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SEARCH ROOM
CROSS REFERENCE

July 31, 1934. A. CLEMENTI 1,968,127

BOMB SIGHT

Filed April 12, 1932

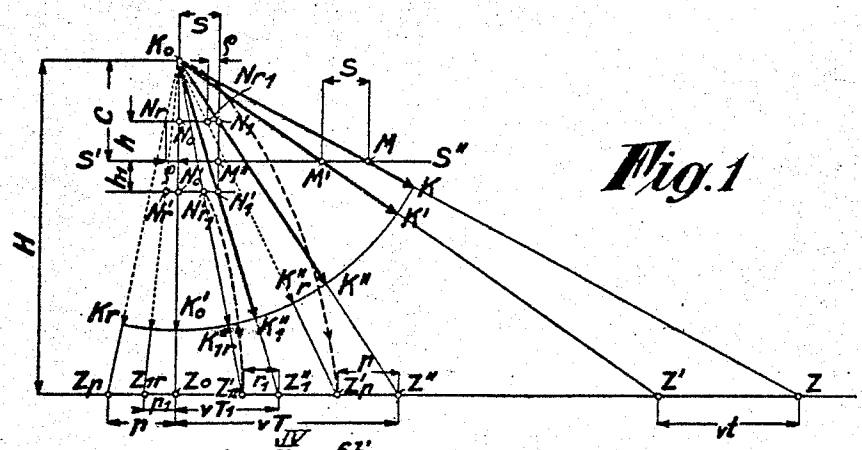


Fig. 1

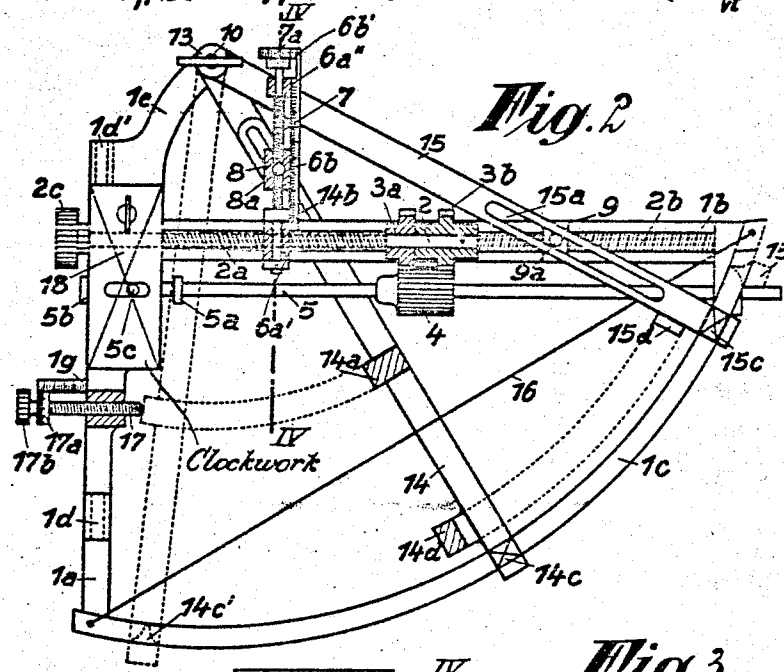


Fig. 2

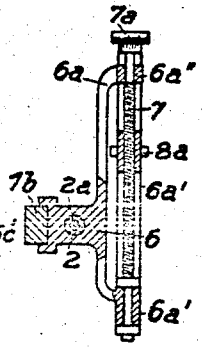


Fig. 4

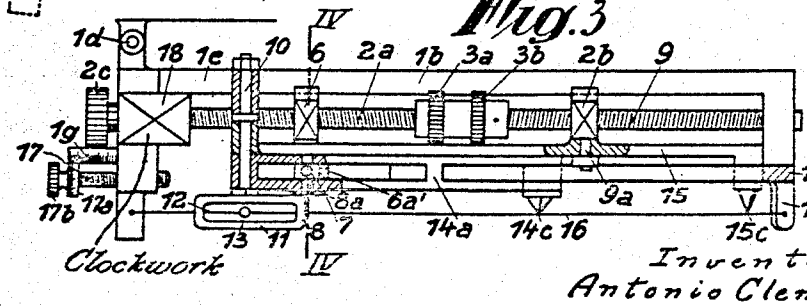


Fig. 3

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Patented July 31, 1934 1,968,127

UNITED STATES PATENT OFFICE

1,968,127

BOMB SIGHT

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Application April 12, 1932, Serial No. 604,795
In Germany April 20, 1931

2 Claims. (Cl. 33—46.5)

The object of the present invention is to provide an apparatus for determining readily, reliably and without the use of an auxiliary target the angle at which an object such as a bomb, a post bag or the like has to be dropped from an air craft for hitting a predetermined point.

With this object in view, according to the present invention the aiming apparatus comprises two sighting rules rotatably mounted on a horizontal pivot pin carrying a sighting mark common to both of the said rules. These two rules are rotated by hand in opposite directions during a given period of time, adjustable at will, in such a manner that as the air craft flies toward the target along a straight line, the target is always kept in the sighting line of the first rule moved rearwardly from its initial position, while the sighting line of the other, the aiming rule, is positively rotated forwards from its initial position to such an extent that the angle between the sighting line of the aiming rule and the vertical is equal to the angle required in order to hit the target.

The drawing illustrates by way of example an embodiment of the present invention. Fig. 1 illustrates the geometrical principle of the present apparatus, Fig. 2 is a side elevation of the aiming apparatus with a sighting rule guide for high altitudes, Fig. 3 is a plan view of Fig. 2 and Fig. 4 is a transverse section of a sighting rule guide for high and low altitudes, on the line IV—IV, Figs. 2 and 3.

In Fig. 1, K_o is a sighting point in the axis of a pivot pin common to the first sighting rule K_oK and the aiming rule $K_oK'_o$. At the moment at which the target Z appears in the sighting line of the first sighting rule K_oK' the predetermined measuring period t begins, for instance 10 seconds, during which the first sighting rule is so turned by hand, say by shifting backwards a support M of this rule, that the target is kept in this sight line during the whole measuring period. This predetermined measuring period is independent of the height of the aircraft above the ground. At the end of this period the point M will have reached the position M', MM' being equal to S, and the rule K_oK will have reached the position K_oK', the target having moved, as it were, into the position Z', $ZZ'=vt$ being the distance by which the air craft, flying horizontally with the speed v towards the target, has approached the target in the measuring period. The other sighting rule $K_oK'_o$, turning around the point K_o, is simultaneously moved from its vertical initial position in a direction opposite to that of the movement of the rule K_oK by shifting forwardly in a horizontal manner, its supporting point, which is located above the horizontal line of movement of the supporting point M or below this latter line at N_o or N'_o respectively, according to whether the altitude or time or fall is long or short respectively, so that this supporting point reaches in the measuring period t the position N_1 or N'_1, the distances $N_oN'_o$ and $N_1N'_1$ being exactly equal to the distance MM', that is to say equal to S. If now at the end of the measuring period t the forward movement of the supporting point N is automatically stopped then the lines K_oN_1 or $K_oN'_1$ would indicate by their points of intersection $Z''Z''_1$ respectively with the horizontal plane passing through the target, at which points an object dropped from the air craft at the end of the measuring period would reach the said horizontal plane, provided the horizontal component of the speed of the object were at all times exactly that of the horizontal speed of the air craft, the distance between the points Z'' and Z_1 and the point of intersection Z_o of a perpendicular from the air craft with the horizontal plane passing through the target is vT and vT_1 respectively. But owing to the resistance of the air the object thrown off lags behind the air craft which moves with a constant speed, by an amount defined by the lagging angle, the tangent of which is represented by

$$\frac{r}{H} \text{ or } \frac{r'}{H}$$

respectively, wherein H is the height of flight for high altitudes or long falling times and H' that for low altitudes or short falling times, and r and r' respectively are the distances by which the actual hitting points $Z'r$ and Z'_1r respectively are in rear of the theoretical hitting points Z'' and Z''_1, respectively.

For securing a sighting as exact as possible the outer sight mark is located as far as possible from the inner sight mark K_o, that is to say not at the rule supporting point N'_r or N_r, but at K_r or K'_r for the initial position of the dropping rule in which the hitting point Z_r is at a lagging distance r for high altitudes or long falling times and the hitting point Z'_r is at a lagging distance r' in rear of the point of intersection Z_o. Therefore at the moment of dropping if lagging is taken into account, the sighting rule must be in the position $K_oZ'_r$ or $K_oZ'_{1r}$, that is to say, on the sighting line $\overline{K_oK'_rK''_r}$ or $\overline{K_oN'_{1r}K''_{1r}}$. If the point K_o is at a distance C from the horizontal guide S'S'' of the supporting point of the

rule and the falling times T is greater than the constant measuring period t, it follows from the two triangles K_oZ_oZ'' and $K_oN_oN_1$ that:

$Z_oZ'':N_oN_1=v.T:S=H:(C-h)$, furthermore we have:

$ZZ':MM'=v.t:S=H:C$ and hence

$vT:vt=C:C-h$ and consequently

$$h=C\left(1-\frac{t}{T}\right).$$

This equation gives positive values for $T>t$ and negative values for $T<t$ and thus in the latter case the horizontal guide of the supporting point N of the rule must be below the horizontal guide of the supporting point M. The negative adjusting height is designated by h_1 and is

$$h_1=c\left(\frac{t}{T}-1\right).$$

The embodiment of the present apparatus shown by way of example in Figs. 2 to 4 is based on the above established facts.

The frame of the apparatus consists of a vertical bar 1*a*, a horizontal bar 1*b* perpendicular thereto and a curved bar 1c. This frame is mounted on the air chaft frame not shown, by means of two journal pins 1*d*, 1*d'* carried by the vertical bar so to be rotatable around a vertical axis. This frame carries a bracket 1*e* with a stud 10 fast in it and provided with a horizontal rectangular frame 11, Fig. 3, equipped with a sighting wire to which a sighting ball 13 is secured. A spindle 2, parallel to the horizontal bar 1*b* carries on its smooth left part an externally right hand threaded tube 2*a*) rotatable thereon, while its right or front part 2*b* is provided with an external left hand screw thread. The spindle 2 carries between the said screw threads two spur wheels equal in diameter, one of which, 3*a*, is rigidly connected to the tube 2*a*, while the other, 3*b*, is fast on the spindle 2 itself. Both spur wheels mesh with a spur wheel 4 fast on a shaft 5 parallel to the spindle 2 and actuated by a clockwork 18 having a constant predetermined running period, namely the measuring period above referred to. The shaft 5 is axially movable in such a manner that at the end of the measuring period the spur wheel 4 is automatically thrown out of engagement with the spur wheel 3*b* so that the latter may be turned further by the handle disc 2*c* at the left hand end of the spindle while the spur wheel 3*a* on the threaded tube 2*a* remains in engagement with the spur wheel 4 which is stopped as soon as the clockwork is stopped.

A nut 6 locked against rotation on the threaded tube 2*a* carries a vertical arm 6*a*. In the bottom and top ends 6*a'* and 6*a''* respectively a screw spindle 7 is journalled. A nut 8 locked against rotation on the screw spindle 7 is provided with trunnions 8*a*. By turning the screw spindle 7 by means of a hand disc 7*a* secured thereto and a stationary pointer 6*b'*, the nut 8 may be adjusted along the vertical scale 6*b* graduated by units of time to indicate the altitude or time of falling of the object. The trunnions 8*a* engage into longitudinal slots 14*b* in the two halves of the forked end of the sighting rule 14 pivoted on the stud 10 and guided on the arc of a circle 1c and carrying the outer dropping pointer 14*c*.

A nut 9 locked against rotation on the screw spindle 2*b* carries a pin perpendicular to said spindle and engaging into the slot 15*a* of the first rule 15 which is pivoted on the stud 10 and guided on the arc of a circle 1c the same as the sighting rule 14 and carries the outer sighting mark 14*c*. By turning the hand disc 2*c* the two rules 14 and 15 are brought into their initial positions before the beginning of the measuring period. The dropping rule 14 is adjusted to its initial position by properly turning the clockwork 18 until the stop 14*a* strikes against the end of the screw spindle 17 adjusted to the proper lagging angle by means of the scale 1*g* for rough adjustment and scale 17*a* for fine adjustment.

The operation of the apparatus hereinbefore described is very simple. By shifting the shaft 5 by means of the handle 5*a* the spur wheel 4 is brought into engagement with the spur wheel 3*b*, whereupon the gearing 3*a*, 3*b*, 4 is actuated by the hand disc 2*c*. Then by turning the hand disc 7*a*, the position of the trunnions 8*a* is adjusted by means of the scales 6*b* and 6*b'* in accordance with the altitude or time of fall of the object. Then by properly turning the screw threads 2*a*, 2*b* by the handle disc 2*c* the two sighting rules are brought into the initial position so that the outer sighting point 14*c* reaches the position 14*c'* and the outer sighting point 15*c* reaches the position 15*c'*. Thereafter the air craft is caused to fly directly towards the target and at the moment when the target appears in the first sighting line 13, 15*c*, that is to say K_oK of Fig. 1, the clockwork 18 is started by actuating a button 5*b* and then the target is kept in the sighting line during the entire measuring period by properly actuating the hand disc 2*c*. Thereby the first sighting rule 15 is turned so far that its outer sighting point comes from the position 15*c'* into the position 15*c* and the dropping rule 14 is turned so far that its outer sighting point comes from the position 14*c'* into the position 14*c*. At the end of the measuring period the clockwork automatically shifts back the shaft 5 and disengages the spur wheel 4 from the spur wheel 3*b* so that the outer sighting point 14*c* is locked in position. The air craft continues to fly directly towards the target until the latter appears in the sighting line 13, 14*c* and at this moment the object is dropped.

The outer sighting point 14*c* may be dispensed with if the dropping rule is provided with a laterally projecting stop 14*d* against which strikes a properly arranged stop 15*d* of the rule 15 when the latter, after the measuring period has lapsed, is turned backwards exactly so far that the outer sighting point reaches the position 14*c*. In this case the sighting point 15*c* serves during the measuring period as the first sighting point and after the measuring period has lapsed, as the throwing off sighting point.

What I claim is:

1. An aiming apparatus for dropping objects from air-crafts comprising a stud, a sighting point on this stud, a first rule, a sighting rule, both of the said rules being rotatably mounted on the said stud, a clockwork having a predetermined running period independent of the height of the aircraft above the ground means for operatively connecting the said sighting rules with each other during the running period of the said clock work whereby the said rules are simultaneously turned in opposite directions, and means operated by said clockwork to render said connecting means inoperative at the end of said period.

2. An aiming apparatus for dropping objects from air crafts comprising a stud, a sighting point on this stud, a first rule, a sighting rule, both of the said rules being rotatably mouted on the said stud, a clockwork having a predetermined

running period independent of the height of the aircraft above the ground means for operatively connecting the said rules with each other during the running period of the said clockwork whereby the said rules are simultaneously turned in opposite directions, an outer sighting point and a stop on one of the said rules and a stop on the other rule, the outer point of the first named sighting rule serving as the outer sighting point of the other rule whenever the said stops strike against each other, and means operated by said clockwork to render said connecting means inoperative at the end of said period.

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