H. S. MAXIM.

BOMB FOR USE WITH AEROPLANES AND OTHER FLYING MACHINES.

APPLICATION FILED MAR. 25, 1912.

1,077,990.

Patented Nov. 11, 1913.

3 SHEETS—SHEET 1.

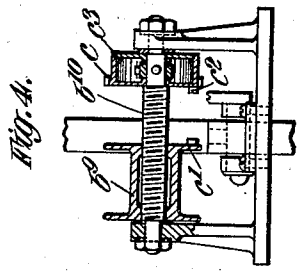


Fig. 4.

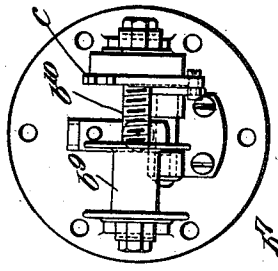


Fig. 5.

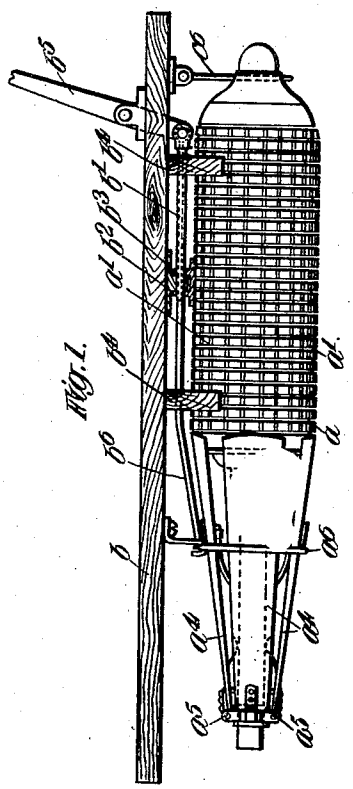


Fig. 1.

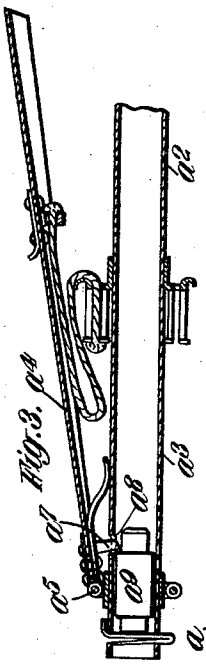


Fig. 3.

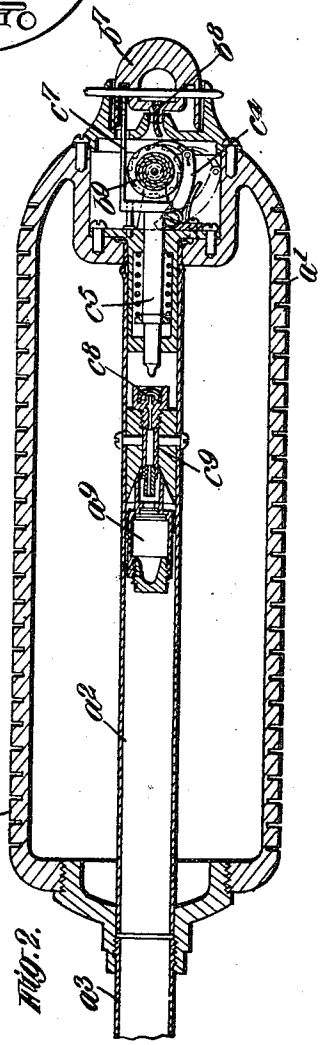


Fig. 2.

Witnesses.

F. C. Schuermann.

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Hiram S. Maxim

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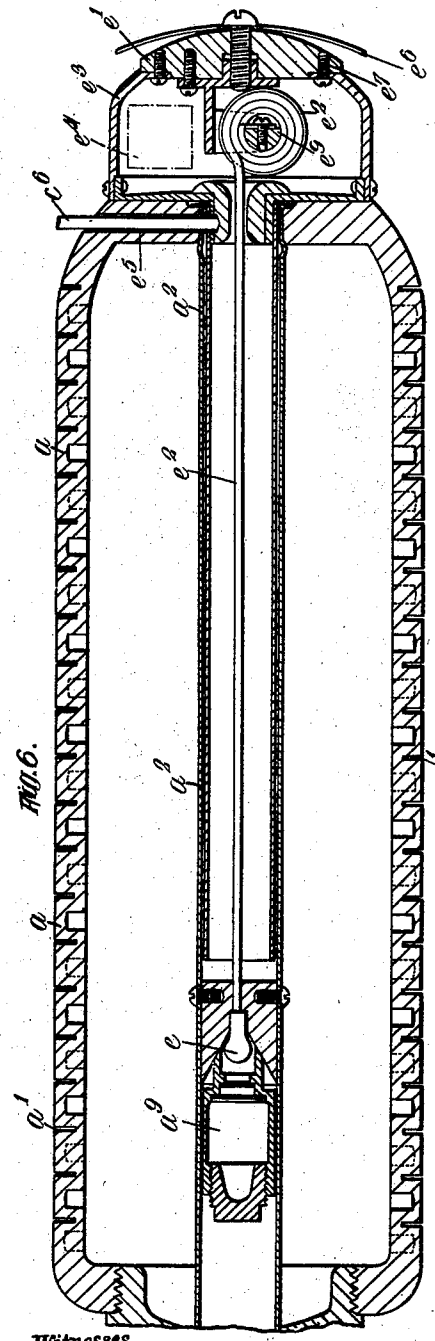


Fig. 6.

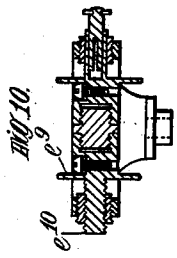


Fig. 10.

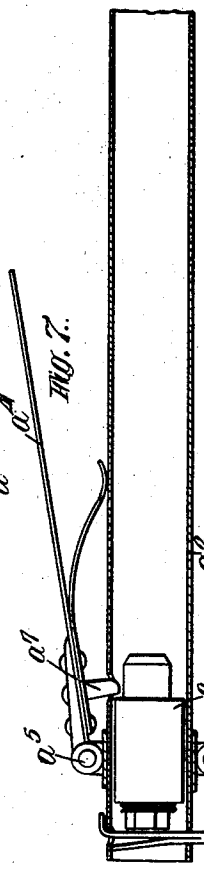


Fig. 7.

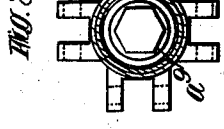


Fig. 8.

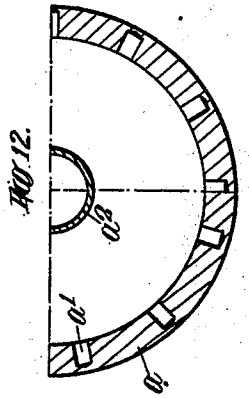


Fig. 12.

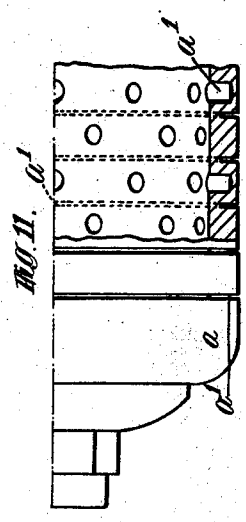


Fig. 11.

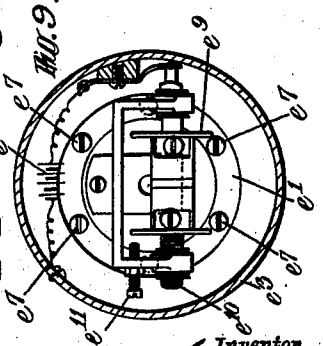


Fig. 9.

Witnesses.

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Atty's.

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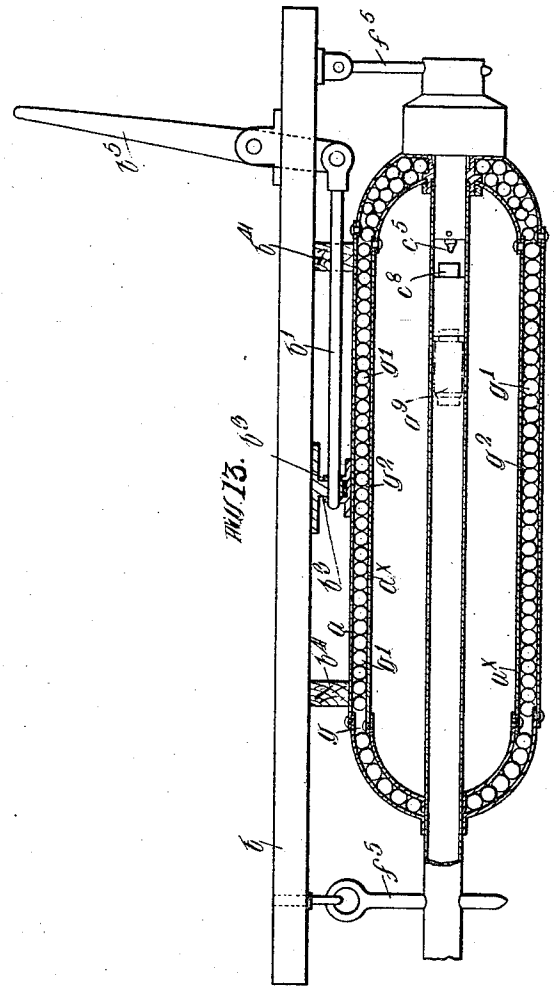


Fig. 13.

Witnesses

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D. B. Gault.

Inventor.

Hiram S. Maxim

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UNITED STATES PATENT OFFICE.

HIRAM STEVENS MAXIM, OF LONDON, ENGLAND, ASSIGNOR TO VICKERS LIMITED, OF WESTMINSTER, ENGLAND.

BOMB FOR USE WITH AEROPLANES AND OTHER FLYING-MACHINES.

1,077,990. Specification of Letters Patent. Patented Nov. 11, 1913.

Application filed March 25, 1912. Serial No. 686,002.

To all whom it may concern:

Be it known that I, HIRAM STEVENS MAXIM, a subject of the King of Great Britain, residing at "Ryecotes," Dulwich Common, in the county of London, England, have invented certain new and useful Improvements in or Relating to Bombs for use with Aeroplanes and other Flying-Machines, of which the following is a specification.

This invention relates to bombs for use with aeroplanes and other flying machines or balloons and particularly to bombs of the character in which a detonating charge is retained in a position remote from the main charge until the bomb is discharged or released.

In connection with the use of bombs it is necessary for effective working that the firing should take place so as to afford the highest degree of destruction whether of life or property, as earthworks, forts or other erections.

According to this invention the bomb is adapted to be exploded at a predetermined distance above or from the ground, object or target, by the initial impact of the bomb or of a part pertaining thereto and in order to accomplish the objects aimed at, the bomb is provided with a device adapted to precede the bomb in its travel toward the target so that the firing of the main charge may be brought about when the bomb is in the most favorable position for performing effective work. For the same purpose, the device may be adapted by means of suitable electric circuits to effect the firing of the main charge when the latter has arrived at a predetermined distance from the earth.

The shell or casing of the bomb may, in the usual manner, be formed or provided with grooves with or without a loading of metal fragments or balls or the like having the interstices between the same filled with a high explosive, so that destructive fragments or bodies are disseminated or spread by the explosion, the effect of the latter being thus productive of the desired destruction, in regard both to life and buildings or erections. The aforesaid device may comprise a projecting piece of the character of a nose adapted for detachment upon the release of the bomb from the machine or balloon and to assume the function of a "pilot" to the bomb. The device may be in connection or communication with the bomb by means of chain, cord or wire connection; the rear or other part of the bomb being provided with a retarding device adapted to arrest the too rapid descent of the bomb although not impeding the descent of the "pilot". Thus the "pilot" upon the discharge of the bomb is allowed to travel away from the latter and when the pilot strikes the ground or target the said "pilot" by means of suitable devices effects the firing of the main charge in the bomb. The height at which the explosion of the main charge will take place will depend upon the length of the connection between the bomb and the "pilot" or upon the strength of the explosive charge or the like effecting the rebounding of the bomb after it has struck the ground.

The term pilot employed in the following description and claims is indicative of a device which precedes the bomb and has relative movement to some distance therefrom.

In order that the said invention may be clearly understood and readily carried into effect I will proceed to describe the same with reference to the accompanying drawings in which:—

Figure 1 is an elevation showing the improved bomb attached to the aeroplane or flying machine. Fig. 2 is a partial sectional view of the aforesaid bomb. Fig. 3 is a sectional view of the tubular extension thereon showing the detonating charge and parachute in the inoperative position. Figs. 4 and 5 are detail views of the pilot device. Fig. 6 is a partial sectional view of another form of the improved bomb. Fig. 7 is a sectional view of the tubular extension thereon. Fig. 8 is an end view of such extension. Fig. 9 is a section of the pilot device showing the internal mechanism. Fig. 10 is a detail thereof. Figs. 11 and 12 are detail views of the shell or casing of the bomb. Fig. 13 is a sectional view of a form of the bomb which on exploding is adapted to disseminate fragments of metal or other suitable material.

Referring to Figs. 1 to 5 the bomb comprises a shell or casing *a* which is provided with circumferential and longitudinal grooves or depressions *a'* so as to insure said shell breaking into fragments when the

bomb is exploded. The shell a is provided with an internal hollow member a^2 which extends beyond said casing to form a tail piece a^3 and said tail piece is provided with a number of hinged members a^4 which, when the bomb is released, are adapted to extend in the same manner as an umbrella to constitute a parachute. If desired a suitable fabric or the like may be arranged on or spread over the said members. The members a^4 are hinged to the tail piece a^3 at a^5 and are retained in the closed position by a band a^6 carried by the machine. One or more of the members a^4 may be provided with an extension a^7 which is adapted to enter a corresponding opening or aperture a^8 formed in the tail piece a^3 of the bomb. The extension a^7 enters the opening a^8 when the parachute is in the closed position, and serves to retain an auxiliary or detonating charge a^9 at the extremity of the tail piece remote from the main charge of picric acid or other high explosive contained in the space between the shell a and the internal hollow member a^2. When the members a^4 are extended the auxiliary or detonating charge is free to move toward the main charge into the firing position. The bomb is secured to the framing b of the aeroplane or flying machine by means of a rod or bolt b' which is adapted to engage with openings b^2 formed in lugs b^3 carried by the shell of the bomb. The bomb rests in saddle pieces b^4 on the framing b and by operating the lever or handle b^5 the rod b' may be released from the lugs b^3 and the bomb liberated. Said lever b^5 is also adapted to operate another rod b^6 so as to release the band a^6 which normally retains the members a^4 of the parachute in the inoperative position.

A pilot in the form of a nose piece or weight b^7 is placed in the forward end of the casing a, a tether or cord b^8 being connected therewith and wound about a cylinder or drum b^9 connected to a shaft b^{10} and having a ratchet or similar wheel c associated therewith in such a manner that the running out of the cord b^8 by the liberation of the weight b^7 has the effect of turning the ratchet backward. Thus upon the release of the bomb from the flying or other machine the weight b^7 falls ahead of the bomb, as this latter is retarded by the action of the parachute and pulls out the cord b^8 and rotates the drum b^9. The shaft or spindle b^{10} is screw threaded and the drum b^9 is adapted to traverse the same when it is rotated by the unwinding of the cord b^8. This traversing movement of the drum will bring a projection c' thereon into engagement with a projection c^2 carried by the ratchet wheel c and will cause the same to rotate. The ratchet wheel c is connected to the shaft b^{10} by means of a spring c^3 of spiral or other suitable form, and when the weight b^7 has got to the end of its tether the stress of the spring c^3 is equal to the weight. Therefore, the effect of the weight touching the ground or target is to slacken the cord b^8 and release the tension on the spring and allow the same to effect the rotation of the ratchet wheel c in the forward direction. The ratchet wheel c will thus engage with a detent or trigger c^4 adapted to liberate the firing pin c^5 which has been previously operated to assume the cocked position and which then effects the firing of the charge. The framing b of the machine is provided with a depending pin or arm c^6 which is adapted to engage with the member c^7, and hold the firing pin c^5 in the fully cocked position so rendering the apparatus secure from premature firing until the said pin or arm c^6 recedes from the bomb, or the latter is released from the flying machine. In this connection, it may be mentioned that the safety also resides in the fact that it is necessary for the cord b^8 to be extended to its full length and for the spring c^3 to be wound, also the auxiliary charge a^9 to be in position before the firing of the main charge can take place. When the striker c^5 is released it will strike the primer c^8 and fire the detonator c^9 which in turn will effect the firing of the detonating charge a^9.

An arrangement, adapted for electrical operation is shown in Figs. 6 to 12 and comprises an auxiliary or fulminating charge a^9 housed in the rear of the central tubular case or elongated chamber a^2 the forward portion of which passes through the bomb. The latter consists of a metallic casing a of elongated or approximately cylindrical form, the fore part of the aforesaid tube a^2 being provided with a common exploder e such as used for exploding dynamite. In order to facilitate the breaking up of the casing a when the main charge therein is exploded a number of external and internal grooves or depressions a' Figs. 6 and 12 may be formed in said casing. A suitable electrical connection e^2 is coiled at the forward end of the tube a^2 in a detachable hollow nose or cap e^3 having a battery e^4 arranged therein. The bomb is carried by or suspended from the aeroplane, flying machine or balloon by means of lugs b^3, not shown in this arrangement, but previously described in connection with the first arrangement, a readily detachable pin b' passing through the said lugs. A depending pin or arm c^6 on the framing of the machine passes through an opening e^5 in the shell a of the bomb and the tube a^2 and serves to retain the detachable nose or pilot e^3 to the bomb.

A disk or block of non-conducting material e' is arranged on the front end of the pilot e^3 and carries a flexible plate e^6 which is adapted to make contact with a number of pins e^7 arranged in the electrical circuit

when the pilot strikes the object or target, or the device may comprise some other light contact making means adapted to operate with certainty and being of spring or yielding character; the plate may be constituted of a number of radial arms each adapted to make contact with one of the pins e^7.

The pilot is electrically connected with the exploder e by means of the twin lead e^2 which is wound on a drum or spool e^9 Fig. 9 carried thereby. The drum e^9 is mounted on a screwed spindle e^{10} so that when the pilot is released from the bomb the drum will be rotated and will move with said spindle until it meets and makes contact with the member e^{11} arranged in the circuit of the battery e^4. Two contact devices are thus provided and the circuit of the battery is incomplete until both devices have been operated to make contact.

Assuming the bomb to be secured to the frame of the aeroplane, flying machine or balloon in a manner such as hereinbefore referred to in which position the auxiliary bomb or detonator a^9 is effectually prevented from moving forward into the tubular chamber a^2 by the members a^4 of the parachute and therefore impossible of being fired by the exploder e in the bomb, and the switch e^6 in the open position, upon the release of the bomb the whole apparatus falls away from the machine leaving the depending pin or arm e^6 and the band a^6, not shown in these figures, securing the retarding members a^4, hanging from the machine. Thus the auxiliary charge a^9 is freed by the opening of the members a^4 of the retarding means and enters the tubular chamber a^2 and at the same time the nose or cap e^3 which contains the battery e^4 is released and owing to the retarding device or parachute which tends to hold the bomb back, while the cap or "pilot" e^3 travels or gravitates away from the bomb, draws out its tether line or electrical conductor e^2 until a suitable distance in advance of the bomb when the whole apparatus travels together. This movement of the pilot effects the operation of the drum e^9 and the contact device pertaining thereto. The nose or cap upon reaching the ground or target, by means of the spring or other light contact plate e^6 provided thereon, completes the circuit of the battery e^4, whereupon a current is sent through the exploder e, and, as the auxiliary charge or detonator a^9 has in the meantime arrived in close proximity to the said exploder, the said auxiliary charge is fired, the tubular chamber a^2 is ruptured and the main charge exploded. The exploder e is usually of such a character as to be effective, for firing the auxiliary charge a^9, only when the latter is in close proximity thereto. It will thus be seen that the bomb comprises a main charge of high explosive adapted for being fired or exploded by means of an auxiliary charge a^9 capable of passing from the rear to the fore end of the apparatus and that the firing is dependent in most cases upon a pilot device d' adapted to travel in advance of the bomb when the same is released from the flying or other machine, the said pilot device carrying means for firing electrically or mechanically the auxiliary charge and through the latter the main charge while the bomb is still elevated some distance from the ground.

So as to insure the destructive effect of the explosion of the bomb the latter may be adapted or constructed as shown in Fig. 13 so as to disseminate fragments of metal or material. An outer casing a of steel is disposed about an inner casing a^x which is filled with picric acid either pure or in a slightly modified condition so as to render it easier of melting or more insensitive. The annular space g between the two casings a, a^x is filled with tough steel balls, g', and the interstices g^2 between the balls with picric acid. The said balls may be produced as rough castings, or otherwise, hardened and tempered so as to withstand shock without being shattered. The detonating charge a^9 and the firing pin c^5 are retained in the inoperative position by the depending arms or members f^5, the detonating charge is however shown in the firing position.

What I claim and desire to secure by Letters Patent of the United States is:—

1. In a bomb for use with aeroplanes or flying machines, the combination of a main explosive charge, a detonating charge, and an impacting part located at a predetermined distance in advance of the bomb and operatively connected with the detonating charge, whereby the main charge is exploded at a predetermined distance above or from the ground, object or target after impact with the latter of the said impacting part.

2. In a bomb for use with aeroplanes or flying machines, the combination of a main explosive charge, a detonating charge, means for retarding the motion of the bomb during its descent, and an impacting part located at a predetermined distance in advance of the bomb and operatively connected with the detonating charge, whereby the main charge is exploded at a predetermined distance above or from the ground, object or target after impact with the latter of the said impacting part.

3. In a bomb for use with aeroplanes or flying machines, the combination of a main explosive charge, a detonating charge, a parachute for retarding the motion of the bomb during its descent, and an impacting part located at a predetermined distance in advance of the bomb and operatively connected with the detonating charge, whereby the main charge is exploded at a predeter-

mined distance above or from the ground, object or target after impact with the latter of the said impacting part.

4. In a bomb for use with aeroplanes or flying machines, the combination of a main explosive charge, a detonating charge capable of moving relatively to the main charge, and a pilot device for exploding said charges at a predetermined distance above or from the ground, object or target.

5. In a bomb for use with aeroplanes or flying machines, the combination of a main charge of high explosive, a detonating charge capable of moving relatively to the main charge, a parachute for retarding the motion of the bomb during its descent and a pilot device for exploding said charges at a predetermined distance above or from the ground, object or target.

6. In a bomb for use with aeroplanes or flying machines, the combination of a main charge of high explosive, a detonating charge capable of moving relatively to the main charge, a parachute for retarding the motion of the bomb during its descent, and a firing device which when the bomb is released assumes a position in advance thereof so as to explode the detonating and main charges a predetermined distance above or from the ground, object or target.

7. In a bomb for use with aeroplanes or flying machines the combination of a main charge of high explosive, a detonating charge capable of moving relatively to the main charge, and a firing device which, when the bomb is released, assumes a position in advance thereof so as to explode the detonating and main charges a predetermined distance above or from the ground, object or target.

8. In a bomb for use with aeroplanes or flying machines the combination of a main charge of high explosive, a detonating charge capable of moving relatively to the main charge, a spring controlled shaft, a firing mechanism associated therewith and a pilot device which is operatively connected to said spring controlled shaft so as to effect the winding thereof during the descent of the bomb and to release the same when the bomb is a predetermined distance above or from the ground, object or target.

9. In a bomb for use, with aeroplanes or flying machines, the combination of a main charge of high explosive, a detonating charge capable of moving relatively to the main charge, a parachute which becomes operative when the bomb is released from the machine and which is adapted to retain the detonating charge in the inoperative position until such release is effected and a pilot device for exploding said detonating charge at a predetermined distance above or from the ground, object or target.

10. In a bomb for use with aeroplanes or flying machines the combination of a main charge of high explosive, a detonating charge capable of moving relatively to the main charge, a spring controlled shaft, a firing mechanism associated therewith, a parachute which becomes operative when the bomb is released from the machine and which is adapted to retain the detonating charge in the inoperative position until such release is effected and a pilot device for exploding said detonating charge at a predetermined distance above or from the ground, object or target.

11. In a bomb for use with aeroplanes or flying machines the combination of a casing formed or provided with grooves, scoring or indentations, a main charge of high explosive, a detonating charge capable of moving relatively to the main charge into the operative position during the descent of the bomb, a parachute for retarding the motion of the bomb during its descent and a pilot device adapted to precede the bomb and to fire the detonating charge a predetermined distance above the ground, object or target.

12. In a bomb for use with aeroplanes or flying machines the combination of a casing formed or provided with grooves, scoring or indentations, a loading of metal fragments having the interstices between the same filled with a high explosive, a main charge of high explosive, a detonating charge capable of moving relatively to the main charge, a parachute for retarding the motion of the bomb during its descent and a pilot device adapted to precede the bomb and to explode the detonating charge a predetermined distance above the ground, object or target.

In testimony whereof I affix my signature in presence of two witnesses.

HIRAM STEVENS MAXIM.

Witnesses:

HARRY A. LYONS,

CH. BRASHEARS BEYLARD.