Dec. 21, 1948. P. G. HAWE 2,456,828

TARGET PRACTICE APPARATUS

Filed Dec. 2, 1944

4 Sheets-Sheet 1

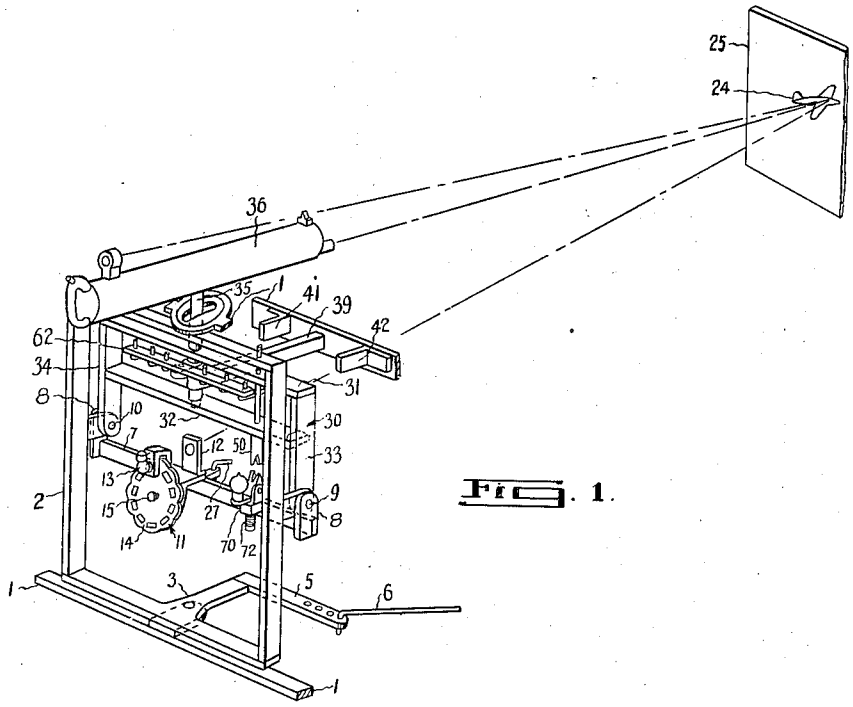


Fig. 1.

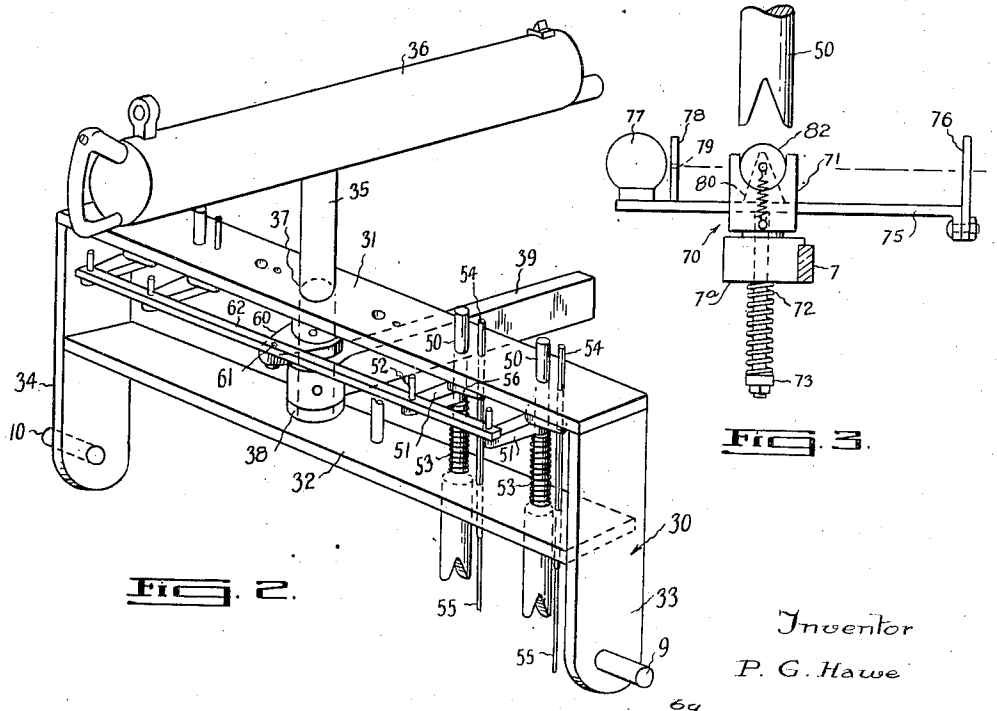


Fig. 2.

Fig. 3.

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TARGET PRACTICE APPARATUS

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4 Sheets-Sheet 2

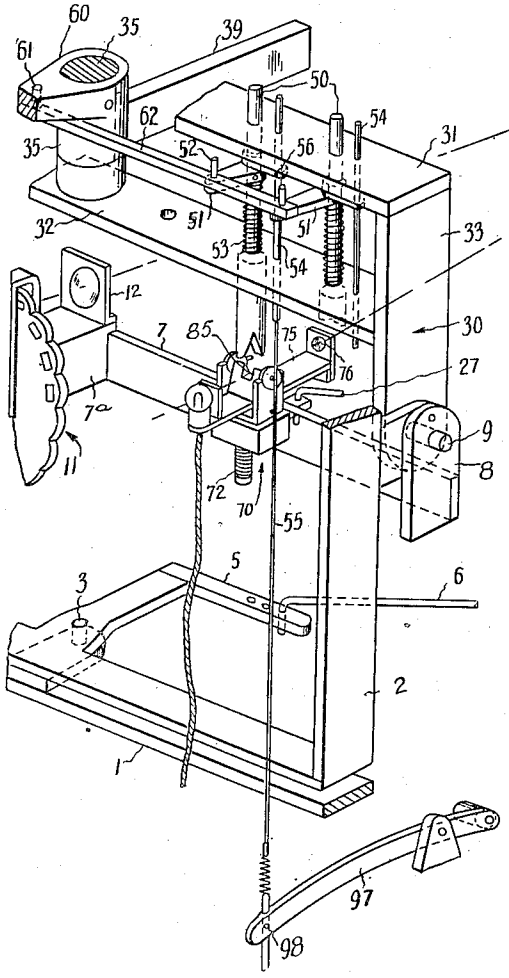


Fig. 4.

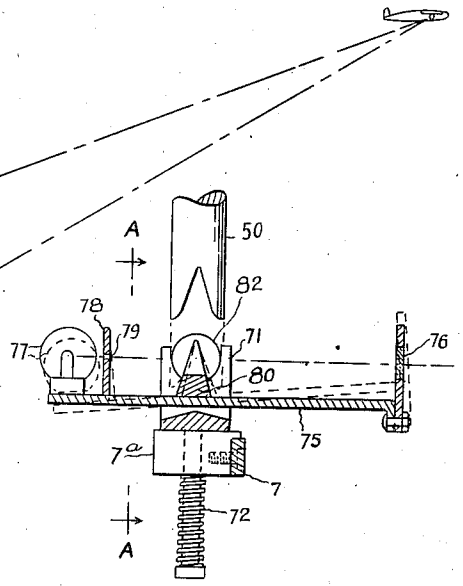


Fig. 5.

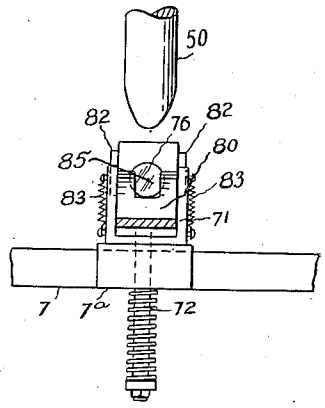


Fig. 6.

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TARGET PRACTICE APPARATUS

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4 Sheets-Sheet 3

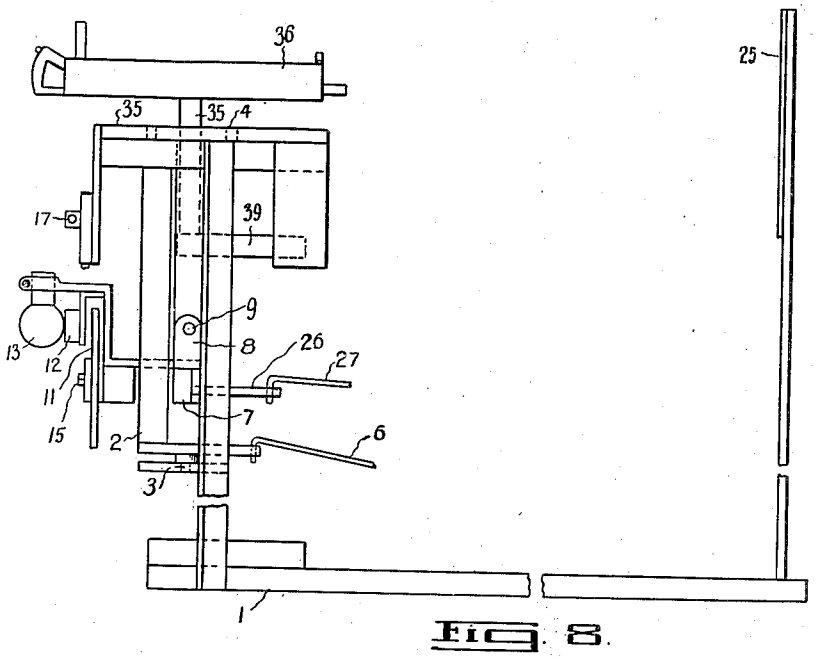


Fig. 8.

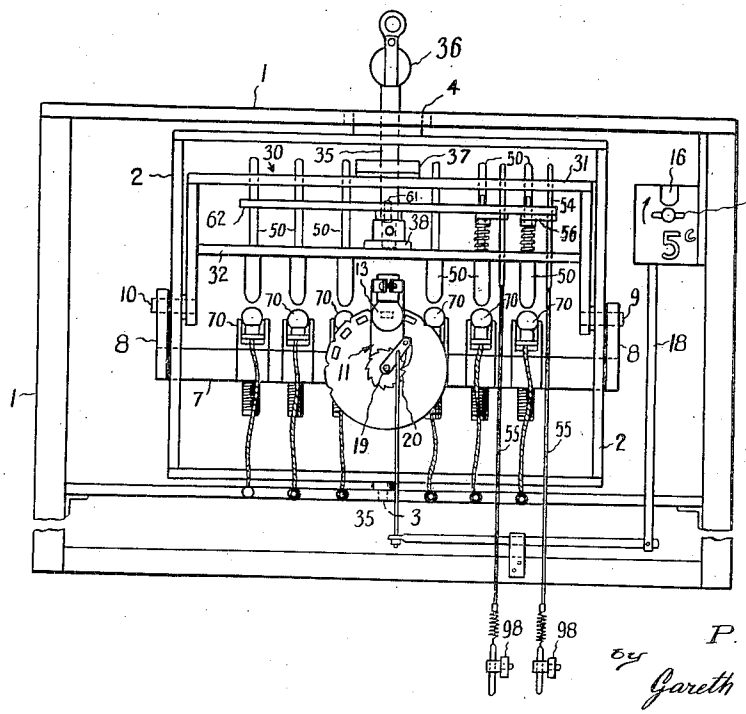


Fig. 7.

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TARGET PRACTICE APPARATUS

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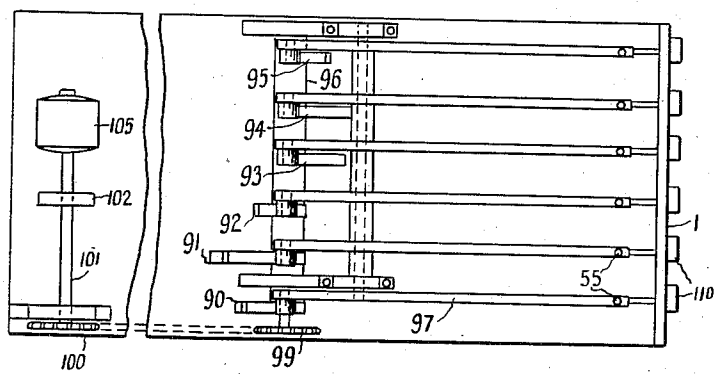


Fig. 9.

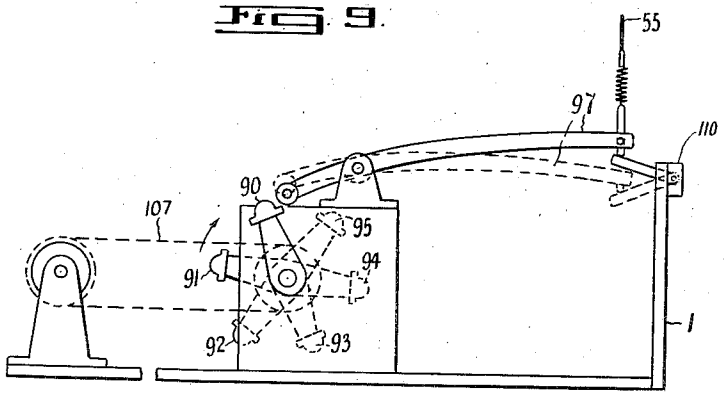


Fig. 10.

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UNITED STATES PATENT OFFICE

2,456,828

TARGET PRACTICE APPARATUS

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Application December 2, 1944, Serial No. 566,335

16 Claims. (Cl. 35—25)

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This invention relates to target practice apparatus, being particularly, though not exclusively, concerned with a coin-controlled device for permitting the practice of marksmanship.

It is an object of my invention to provide an automatic shooting machine comprising a dummy machine gun supported on a universal joint and adapted to operate a synchronizing device whereby the aim at the instant of firing each shot can be accurately indicated and will remain on the moving target, without the use of any projectiles. The invention consists essentially in the provisions of an optical projection apparatus whereby a light image of said target is projected on a wall or suitable screen, means to impart motion to the optical projector whereby the target is made to travel on the screen, and other optical means responsive to the trigger for projecting spots of light on the target which are synchronized with the moving target, thereby giving the operator an illusion of having pierced the target with his shots.

As an example, if my target is a plane which travels or flies along the screen and the operator fires at and hits, say the fuselage, the plane, although it continues flying around, will present the appearance of being riddled with shots.

There is also disclosed herein a suitable coin-controlled mechanism to permit movement of the target and also suitable target changing devices.

My invention will best be understood by reference to the following specification when taken in connection with the accompanying illustrations of one specific embodiment thereof, while its scope will be more particularly pointed out in the appended claims.

In the drawings:

Figure 1 is a perspective view of the essential components of my machine;

Figure 2 is a perspective view of the mounting of my gun, illustrating also the mechanism whereby the traverse and elevation of the gun are transmitted to the shot projectors;

Figure 3 is a side elevation of a shot projector;

Figure 4 is another perspective view showing the mechanism whereby the instantaneous aim of the gun is transmitted to the shot projector;

Figure 5 is a vertical cross-sectional view of a shot projector;

Figure 6 is another vertical cross-sectional view of a shot projector taken along the line A—A of Figure 5;

Figure 7 is a front elevation of my aiming and

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shot projecting mechanism showing a plurality of shot projectors;

Figure 8 is a side elevation of the said aiming and shot projecting mechanism;

Figure 9 is a simplified top plan view of the mechanical means whereby the shot projectors are actuated;

Figure 10 is a simplified side elevation of the said mechanical means whereby the shot projectors are actuated.

In all the several views similar reference characters refer to similar parts.

1 indicates the fixed framework of the machine. 2 is a rectangular frame pivotally mounted to the framework 1 by bearings 3 and 4; an extension to this frame forms a bell crank lever 5 to which is connected a rod 6. Thus, if the rod 6 is suitably pushed back and forth an oscillatory rotative motion about a vertical axis will be imparted to the frame 2.

A transverse bar 7, having upturned ends 8, is pivotally mounted on the frame 2 by means of bearing pins 9 and 10 passing through the said upturned ends 8 and through the frame 7. I hereinafter refer to this transverse bar 7 as my "projector carrier." At a suitable place on this transverse bar or projector carrier, preferably at the centre, is fixedly mounted the target projector 11 comprising an optical system 12, an electric light 13, a rotatable slide holding disc 14 pivotally mounted on a horizontal axis 15 to the projector carrier and having near its periphery a series of rectangular openings in which are securely fixed projection slides. This slide holder is mounted in such a fashion that any one of the slides can be inserted into the projection system by rotation of the disc.

In the preferred form of my invention when the operator inserts a coin in the slot 16, and turns the handle 17, the rod 18 moves upward, and this motion is translated, by means of a lever and fulcrum, into a downward movement of rod 35, which is connected to the pawl 19, said pawl engaging the ratchet 20, thereby rotating the slide holder to insert the adjoining slide into the projector, thus presenting a new target to the operator. By means of this target projection system, a target 24 is optically projected on a screen 25 which is placed at any convenient distance from the machine.

Rigidly fixed to the projector carrier 7 at any convenient point eccentric to its axis of rotation is a lever 26 (see Fig. 8) to which is connected a reciprocable rod 27. By imparting a reciprocat-

ing motion to this rod, the projector carrier 7, and consequently the target projector 11, will have an oscillatory rotative motion about a horizontal axis.

The frame 2 being rotatively mounted about a vertical axis and the projector carrier being mounted on this frame 2 and being rotative with respect to it about a horizontal axis, I have a target projection system which is mounted on a universal joint. By reciprocating independently rods 6 and 27, the projector carrier is made to move irregularly on this universal joint and thus, the projected target 24 appears to travel on the screen 25. To reciprocate rods 6 and 27 I provide means well known in the art, namely cams or cranks connected thereto, which are operatively rotated by an electric motor, preferably through a system of reduction gears. By rotating the two cranks at slightly different speeds, the target follows a path which is repeated only after a considerable period of time has elapsed; thus, in practice the operator is unable to predict the path of the moving target.

The gun supporting structure 30 which is better shown in Figure 2, is a rectangular frame comprising a top bar 31, and bottom bar 32, and elongated end bars 33 and 34. Passing through each end bar are the pins 9 and 10 by means of which the gun supporting structure is pivotally mounted to the frame 2. Since the pins 9 and 10 also serve to mount the projector carrier to the frame 2, the gun supporting structure and the projector carrier are therefore pivoted on the same horizontal axis.

A post 35 on which is rigidly mounted a dummy gun 36 is rotatively mounted at the centre of the gun supporting structure 30; suitable bearings are provided for this purpose at 37 in the upper bar 31, and at 38 in the lower bar 32. The gun being rotatively mounted on a post which provides a vertical axis of rotation, and the gun supporting structure 30 being rotatable about a horizontal axis, it is thus obvious that my gun is on a universal joint and therefore it may be aimed in any direction within practical limits.

A horizontal bar 39 is rigidly fixed to the post 35. The free end of this bar cannot move beyond stops 41 and 42 on the framework of the machine (see Fig. 1), and thus, it prevents the operator from traversing the gun beyond definite extreme right and left limits.

It should be noted here that both my target projector and my gun are mounted on universal joints which are mechanically inter-dependent but which are nevertheless independently movable. Consequently when the frame 2 is being rotated about its vertical axis to give the lateral component of motion to the target, the gun will not simultaneously be traversed since it is mounted on the frame in rotatable fashion. For the same reason, if the operator traverses the gun, this action will have no effect on the rotation of the frame 2.

Also the projector carrier 7 is pivotally mounted on the frame 2 and is thereby pivotable on a horizontal axis. The gun supporting structure 30 is independently pivoted to the frame 2 about the same bearing pins 8 and 9, and therefore the projector carrier can be rotated on a horizontal axis without affecting the elevation of the gun. Conversely, when the gun is elevated or depressed, it has no effect on the position of the projector carrier or on its rotation about its horizontal axis.

Reciprocably and rotatively mounted between

the upper bar 31 and the lower bar 32 of the gun supporting member 30 are six rods 50 which I hereinafter call "jabbers." In some views I show only one or two jabbers, the others being broken away or omitted for the sake of clarity. A coil spring 53 surrounding said jabber (and compressed between the bar 32 and a crank arm 51) holds it normally in an "up" position, except when outside force is applied to the jabber to pull downwards; if the force pulling the jabber downwards is released the jabber will immediately return to its "up" position (See Fig. 4).

Rigidly fixed to the jabber is the crank arm 51 having at its extremity a pivot pin 52. Among other purposes, the crank arm 51 acts as a stop against the upper bar 31 to prevent the jabber from travelling beyond a predetermined upward limit.

Parallel to the jabber and alongside it is another reciprocating rod 54 to the lower end of which is attached a wire 55. A lever 56 is rigidly fixed perpendicularly to this rod 54 and its other end is slidably connected to the jabber 50 above the crank 51 of said jabber. Thus, if the rod 54 is pulled downward by an outside force exerted on the wire 55 the lever 56 will simultaneously carry the jabber downwards. As soon as the tension on the wire 55 is released the coil spring 53 will force the jabber into its "up" position, the jabber in turn forcing the lever 56 and the rod 54 back in the "up" position.

Rigidly fixed to the gun post 35 is crank 60 having at its extremity a pivot pin 61. I provide a connecting bar 62 joining the pivot pin 61 to the pivot pin 52 of the jabber crank 51. This connecting bar taken in conjunction with the jabber crank 51 and the gun crank 60 provides a parallel link motion between the gun and the jabber, and therefore if the gun is traversed the jabber will rotate to the same extent as the gun was rotated.

Also if the gun is elevated, the gun supporting structure 30 which also supports the jabber 50 will be inclined by an angle corresponding to the elevation of the gun. Thus, by the construction of this mechanism, the jabber's inclination is always determined by the elevation of the gun and its radial position is always determined by the traverse of the gun.

Mounted on bracket 7a of the projector carrier 7 in universally rotatable fashion is the shot projector 70. Referring particularly to Figures 3, 5, and 6, the shot projector comprises a yoke 71 rigidly fixed to an upright rod 72 which is journalled on the projector carrier bracket 7a. The upright rod 72 projects below the projector carrier and surrounding said rod is a coil spring which is suitably held in compression between the bottom of the projector carrier bracket 7a and a suitable bolt and washer 73 at the lower extremity of the rod. The spring is compressed to such an extent as will provide sufficient friction between the under surface of the yoke and the bearing surface of the projector carrier to prevent the yoke from rotating in its bearing loosely. However, the friction is not so great as to prevent rotation upon application of very slight torque to it. Mounted between the forks of the yoke 71 is the optical shot projection system which comprises a rigid arm 75, at the front portion of which is perpendicularly mounted a suitable lens 76. At the rear end of said arm is a small electric bulb 77 and immediately in front of the light and perpendicular

to the arm is a shield 78 in the centre of which is a peep hole 79. Rays of light from the electric bulb pass through the peep hole and then through the lens and are projected on the screen 25 as a small light spot of a size suitable to simulate a bullet hole. At the centre of the arm I provide an accurately machined wedge-shaped upright lug 80, and to each side of said lug are rigidly fixed small upright circular discs 82; these discs fit in semicircular grooves in each fork of the yoke 71 and thus act as bearings. Two small springs 83 having one end fixed to a disc and the other end fixed to the yoke securely hold the discs or bearings in their seats and also provide sufficient friction between the bearings and the seats to prevent the projector from rocking freely. The projector being mounted on the projector carrier on a vertical axis, the projection system is therefore universally movable and a simulated shot can be projected anywhere on the screen.

The central portion of the wedge-shaped lug 80 has a recess 85 therein to permit the beam of light to pass between the bulb and the front lens.

I construct and mount my shot projector system in such a way that the axis of its horizontal bearings passes through the same line as the axis of rotation of the projector carrier. Also I mount it so that the wedge-shaped lug 80 is immediately beneath the jabber 50.

If the wire 55 is pulled downwards, thus carrying with it the jabber, the accurately machined recess at the end of the jabber, which is triangular in cross section, will strike the wedge-shaped lug 80 thereby forcing the shot projector to move on its universal joint into such a position that the wedge-shaped lug will fit into the recess of the jabber. Since the radial position of the jabber is controlled by the traverse of the gun and since its inclination is controlled by the elevation of the gun as explained previously, the aim of the shot projector will be identical to the aim of the gun at the instant when the jabber is pulled downwards, i. e., the shot indication projector will be synchronized with the aiming device. But upon the jabber being released the projector will remain in the position in which the jabber set it due to frictional resistance of its bearings. Being mounted on the same projector carrier 7 as the target projector, the shot indication projector will then be in synchronism with the target projector. It will be apparent that the above described means for maintaining the shot indication projector in synchronism with the target projector will maintain the indication in a constant position relative to the moving target.

Means which I will hereinafter explain are provided to instantaneously pull down the jabber upon pressing the trigger of the gun. If the moving target is a plane, and assuming that at the instant when the trigger was pressed the gun was aimed at the nose of the plane, the jabber will strike the shot projector and aim it at that point, and a spot of light projected by the shot projector will appear on the nose of the plane. However, the jabber is instantly released and the shot projector being mounted on the same projector carrier as the target projector, there will be no relative motion between the shot projector and the target projector. The motion of the target is provided by the motion of the projector carrier and therefore although the target will appear to be travelling on the screen, the shot which has struck it will remain on the original point, and therefore the plane will appear to be travelling as if a shot had pierced its nose.

It should also be noted that when the jabber is pulled downwards, it blocks recess 85 in the central portion of wedge-shaped lug 80 through which the beam of light would normally be passing. It therefore acts as a shield cutting off the beam of light and consequently the shot or beam of light does not travel across the screen when the shot projector is moved through the action of the jabber, but the beam of light is instantaneously cut off and reappears in a different position on the screen upon release of the jabber.

Having described the action of one jabber, it is obvious that I may place on the projector carrier a plurality of jabbers and a plurality of shot projectors actuated by their respective jabbers as shown in Figure 8. The radial position and inclination of each jabber will, of course, be determined by the traverse and elevation of the gun since they are all mounted in identical fashion. They are all operatively joined together by the connecting bar 62.

Thus, by consecutively depressing each jabber, the shot projector will indicate on the screen a shot in a position determined by the aim of the gun at the instant when the jabber was depressed.

In Figures 9 and 10 I show in simplified form the mechanical means whereby each jabber is consecutively depressed. A plurality of cams 90, 91, 92, 93, 94 and 95 are fixedly mounted to a rotatable shaft 96 in spaced radial relationship to each other. Co-acting with each individual cam are a plurality of followers, one of which, 97 is shown in Figures 9 and 10 at the point when it is just about to be struck by cam 90. The extremity 98 of each follower connects to the wire 55 of each jabber. At one end of the cam shaft 96 is a sprocket 99 which is joined by means of a belt 107 to another sprocket 100. This second sprocket 100 is at the end of a power shaft 101 which is normally out of engagement with a motor 105 but which may be instantaneously engaged therewith by a solenoid-operated clutch 102.

Although the motor is constantly operating, the clutch being normally out of engagement, the cams will not rotate. However, upon pressing the gun trigger the clutch 102 will instantaneously engage the power shaft 101 with the motor 105, thereby rotating the cam shaft 96. As the cam shaft rotates, each cam will consecutively strike its follower, thereby pulling downwards the wire 55 and actuating the jabber. The cams being in spaced radial relationship, each jabber will be actuated in turn until one cycle is completed. Thus in my preferred machine, six consecutive shots may be fired and these six shots will remain showing on the target. If the trigger is released, say after three shots have been fired, the clutch will instantaneously be disengaged and thus the other three cams will not actuate their respective jabbers. If a cycle of rotation of the cams is completed, pressing the trigger will actuate the cams again and the shots will appear on different positions on the target. If the trigger is pressed for a longer period of time than it takes for a cycle to be completed, new shots will appear on the target as determined by the instantaneous position of the gun; obviously, only the last six shots fired will be showing on the target.

I also provide individual switches 110 for each shot projector, and these switches are actuated

by each cam follower 97 during the first cycle of rotation of the cam. Therefore no shots will appear on the screen until the trigger is depressed for the first time. However, once a cycle has been completed, the switches remain on and they are turned off only by a time relay mechanism or by the insertion of a coin by the next operator. Means to do this are well known in the art and need not be described.

Although I have shown only six shot projectors and jabbers, it is obvious that it is possible to build a machine which will contain as many as desired. Also I may build a single acting gun by using only one jabber acted upon by a single cam. It is also obvious that my apparatus can be used without necessarily moving the target.

What I claim as my invention is:

1. In a target aiming device, means for projecting a moving target, aiming means, means actuated by the aiming means for projecting on the target an indication, and means for maintaining said indication in a constant position relative to said moving target.

2. In a target aiming device, means for projecting a moving target, aiming means, means actuated by the aiming means for successively projecting on the target a plurality of indications, and means for maintaining said indications in constant positions relative to said moving target.

3. A target practice device, comprising a movable target projector, aiming means, an indication projector normally synchronized with said target projector, indication projector actuating means including means to synchronize said indication projector with said aiming means, and means to release the indication projector from the indication projector actuating means, thereby allowing said indication projector to remain in its normal state of synchronism with the target projector.

4. A target practice device, comprising a movable target projector, aiming means, a movable indication projector normally in synchronism with the target projector, means for actuating the indication projector, including means to instantaneously synchronize the indication projector with said aiming means, and means to maintain the indication projector thereafter in synchronism with the target projector, thus simulating a target pierced by a shot.

5. A target practice device, comprising a movable target projector, aiming means, a plurality of movable indication projectors normally in synchronism with the target projector, means for successively actuating the indication projectors, including means to successively synchronize the indication projectors with said aiming means, and means to maintain the indication projectors thereafter in synchronism with the target projector, thus simulating a target pierced by a burst of shots.

6. A target practice device, comprising a frame, aiming means mounted on said frame by a universal joint, a projector carrier mounted on another universal joint, means to move the projector carrier on its universal joint, a target projector mounted on said projector carrier, an indication projector mounted on another universal joint, said last named universal joint being also mounted on the said projector carrier, means for actuating the indication projector on its universal joint, including a linkage system responsive to the movement of the aiming means, means controlled by said linkage and positioned to co-act with the indication projector, and means for moving the linkage actuated means into and instantaneously thereafter out of co-acting relationship with the indication projector, thus synchronizing the indication projector momentarily with the aiming means.

7. A target practice device, comprising a frame, aiming means mounted on said frame by a universal joint, a projector carrier mounted on another universal joint, means to move the projector carrier on its universal joint, a target projector mounted on said projector carrier, an indication projector mounted on another universal joint, said last named universal joint being also mounted on the said projector carrier, means for actuating the indication projector on its universal joint, including a linkage system responsive to the movement of the aiming means, means controlled by said linkage and positioned to co-act with the indication projector, said linkage actuated means being also adapted to shield the indication projector when it is in co-action therewith, and means for moving the linkage actuated means into and instantaneously thereafter out of co-acting relationship with the indication projector, thus synchronizing the indication projector momentarily with the aiming means.

8. A target practice device, comprising a frame, aiming means mounted on said frame by a universal joint, a projector carrier mounted on another universal joint, means to impart motion to the projector carrier, a target projector mounted on said projector carrier, a plurality of indication projectors each mounted on an individual universal joint, said last named universal joints being also mounted on the said projector carrier, means for successively actuating each indication projector on its universal joint, including a plurality of linkage systems responsive to the movement of the aiming means, means successively controlled by said linkages and positioned to co-act with the indication projectors, and means for successively moving each linkage actuated means into and instantaneously thereafter out of co-acting relationship with the respective indication projectors, thus successively synchronizing each indication projector momentarily with the aiming means.

9. A target practice device, comprising a frame, aiming means mounted on said frame by a universal joint, a projector carrier mounted on another universal joint, means to impart motion to the projector carrier, a target projector mounted on said projector carrier, a plurality of indication projectors each mounted on an individual universal joint, said last named universal joints being also mounted on the said projector carrier, means for successively actuating each indication projector on its universal joint, including a plurality of linkage systems responsive to the movement of the aiming means, means successively controlled by said linkages and positioned to co-act with the indication projectors, and means for successively moving each linkage actuated means into and instantaneously thereafter out of co-acting relationship with the respective indication projectors, thus successively synchronizing each indication projector momentarily with the aiming means, and friction means to thereafter hold each indication projector relative to the projector carrier in the position in which it was set by the linkage actuated means.

10. A target practice device, comprising a support, a frame pivotally mounted on said support, a second frame mounted on the first frame and

pivoted on an axis substantially at right angles to the pivotal axis of the first frame, aiming means mounted on the second frame and pivoted on an axis parallel to the pivoted axis of the first frame, a supporting bar mounted on the first frame and pivoted on an axis substantially at right angles to the axis of said first frame, a target projector mounted on said bar, an indication projector mounted on the said bar by means of a universal joint, a parallel motion linkage responsive to the traverse of the aiming means, a rod mounted on the second frame and rotatable about a vertical axis by said parallel motion linkage, and means to correlate the traverse and elevation of the indication projector with the radial position and inclination of the rod.

11. A target practice device, comprising a support, a frame pivotally mounted on said support, a second frame mounted on the first frame and pivoted on an axis substantially at right angles to the pivotal axis of the first frame, aiming means mounted on the second frame and pivoted on an axis parallel to the pivoted axis of the first frame, a supporting bar mounted on the first frame and pivoted on an axis substantially at right angles to the axis of said first frame, a target projector mounted on said bar, an indication projector mounted on the said bar by means of a universal joint, a parallel motion linkage responsive to the traverse of the aiming means, a rod mounted on the second frame and rotatable about a vertical axis by said parallel motion linkage, said rod shielding the indication projector when co-acting therewith, and means to correlate the traverse and elevation of the indication projector with the radial position and inclination of the rod.

12. A target practice device, comprising a support, a frame pivotally mounted on said support, a second frame mounted on the first frame and pivoted on an axis substantially at right angles to the pivoted axis of the first frame, aiming means mounted on the second frame and pivoted on an axis parallel to the pivoted axis of the first frame, a supporting bar mounted on the first frame and pivoted on an axis substantially at right angles to the axis of said first frame, a target projector mounted on said bar, an indication projector mounted on the said bar by means of a universal joint, a parallel motion linkage responsive to the traverse of the aiming means, a reciprocable rod having a cam at the lower end thereof, and mounted in the second frame and being rotatable about a vertical axis by said

parallel motion linkage, a cam-shaped lug on the indication projector adapted to receive the cam of the reciprocating rod, means to actuate the rod and press it into contact with the cam-shaped lug of the indication projector, thereby correlating the traverse and elevation of the indication projector with the traverse and elevation of the aiming means.

13. A target practice apparatus comprising a moving target projector, aiming means, a plurality of projectors for projecting an indication on the target, said projectors being mounted for universal movement, means for moving the indication projectors in correspondence with the aiming means, and means to retain the indication on the target while said target is in motion.

14. A target practice apparatus comprising a moving target projector, aiming means, a plurality of projectors for projecting an indication on the target, said projectors being mounted for universal movement, means for moving the indication projectors in correspondence with the aiming means, and for shielding the indication projector when it is being moved into correspondence with the aiming means, and means to retain the indication on the target while said target is in motion.

15. In a target aiming device, means for projecting a moving target, aiming means, means actuated by the aiming means for projecting on the target an indication, and means for maintaining said indication projecting means in a constant position relative to said moving target projecting means.

16. In a target aiming device, means for projecting a moving target, means for projecting an indication on the target, means for normally maintaining said indication projecting means in synchronism with the target projecting means, aiming means, and means controlled by the aiming means for causing the indication projecting means to momentarily synchronize with the aiming means.

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