

June 6, 1939.

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2,161,081

AUTOMATIC BOMB RELEASING DEVICE

Filed April 1, 1936

2 Sheets-Sheet 1

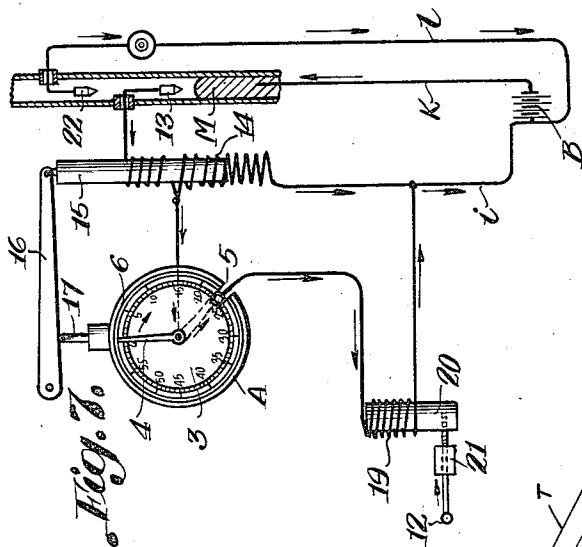
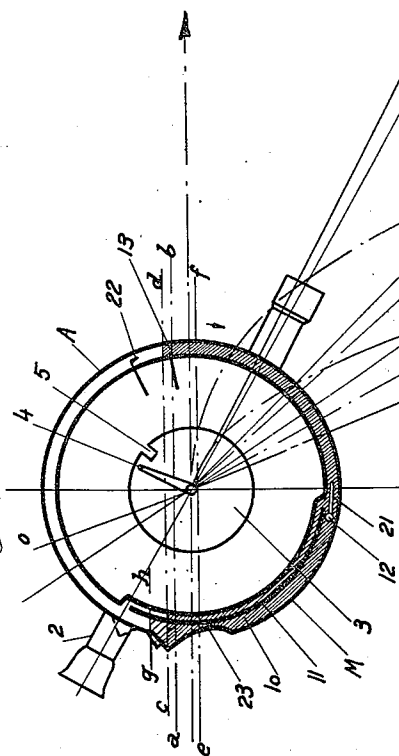


Fig. 1.



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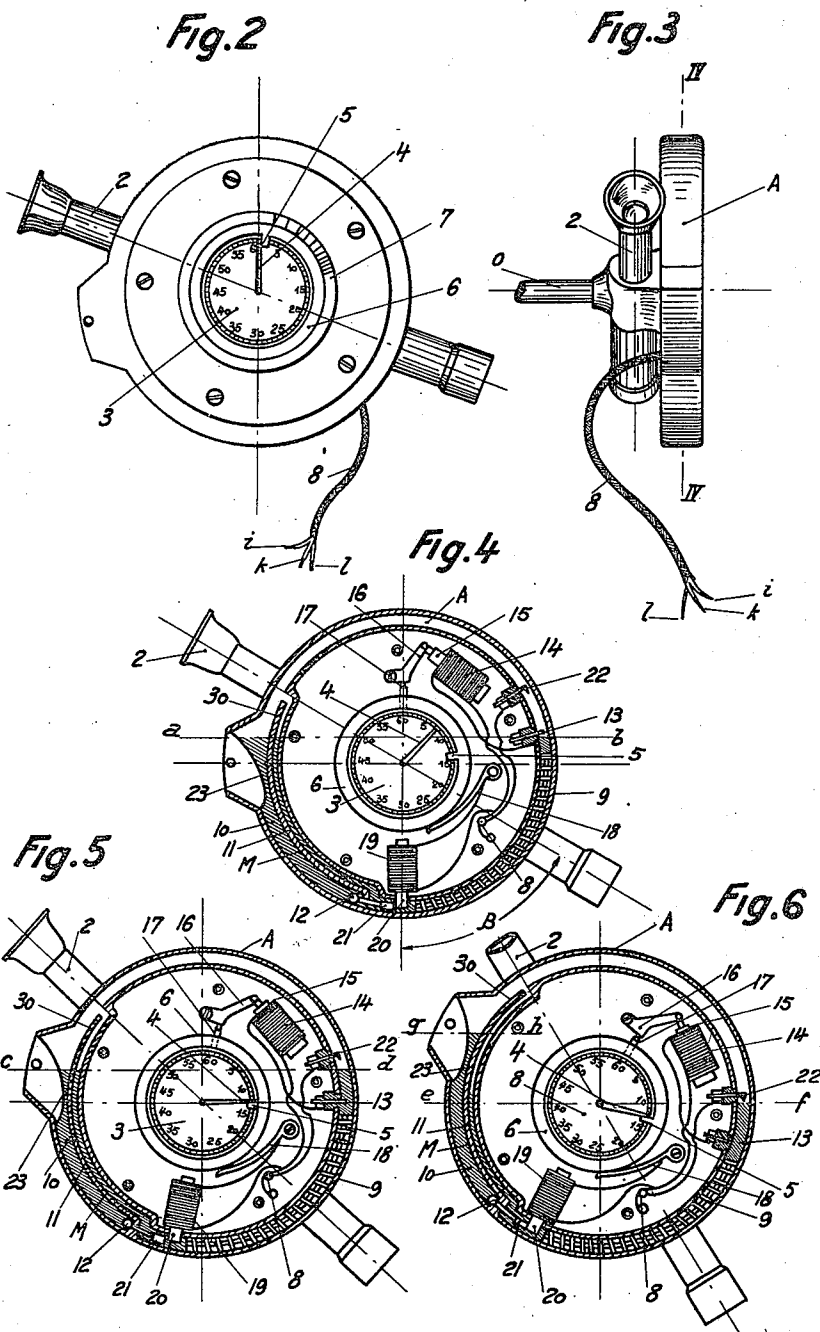
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UNITED STATES PATENT OFFICE

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AUTOMATIC BOMB RELEASING DEVICE

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FranceApplication April 1, 1936, Serial No. 72,134
In France July 9, 1935

7 Claims. (Cl. 89—1.5)

My invention relates to means for releasing bombs suspended from aircraft and more especially to an automatically operated device for releasing the bomb at the moment when the craft passes over a point on the ground so spaced from the point to be hit that, taking into consideration the speed and altitude at which the craft is travelling, the bomb, when released, will drop on the predetermined place.

The invention relates quite particularly to a device of the kind aforesaid which is released automatically in dependency upon the turning, about a horizontal axis, of a telescope used as a sighting device.

With these and other objects in view my invention will now be described with reference to the drawings affixed to this specification and forming part thereof, which illustrate, in a purely diagrammatic manner and by way of example a bomb releasing device embodying my invention.

In the drawings:

Fig. 1 is a diagram serving to explain the principle according to which the new device operates.

Figs. 2 and 3 are a side and end elevation, respectively, of the device as a whole and

Figs. 4, 5 and 6 are sections on the line IV—IV in Fig. 3 illustrating the device in three consecutive positions.

Fig. 7 is the wiring diagram.

Referring to the drawings and first to Fig. 1, which is intended to explain the effects of the displacement of an aircraft travelling at a predetermined distance above ground relative to the object to be hit, S represents the ground, A the automatically active switching device serving to actuate the releasing device proper and 2 is the sighting telescope fixed to the switching device and arranged to be turned together with same about a horizontal pivotal axis O. Assuming the telescope to be directed onto the point N, which marks the place or object to be hit, N₁ and N₂ are the end points of two possible curves described by a bomb when dropped at the point occupied, in the drawings, by the pivotal axis O, according to the speed of flight of the craft. While the craft is displaced in the direction of the arrow relative to the ground, the trajectories, which depend solely on the altitude and the speed of flight, remain the same and there is a moment when the point of intersection between these trajectories and the ground, after having passed through the positions indicated at N₁, N₂ and N_a, will reach the point N aimed at. If the altitude, at which the craft is flying should change, the

ground need only be shifted graphically into a position such as S' shown in the drawings. At the moment when the point of intersection between the trajectory and the ground reaches the point N, which is the moment at which the bomb must be released, the sighting line T and the vertical V extending through O enclose between them a predetermined angle α at which the switching device must automatically establish the contact for the release of the bomb. In order that the automatic establishing of this contact takes place in time, the switching device is arranged to close, by means of a mercury switch M, a first circuit to cause a chronometer 3 to start running, the moment, when this circuit is closed, being determined by a sighting angle β which is much larger than the angle α and in fact larger than any angles α corresponding to all possible speeds and altitudes of the craft. This chronometer 3 is adapted to produce, a predetermined, and variable, time after the passage of the telescope through a given fixed angular position, a modification in the flow of the mass of mercury of a mercury switch pivoted together with said telescope and adapted to close the circuit of the bomb release device.

The sighting and switching device as illustrated in detail in Figs. 2 to 6, comprises a body of mercury M filling about one half of the length of the annular conduit A into which extend two contacts 13 and 22 which are spaced angularly and the first of which is connected in the circuit of an electromagnet 14, the armature 15 of which governs a rock lever 16 serving to act on a pin 17, which is arranged to set the chronometer 3 going. The contact 22 is connected in the electric circuit of the bomb release device proper.

The chronometer 3 is also fixed to the switching device A. 6 is a ring arranged to be turned about the chronometer and held in place by the leaf spring 18. 5 is a stop formed on the ring 6 and serving to cooperate with the pointer 4 of the chronometer to cause the pointer, when the stop 5 has been set to a predetermined angular position, to be read on the scale 7 (Fig. 2) to close, across the spring 18 a circuit enclosing the electromagnet 19 which governs the quantity of mercury utilized to close the releasing circuit. The two electromagnets are connected in parallel in a circuit including the wire i (Fig. 3) of the cable 8 and also the wire k leading to the body of mercury. Both these wires are connected to the poles of the battery B in Fig. 7, which also illustrates the contacts 13 and 22 in a position

outside of the annular conduit, for the sake of simplicity.

The annular conduit A is subdivided, in its left hand half, into two concentric segments 10 and 11 by an annular partition 30. The conduit 11 is comparatively narrow; the conduit 10 is larger, but is constricted at 23. The conduit 11 is in permanent open communication with the right hand part of the annular conduit A. Communication between this right hand part of conduit A and the conduit 10 is governed by the valve 12 controlled by the armature 20 of the electromagnet 19 acting on the valve rod 21. In the right hand side of the annular conduit A there is provided a spiral-shaped element 9 which serves to reduce the rate of the flow of the mercury therethrough.

The releasing circuit, which is closed by the contact 22, comprises the wire *l* of the cable 8, the return wire *k* connected to the main body of mercury, the battery B and the igniting or other actuating device (not shown) of the releasing device proper.

The operation of the device above described is governed by the telescope 2 directed towards the point or object sighted and gradually inclined in correspondence with the reduction of the distance between this point and the craft. In the position shown in Fig. 2 the telescope A is assumed to be directed onto a point beyond the angle β in Fig. 1. In this position of the telescope the chronometer is at rest and the two contacts 13 and 22 are positioned above the mercury. In the position of the telescope shown in Fig. 4 the mercury level has reached the plane *a-b* right above the throttled portion 23 and corresponds to the angle β enclosed between the telescope and the vertical. In this position the contact 13 just touches the mercury so as to close the circuit of the electromagnet 15 which thereupon attracts the lever 16 to set the chronometer 3 moving, the pointer 4 of which now starts on its course. In the position shown in Fig. 5 the mercury level has reached the plane *c-d* extending through the constricted portion 23 of the annular conduit 10 and through a point between the contacts 13 and 22. At the same time the pointer 4 has reached the stop 5, which had previously been adjusted to the position corresponding to 13 seconds calculated by the operator as corresponding to the altitude at which the craft is traveling. Exactly 13 seconds after the telescope has entered the angle β , the circuit of the electromagnet 19 is closed, and this electromagnet in its turn closes the valve 12, thereby closing up that part of the body of mercury which is enclosed in the section 10 of the annular conduit. As the telescope continues to be turned more or less rapidly according to altitude and speed of flight, the mercury, the movable mass of which has been reduced, now passes from the plane *c-d* to the plane *e-f* (Fig. 6) which passes through the contact 22, while the mercury level in the section 10 of the conduit remains in the plane *g-h*. The period of time required by the mobile body of mercury to reach *e-f* and to close the switching circuit will obviously differ from that which the entire body of mercury enclosed in the device would require.

The period of time, within which the mercury travels from the plane *a-b* including the contact 13 to the plane *e-f* including the contact 22, and which corresponds to the rotation of the telescope between the sighting lines enclosing the angles β and α and ending in N_1 and N_2 , is the sum of a variable period defined by the posi-

tion of the stop 5 of the chronometer and the period required by the mercury to travel between the constricted portion of the annular section 10 and the plane *e-f*, this latter period of time depending upon the speed of flight on which depends the speed of rotating the telescope, and the altitude of flight, which acts on the position of the plane *c-d*. By calculation considering the altitude of flight the stop 5 can be so adjusted that the sum total of the two periods of time above defined causes the bomb to be released for the correct sighting angle which corresponds to the passage of the sighting point from N_1 to N_2 .

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described for obvious modifications will occur to a person skilled in the art.

I claim:

1. A control apparatus for use on an aircraft in connection with an electrically operated bomb release device, which comprises, in combination, a frame adapted to be fixed on said aircraft, a sighting element pivotally carried by said frame about a horizontal axis, so as to permit of keeping said element continuously pointed toward a target on the ground, an electric contactor carried by said frame including an insulating conduit with at least one contact, and a conducting liquid normally apart from said contact, means, operative by said sighting element, for producing a relative movement of said liquid in said conduit toward said contact synchronous with the movement of said sighting member when the latter is pivoted downwardly so as to be kept pointed toward the target, means for modifying the conditions of flow of said liquid in said conduit an adjustable time after said sighting element has passed through a given angular position, and an electric circuit for controlling said bomb release device including in series said contact and said liquid.

2. A control apparatus for use on an aircraft in connection with an electrically operated bomb release device, which comprises, in combination, a frame adapted to be fixed on said aircraft, a sighting element pivotally carried by said frame about a horizontal axis, so as to permit of keeping said element continuously pointed toward a target on the ground, an electric contactor carried by said frame including an insulating conduit with at least one contact, and a mass of a conducting liquid in said conduit normally apart from said contact, means operative by said sighting element for pivoting said conduit so as to produce a displacement of said mass of liquid toward said contact synchronous with the movement of said sighting member when the latter is pivoted downwardly so as to be kept pointed toward the target, means for modifying the conditions of flow of said liquid in said conduit an adjustable time after said sighting element has passed through a given angular position, and an electric circuit for controlling said bomb release device including in series said contact and said mass of liquid.

3. A control apparatus for use on an aircraft in connection with an electrically operated bomb release device, which comprises, in combination, a frame adapted to be fixed on said aircraft, a sighting element pivotally carried by said frame about a horizontal axis, so as to permit of keeping said element continuously pointed toward a target on the ground, an electric contactor carried by said frame including an insulating an-

nular conduit rigid with said pivoting sighting element coaxially therewith, a contact in said conduit, and a mass of a conducting liquid in said conduit, normally apart from said contact and adapted to move toward said contact when said sighting element is pivoted downwardly so as to be kept pointed toward the target, means for modifying the section of the passage for said liquid in said conduit an adjustable time after said sighting element has passed through a given angular position, and an electric circuit for controlling said bomb release device including in series said contact and said liquid.

4. A control apparatus for use on an aircraft in connection with an electrically operated bomb release device, which comprises, in combination, a frame adapted to be fixed on said aircraft, a sighting element pivotally carried by said frame about a horizontal axis so as to permit of keeping said element continuously pointed toward a target on the ground, an electric contactor carried by said frame including an insulating annular conduit rigid with said pivoting sighting element coaxially therewith, a contact in said conduit, and a mass of a conducting liquid, normally apart from said contact and arranged to move in said conduit toward said contact, when said sighting element is pivoted downwardly so as to be kept pointed toward said target, an annular partition dividing said conduit longitudinally into two chambers, extending to a distance from said contact, means for closing one of said chambers an adjustable time after said sighting element has passed through a given angular position, and an electric circuit for controlling said bomb release device including in series said contact and said mass of liquid.

5. A control apparatus for use on an aircraft in connection with an electrically operated bomb release device, which comprises, in combination, a frame adapted to be fixed on said aircraft, a sighting element pivotally carried by said frame about a horizontal axis, so as to permit of keeping said element continuously pointed toward a target on the ground, an electric contactor carried by said frame including an insulating annular conduit rigid with said pivoting sighting element coaxially therewith, a contact in said conduit and a mass of a conducting liquid in said conduit normally apart from said contact and adapted to move toward said contact when said sighting element is pivoted downwardly so as to be kept pointed toward said target, liquid control means for modifying the conditions of flow of said liquid in said conduit, a chronometer having a pointer, an adjustable contact on said chronometer adapted to cooperate with said pointer for a given angular position thereof, means operative by the mass of liquid in said conduit for starting said chronometer when said sighting element passes through a predetermined angular position, an electric circuit for operating said liquid control means, including said adjustable contact and said pointer, and an electric circuit for controlling said bomb release device including in series said first mentioned contact and said mass of liquid.

6. A control apparatus for use on an aircraft in connection with an electrically operated bomb release device, which comprises, in combination, a frame adapted to be fixed on said aircraft, a sighting element pivotally carried by said frame about a horizontal axis, so as to permit of keeping said element continuously pointed toward a target on the ground, an electric contactor carried by said frame including an insulating annular conduit rigid with said pivoting sighting element coaxially therewith, a contact in said conduit and a mass of a conducting liquid, normally apart from said contact and arranged to move in said conduit toward said contact when said sighting element is being pivoted downwardly so as to be kept pointed toward the target, an annular partition dividing said conduit longitudinally into two chambers, extending to a distance from said contact, means for closing one of said chambers, a chronometer having a pointer, an adjustable contact on said chronometer adapted to cooperate with said pointer for a given angular position thereof, means operative by the mass of liquid in said conduit for starting said chronometer when said sighting element passes through a predetermined angular position, an electric circuit for operating said closing means, including said adjustable contact and said pointer, and an electric circuit for controlling said bomb release device including in series said first mentioned contact and said mass of liquid.

7. A control apparatus for use on an aircraft in connection with an electrically operated bomb release device, which comprises, in combination, a frame adapted to be fixed on said aircraft, a sighting element pivotally carried by said frame about a horizontal axis, so as to permit of keeping said element continuously pointed toward a target on the ground, an electric contactor carried by said frame including an insulating annular conduit rigid with said pivoting sighting element coaxially therewith, two contacts in said conduit, and a mass of a conducting liquid, normally apart from said contacts and arranged to move in said conduit toward said contacts, when said sighting element is being pivoted downwardly so as to be kept pointed toward said target, an annular partition dividing said conduit longitudinally into two chambers, extending to a distance from said contact, a valve for closing the end of said chamber that is nearer said contacts, a chronometer having a pointer, an adjustable conducting abutment on said chronometer adapted to cooperate with said pointer for a given angular position thereof, electric means including a circuit containing in series said mass of liquid and the first of said two contacts, for starting said chronometer when said mass of liquid reaches said first contact, which corresponds to said sighting element passing through a predetermined fixed angular position, an electric circuit for operating said valve, including said adjustable abutment and said pointer, and an electric circuit for controlling said bomb release device including in series the second of said contacts and said mass of liquid.

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