J. H. BARR.

BOMB DROPPING DEVICE.

APPLICATION FILED OCT. 17, 1917.

1,339,432.

Patented May 11, 1920.

6 SHEETS—SHEET 1.

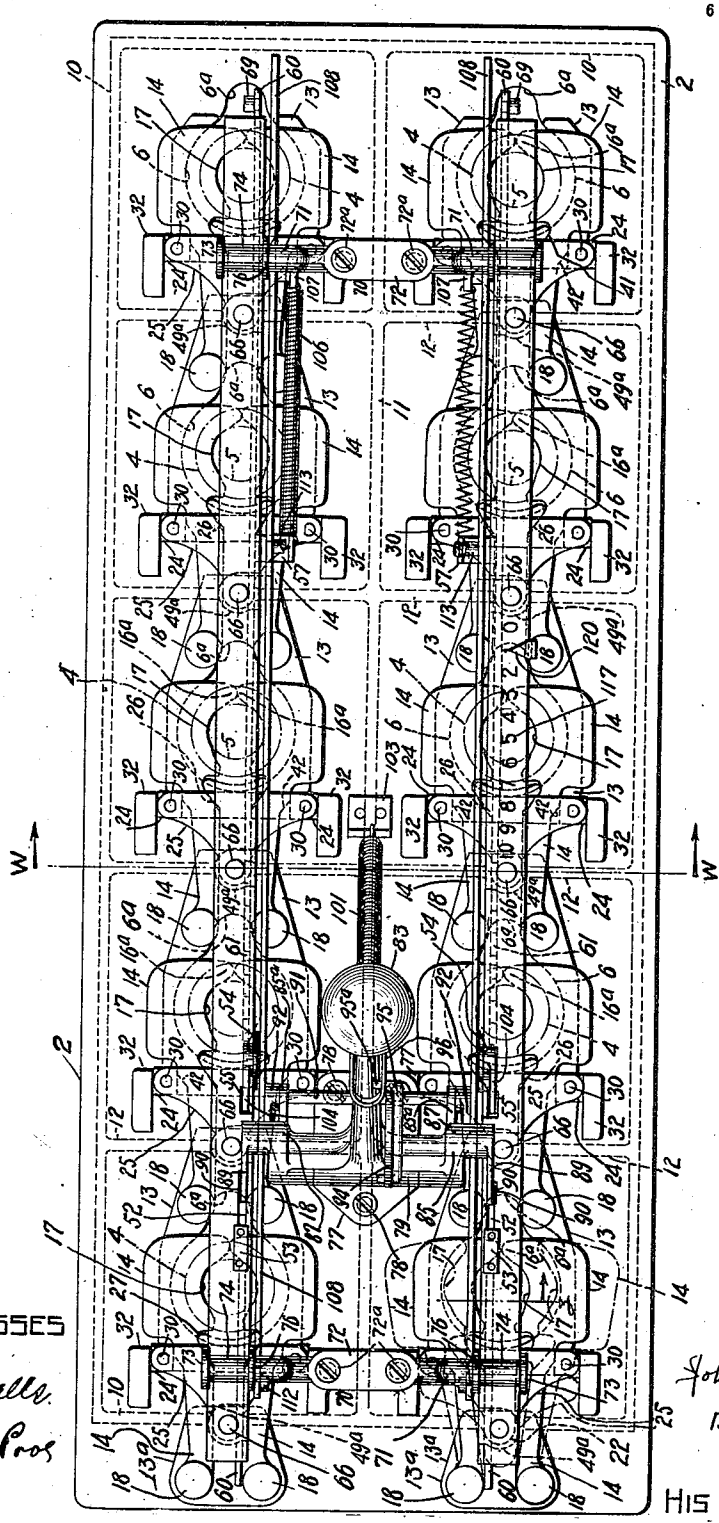


FIG. 1.

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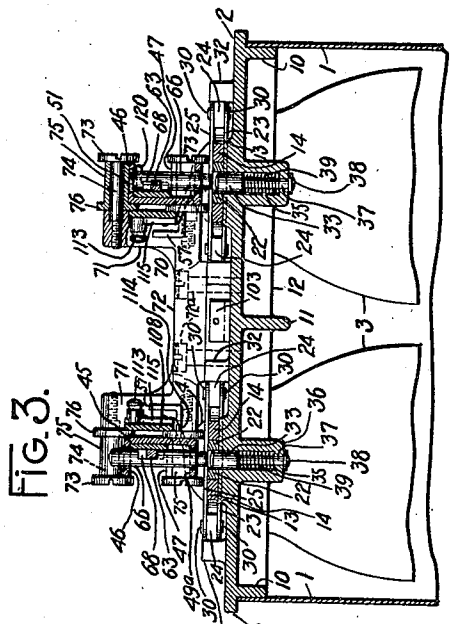


FIG. 3.

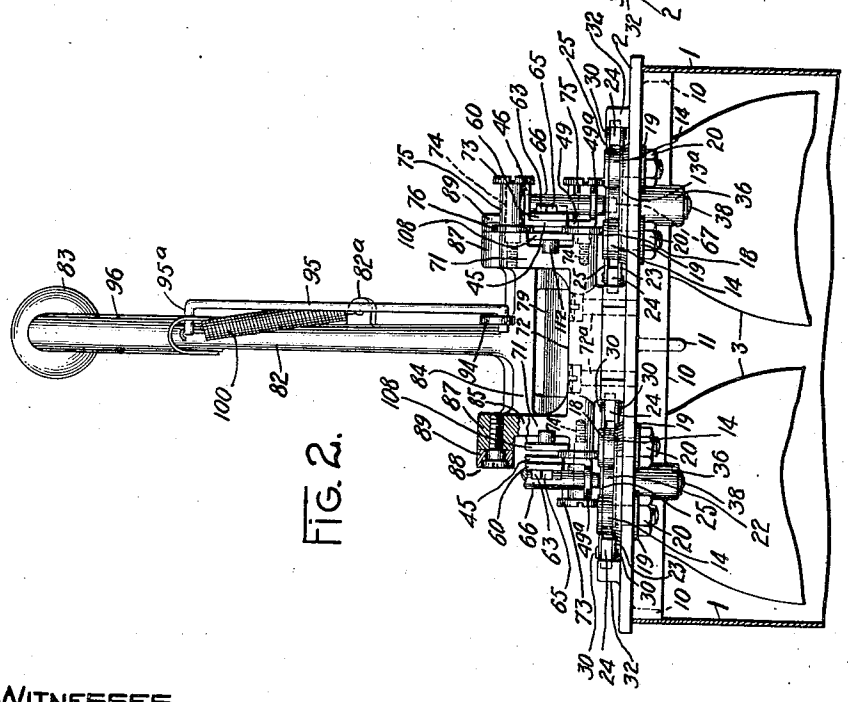


FIG. 2.

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5 SHEETS—SHEET 3.

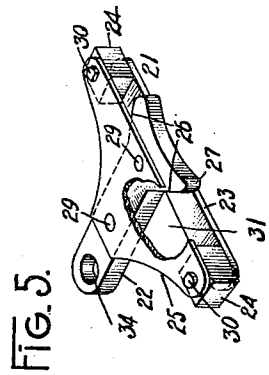


FIG. 5.

FIG. 4.

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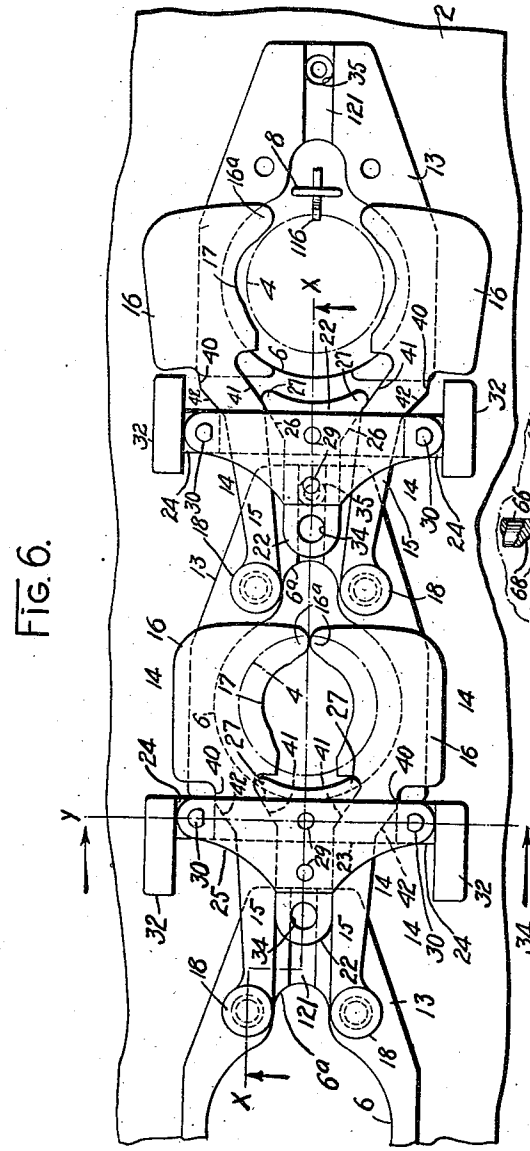


FIG. 6.

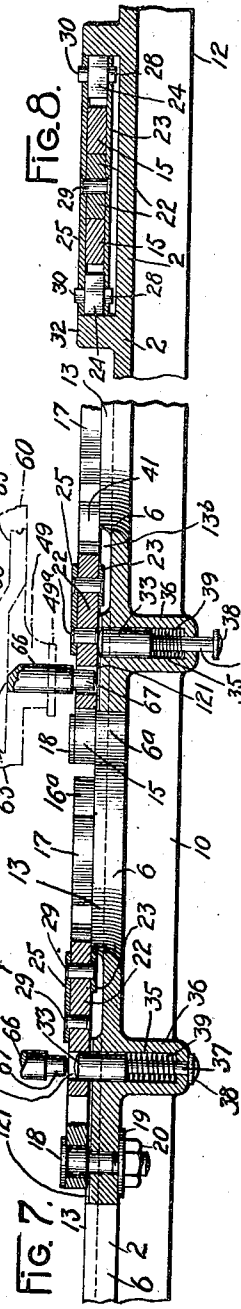


FIG. 7.

FIG. 8.

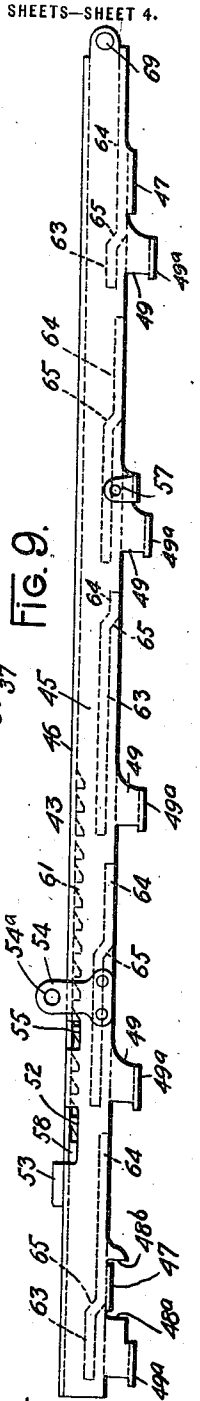


FIG. 9.

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6 SHEETS—SHEET 5.

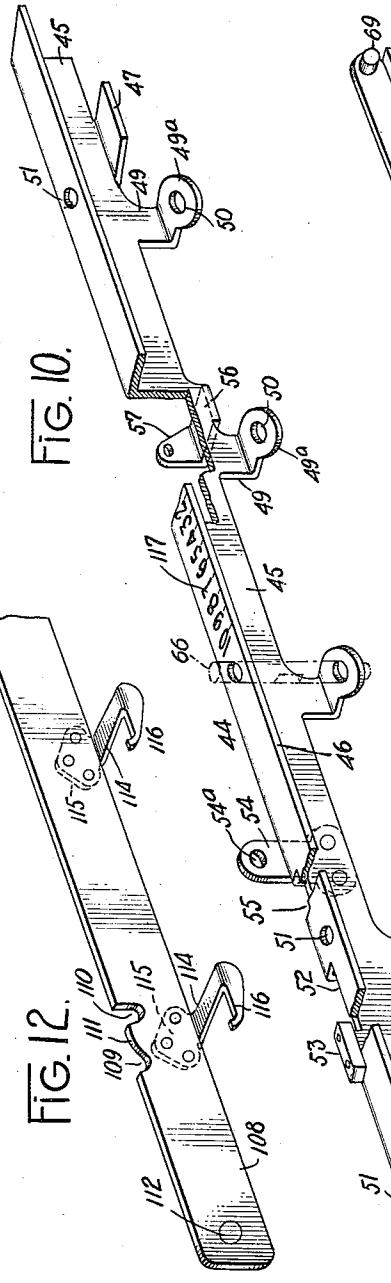


FIG. 10.

FIG. 12.

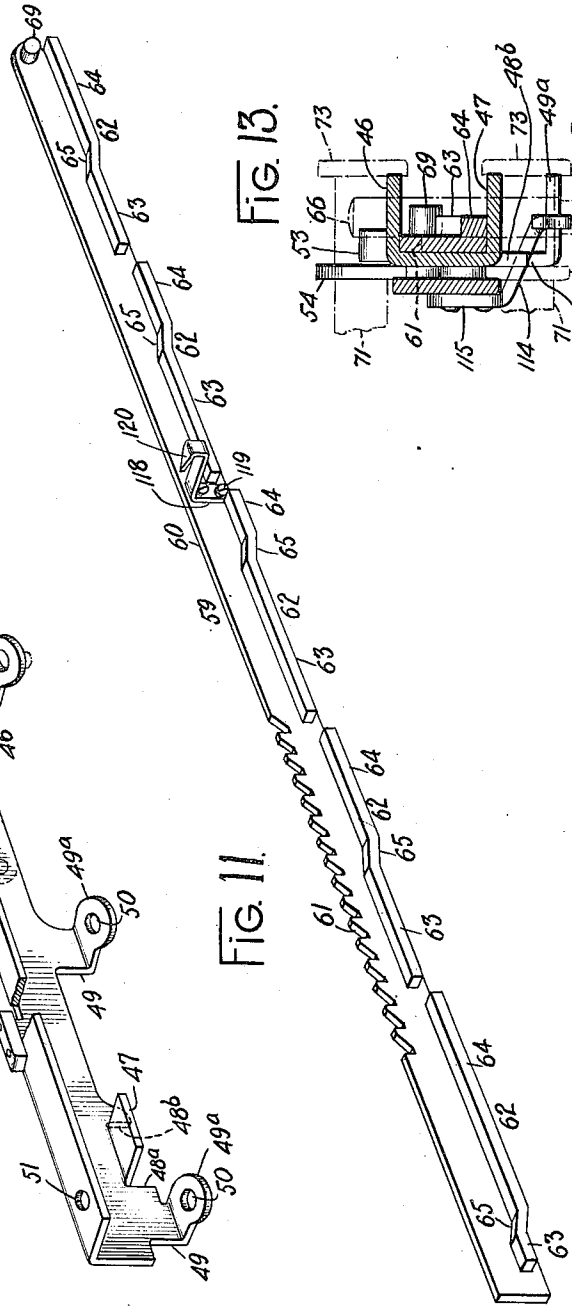


FIG. 11.

FIG. 13.

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6 SHEETS—SHEET 6.

FIG. 14.

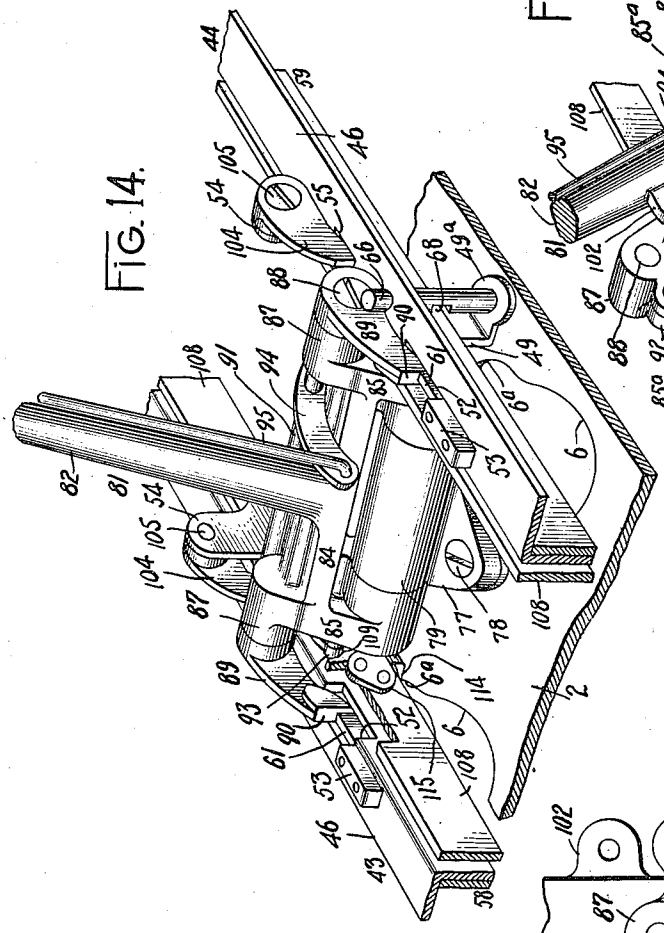


FIG. 15.

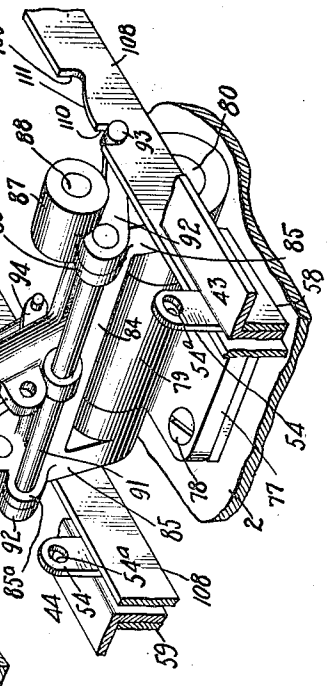
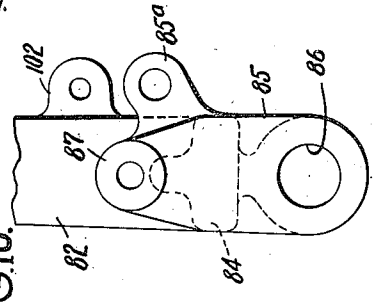


FIG. 16.



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UNITED STATES PATENT OFFICE.

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BOMB-DROPPING DEVICE.

1,339,432. Specification of Letters Patent. Patented May 11, 1920.

Application filed October 17, 1917. Serial No. 197,038.

To all whom it may concern:

Be it known that I, JOHN H. BARR, a citizen of the United States, and resident of the borough of Manhattan, city of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Bomb-Dropping Devices, of which the following is a specification.

My present invention relates to means for dropping or discharging bombs or other missiles, and its principal object is to provide a contrivance or apparatus embodying new and improved means of the character specified.

To the above and other ends which will hereinafter appear, my invention consists in the features of construction, combinations of devices and arrangements of parts hereinafter described and particularly pointed out in the claims.

In carrying out my invention in the present instance, I provide a magazine, receptacle or holder for a plurality of bombs or missiles, ten, for example, which magazine or holder is adapted to be carried by an aeroplane or other air-craft and to be operated therefrom during flights. My invention provides means for holding the bombs locked securely in the magazine so that accidental dropping or discharging is prevented, said means comprising preferably grippers or clamping jaws which coöperate with the neck of the bomb and are positively maintained locked in engagement with the bomb by a controller, which is actuated by a handle or hand lever to positively swing the clamping jaws so as to release the bomb. The controllers are selectively operated so that the bombs may be released in predetermined succession by actuations of the handle but means are also provided for so actuating the controllers that at a single movement of the handle any desired number of bombs may be simultaneously released and permitted to drop so as in effect to discharge a broadside. The bombs themselves are provided with safety devices which prevent their discharge should they be accidentally dropped, and my invention contemplates means for automatically rendering these safety devices operative, but means are also provided for rendering said automatic means ineffective, enabling the bombs to be dropped by operating the releasing handle so that they will not explode on striking, as may be desired in some circumstances. Other improvements and advantages will appear in the course of the following specification.

The accompanying drawings illustrate the preferred form of my invention, only so much of the magazine and bombs being disclosed, however, as is necessary to a complete understanding of the invention. For military reasons it is preferred not to make a fuller disclosure of the bombs themselves in the present case, said bombs *per se* not being of my invention.

In the drawings,

Figure 1 is a top plan view of a magazine or container embodying my invention.

Fig. 2 is a fragmentary end view of Fig. 1, looked at from the left, the magazine below the top plate being shown in section.

Fig. 3 is a fragmentary transverse sectional view taken on a plane indicated by the dotted lines *w w* in Fig. 1 and looking in the direction of the arrows at said line.

Fig. 4 is a fragmentary side elevation of Fig. 1 parts being shown in section and other parts being broken away.

Fig. 5 is a detached perspective view of a part hereinafter termed a controller.

Fig. 6 is a fragmentary top plan view on a larger scale than Fig. 1, showing the bomb locking devices and associate parts.

Fig. 7 is a longitudinal sectional view taken on planes indicated by the broken dotted line *x x* in Fig. 6.

Fig. 8 is a transverse sectional view, taken on a plane indicated by the dotted line *y y* in Fig. 6.

Fig. 9 is a detached view of the left-hand or rear one of two members hereinafter referred to as channel bars, the parts associated with the left-hand channel bar being shown.

Fig. 10 is a perspective view of the right-hand channel bar, or that one which is at the front side in Figs. 1 and 4.

Fig. 11 is a perspective view of a ratchet bar associated with the channel bar of Fig. 10.

Fig. 12 is a fragmentary perspective view of a hook bar associated with the channel bar of Fig. 10.

Fig. 13 is a transverse sectional view taken on a plane indicated by the dotted line *z* in Fig. 1.

Figs. 14 and 15 are fragmentary perspective views showing the hand lever or handle and associate parts, the views being taken from opposite sides.

Fig. 16 is a fragmentary elevation of the lower end of the hand lever member.

Referring first to the general views, Figs. 1 to 4, the magazine, container or holder for the missiles or bombs comprises a rectangular body portion 1 which may be of sheet metal, and a cover or top plate 2. The magazine shown is of a size adapted to contain ten T. N. T. bombs weighing twenty-five pounds each, said bombs being arranged in two rows of five bombs each. The clamping jaws and controllers are correspondingly arranged in two lines or rows. The bombs, each designated as a whole by the reference character 3, are not shown in detail herein, nor is it deemed desirable to disclose the details of the magazine, it being thought sufficient to say that the bombs may be introduced through a door or opening at the upper part of one of the sides of the magazine and discharged through spring trap doors in the bottom of the magazine. A projecting lip or ledge extends around the magazine at or near its bottom, said ledge being made preferably of light angle iron and providing stock to which may be fastened struts or other devices that secure the magazine to the aeroplane or other support or carrying device. Referring to the bombs as they are arranged in the magazine, each one is provided at its upper end with a head or nose portion 4 which is joined to the body portion by a neck 5. The end portion or neck extends upward through a circular opening 6 in the top plate 2, said opening being provided at one side with a narrow extension 6^a. A wire safety device 7, carried by the bomb also extends upward through the hole 6, being accommodated by the narrow end portion 6^a thereof. An upwardly extending portion 8 of said wire terminates in a cross portion which is adapted for coöperation with a hook or stripping bar, as hereinafter explained. Somewhat below the neck the wire 7 is looped into a groove 9 in the body of the bomb, the looped portion or clip extending somewhat more than half-way around the bomb and providing a disconnectible spring connection between it and the wire 7. Thence the wire extends downward to the lower end of the bomb where it engages with one of the vanes or blades of a wheel, propeller or rotary device, or other arming device, which is included in the means for controlling the coöperating firing or detonating devices for the bomb. These devices, which as has been stated are preferably not herein disclosed, are normally separated so that they can not coöperate to fire the bomb until the rotary device is rotated to permit bringing them in juxtaposition. It will be understood that when the bomb is discharged and the wire 7 stripped from it, as hereinafter explained, the bomb under the force of gravity will drop through a trap door in the bottom of the magazine and turn over so that the nose is at its lower end, and as it descends the rotary device will rotate, releasing one of the detonating devices into position to coöperate with the other when the nose strikes. If, however, the wire is not stripped but remains on the bomb, then the detonating devices remain locked in safety condition; or so far separated that even when the nose strikes the bomb will not be discharged.

The top plate 2 is provided at its under side with a downwardly extending rectangular rib 10 which fits into the upper end of the magazine 1 and is suitably secured thereto. The under side of the top plate is also provided with a central longitudinal rib 11, which tapers somewhat from the ends to the middle and from which branch out a number of lateral ribs 12 that connect it with the outer rib 10. Thus in effect the top plate comprises a grid and a connecting web portion. Around the holes or bomb openings 6 the top plate is provided with a thickened finishing face or boss 13. This thickened portion, except in the case of the two right-hand end holes, extends entirely around the holes except at their left-hand sides. In the case of the two end holes aforesaid the thickened portions 13 do not extend around the portions 6^a of the holes. Additional bosses or thickened portions 13^a are provided on the top plate near its left-hand end.

Each bomb is provided with separate and independent holding means for holding it in place in the magazine, said holding means in the present instance comprising a pair of pivoted grippers or jaws that coöperate with the neck portion 5 of the bomb below the head 4. These jaws, designated by the reference numeral 14, are clearly shown in the general views, Figs. 1 to 4, and in greater detail in Figs. 6 and 7. Each pair of grippers are arranged in parallelism at opposite sides of the associate bomb opening, each gripper comprising a shank 15 and a wider end portion or jaw proper 16, the inner face of which is so curved or shaped, as indicated at 17, as to coöperate properly when operated with the neck portion of the bomb and so that when the grippers are swung apart to release the bomb they will do so at all points substantially simultaneously. This will be better understood from a consideration of Fig. 6, which shows a pair of grippers open, the head 4 of the bomb being indicated by a dotted circle. It will be seen that each face or edge 17 is so shaped near its ends that the four end portions will swing clear of the bomb head practically at

the same instant. At the opposite end from the jaw portion 16, each shank 15 is provided with a hole which receives a headed shoulder screw 18 that serves as a pivot for the gripping arm 14. The pivot screw 18 passes down through an opening in one of the thickened portions 13 of the top plate and at its lower end below the top plate receives a washer 19 and a clamping nut 20 by which the pivot screw is firmly clamped in place, its upper shouldered portion resting on the upper surface of the thickened portion 13. The construction permits the gripping arm to swing freely on its pivot, said arm being loosely confined between the head of the screw 18 and the upper face of the thickened portion 13. Each gripper rests on and is adapted to slide over the adjacent thickened portions 13, as will be understood from Fig. 1. In the case of the two left-hand grippers, their pivot ends are supported on the bosses or thickened portions 13^a.

The grippers are adapted to be operated by means which positively control their swinging movements, both away from and toward each other, said means comprising a plurality, ten in the present instance, of controllers or cam members, there being one controller for each pair of grippers. The construction of the controllers will be best understood from an examination of the general views, Figs. 1 to 4, and in detail views, Figs. 5 to 8. Each controller, designated as a whole by the reference numeral 21, comprises a stem 22, a cross bar 23, end blocks 24, and a top plate 25. The stem is formed at one end with diverging cam faces 26, terminating in noses or rounded portions 27. The cross bar 23 at its ends supports the end blocks 24, said end blocks being provided with downward projections 28 which may be spread or upset slightly to hold the bearing blocks in place. The cover plate 25 is generally triangular in shape and is secured to the stem 22 by rivets 29, one of these rivets passing down through the cross bar 23 and securing it directly to the stem 22. Upward projections 30 on the end blocks pass through holes in the cover plate and may be upset slightly to secure the parts together. The end blocks are rectangular in shape. The projections 28 and 30 are round but are flattened on one side (D-shape) so as to prevent the end blocks from turning. The controller is arranged between the shanks of the associate pair of grippers, that is, the body portion or stem 22 is arranged between said shanks which pass through the space or passageway designated as 31. This space or opening 31 affords passage for one of the grippers, which is thus loosely confined between the end block and the stem at the sides while above and below the gripper is confined between the cross bar 23 and the cover plate 25. The controllers 21 are slidably supported on the top plate 2, taking direct bearing on the thickened portions 13. The cross bars 23 which are below the surface of their stems 22 slide freely in the spaces, indicated at 13^b (Fig. 7) between the portions 13. The end blocks 24 of each controller are loosely confined between two lugs or guides 32 rising from the top plate 2, these lugs preventing sidewise displacement of the controller and confining it to rectilinear movement. The controllers are normally locked against sliding movement by plungers or locking pins 33 which project upward through holes 34 in the stems 22. The plungers take bearings in depressions or seats 35 formed in lugs 36 which project downward from the under side of the top plate, these lugs being preferably extensions or enlargements of certain of the top plate ribs. Each plunger 33 is provided with a stem 37 which extends downward through the bottom of the lug 36 and terminates below said lug in a head 38. A coiled plunger spring 39, confined between the plunger proper and the bottom of the depression or socket 35, tends constantly to press the plunger upward, this upward movement being limited by the contact of the head 38 with the lug 36. In its uppermost position the plunger, as clearly illustrated in Fig. 7, projects partly through the hole 34 in the controller and positively locks it against sliding movement back and forth. Since the lugs 32 positively prevent movement of the controller laterally or at right angles to its sliding movement, it will be seen that the controller is thus positively locked against any movement whatever. When thus locked the controller positively locks the grippers against effective rotary movement. This is due to the fact that the inner faces of the end blocks 24 at this time contactively engage with parallel edge portions 40 of the shanks 15 while the diverging faces 26 at the same time are contiguous to correspondingly diverging faces 41 on the inner sides of the shanks 15. Thus movement of the grippers either away from or toward each other is prevented. As hereinafter explained, the controllers are adapted to be separately unlocked and slid endwise toward the pivots of the grippers, bringing them to position such as is illustrated at the right in Fig. 6. During this sliding movement the cam faces 26 operate on the faces 41 of the grippers to swing them outward, this movement being permitted by reason of the fact that the inner faces of the blocks 24 have moved out of contact with the edges 40. On the return movement of the controller from left to right the inner corners of the blocks 24, acting on the inclined faces 42 of the grippers, will swing them inward, the cam faces 26 moving correspondingly rightward

to permit of such a movement. The inward swing of the grippers toward each other is limited by a contact of the nose portions 16ª in which the outer ends of the jaws 16 terminate. At the end of the right-hand movement of the controller the noses 27 are seated in the rounded openings formed by the junction of the faces 41 with the jaw portions 16 of the grippers. It will be understood that during swinging movements of the grippers toward and away from each other they remain positively controlled by the controllers by reason of the fact that the shanks 15 are at all times closely confined between the blocks 24 and the cam faces 26. Throughout the swinging movements the faces 42 remain in contactive engagement with the inner corners of the blocks 24, while the edges or faces 41 remain in contactive engagement with the cam faces 26. The result is that any possibility of loss of control of the grippers or clamping jaws is avoided. It will be understood that the controllers are arranged in two parallel rows or lines, each row containing five controllers and that the locking pins or plungers 33 are arranged in two parallel lines, each line containing five locking pins.

Means are provided for selectively displacing the locking pins 33 or moving them downward out of engagement with the controllers and associate means are provided for moving the controllers after they have been unlocked so as to cause them to swing the grippers outward to release the bombs. These means are so related that the controllers may be unlocked and operatively moved to effect a release of the bombs one at a time, or, if preferred, the controllers may be released from their locking pins one at a time to any desired number and subsequently simultaneously caused to operate to effect releasing movements of the grippers so that a selected or predetermined number of bombs may be simultaneously dropped. Generally described, the means aforesaid comprise two rows or sets of releasing pins corresponding to the locking pins, each row mounted on a carrier, there being two parallel carriers, said carriers also supporting devices or releasing members for effecting operative movements of the releasing pins in selected order, the releasing pins having the further function of connecting the controllers with the carriers so that subsequent movements of the carriers may effect operative movements of the controllers. There are two releasing members, one for each row of releasing pins, said members being controlled by a hand lever in such a way that they may be moved step by step independently of said carriers, so that any desired number of controllers may be released prior to being operatively moved. The carriers and the releasing members are all under the control of a single operating handle or hand lever.

The carriers aforesaid are in the form of channel bars and are illustrated in Figs. 1 to 4, 9, 10 and 13. Fig. 9 shows a channel bar that is at the rear, when viewed as in Fig. 1, while Fig. 10 shows the front channel bar of Fig. 1. These channel bars, respectively designated as a whole by the reference numerals 43 and 44, correspond in construction but are rights and lefts, being arranged lengthwise of the top plate and having their corresponding portions extending away from each other. With this understanding it will only be necessary to describe in detail one of the channel bars, preferably the forward channel bar 44 since it is the more clearly illustrated in detail.

The channel bar 44 comprises a vertically arranged body portion 45, from the top of which projects forward, or toward the observer, as viewed in Figs. 4 and 10, a horizontally arranged ledge or lip 46. From the lower edge of the body portion near either end project two short horizontal ledges or lips 47, these being sections, in effect, of a lower lip corresponding to the upper lip 46. At either side of the left-hand lip 47 the body portion projects downward, forming two vertical faces 48ª and 48ᵇ which act as stops, as explained later. Projecting downward from the body portion 45 at intervals are a number of angular fingers 49, these fingers terminating in forwardly projecting horizontal rounded portions 49ª. In the present instance there are five of these fingers, one near the left-hand end of the channel bar and the others arranged at regular intervals along it. The horizontal portions 49ª are formed with holes 50 and in register with these holes are corresponding holes 51 in the ledge 46, each registering pair of holes providing bearings for one of a set of releasing pins, subsequently to be described. Near its left-hand end the channel bar 44 is provided with a cutaway or notch, indicated at 52, part of this notch being in the ledge 46 and part in the body portion 45. To the left of the notch a stop block or abutment 53 is secured to the top channel bar in any suitable way as by rivets. Somewhat to the right of the notch 52 an upright finger 54, formed at its upper end with a hole, indicated at 54ª, is secured to the rear face of the body portion 45 in any suitable way, as by riveting. Just to the left of the finger or standard 54 a notch 55 is cut in the channel bar, this notch or slot 55 being similar to the notch or slot 52 but being somewhat shorter. Farther back along the channel bar toward the right, between the last two fingers 49, is an angular finger 56 that extends rearward from the lower part of the body portion and terminates in an upstanding portion 57. The

channel bar 43, best illustrated in Fig. 9, being similarly constructed to the channel bar 44, the corresponding parts are similarly numbered. Before describing the mounting of the channel bars or carriers it may be well to describe the releasing members or ratchet bars, which are arranged within the channel bars and control the releasing pins.

There are two cam or ratchet bars, rights and lefts but otherwise similar in construction. The one that coöperates with the channel bar 43 is numbered 58 and is most fully illustrated in Fig. 9, although it is there shown behind the channel bar 43. The other ratchet bar 59 coöperates with the channel bar 44 and is fully shown in Fig. 11.

A description of the front ratchet bar 59 will suffice for both, the corresponding parts of the ratchet bar 58 being similarly numbered. The ratchet bar 59 comprises a vertically disposed bar or body portion 60, provided along its upper edge with a series or set of ratchet teeth 61 forming a ratchet, this ratchet being arranged to the left of the middle of the bar. The front vertical face of the bar 60 is provided with a series or set of projecting cam devices 62 which project outward from the face of the bar and are preferably made of pieces separate from the bar and which are suitably secured to it. Each cam piece 62 comprises two horizontal portions, one above the other, numbered respectively 63 and 64, and a connecting diagonally arranged portion 65 which is the cam proper. There are five of these cam pieces 62 in the present instance secured to the bar 60. While the general construction is similar they vary one from another, as more fully described later on, so as successively to control the releasing pins with which they coöperate.

The releasing pins aforesaid, designated by the reference character 66 and illustrated in Figs. 1 to 4, 7, 13 and 14, are upright pins arranged to slide freely in the openings 50 and 51 in the reciprocating members or channel bars, their lower ends being reduced, as indicated at 67 to facilitate coöperation with the plungers 33. Each pin 66 at the inner side facing the channel bar is cut or otherwise formed to provide a notch or cut-out 68. This notch, as will be understood from Figs. 4 and 7 has its upper wall partly inclined and partly horizontal and its lower wall or edge similarly formed, the inclined portion of the upper wall being at the left and the inclined portion of the lower wall at the right. The ratchet bars 58 and 59 are arranged within their respective channel bars between the body portions 45 of the bars and the releasing pins 66, the cam pieces 62 passing through the notches of their associate releasing pins, thus preventing the releasing pins from dropping out of place. The releasing pins, on the other hand, it will be noted serve to connect the releasing members or ratchet bars with their associate channel bars and prevent said ratchet bars from dropping out of place. The right-hand ends of each of the bars 60 are provided with outwardly extending stop pins 69 which are adapted to coöperate with the right-hand releasing pins to prevent leftward withdrawal of the releasing members 58 and 59 from their channel bars.

The channel bars 43 and 44, together with the releasing members and releasing pins, for which they serve as carriers, are supported to reciprocate slidably on roller bearings above the top plate 2. To provide such bearings two brackets 70 are mounted on the top plate 2, one near each end. Said brackets, illustrated in Figs. 1 to 4, are generally U-shaped, comprising two uprights or standards 71 and a connecting base portion or cross bar 72. Through the cross bar 72 of each bracket pass screws 72^a which serve to secure the bracket to the top plate. Screwed into the outer face of each standard 71 near its top and bottom are headed screws 73 having long shouldered portions 74 which provide bearings for rollers or spools 75. Each spool has an inner flange or head 76 corresponding in diameter with the head of its screw 73. The channel bars are slidably supported on the rollers 75, each channel bar coöperating with four of these rollers, there being a pair of rollers to coöperate with the top and bottom of each channel bar near either end thereof. The lower roller of each bar supports the weight of the channel bar through one of the ledges 47 which rests on said roller. The upper roller prevents upward displacement. The spool heads or flanges 76 prevent inward displacement of the channel bars or displacement toward each other, while the heads of the screws 73 prevent outward displacement; said heads coöperating with the edges of the ledges or lips 47 and 46 (see particularly Fig. 13). The back faces of the body portions 45 contact with the flanges 76. The construction it will be perceived is such that while the channel bars may move or slide back and forth freely on their roller supports, they are confined to a definite path and cannot be accidentally displaced. The parts are so mounted and arranged that the vertical planes extending lengthwise of the top plate and that contain the locking plungers 33 of the grippers, will also contain the releasing pins 66.

Hand controlled means are provided for reciprocating or moving the channel bars and parts carried by them to and fro and also for moving progressively step by step the ratchet bars relatively to the channel bars so as to operate the releasing pins, said means being illustrated in Figs. 1, 2, 4 and

14 to 16. A bracket or journal bearing 77 is secured by screws 78 to the top plate 2 near its left-hand end and midway between the rows of bomb openings, said bracket having a cylindrical portion 79 which is bored out to receive a shaft 80 of a lever member or handle designated as a whole by the numeral 81. The shaft 80 is adapted to project beyond the ends of the journal or bracket to provide bearings for the lever member, and after the parts have been assembled the shaft is preferably pinned or otherwise secured in the bracket so that it will remain stationary during operations of the lever member. Said lever member comprises a handle proper 82, terminating at the top in a ball or finger piece 83 and gradually thickening from the top to the lower end where it is provided with a transverse integral cross bar or arm 84 that terminates at its ends in two parallel cross heads 85. The lower ends of the cross heads are rounded and bored out, as indicated at 86, to cooperate with the end portions of the shaft 80, about which the lever member 81 swings as a center. The upper ends of the cross heads are thickened or provided with bosses 87 on their outer faces which are tapped to receive shoulder screws 88 that provide bearings for pawls 89, said pawls extending downward and toward the left and terminating in broadened teeth 90, one tooth 90 coöperating with the ratchet or teeth 61 of the releasing member 58 and the other with the ratchet or teeth 61 on the releasing member 59. The pawls 89 pass downward through the slots 52 in the channel bars, and it will be understood that they may operate on the releasing members through said slots without affecting the channel bars until the pawls are brought in contact with the stops or abutments 53 at the left-hand ends of said slots. The backs of the cross heads 85 are provided with ears 85^a which provide bearings for a cross shaft 91 to which outside the ears are fixed arms 92, said arms at their free ends having short lateral pins 93 that coöperate with a hook bar hereinafter described.

In order fully to complete at this time the description of the member 81 and the devices supported on it, it may be set forth that the shaft 91 is controlled by a crank arm 94 that is fixed to it forward of the handle proper 82 and extends leftward, the free end of said crank arm having connected to it the lower end of a connecting rod or wire 95 that extends upward substantially parallel with the handle proper 82 and at its upper end is connected to an angular hand lever 96 that straddles the handle and is pivoted at 97 to an ear 98 integral with said handle. The finger piece or hand lever 96 has a movement relative to the handle that is limited by stops or lugs 99 projecting from the forward side of said handle. It will be plain from the drawing that the latch 96 is formed of sheet metal that is bent to provide the side portions that straddle the handle 82 and, also that the upper end or finger portion of the latch which is substantially U-shaped in cross section is arranged in proximity to the ball or finger piece 83, so that they may both be conveniently manipulated by one hand of the operator. The latch 96 and connected parts are maintained normally in the position shown in Fig. 4 by a coiled spring 100, the lower end of which is anchored to an ear 82^a projecting from the handle 82, the upper end of said spring, as appears from Fig. 2, being hooked through a hole in the upper end portion of the connecting rod 95. This upper end portion, indicated at 95^a, is angularly disposed to the body of the rod and passes through a hole in one side of the latch piece 96. The construction is such that the spring connection with the portion 95^a between the parallel ears of the latch prevents accidental detachment of the rod from the latch.

The member 81 is provided with a coiled restoring spring 101, one end of which is hooked through a hole in an ear 102 projecting rightward from the handle 82 near its lower end, the other end of said spring being anchored to an angular plate or bracket 103 which is riveted or otherwise suitably secured to the top plate. A back stop rod not shown is provided interiorly of spring 101, to limit the contraction of the spring and serve as a backing for lever 82.

Back pawls or detents are provided to maintain the relationship between the controlling members or ratchet bars and the channel bars. Said pawls, designated as 104, are pivoted on screws 105 which are secured in the holes 54^a in the standards 54. The pawls 104 are gravity or spring controlled and coöperate with the ratchet teeth 61 through the slots or notches 55 in the channel bars. These pawls 104 prevent while in operation rightward movement of the ratchet bars independently of or relatively to the channel bars. The channel bars are constantly urged rightward by coiled springs 106, one for each bar. The rear ends of the coiled springs 106 are anchored to webs or projections 107 on the bracket arms 71, and which are provided each with upper and lower holes. The springs 106 are hooked through the lower holes of the webs and thence extend horizontally leftward, the left-hand ends of said springs being hooked through holes in the portions 57 of the angular fingers 56. The effect of these springs 106 is normally to maintain the stop faces 48^a of the channel bars in contactive engagement with the lower left-hand rollers 75, as appears in Fig. 4. From this figure it will be plain that the movement of the chan-

nel bars toward the left will be limited by the engagement of the stop faces 48b with said rollers.

Referring now to the means for controlling the stripping of the safety devices or wires 7 from the bombs 3, said means comprise stripping or hook bars illustrated in Figs. 1 to 4 and 12 to 15. Said hook bars comprise bars proper 108 formed along their upper edges near the left-hand ends with slots or notches 109 and 110 connected by curved surfaces 111. Near its left-hand end each bar is provided at its inner face with a stop pin or lug 112. Somewhat to the right of its middle each bar has on its rear face a grooved pin 113. Arranged at intervals along each bar are hooks 114, there being five hooks on each bar in the present instance, or one hook for each bomb wire. These hooks are broadened or splayed, as indicated at 115, the splayed portions receiving rivets or other securing means by which the hooks are secured to the bars on their inner faces or the faces nearest each other. Thence the hooks extend outward away from each other under the bars in a general horizontal direction and terminate in downwardly bent and leftwardly extending end portions or hooks proper 116. The hook bars are slidably mounted on the bracket arms 71, being arranged between said bracket arms and the spool flanges 76, the bracket arms being cut or shaped to provide a passage-way for the hook bars so that they may slide freely lengthwise. Coiled springs are hooked over the pins 113 and extend thence toward the right, being hooked through the upper holes in the webs 107. These springs urge the hook bars constantly toward the right and the stops 112 prevent excess movement of the hook bars in this direction, said stops being adapted to coöperate with the faces of the left-hand standards 71. Normally the hook bars are limited in their rightward movement by reason of the engagement of the pins 93 with the notches 110 in the hook bars so that at this time the hooks 116 are clear of or to the right of the cross portions 8 of the wires 7.

Means are provided indicating to the operator the various relationships of which the channel bars and ratchet bars are capable, or in other words of indicating the number of bombs which have been dropped. Such indicating means may be preferably scale and pointer devices which comprise, as best shown in Figs. 1, 10 and 11, a scale indicated at 117 that is cut or otherwise suitably formed on the ledge 46 of the channel bar 44. With this scale coöperates an angularly shaped pointer 118 secured to the base of the ratchet bar 59 by screws 119 and looping around the ledge 46, terminating above said ledge in a beveled pointer proper 120. The pointer and scale are shown in Fig. 1 as indicating that one of the bombs has been dropped but for descriptive purposes it is desirable to assume for the moment that no bomb dropping operation has as yet occurred, and consequently the pointer will be one step to the right, or opposite the "0" on the scale, said scale running from "0" to "10" since the capacity of the magazine is ten bombs.

Referring to the operation of my invention, it will be understood that normally the locking plungers 33 are engaged with their respective controllers 21, which at this time maintain the grippers positively locked in engagement with the bombs. Also the releasing pins 66 are in register with their respective locking plungers or pins but are above and out of contact therewith. The general views show the parts after the first operation, which has been effective to advance the ratchet bars 58 and 59 one space to the left relative to their channel bars and as a consequence to cause the left-hand cam piece 62 on the ratchet bar 59 to act on its releasing pin to effect a release of the associated bomb. It will be understood, however, that before this operation has taken place the cam or diagonal portion 65 of the cam piece aforesaid is at the right of its releasing pin and has not as yet affected it. Let it be assumed that the parts are in this last mentioned relationship, and that the operator desiring to drop or discharge a bomb, pushes the finger piece 83 in the direction of the arrow in Fig. 4, or toward the left. The first effect of the movement of the finger piece 83 and handle 82 is to cause the pawls 89, acting on their associate ratchets 61, to move the ratchet bars 58 and 59 toward the left, the parts being so proportioned and arranged that this movement will cause the diagonal cam portion 65 of the left-hand cam piece 62 on the ratchet bar 59 to engage with the cam slot in its associate releasing pin 66 and depress said pin or slide it downward in its bearings in the channel bar, which as yet remains motionless.

It may be well at this point to refer somewhat more in detail to the variations of the cam pieces 62. As stated, the cam pieces 62 are generally similar. Their horizontally disposed portions 63 and 64, however, differ in length. As shown, the upper horizontal portion 63 of the left-hand cam piece 62 on the bar 59 is quite short and the lower horizontal portion 64 is quite long. Referring next to the right-hand cam piece 62, its upper horizontal portion 63 is somewhat longer than the portion 63 of the left-hand cam piece, while the lower horizontal portion 64 of the right-hand cam piece is somewhat shorter than the portion 64 of the left-hand cam piece. The three intervening cam

pieces vary it will be seen in the respect described from one another as well as from the end or left-hand and right-hand cam pieces. The cam pieces 62 on the ratchet bar 58 also vary from one another as well as from the cam pieces of the member 59. In other words, all of the ten cam pieces on the two controlling members or ratchet bars 58 and 59 are different from one another in the respect stated, so that the timing of the operations of the releasing pins which they control may be successive or progressive. It will be understood, of course, that the cams may be arranged on the ratchet bars so as to become effective in any desired order; or in other words, their arrangement is selective and at the will of the constructor. After they have been thus arranged, the result will be to cause the bombs to drop in predetermined succession or order. In the present instance, the order in which the bombs will drop will be readily grasped from comparing the lengths of the upper horizontal portions 63 of the cam members. This order has been determined in the present instance by the consideration that it is desirable to keep the magazine and the aircraft on which it is carried as evenly trimmed as possible. The bombs are of considerable weight and if they were dropped from one end straight back toward the other end without change, the loss of weight would not be evenly distributed. Accordingly, as will be understood from a comparison of Figs. 9 and 10, the bomb at the left-hand front end of the set will first be dropped, followed by, second, the one at the right-hand rear end, and thence successively by, third, the one at the left-hand rear end; fourth, the one at the right-hand front end; fifth, the one next to the right of the first one discharged; sixth, the one next to the left of the second one discharged; seventh, the one next to the right of the third one discharged; eighth, the one next to the left of the fourth one discharged; ninth, the middle one of those in the front line; and, tenth, the middle one of the ones in the rear line, as viewed in Fig. 1. However, the order of discharge is not fixed but may be varied as desired, either by changing the cams on the bars or by substituting the illustrated ratchet or cam bars by other bars having different cams or pin actuating or moving means.

Returning now to the effect of the downward movement of the left-hand front releasing pin in its bearing under the action of its associate cam piece 62, it will be understood that the reduced end of said pin 66 engaging with the underlying plunger 33, will move said plunger downward out of the hole 34 in the controller 21, the releasing pin taking the place of the plunger 33 and thereby connecting the controller with the channel bar 44. It may be here remarked that as a matter of precaution it is preferable to provide a slight groove or depression, indicated at 121 (Figs. 6 and 7) in the thickened portion 13 of the top plate in order to allow a margin of safety for the operation of the plunger 33 and its pin 66. The effect of this construction is to enable the parts to work properly even if the lower end of the pin 66 should be depressed slightly below the bottom surface of the controller, whereas if the controller were in direct contact with the part 16, the pin 66 contacting with the side of the depression 35 would block the controller against sliding movement. The operation of depressing the plunger 33 is effected by a swinging to the left of the handle 82 which is sufficient in extent to bring the ends of the pawl teeth 90 into contact with the abutments 53 on the channel bars, the result being that as leftward movement of the handle is continued thereafter the channel bars will be forced leftward and the controller 21, that has been coupled with the channel bar 44 by its engaging pin, will participate in this leftward sliding movement, causing the associate grippers to be opened as has been described, and releasing the bomb which will drop through the magazine from the force of gravity, as has been heretofore explained. In Figs. 6 and 7 one of the controllers is illustrated in the position it will occupy after it has been slid leftward by its releasing pin and has opened the associate grippers, although the particular parts here illustrated are not the ones whose interaction is now being described. It will be seen that after the pin 66 passes to the left of the plunger 33, the latter will be maintained depressed by the stem 22. The bomb wire will be automatically stripped as the bomb drops owing to the fact that the hook bars have been slid leftward during the described operation by reason of the engagement of the pins 93 with the slots 110, the movement of the hook bars bringing the hooks 116 under the transverse ends 8 of the bomb wires, so that as the bomb drops the wire will be stripped from it by the hook. Normally as has been described, the hooks are to the right of the portions 8 of the wires so that should the bombs drop accidentally by reason of defective gripper action or for any other cause, the safety wires will remain in place thereon. The left-hand movement of the channel bars will be limited by the coaction of the stop faces 48^b with their associate rollers 75. On releasing the hand lever it will be restored to normal position, together with the parts carried by and connected to it, by the spring 101. At the same time the channel bars will be moved back to normal position by their restoring springs as will the hook bars. The return movement of the channel bars will be participated in by the

ratchet bars supported on them. It will be understood, however, that the first or preliminary movement of the ratchet bars toward the left, independent of the channel bars, will not be lost but that by reason of the engagement of the detent pawls 104 with the ratchet bars the ratchet bars will have been advanced one step leftward in relation to the channel bars. This will be plain from a consideration of Figs. 1 to 4, in which the parts are shown in the normal position following the described operation which has been effective to release the first bomb or the one at the left-hand end of the front row.

As a result of the relative movement between the ratchet bars and their associate channel bars, by which the ratchet bars have been advanced on step to the left of their channel bars, the parts will now be in such relationship that at the next operation of the handle 82 the cam piece at the right-hand rear end of the set will become effective on its releasing pin, and consequently the associate bomb will be dropped as the handle 82 nears the end of its stroke. On releasing the handle the parts will be restored, as has been described, and successive operations of said handle will result in the discharge of the bombs one after the other in the order that has been set forth.

My invention also provides for discharging simultaneously any desired number of bombs, and to this end it is only necessary as a preliminary to operate the hand lever 82 less than its full throw a number of times corresponding to the number of bombs that it is desired to drop. In thus operating the hand lever it will be moved from normal position to the left only far enough to bring the pawl teeth 90 into contact with the abutments 53. As soon as the operator feels this contact take place, he reverses the hand lever and pulls it back to normal position, after which he again partially operates it. These successive partial operations or short strokes may be effected with comparative rapidity. As a result it will be understood that the ratchet bars will be advanced step by step relatively to the channel bars and that at each step by step movement one of the coupling pins will operate, unlocking the associate controller and connecting it with the channel bar. Since, however, the channel bars themselves are not affected by these partial operations, no movements of the controllers will take place and no bombs will be discharged. The desired number of controllers having been connected with the channel bars, the operator effects a complete actuation of the handle 82, giving it its full stroke and causing it to move the channel bars leftward, together with all of the connected controllers, thus releasing simultaneously the predetermined number of bombs.

Sometimes it may be desired to drop the bombs so that they will not explode on striking; for example, the aviator may meet with an accident or may be pursued by the enemy in force, and may consequently desire to lighten his machine when not over hostile territory. In such circumstances the bombs should be dropped without stripping the safety devices or wires 7. To accomplish this result it is only necessary to operate the latch or finger piece 96 preliminarily to actuating the handle 82. Accordingly the upper end of the latch is pulled toward the handle, causing said latch to turn on the pivots 97 and pulling up on the connecting wire 95, which, acting on the crank arm 94, will turn the shaft 91 in its bearings, swinging up the arms 92 and lifting the pins 93 out of the notches 110 in the hook bars 108, thus disconnecting said hook bars from the handle 82 which may then be operated, as has been described, to discharge the bombs. The hook bars, however, will not participate in the movement of the handle and the pins 93 will slide over the surfaces 111 and into the notches 109 during the handle movement during which said hook bars will be retained in normal positions by their springs and the bombs will drop without the bomb wires being engaged by the hooks 116. By maintaining the latch 96 pressed back toward the finger piece 83 during the successive operations of the handle 82, all of the bombs may be dropped so that they will not explode or be discharged on striking.

It will be observed that by my present invention there is provided a combination of means for holding a plurality of bombs, and means controlled by a single handle for releasing or discharging the same; that in the present instance the means for holding the bombs are means that operate to retain the bombs securely in a container or magazine; that in the present instance, the means for releasing or discharging the bombs are means that operate to free the bombs which thereupon are dropped from or discharged from the magazine by the force of gravity; that means are provided for releasing bombs or other missiles in predetermined order; that means are provided for releasing at will at a single operation any selected number of a plurality of bombs or other missiles; that separate means are provided for holding each bomb in combination with means for rendering inoperative said separate holding means; that means are provided for rendering the separate holding means inoperative in predetermined order; that means are provided for rendering inoperative the separate holding means singly or simultaneously to any desired number; that in combination with separate holding means for each bomb there are provided releasing devices, one for each holding means, normally operative

locks for said releasing devices, and means for rendering said locks inoperative; that in the present instance the separate holding means comprise a pair of grippers or holders for each bomb; that while other arrangements are obvious, in the present instance both the grippers are pivoted; that the separate holding means for each bomb comprises a pivoted gripper; that a device or controller is provided for positively preventing the gripper from turning on its pivot; that a latch or locking plunger is provided for said device; that a movable releasing element, pin or plunger is provided for each locking plunger, said releasing pin being mounted on a hand operated reciprocatory carrier, slide bar, channel bar, or support; devices on said channel bar being provided for operating the releasing pin or pins, said devices comprising moving devices, ratchet bars or cam bars, which are provided with cam pieces, or releasing pieces which differ or vary one from another; that the controllers for the grippers are comprised in a set arranged in two series of parallel lines, corresponding to the parallel lines or series in which the grippers are arranged; that the set of locking pins is likewise divided into two series or parallel lines corresponding to the parallel lines of the grippers, as are also the releasing pins; that means are provided for varying the relationship between the cam bar or ratchet bar and its support or channel bar, and for retaining said ratchet bar in set relationships with said support; that a hand operated pawl coöperates with the toothed portion or ratchet on the ratchet bar or cam bar to move said cam bar step by step relatively to the channel bar, said pawl coöperating also with the channel bar to move the channel bar itself longitudinally, this movement of the channel bar taking place during the latter part of the pawl stroke while the relative movement effected between the channel bar and the cam bar is caused by a movement of the cam bar only during the first part of the pawl stroke; and that the cam bar is thus moved step by step relatively to the support, in the present instance the channel bar, while said support is reciprocated, or moved in the present instance to the left and back again, at each of these step by step movements; *i. e.*, the complete operation of the hand piece or lever from right to left and back again to normal position effects an advance or step toward the left of the cam bar and also a reciprocation of the channel bar.

Various changes may be made without departing from my invention.

What I claim as new and desire to secure by Letters Patent, is:—

1. In a machine of the character described, the combination with a plurality of bombs or other missiles, of separate holding means for each bomb comprising a pivoted gripper, a device for positively preventing said gripper from turning on its pivot, a latch for said device, and means operative by a single hand piece for throwing said latch out of use and for moving said device to turn said gripper.

2. In a machine of the character described, the combination with a plurality of bombs or other missiles, of separate holding means for each bomb comprising a pivoted gripper, a device for positively preventing said gripper from turning on its pivot, a locking plunger normally engaging said device, a releasing pin or plunger, a hand operated carrier for said releasing pin, and devices on said carrier for operating said releasing pin.

3. In a machine of the character described, the combination with a bomb, of a pair of pivoted grippers for holding said bomb, a slidable device for positively preventing movement of the grippers, a locking plunger normally engaging said device, a releasing pin, a hand operated carrier for said releasing pin, and means on said carrier for operating said releasing pin, said releasing pin connecting said carrier with said slidable device.

4. In a machine of the character described, the combination with a plurality of bombs or other missiles, of separate holding means for each bomb comprising a pivoted gripper, devices one for each gripper for positively preventing said gripper from turning on its pivot, locks for said devices, releasing devices for said locks, a slidable carrier by which said releasing devices are supported, and means for actuating said releasing devices to unlock said lock and connect said preventive devices with said slidable carrier.

5. In bomb dropping mechanism, the combination of a pivoted bomb gripper, a controller which at all times closely engages said gripper so as substantially to prevent lost-motion thereof, a locking pin which prevents movement of said controller, a second pin, and means associated therewith to enable said second pin to displace said locking pin and thereafter to move said controller.

6. In bomb dropping mechanism, the combination of a pivoted bomb gripper, a controller constantly connected with said gripper, locking means for preventing movement of said controller, moving means for said controller, and a device for displacing said locking means and connecting said controller with said moving means.

7. In bomb dropping mechanism, the combination of a pair of pivotally mounted coöperating bomb grippers, a single controller which at all times closely engages both said grippers so that relative motion

between the grippers can only take place as a result of movement of said controller, locking means for said controller, moving means for said controller, and means for displacing said locking means and connecting said controller with said moving means.

8. In bomb dropping mechanism, the combination of a pair of pivoted coöperating grippers, a single controller which at all times closely engages said grippers so as to prevent relative movement between them except when said gripper is moved, a locking pin which prevents movement of said controller, a second pin, and means to enable said second pin to displace said locking pin and thereafter to move said controller.

9. In bomb dropping mechanism, the combination of a bomb gripper capable of rotary movement, a slidable controller normally directly engaging therewith, means to lock the gripper and controller against movement, and means including a hand piece to actuate them after the locking means has been automatically rendered ineffective through the actuation of said hand piece.

10. In bomb dropping mechanism, the combination of a pair of pivoted grippers each comprising a shank and a wider jaw portion; a controller comprising a stem, a cross bar, two end blocks, and a cover plate, and providing passageways with the walls whereof said shanks engage; guides coöperative with said end blocks, and means for moving said controller.

11. In bomb dropping mechanism, the combination of a pair of pivoted grippers, a member provided with devices which constantly and positively control the relationship of said grippers to each other, a lock cooperative with said member, and means operative by a single hand piece both for rendering said lock inoperative and also for actuating said member.

12. In bomb dropping mechanism, the combination of a series of grippers arranged in pairs in a line, a series of controllers one for each pair of grippers, said controllers being arranged in a corresponding line, a series of locking pins one for each controller and arranged in a line, and hand controlled means controlled for withdrawing said locking pins in predetermined order and actuating said controllers.

13. In bomb dropping mechanism, the combination of a set of grippers arranged in pairs in two parallel lines, a set of controllers one for each pair of grippers, said controllers being arranged in corresponding lines, a set of locking pins one for each controller arranged in two parallel lines, and means controlled by a single hand piece for withdrawing said locking pins in predetermined order and successively actuating said controllers.

14. In bomb dropping mechanism, the combination of a set of grippers arranged in pairs in two parallel lines or series, a set of controllers one for each pair of grippers, said controllers being arranged in corresponding lines, a set of locking pins one for each controller arranged in two parallel lines, and means controlled by a single hand piece for withdrawing a locking pin in one of the parallel lines and actuating the associate controller, and thereafter withdrawing a locking pin in the other of said parallel lines and actuating the associate controller.

15. In a machine of the character described, the combination of a bomb magazine or container comprising a top plate formed with a plurality of openings, bombs within said container and projecting upward through said openings, grippers supported above said top plate and coöperating with the necks of said bombs, members that constantly maintain said grippers under positive control, and means comprising a single hand piece for operating said members to effect the discharge of said bombs from said magazine singly or simultaneously to any desired number.

16. In a machine of the character described, the combination of a bomb magazine or container comprising a top plate formed with a plurality of openings, bombs within said container and projecting upward through said openings, grippers supported above said top plate and coöperating with the necks of said bombs, members that constantly maintain said grippers under positive control, and means comprising a single hand piece for operating said members singly in predetermined order or simultaneously to any desired number.

17. In bomb dropping mechanism, the combination of a pair of pivoted grippers each comprising a shank and a wider jaw portion, a controller comprising a stem, a cross bar, two end blocks and a cover plate and providing passageways with the walls whereof said shanks engage, guides coöperative with said end blocks, a spring pressed locking pin normally engaging a hole in said stem, and means for displacing said locking pin and moving said controller.

18. In bomb dropping mechanism, the combination of a pair of pivoted grippers each comprising a shank and a wider jaw portion, a controller comprising a stem, a cross bar, two end blocks and a cover plate and providing passageways with the walls whereof said shanks engage, guides coöperative with said end blocks, a spring pressed locking pin normally engaging a hole in said stem, and means for displacing said locking pin and moving said controller, said last recited means comprising a disengaging pin and a hand actuated carrier therefor.

19. In bomb dropping mechanism, the combination of a pair of pivoted grippers each comprising a shank and a wider jaw portion, a controller comprising a stem, a cross bar, two end blocks and a cover plate and providing passageways with the walls whereof said shanks engage, guides coöperative with said end blocks, a spring pressed locking pin normally engaging a hole in said stem, and means for displacing said locking pin and moving said controller, said means comprising a disengaging pin, a cam for controlling the same, and a carrier on which said disengaging pin and said cam are mounted.

20. In bomb dropping mechanism, the combination with normally locked devices for holding a bomb, of means controlled by a single actuating device for unlocking said devices and moving them to effect the release of the bomb, said means comprising a movable element, a support therefor, spring means constantly tending to move said support in one direction, stop devices for said support, and means for moving said element relatively to said support and for moving said support in opposition to said spring means.

21. In bomb dropping mechanism, the combination with normally locked devices for holding a bomb, of means controlled by a single actuating device for unlocking said devices and moving them to effect the release of the bomb, said means comprising a movable element, a support therefor, and means for moving said element relatively to said support and for moving said support.

22. In bomb dropping mechanism, the combination with normally locked devices for holding a bomb, of means controlled by a single actuating device for unlocking said devices and moving them to effect the release of the bomb, said means comprising a pin, a support in which said pin is slidably mounted, and means for sliding said pin on said support and relatively thereto and for moving said support.

23. In bomb dropping mechanism, the combination with normally locked devices for holding a bomb, of means for unlocking said devices and moving them to effect the release of the bomb, said means comprising a movable element, a support therefor, a cam mounted on said support for moving said element relatively thereto, and means for moving said support and the parts carried thereby.

24. In bomb dropping mechanism, the combination with normally locked devices for holding a bomb, of means controlled by a single actuating device for unlocking said devices and moving them to effect the release of the bomb, said means comprising a movable element, a slidable support therefor, devices on said support for moving said element relatively thereto, a hand piece, and means for connecting said hand piece with said support to transmit the movement of said hand piece to said support.

25. In bomb dropping mechanism, the combination with bomb holding devices, of a slotted pin, a support therefor, a cam mounted on said support and engaging the slot in said pin, and means for actuating said cam and also for moving said support.

26. In bomb dropping mechanism, the combination with bomb holding devices, of a support, means for moving the same, a pin mounted to slide vertically in said support and provided with a slot, and a cam device mounted to move horizontally on said support and engaging the slot in said pin, said means for moving the support also operating to actuate said cam device.

27. In bomb dropping mechanism, the combination with bomb holding devices, of a vertically arranged pin provided with a slot; a support provided with upper and lower bearings in which said pin is adapted to slide; a cam device comprising two horizontally projecting portions, one above the other, and a connecting diagonally projecting portion, said projecting portions being adapted to coöperate with said slot in said pin; and means for moving said support, and also for actuating said cam device.

28. In bomb dropping mechanism, the combination with bomb holding devices, of a movable element; a support therefor; devices for moving said element relatively to said support and comprising a cam, and a bar on said support to which said cam is secured; and means for varying the relationship between said bar and said support and for retaining said bar in set relationships with said support and also for moving said support.

29. In bomb dropping mechanism, the combination with bomb holding devices, of a movable element, a channel bar on which said element is mounted, roller bearings for said channel bar, means for moving said channel bar, and devices for moving said movable element independently of said channel bar.

30. In bomb dropping mechanism, the combination of a pin, a channel bar from which said pin is slidable, roller bearings for said channel bar, means for moving said channel bar, and a cam for moving said pin on said channel bar.

31. In bomb dropping mechanism, the combination of a pin, a channel bar providing bearings for said pin, a cam bar engaging said pin, means for moving said cam bar a predetermined extent along said channel bar to slide said pin, and means for actuating said channel bar.

32. In bomb dropping mechanism, the

combination with bomb dropping devices, of a plurality of movable elements, a single support therefor, spring means tending constantly to move said support in one direction, moving devices for moving said elements relatively to said support, means for actuating said support in opposition to said spring means and for controlling said moving devices, and stops for said support.

33. In bomb dropping mechanism, the combination with bomb dropping devices, of a plurality of movable elements, a single support therefor, spring means tending constantly to move said support in one direction, moving devices for moving said elements relatively to said support, means for actuating said support in opposition to said spring means and for controlling said moving devices, roller bearings for guiding the reciprocatory movements of said support, and stop devices coöperative with certain of said roller bearings to limit the reciprocatory movements of said support.

34. In bomb dropping mechanism, the combination with a plurality of normally locked devices for holding a plurality of bombs, of means for unlocking said devices and moving them to effect the release of the bombs, said means comprising a series of movable pins, a support on which said pins are slidably mounted, devices on said support for moving said pins relatively thereto, and means for moving said support.

35. In bomb dropping mechanism, the combination of a plurality of movable elements, a common support therefor, a plurality of cams, one for each element, mounted on said support, and operative to move said elements relatively thereto, and means for moving said support and the parts carried thereby.

36. In bomb dropping mechanism, the combination of a plurality of slotted pins, a common support therefor, a plurality of cams mounted on said support, one engaging the slot in each pin, means for actuating said cams, and means for moving said support.

37. In bomb dropping mechanism, the combination with bomb holding means, of a plurality of movable elements; a common support therefor; devices for moving said elements relatively to said support, said devices comprising a series of cams, a bar to which said cams are secured, and means for varying the relationship between said bar and said support and for retaining said bar in set relationships with said support; and means for moving said support.

38. In bomb dropping mechanism, the combination with bomb holding means, of a series of pins, a single support therefor, devices for moving said series of pins successively, relatively to said support, and means for moving said support.

39. In bomb dropping mechanism, the combination with bomb holding means, of a series of pins, a single support therefor, devices for moving said series of pins successively, relatively to said support, said last recited devices comprising a series of cams, and means for moving said support.

40. In bomb dropping mechanism, the combination with bomb holding means, of a series of pins, a single support therefor, devices for moving said series of pins successively, relatively to said support, said last recited devices comprising a bar on said support and a series of cams on said bar, and means for moving said support.

41. In bomb dropping mechanism, the combination with bomb holding means, of a series of pins, a single support therefor, devices for moving said series of pins successively, relatively to said support, said last recited devices comprising a bar on said support and a series of variable cams on said bar, each of said cams comprising two horizontal portions, one above the other, and a connecting diagonally arranged portion, the horizontal portions of each cam varying in length from the horizontal portions of every other cam, and means for moving said support.

42. In bomb dropping mechanism, the combination with normally locked devices for holding a plurality of bombs, of means for unlocking said devices and moving them to effect the release of the bombs, said means comprising a series of slidable releasing pins, a channel bar on which said pins are mounted, standards provided with roller bearings between which said channel bar is slidable, a bar provided with a series of cams coöperative with slots in said pins, and means for moving said last recited bar relatively to said channel bar and for moving said channel bar.

43. In bomb dropping mechanism, the combination with normally locked devices for holding a plurality of bombs, of means for unlocking said devices and moving them to effect the release of the bombs, said means comprising a series of movable pins, a support on which said pins are slidable, cam devices for controlling said pins relatively, and pawl and ratchet mechanism for effecting progressive variations between said cam devices and said support, and for moving said support.

44. In bomb dropping mechanism, the combination with a series of normally locked devices for holding a plurality of bombs, of means for unlocking said devices and moving them to effect the release of the bombs, said means comprising a series of progressively movable pins, a support therefor, devices for moving said pins progressively, and hand operated mechanism which during the first part of its movement oper-

ates certain of said devices and during the latter part of its movement effects a bodily movement to said support.

45. In bomb dropping mechanism, the combination with two rows of normally locked devices for holding a plurality of bombs likewise arranged in two rows, of means for unlocking said devices and moving them to effect the release of the bombs, said means comprising a pair of parallel bars, a series of pins on each bar, ratchet bars on said first recited bars, each ratchet bar provided with a series of cams for actuating said pins, and pawl and ratchet mechanism that is effective to progressively advance said ratchet bars relatively to said first recited bars and also to actuate said first recited bars.

46. In bomb dropping mechanism, the combination with two rows of normally locked devices for holding a plurality of bombs likewise arranged in two rows, of means for unlocking said devices and moving them to effect the release of the bombs, said means comprising a pair of parallel slide bars, a series of pins on said slide bars, ratchet bars on said slide bars, each ratchet bar provided with a series of cams for actuating said pins, and pawl and ratchet mechanism that is effective to progressively advance said ratchet bars relatively to said slide bars and also to actuate said slide bars, said mechanism being effective to actuate any desired number of said pins prior to the movement of said slide bars.

47. In bomb dropping mechanism, the combination of bomb grippers, controlling devices therefor including locking pins, a channel bar, releasing pins thereon, a cam bar within said channel bar and having a set of cams coöperative with said releasing pins, said cam bar being provided with a ratchet and said channel bar being provided with a slot exposing said ratchet in part, and a hand operated pawl coöperative with said ratchet to move said cam bar step-by-step relatively to said channel bar, said pawl coöperating also with said channed bar to move it longitudinally.

48. In bomb dropping mechanism, the combination of bomb grippers, controlling devices therefor including locking pins, a channel bar, releasing pins thereon, a ratchet within said channel bar and having a set of cams coöperative with said releasing pins, said channel bar being provided with a slot exposing said ratchet in part, and a hand controlled pawl coöperative with said ratchet to move said cam bar relatively to said channel bar during the first part of the pawl stroke, said pawl during the latter part of its stroke operating on said channel bar to move it longitudinally.

49. In bomb dropping mechanism, the combination with bomb holding devices, of a series of pins, a channel bar supporting the same, a ratchet bar on the channel bar and provided with cams coöperating with said pins, and operating means comprising a hand lever provided with a pawl which coöperates with said ratchet bar through a slot in said channel bar, said pawl during the latter part of the stroke of said hand lever co-acting with said channel bar to move the same.

50. In bomb dropping mechanism, the combination with bomb holding devices, of a series of pins, a channel bar supporting the same, a ratchet bar on the channel bar and provided with cams coöperating with said pins, a pawl coöperating with said ratchet bar to maintain its relationship with said channel bar, and a hand lever provided with a pawl which coöperates with said ratchet bar through a slot in said channel bar, said pawl during the latter part of the stroke of said hand lever co-acting with one end of said slot to move said channel bar.

51. In bomb dropping mechanism, the combination with bomb holding devices, of two parallel channel bars, a series of pins on each channel bar, two ratchet bars, one on each channel bar, said ratchet bars provided with cams coöperating with said pins, and operating means comprising a lever member having cross-heads on which are pivoted pawls, each pawl coöperating with one of said ratchet bars through a slot in the associate channel bar, said pawls during the latter part of the stroke of said lever member co-acting with their associate channel bars to move the same.

52. In bomb dropping mechanism, the combination with bomb holding means, of a series of pins, a single support therefor, a bar on said support provided with a series of cams, and means for moving said bar step-by-step relatively to said support and for reciprocating said support at each of said step-by-step movements.

53. In bomb dropping mechanism, the combination with two rows of normally locked devices for holding a plurality of bombs that are likewise arranged in two rows, of means for unlocking said devices and moving them to effect the release of the bombs, said means comprising a pair of bars, a series of pins on each bar, ratchet bars on said first recited bars, each ratchet bar provided with a series of cams for actuating said pins, and hand operated mechanism that is effective to progressively advance said ratchet bars relatively to said first recited bars and also to effect reciprocations of said first recited bars.

54. In bomb dropping mechanism, the combination with bomb holding means, of a series of pins, a supporting bar therefor, a ratchet bar on said supporting bar pro-

vided with a series of cams operative on said pins, spring means tending to move said supporting bar constantly in one direction, and means for moving said supporting bar in opposition to said spring means and for varying the relationship between said ratchet bar and said supporting bar.

55. In bomb dropping mechanism, the combination with bomb holding means, of means for releasing the bombs, said last recited means comprising a pair of parallel carrier bars, springs constantly tending to move said bars in one direction, means for moving said carrier bars in opposition to said springs, a series of pins on each bar, ratchet bars on said first recited bars, pawls for maintaining said ratchet bars in set relationships with said first recited bars, cams on said ratchet bars coöperative with said pins, the means for moving said carrier bars being also effective to vary the relationship between said ratchet bars and said carrier bars.

56. In bomb dropping mechanism, the combination with bomb holding means, of a series of pins, a supporting bar therefor, a ratchet bar on said supporting bar provided with a series of cams operative on said pins, spring means tending to move said supporting bar constantly in one direction, and means for moving said supporting bar in opposition to said spring means and for varying the relationship between said ratchet bar and said supporting bar, and stops for limiting the back and forth reciprocating movements of said supporting bar.

57. In bomb dropping mechanism, the combination with bomb holding means, of a series of pins, a supporting bar on which said pins are mounted, roller bearings for said supporting bar, a ratchet bar on said supporting bar and provided with cams coöperative with said pins, spring means constantly tending to move said supporting bar in one direction, hand operated means for moving said supporting bar in the opposite direction and for varying the relationship between said ratchet bar and said supporting bar, and stop devices for limiting the back and forth movements of said supporting bar, said stop devices coöperating with certain of said roller bearings.

58. In a machine of the character described, the combination of means for holding a plurality of bombs each provided with a safety device, means for releasing or discharging said bombs, means for detaching said safety devices, and means controlled by a hand piece for rendering inoperative said last recited means.

59. In a machine of the character described, the combination of means for holding a plurality of bombs or other missiles, each of which is provided with a safety device, means for releasing said bombs or missiles in predetermined order, means for automatically detaching said safety devices, and hand controlled means for throwing said automatic detaching means out of use.

60. In a machine of the character described, the combination with a plurality of bombs or other missiles, each provided with a safety device, of separate holding means for each bomb, controllers, one coöperating with each holding means to positively control the same, strippers for disconnecting said safety devices from said bombs, said strippers being normally in inoperative positions, hand operated means for actuating said controllers and for moving said strippers to operative positions so that the safety devices will be automatically detached when the bombs are released, and hand controlled mechanism effective to break the connection between said strippers and said hand operated means so that said strippers will remain in their normal inoperative positions when said hand operated means is operated to actuate said controllers.

61. In a machine of the character described, the combination with a bomb provided with a safety wire, of a pair of pivoted grippers for holding said bomb, a slidable device for positively preventing movement of the grippers, a locking plunger normally engaging said device, a releasing pin, a hand operated carrier for said releasing pin, a stripper for said safety wire, and means on said carrier for operating said releasing pins, said releasing pins connecting said carrier with said slidable device, said means also automatically moving said stripper from inoperative to operative position.

62. In bomb dropping mechanism, the combination with normally locked devices for holding a plurality of bombs each provided with a safety wire and a hook bar for stripping the safety wires, of means for unlocking said devices and moving them to effect the release of the bombs, said means comprising a series of slidable releasing pins, a channel bar on which said pins are mounted, a bar provided with a series of cams coöperative with slots in said pins, and means for moving said last recited bar relatively to said channel bar and for moving said channel bar, said means being also effective automatically to move said hook bar from operative to inoperative position.

63. In bomb dropping mechanism, the combination with a plurality of bombs each provided with a safety wire, and means for effecting the release of the bombs including a hand piece, of a slidable bar provided with a plurality of hooks each adapted for cooperation with one of said safety wires, spring means tending constantly to main-

tain said bar in inoperative position, stop devices for said bar, and connections between said bar and said hand piece.

64. In bomb dropping mechanism, the combination with a plurality of bombs each provided with a safety wire, and means for effecting the release of the bombs including a hand piece, of a slidable bar provided with a plurality of hooks each adapted for cooperation with one of said safety wires, spring means tending constantly to maintain said bar in inoperative position, stop devices for said bar, and connections between said bar and said hand piece but whereby said hand piece is normally effective to overcome said spring means and move said bar to bring the hooks in the path of said safety wires, said connections being disconnectible at will so that a movement of said hand piece is ineffective on said bar.

65. In bomb dropping mechanism, the combination with a plurality of bombs each provided with a safety wire, and means for effecting the release of the bombs including a hand piece, of a slidable bar provided with a plurality of hooks each adapted for cooperation with one of said safety wires, spring means tending constantly to maintain said bar in inoperative position, stop devices for said bar, and disconnectible pin and slot connections comprising a spring pressed pin on said hand piece that engages with a slot in said bar so that normally the movement of said hand piece is effective to overcome said spring means.

66. In bomb dropping mechanism, the combination with a plurality of bombs each provided with a safety wire, and means for effecting the release of the bombs including a hand piece, of a slidable bar provided with a plurality of hooks each adapted for cooperation with one of said safety wires, spring means tending constantly to maintain said bar in inoperative position, stop devices for said bar, and connections between said bar and said hand piece, said connections comprising a finger piece in juxtaposition to said hand piece, pin and slot devices, and a train of connections between said pin and slot devices and said hand piece, said finger piece being operative to disconnect said pin and slot devices.

Signed at the borough of Manhattan, city of New York, in the county of New York, and State of New York, this 13th day of October, A. D. 1917.

JOHN H. BARR.