomb comprising a casing, an igniter in the upper end of said casing, a main charge in said casing spaced from said igniter and movable into cooperative relationship therewith, impact controlled means in said casing for moving said main explosive charge within said casing upwardly into cooperative relationship with said igniter, bomb guiding means releasably held in said casing between said igniter and said main charge, and automatic means for moving said bomb guiding means out of said casing into guiding position when the bomb is dropped.

6. A bomb comprising a hollow casing providing a chamber therein having rear, forward, and intermediate chamber portions, bomb guiding means normally arranged in said rear chamber portion and movable outside thereof to bomb guiding position when the bomb is dropped, a main charge normally held in said intermediate chamber portion and movable from said intermediate chamber portion into said rear chamber portion after said bomb guiding means is moved to bomb guiding position, a propellent charge in said forward chamber portion, a slidable plunger having one end in said forward chamber portion carrying said propellent charge therein and having its other end extending outside of said forward chamber portion, an impact-controlled operating member on said slidable plunger outside of said forward chamber portion, a relatively stationary igniter for said main charge arranged in said rear chamber portion, and a striker movable in said forward chamber portion with said slidable plunger for firing said propellant charge whereby to move said main charge out of said intermediate chamber portion into said rear chamber portion in firing relationship with said igniter to discharge the main charge.

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