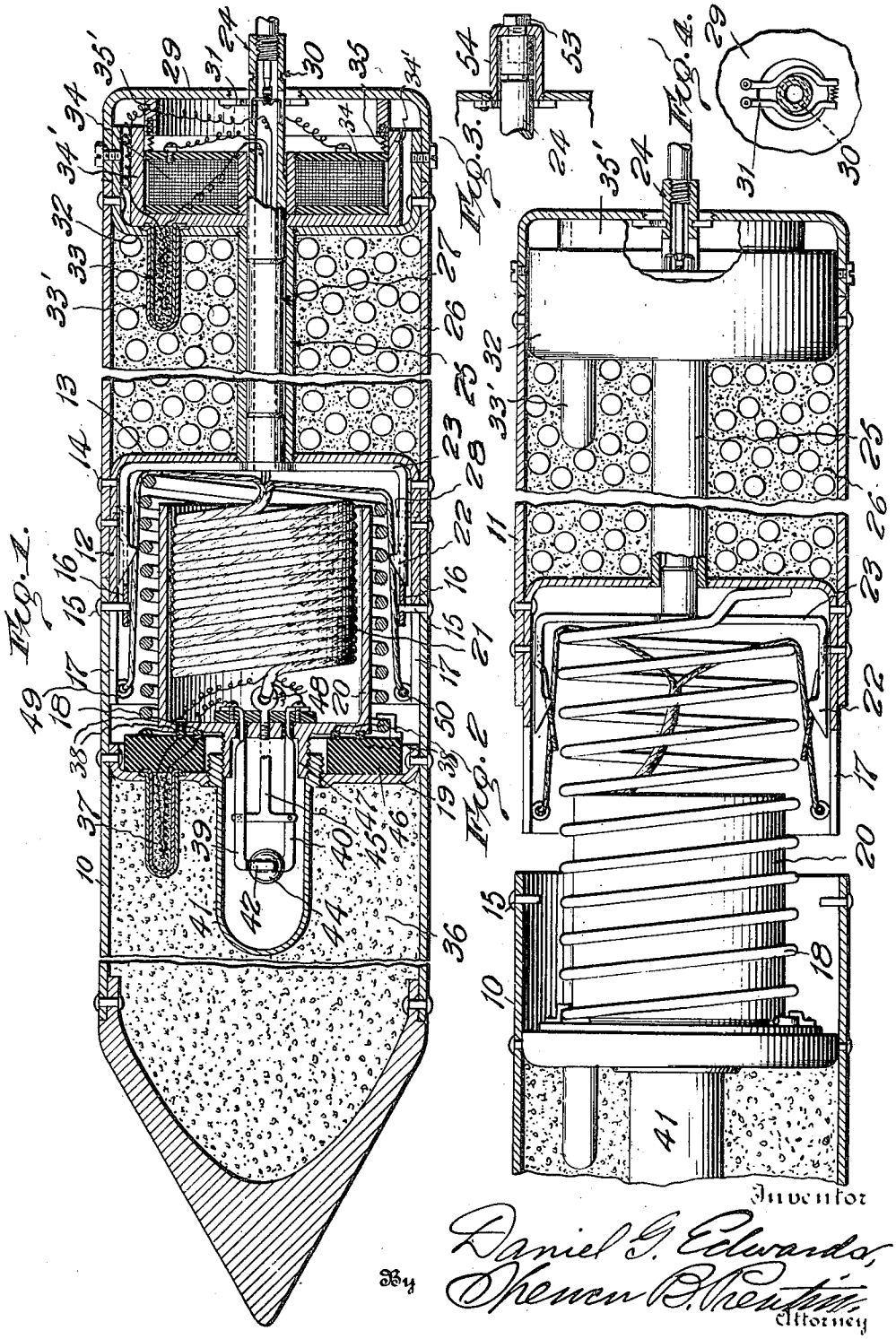
D. G. EDWARDS.

AERIAL BOMB AND LAUNCHING MECHANISM THEREFOR.

APPLICATION FILED MAY 2, 1919.

1,363,578. Patented Dec. 28, 1920.

3 SHEETS—SHEET 1.



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3 SHEETS—SHEET 2.

Fig. 5.

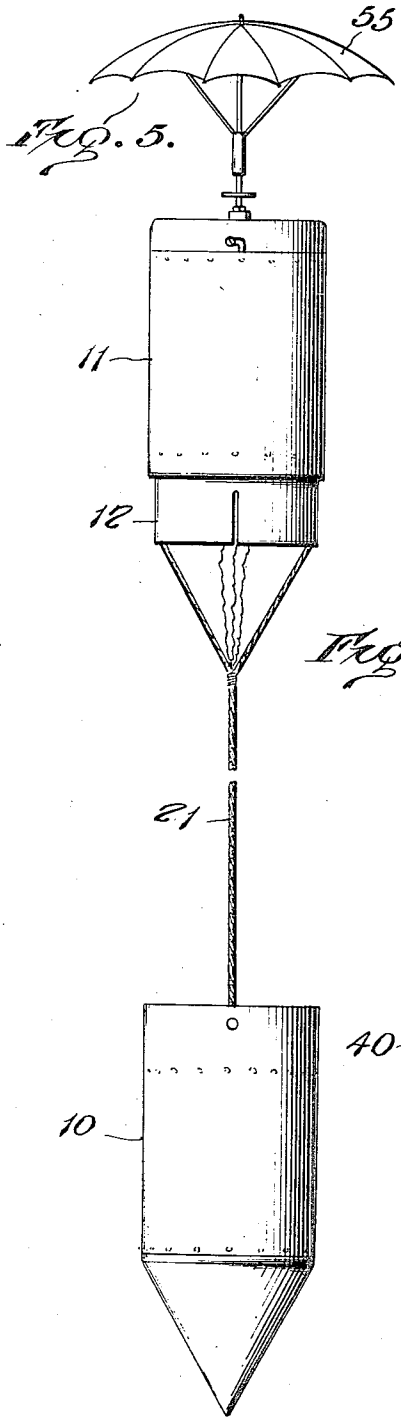


Fig. 6.

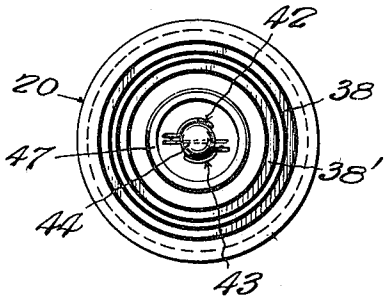
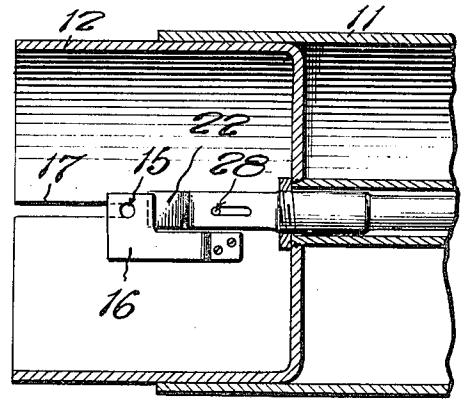


Fig. 7.



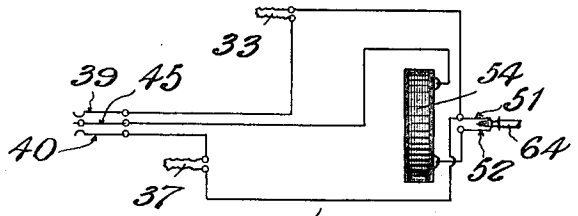


Fig. 8.

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3 SHEETS—SHEET 3.

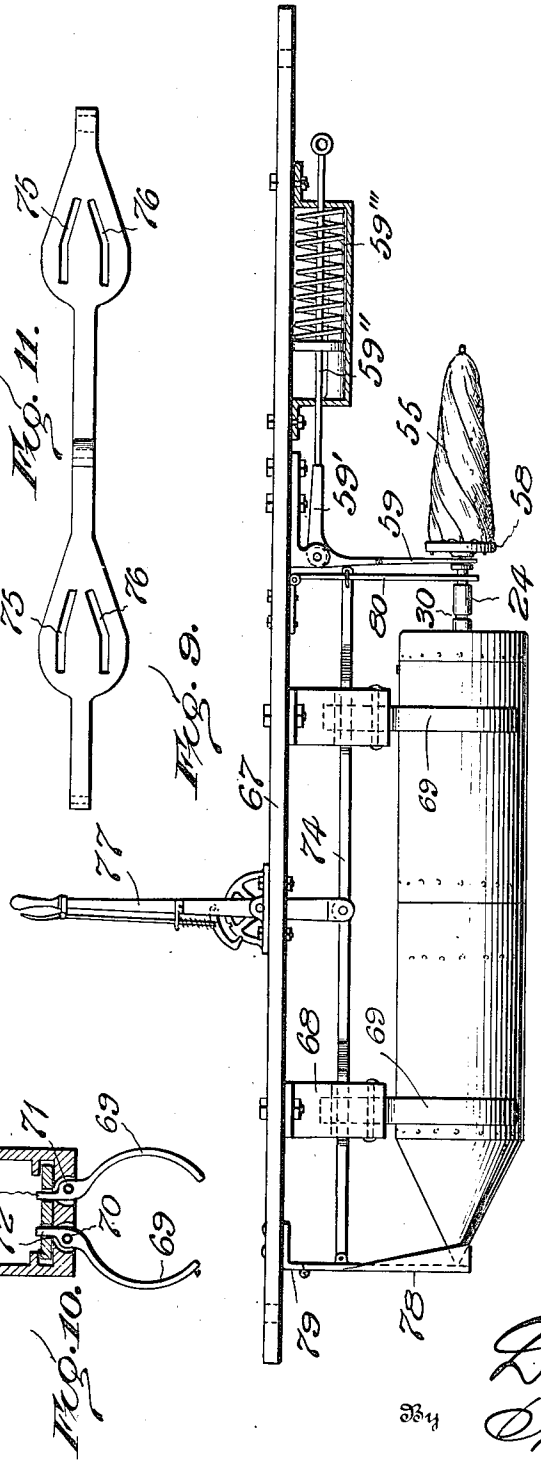


Fig. 9.

Fig. 11.

Fig. 10.

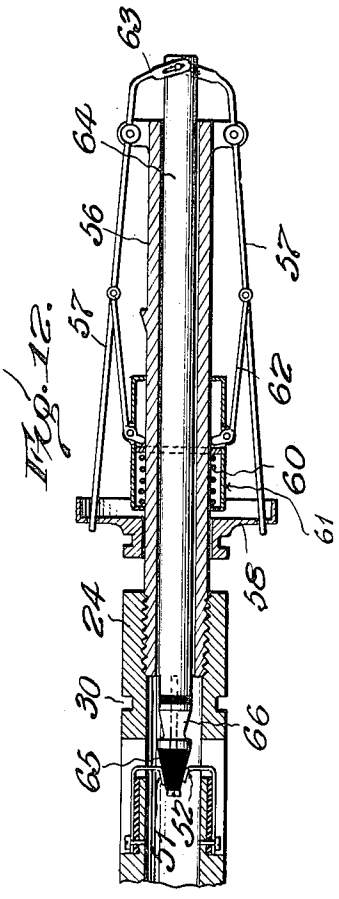


Fig. 12.

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UNITED STATES PATENT OFFICE.

DANIEL G. EDWARDS, OF HOPKINSVILLE, KENTUCKY.

AERIAL BOMB AND LAUNCHING MECHANISM THEREFOR.

1,363,578. Specification of Letters Patent. Patented Dec. 28, 1920.

Application filed May 2, 1919. Serial No. 294,180.

To all whom it may concern:

Be it known that I, DANIEL G. EDWARDS, a citizen of the United States, residing at Hopkinsville, in the county of Christian and State of Kentucky, have invented new and useful Improvements in Aerial Bombs and Launching Mechanism Therefor, of which the following is a specification.

My invention relates to bombs designed to be released from aircraft flying over either land or water, and to mechanism for holding and releasing said bombs.

The principal objects of the invention are to provide a bomb which will explode a predetermined distance above the earth, either the ground or water; to provide a two-part bomb, one part of which will explode upon the earth, either ground or water, and the other part at a predetermined distance above the earth, the explosion of both parts being controlled by impact of said first-mentioned part upon the earth; an electrically fired bomb which may be safely carried by aircraft and readily launched or released without danger of an explosion in the vicinity of the aircraft; an electrically fired bomb in which the firing circuit is prepared by the act of releasing the bomb and completed by impact with the earth; an electrically fired two-part bomb having a parachute and combined with launching or releasing mechanism arranged to unlatch the parts of the bomb and also initiate the opening of the parachute; an electrically fired bomb having a parachute for acting upon the bomb during its descent and connected to prepare the firing circuit during its opening. These and other objects will more fully appear hereinafter.

In carrying my invention into effect, I provide a bomb having two separate parts, each of which parts carries explosive, the parts being fitted together so that the rear part is inserted into the rear end of the front part with a powerful spring between the parts for the purpose of separating them. Normally the spring is held compressed by the parts being latched together, and this latch is designed to be released when the bomb is dropped from the aircraft, or it may be released for inspection, by means of a rod which extends at the rearward part of the bomb.

The two parts are provided with a distance connection which may be an electrical cord or chain, carrying the conductors for the firing circuit of the two parts. This distance connection may be of any desired length, the length being determined in accordance with the distance which it is desired shall exist between the two parts when explosion takes place. The forward part of the bomb is intended to carry high explosive to destroy the ground surface, and the rearward to carry either gas, liquid fire, shrapnel, or plain explosive according to the object to be destroyed.

The firing circuit for controlling the firing means in each part of the bomb includes an impact operative switch on the forward part, which completes the circuit upon impact of this part with the earth, either ground or water.

The rearward part of the bomb carries a parachute which is normally in the closed position but which automatically opens when the bomb is released and begins its flight, the rush of air completing the opening of the parachute and simultaneously preparing the firing circuit by closing a switch carried on the rearward part of the bomb. This mechanism constitutes a safety device for preventing the bomb from exploding accidentally at the same time it is released, if for any reason the switch on the forward part of the bomb should have been already accidentally or inadvertently closed before the bomb is launched. The action of the parachute also causes the rearward part of the bomb to lag behind the forward part during its flight so that when impact of the forward part occurs, the two parts will be usually separated by the whole length of the distance connection.

The invention consists in the novel construction and arrangement of parts of a bomb and releasing mechanism therefor hereinafter described and claimed, and illustrated in the accompanying drawings, in which,

Figure 1 is a central longitudinal section through the bomb, the parts being in the latched or closed position;

Fig. 2 is a similar view, the parts being unlatched and the partial separation of the parts being shown;

Fig. 3 is a fragmentary view on a slightly enlarged scale showing the storage cap which is substituted for a part of the mechanism;

Fig. 4 is a detail of the locking device shown in Figs. 1, 2 and 3 for the latch releasing rod;

Fig. 5 is a view in elevation, on a reduced scale, showing the bomb in condition of flight;

Fig. 6 is a detail showing the impact operative switch of the forward part of the bomb;

Fig. 7 is a fragmentary section taken in a plane at right angles to the section of Fig. 1;

Fig. 8 is a diagram of the electric firing circuit;

Fig. 9 is a side elevation of the bomb launching or releasing mechanism;

Fig. 10 is an end view of the retaining and releasing arms of said mechanism;

Fig. 11 is a detached view of the cam rod for operating said retaining and releasing arms;

Fig. 12 is an enlarged view of the parachute mechanism and the switch controlled thereby.

Referring to the drawings, and first particularly to Figs. 1 to 4, it will be seen that the bomb comprises a forward part 10 and a rearward part 11. These parts are normally held together by a latching mechanism which includes the following instrumentalities. The rearward part 11 of the bomb is provided with a forwardly extending flange 12 which is an extension or part of a cup shaped member of which 13 extends across and forms a forward wall of the rearward part 11. This cup shaped member is secured to the shell of the rearward part in any suitable manner, as by rivets 14.

Extending inwardly from near the rearward edge of the shell of the forward part 10 are latching pins 15, which coöperate with spring latch members 16 mounted within cup shaped member 13. The forwardly extending flange 12 is provided with notches 17 for the admission of latch pins 15.

In order to cause the quick and positive separation of parts 10 and 11, I provide a powerful coil spring 18 which when the parts are in the latched position is compressed between the forward part of the cup shaped member 13 and the diaphragm 19 at the rear of the forward part 10. This spring surrounds the spring barrel 20, within which is inclosed the distance connection 21 of the parts, to be hereinafter more fully described.

In order to effect the unlatching of the parts, fingers 22 are provided, these being provided with oblique surfaces arranged so that when advanced they will press inwardly the latching members 16 in order to clear the pins 15. The fingers 22 are carried on a suitable member 23 which is mounted upon an operating rod 24 extending back through the rearward part 11 and through the outer wall thereof. This operating rod is inclosed within a housing 25 so as to be separated from the explosion chamber 26 of the rearward part, and has a reduced diameter for the greater portion of its length as shown at 27, in order to reduce friction. The fingers 22 are held and guided in their proper positions by pins 28 working in slots in the said fingers.

The rear end of the rearward section 11 is constituted by a detachable cap 29, through which extends the operating rod 24, this rod being provided with an annular notch 30 which coöperates with locking arms 31 upon the inner face of the rear end, these arms being spring pressed inwardly so that when said rod is moved to its inward position it will be locked by engagement of the arms 31 with notch 30.

Between the end cap 29 and the explosion chamber 26, is provided a partition 32 through which extends the detonator 33 for the charge of the rearward part, this detonator being of any preferred type, but being shown as electrically actuated. The source of current is shown at battery 34 located within the end chamber at the rear of the rearward section, this battery being mounted in a cup 34′ of insulating material and held therein by springs 35 mounted upon a ring 35′ of insulating material secured to the inner face of cap 29. The detonator 33, which is mounted upon the insulation cup 34′ is fitted within a housing 33′ which latter is removable so that the explosive chamber 26 may be filled through this aperture.

The forward section is provided with an explosive chamber 36 in which is located a detonator 37 for this charge, this detonator being of any preferred type, but preferably similar to the one already described for the rearward part. It is mounted upon flange or partition 19 and the circuit connections are through coöperating contacts 38. The terminals of these contacts are connected by circuit wires respectively with the firing circuit including impact operative switch in the forward section which comprises a spring 39 and spring 40 suitably mounted and inclosed within a housing 41 within the explosive chamber 36. Said springs are provided with forward bends 42 43 shaped to inclose a detachable member 44 which is shown as a heavy ball. While this insulated ball is in position, said springs are held out of contact with a bridging member 45, and the circuit remains open. When said ball is displaced, however, the electrical connection between springs 39 and 40 is completed through bridging contact 45.

The details of the above construction preferably include the various mountings as shown in the drawings, insulating ring 46 being provided for the mounting of the various electrical connections. The spring barrel 20 has a threaded boss 47 which screws into the base of the switch housing cup 41, this latter having an external thread which in turn is screw threaded into diaphragm 19. Insulation ring 46 carries con-

tact rings 38 which constitute the terminals of the detonator 37, these terminals coöperating with similar rings upon the face of cup 20 from which they are suitably insulated. Springs 39 and 40 are also suitably mounted upon the base of cup 20 but insulated therefrom. In assembling these parts, the explosive chamber 36 of the forward part may be filled with explosive either through the aperture of the detonator or that of the switch housing, the detonator casing being then slipped into place and the switch housing screwed in the central aperture. The insulation ring 46 is then placed in position carrying the detonator, and the spring barrel 20 is screwed into place until the contacts are firmly engaged.

The distance connection 21 consists of any suitable cable and includes circuit conductors which constitute the electrical connection between the forward and rearward parts of the bomb. This distance connection is attached to the forward part 10 at 48, and to the rearward part at points 49 and 50. The cable is contained within the spring barrel which constitutes its housing, while the parts are connected, and is adapted to be fed out as the distance between the parts increases after they are disconnected.

Referring to Fig. 8, it will be seen that each of the detonators 33 and 37 is connected on one side to the spring contacts 39 and 40 respectively, and on the other side to one side 51 of the disabling or safety switch. The other side 52 of said switch is connected to one side of battery 34, the other side of battery being connected to the common contact 45 of the impact operative switch. It will thus be seen that when the safety switch 51—52 is open, the firing circuit cannot be closed by said impact operative switch.

While the bomb is in storage or in shipment, the latch controlling rod 24 is held in its normal position by means of a screw 53 which engages a thread in the end of said rod, and also a cap 54 which is screwed into the end cap 29 of the rear part of the bomb.

The circuit conductors from the forward part 10 of the bomb pass through the central bore of the latch controlling rod 24, which is made tubular for the purpose, and the contact springs 51—52 of the safety or disabling switch are mounted within this tube near the rear end thereof as shown particularly in Figs. 1, 2 and 12. This switch is adapted to be controlled by the mechanism to be described in connection with the parachute of the rear part 11 of the bomb. This parachute 55 is preferably an umbrella like structure of which the tubular stem 56 screws into the threaded socket at the outer end of operating rod 24, this connection taking place of the screw 53 and cap 54 after removal of these parts when the bomb is being prepared for use. The ribs 57 of the parachute have their outer ends in engagement with a flanged collar 58 which is slidable upon tubular stem 56 and is engaged by an arm 59 of the launching mechanism to be presently described. Compression spring 60 is mounted within a housing 61 and has a tendency to force ribs 57 outwardly by its action upon arms 62 when released by the movement of collar 58 to clear the outer ends of the ribs. The inner ends of the ribs connect with arms 63 which have a pin and slot connection with a central rod 64 which extends through the hollow stem 56 and carries on its inner end an insulation section 65 and also a conductive section 66, for coöperation with switch springs 51 and 52. When the parts are in the position shown in Figs. 1 and 12, the insulation section 65 is between contact springs 51 and 52 and hence the safety or disabling switch thus constituted is open. When the parachute arms move outwardly and rod 64 is moved inwardly to place conductive section 66 into engagement with said contact spring 51 and 52, the safety or disabling switch is closed and the circuit is in condition to be completed by the impact operative switch in the forward part 10 of the bomb.

The launching mechanism which is especially designed to carry this bomb upon the airplane or other bombing machine, and to release the same and start the action of the various parts, will now be described. 67 indicates a portion of the frame of the airplane or other machine, beneath which the bomb is intended to be carried for the purpose of being launched or dropped. Pivotally mounted upon the lower side of the support 67, upon suitable brackets 68, are two pairs of holding and releasing arms, each pair consisting of a curved portion 69 adapted to engage the outer surface of the bomb, and pivoted at 70, 71 to the bracket. Extending beyond said pivot are short lugs 72, 73 by means of which the arms are operated through the agency of a cam rod 74. This cam rod is provided with cam slots or surfaces 75, 76 which engage said lug 72 and 73, when the cam rod is moved longitudinally within the brackets. This cam rod is adapted to be operated by a hand lever 77 suitably mounted upon the frame 67.

The forward end or nose of the bomb is preferably engaged by an arm or stirrup 78 which is mounted upon and hinged to a bracket 79 so as to swing forwardly when the cam rod 74 is operated to release the engagement of arms 69 with the bomb.

The rear end of cam rod 74 is connected with and actuates an arm 80 which engages the end of rod 24 for the purpose of unlatching the two parts of the bomb.

The parachute tripping means comprises an arm 59 which is part of the bell crank lever, the other arm of which, 59′, engages

the forward end of the rod 59″ normally pressed forward by spring 59‴. This bell crank lever is held in its normal position by the rearward end of cam rod 74, which on its forward movement to launch the bomb trips said rod 59″ and its spring causes a sudden and positive forward movement of arm 59, thereby withdrawing flange 58 from the outer ends of the parachute ribs 57. Spring 60 within the parachute, combined with the action of the rush of air under the parachute caused by the forward motion of the bomb then completes the opening of the parachute and the forward movement of switch rod 64.

The operation of the apparatus will be readily understood from the foregoing, but may preferably be described as follows:

The operator grasps lever 77 and moves the same rearwardly with a positive action, thereby advancing cam rod 74 which opens the holding arms 69 and moves stirrup 78 out of engagement with the nose of the bomb. At the same time, arm 80 is moved forwardly, thereby advancing the latch releasing rod 24 which moves fingers 22 forwardly and thereby presses inwardly latch springs 16 out of engagement with hinge 15, thereby unlatching the two parts of the bomb. This leaves the powerful compression spring 18 free to act, which thereby initiates the separation of the two parts of the bomb.

At the same time that this takes place, the forward motion of arm 59, as above explained, initiates the opening of the parachute by releasing the forward ends of rods 57 and thus permitting these ends to move outwardly, which opening progresses but is not immediately completed as it requires some little interval of time. The opening of the parachute advances switch rod 64 to close the safety switch contact 51—52 thereby closing the firing circuit through the conductor 66, but this does not take place until after the bomb has progressed a considerable distance from the aircraft, so that if by any chance the impact switch on the forward part of the bomb had been accidentally closed, the explosion would not occur in the immediate vicinity of the airplane and hence no damage would be done.

When the retarding action of the parachute begins to widen the distance between the parts of the bomb, the distance connection 21 is paid out from its inclosing barrel until the parts are separated to the full extent of said connection, the parachute also serving to keep the sequence of motion of the bomb parts in proper order.

The final action of the bomb will of course occur upon impact of the forward portion with the ground or water against which it is aimed, when the switch contacts 39 and 40 will act and both parts of the bomb will explode, one upon the surface of impact and the other part above said surface the distance as allowed by the distance connection.

The advantages of this construction will be readily apparent. Any number of the bombs may be arranged upon the aircraft and released separately or simultaneously as desired. The two parts of the bomb may be made of any desired size or particular construction, and the proper explosive used in each part to accomplish the results intended.

It is obvious that many modifications in details of construction and relation of parts may be made without departing from the invention, and these I aim to cover within the scope of the appended claims.

What is claimed is:—

1. A bomb comprising two parts latched together, means for unlatching the parts, and a spring for separating the parts when unlatched.

2. A bomb comprising two parts latched together and each provided with explosive, means for unlatching the parts, and means carried by one part for controlling the explosion of both parts.

3. A bomb comprising two parts latched together and each provided with explosive, means for unlatching the parts, a spring for separating the parts when unlatched, a distance connection between the parts, and means carried by one part for controlling the firing of that part and for controlling through said distance connection the firing of the other part.

4. A bomb comprising a forward part and a rearward part separably held together and each provided with explosive, means for separating the parts, an electric battery in said rearward part, and electrical means carried by the forward part to control the firing of both parts after separation.

5. A bomb comprising a forward part and a rearward part separably held together and each provided with explosive, means for separating said parts, a source of electric current in said rearward part, a distance connection for the parts, firing means for the explosive in each part, and electric contact means carried by the forward part for operating the firing means of that part and for operating through said distance connection the firing means of the rearward part.

6. A bomb comprising a forward part and a rearward part separably held together and each provided with explosive, means for separating said parts, a source of electric current in said rearward part, firing means for the explosive in each part, a distance connection between the parts, and electrical means controlled from the forward part to operate the firing means on both parts after separation.

7. A bomb comprising a forward part and a rearward part separably held together and

each provided with explosive, firing means for the explosive in each part, a distance connection between the parts, an electric circuit extending through said connection which controls said firing means and a source of current, and a switch on said forward part for completing said circuit.

8. A bomb comprising a forward part and a rearward part separably held together and each provided with explosive, electrical firing means for the explosive in each part, a distance connection between the parts, an electric circuit extending through said connection which includes said firing means and a source of current, and a switch on said forward part for completing said circuit.

9. A bomb comprising a forward part and a rearward part separably held together and each provided with explosive, firing means for the explosive in each part, a distance connection between the parts, an electric circuit extending through said connection which controls said firing means and a source of current, and an impact operated switch on said forward part for completing said circuit.

10. A bomb comprising a forward part and a rearward part separably secured together and each provided with explosive, a distance connection between the parts, an electric circuit extending through said connection which controls said firing means and a source of current, and means for causing the rearward part to lag behind the forward part to the extent of said distance connection during flight.

11. A bomb comprising a forward part and a rearward part each provided with explosive, and means for causing said parts to explode upon and above the surface of the earth respectively at the moment when the forward part reaches the end of its flight.

12. A bomb comprising a forward part and a rearward part separably secured together and each provided with explosive, a distance connection between the parts, an electric circuit extending through said connection which controls said firing means and a source of current, and a parachute mounted upon the rearward part to cause said part to lag behind the forward part during flight.

13. A bomb comprising a forward part and a rearward part separably secured together and each provided with explosive, a distance connection between the parts, an electric circuit extending through said connection which controls said firing means and a source of current, and a parachute mounted upon said rearward part and the opening of which is mechanically initiated when said bomb is launched.

14. A bomb comprising a forward part and a rearward part separably held together and each provided with explosive, firing means for the explosive in each part, a distance connection between the parts, an electric circuit extending through said connection which controls said firing means and a source of current, a parachute mounted upon the rearward part for causing said part to lag behind the forward part during flight, and means carried by the forward part for controlling the firing means on both parts.

15. A bomb comprising a forward part and a rearward part separably secured together and each provided with explosive, a distance connection between the parts, an electric circuit extending through said connection which controls said firing means and a source of current, means for positively causing the separation of the parts when the bomb is launched, a parachute for causing the rearward part to lag behind the forward part during flight, and means for initiating the opening of said parachute when the bomb is launched.

16. The combination of a bomb launching device and a bomb comprising two parts latched together and each provided with explosive, unlatching means for said parts, means carried by one part for controlling the explosion of both parts, said launching device including releasing means for the bomb, and means simultaneously controlled with said releasing means for operating said unlatching means.

17. The combination of a bomb launching device and a bomb comprising two parts latched together and each provided with explosive, unlatching means for said parts, a compression spring for initiating the separation of the parts when unlatched, said launching means for the bomb including a holding device, and means for simultaneously releasing said holding device and operating said unlatching means.

18. A bomb comprising a forward part and a rearward part latched together and each provided with explosive, firing means for the explosive in each part, a distance connection between the parts, electrical means controlled from the forward part to operate the firing means on both parts after separation, an electric circuit through which the firing means are controlled, a parachute mounted on the rearward part, a switch in said circuit arranged to be closed by the opening of said parachute to prepare said circuit, and an impact operative switch on the forward part to complete said firing circuit.

19. A bomb comprising a forward part and a rearward part latched together and each provided with explosive, unlatching means for said parts, means carried by one part for controlling the explosion of both parts, a disabling member carried by the rear-

ward part, a parachute mounted upon the rearward part and connected to operate the disabling member, and a launching device arranged to simultaneously operate said unlatching means and initiate the opening of said parachute to enable the latter to cut out said disabling member.

20. A bomb comprising a forward part and a rearward part separably secured together and each provided with explosive, electrical firing means for the explosive in each part, a circuit through which said firing means are controlled, a source of current for said circuit, an impact operated switch in the forward part for completing said circuit, said switch comprising contact springs provided with coöperating bends for the inclusion of a detachable member, said member, and contacts for completing said circuit when said member is displaced.

21. A bomb comprising a forward part and a rearward part separably secured together and each provided with explosive, electrical firing means for the explosive in each part, a circuit through which said firing means are controlled, a source of current for said circuit, an impact operated switch in the forward part for completing said circuit, said switch comprising contact springs each having an arm bent out of the plane thereof to form a socket for a detachable member, said member, and contact points which are closed by said springs when said member is displaced.

22. A bomb comprising a forward part and a rearward part separably secured together and each provided with an explosive, electrical firing means for the explosive in each part, a latch for connecting said parts, unlatching means for releasing said latch, a rod extending inwardly through the rearward part for operating said unlatching means, and a catch for holding said rod in the unlatching position.

23. The combination of a bomb launching device and a bomb comprising a forward part and a rearward part latched together and each provided with explosive, means for unlatching said parts, a distance connection between the parts, an electric circuit extending through said connections which controls said firing means and a source of current, a parachute mounted on the rearward part, a spring for opening said parachute, said launching means including means for simultaneously performing the unlatching of said parts and releasing said parachute opening spring.

24. The combination of a bomb launching device and a bomb comprising a forward part and a rearward part latched together and each provided with explosive, and said launching device being provided with arms for holding and releasing said bomb, and common means for operating said arms to release the bomb and for unlatching said parts.

25. A bomb comprising a forward part and a rearward part latched together and each provided with explosive, in combination with a launching device provided with arms for holding and releasing said bomb, a cam rod for actuating said arms to open and close the same, means for moving said cam rod, and a connection with said rod for unlatching the parts of the bomb when said bomb is released.

In testimony whereof I have hereunto set my hand.

DANIEL G. EDWARDS.