E. H. BARRY.

BOMBER'S TRAINING DEVICE.

APPLICATION FILED FEB. 18, 1919.

1,381,158. Patented June 14, 1921.

3 SHEETS—SHEET 1.

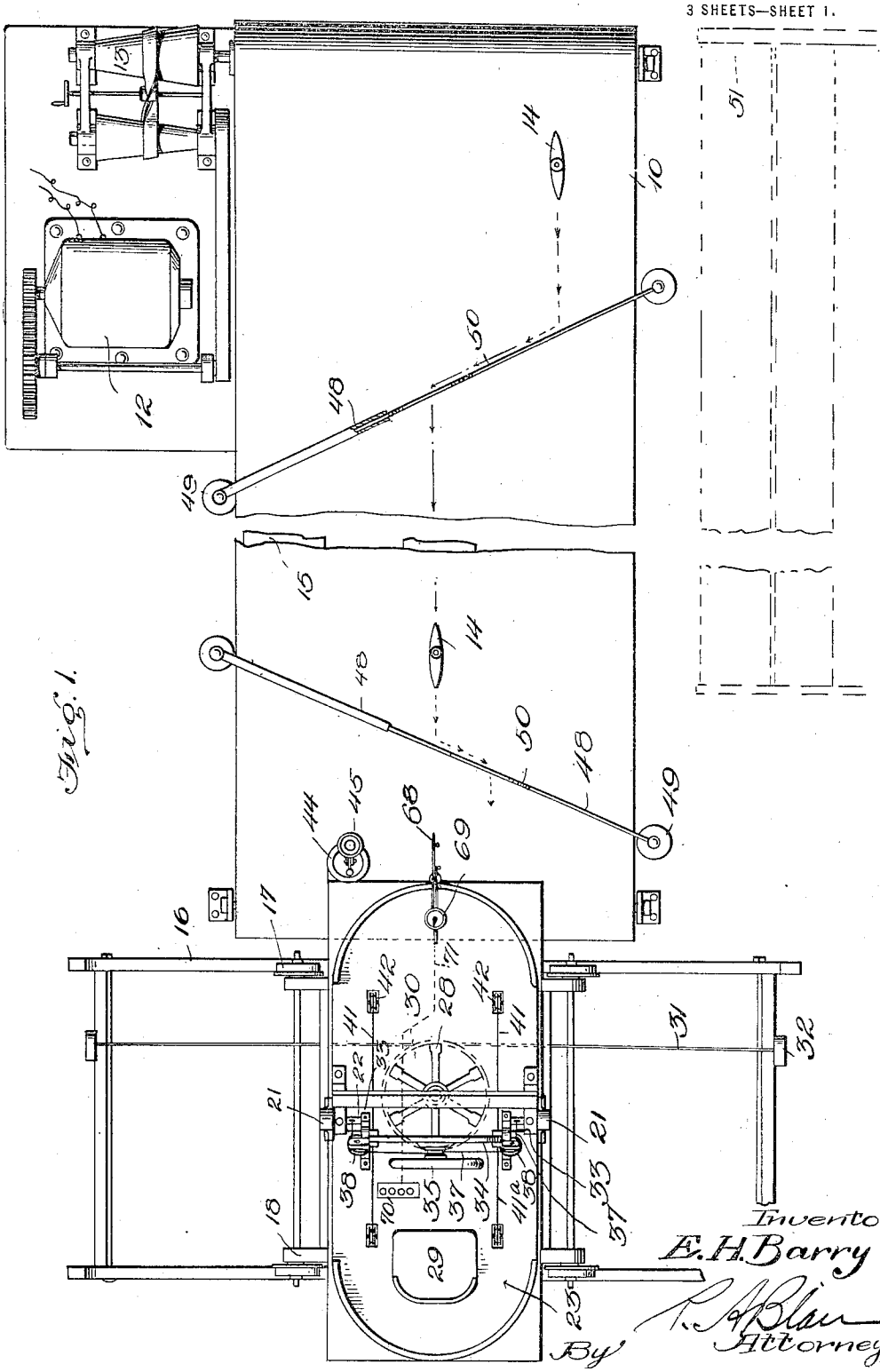


Fig. 1.

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3 SHEETS—SHEET 2.

Fig. 2.

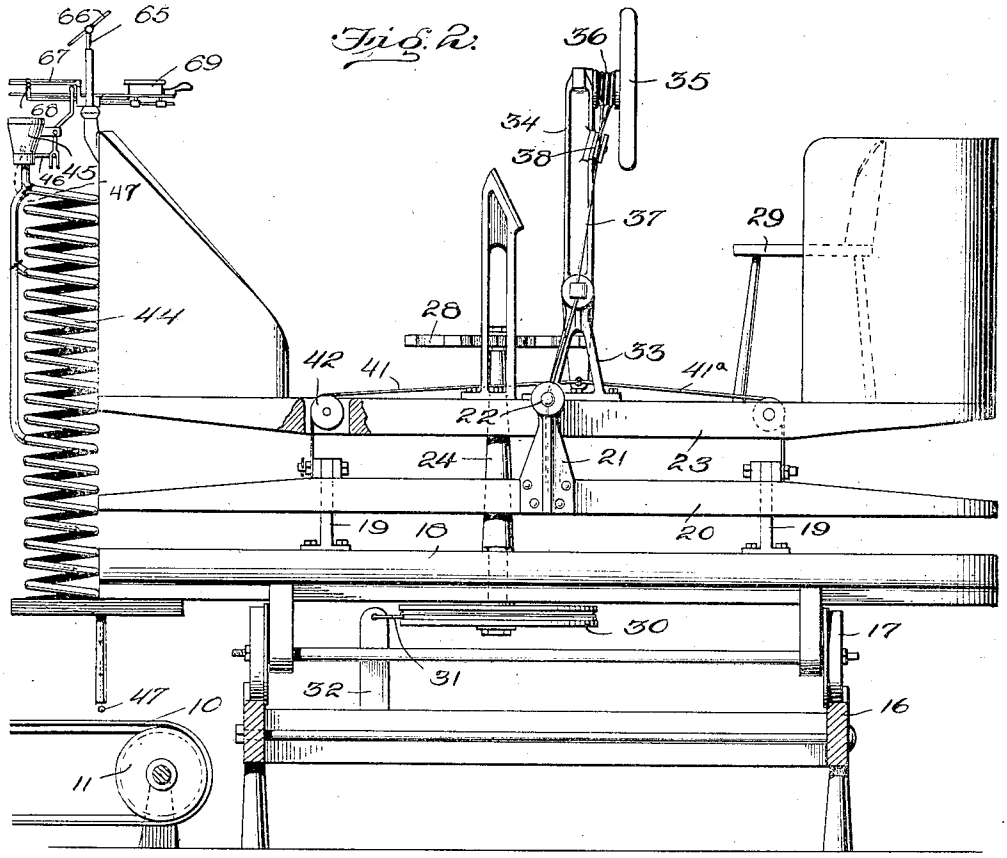
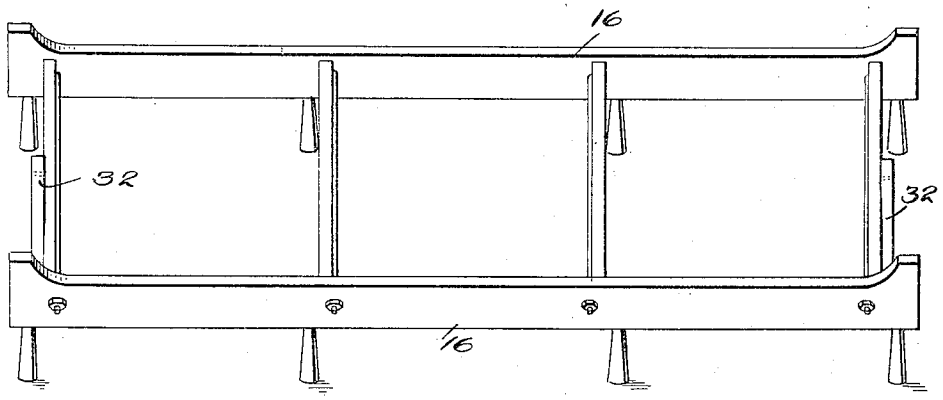


Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 4.

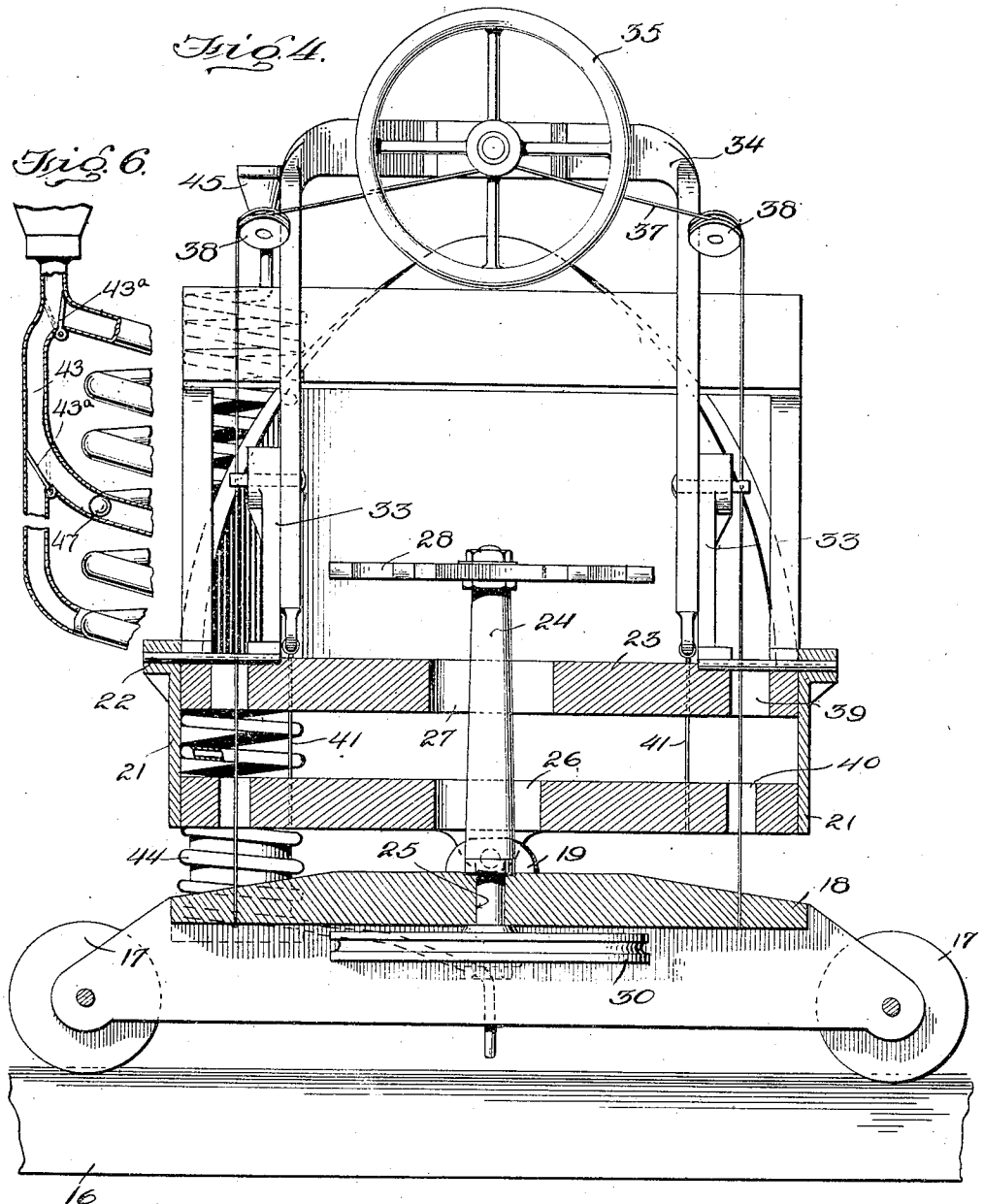


Fig. 6.

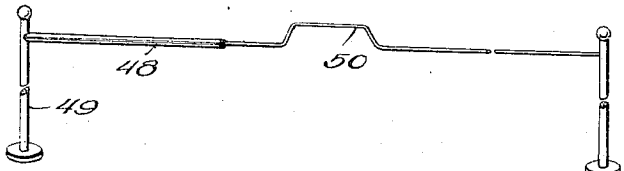


Fig. 5.

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UNITED STATES PATENT OFFICE.

EDWARD H. BARRY, OF NEWTON, MASSACHUSETTS, ASSIGNOR TO THE GOVERNMENT OF THE UNITED STATES.

BOMBER'S TRAINING DEVICE.

1,381,158. Specification of Letters Patent. Patented June 14, 1921.

Application filed February 18, 1919. Serial No. 277,735.

To all whom it may concern:

Be it known that I, EDWARD H. BARRY, a citizen of the United States, residing at Newton, Massachusetts, have invented new and useful Improvements in Bombers' Training Devices, of which the following is a specification.

This invention contemplates a device for training aviators in the art of dropping bombs or other missiles from aircraft onto targets such, for instance, as submarine vessels or trenches.

Before an aviator reaches a high degree of efficiency in dropping bombs or missiles from aircraft onto targets, considerable experience and practice is necessary, as it is requisite that the pilot be thoroughly schooled in steering his craft into proper position relative to the target; that the observer or sighting member, where such member accompanies the pilot of the aircraft, be highly trained in properly sighting the target and conveying to the pilot directions whereby the pilot may bring his craft into proper position, and that the member who is dropping the bomb or missile, whether he be the pilot or observer, have the requisite experience in correctly estimating among other things, the length of time required for the bomb to fall to the ground, due consideration being given to the speed, the height, and the direction of travel of the aircraft and targets so that the missile, having regard to its trajectory, will be dropped amply in advance of the target to make a direct hit. Furthermore, difficulty in maintaining a bombing sight on a target and steering the aircraft into the correct position to drop a bomb onto the target is met with due to the fact that the aircraft rocks and sways and is very unsteady and the target at times quickly changes its direction of travel, the latter being the case where the target is a submarine vessel, or the like. The present practice of training aviators in the art of dropping bombs by making actual air flights and dropping missiles at targets is very expensive, and while such training is necessary, it may for purposes of instruction and preliminary practice, be supplemented with the use of a device constructed in accordance with the present invention.

It is the aim of the present invention to provide a device with which aviators may receive preliminary instructions and training in bomb dropping without making actual flights in aircrafts, and to this end the invention contemplates a structure wherein a practice or drill in the art of dropping bombs may be carried out under conditions simulating those which are met with in actual practice.

To accomplish the purposes of the present invention I provide a device comprising briefly, an aviator's support movable to simulate aeroplane movement and which might be termed a miniature aircraft operated by a pilot under the direction of an observer or sighting member, capable of substantially the same movements as are met with during actual flights, except that it does not move forwardly; means, comprising an endless belt, for moving the targets toward the aircraft to give the illusion that the latter is moving toward the targets; and means for guiding the missile, representing a bomb, so that the missile will, in falling from the aircraft onto the belt, require a space of time corresponding on the scale selected, to that necessary for missiles to alight in real bombing operations, the entire structure being preferably made on the same scale of measurements so as to approach as closely as possible, actual conditions in bombing operations.

To enable others skilled in the art so fully to comprehend the underlying features of the invention that they may embody the same into the numerous modifications in structure and relation contemplated by this device, drawings depicting a preferred form have been annexed as a part of this disclosure, and in such drawings like characters of reference denote corresponding parts throughout all of the views, of which:—

Figure 1 is a top plan view of my entire device.

Fig. 2 is an elevation view of the miniature aircraft, its mounting, and the tracking upon which it may move.

Fig. 3 is a perspective view of a trackway upon which the miniature aircraft may move.

Fig. 4 is a central sectional view taken through Fig. 2.

Fig. 5 is a perspective view of a device for changing the courses of the targets, and,

Fig. 6 is an enlarged view of a portion of the missile dropping device.

Referring to the drawings in detail, the

means for moving the targets toward the aviator's support comprises an endless belt 10 passing over pulleys 11, one or more of such pulleys being driven from a suitable motor 12. As in actual bombing operations, aircrafts fly at various speeds, and it is the purpose of this invention to provide a device wherein actual conditions are simulated as closely as possible, a speed changing mechanism, comprising in part the cones 13 is interposed between the motor 12 and the pulleys 11 so that the speed of relative movement between the aircraft and the targets (the targets in the drawings being designated by character 14 and representing miniature submarine vessels) may be changed at will. The belt 10 may be of any suitable construction, three strips 15 being illustrated as secured to the belt so as to strengthen the same and facilitate driving thereof.

The targets 14 are moved toward the aviator's support for the reason that, the device being on a miniature scale, to move the aviator's support at a speed corresponding, on the scale selected, to that met with in actual practice would involve many difficulties, while the targets may be readily moved toward the aviator's support at the desired speed giving, for purposes of instruction and practice, the same relative movements between the aviator's support and target as are experienced in real warfare.

Positioned at one end of the belt and extending transversely thereof is a trackway 16 which may be of any suitable construction, that shown in the drawings being disclosed by way of illustration only. The ends of the rails of the tracking curve upwardly to form abutments or bumpers for preventing the wheels 17 of the truck or mounting 18 upon which the aviator's support is carried from running off the rails. Arising from and located on a central longitudinal line of the truck 18 are the standards or posts 19 to which is pivoted a platform 20 so that this platform may rock about a longitudinal axis.

Arising from opposite sides and intermediate the ends of the platform 20 are the brackets or standards 21 in which are journaled the trunnions 22 of the miniature aircraft designated by the numeral 23. It will be noted that the platform 20 and the aviator's support 23 carried thereby, may be rocked about a longitudinal axis on the posts 19 and the aviator's support 23 may rock about a central transverse axis in the brackets 21, so that by combining these movements the aviator's support 23 may roll and sway similarly to a real aircraft.

For the purpose of causing the truck 18 to move back and forth upon its trackway 16 and thus carry the aviator's support 23 transversely to the direction of travel of the belt 10, an upright spindle 24 is journaled in a vertical bearing 25 located adjacent the center of the truck 18, passes through enlarged openings 26 and 27 in platform 20 and the floor of the aviator's support 23, respectively, and carries at its upper end a horizontally disposed steering wheel 28, which may be operated by the feet of the aviator who sits upon a chair 29 in that part of the aviator's support 23 representing the waist of the usual craft. Upon the lower end of the spindle 24 and beneath the truck 18 is a grooved pulley 30 about which a rope or cable 31 is wound, the opposite ends of this cable being secured to posts 32 arising from the opposite ends of the trackway 16.

Arising from opposite sides of the floor of the aviator's support 23 and located rearwardly of the trunnions 22 is a pair of standards 33 to which is pivoted an operating lever 34, said lever being of U-shape with the crossbar thereof in an elevated position. For the purpose of rocking the aviator's support 23 about a longitudinal axis, namely, in the posts 19, the crossbar of the operating lever 34 carries on the side toward the pilot's chair 29 a wheel 35, having a pulley 36 about which is wrapped a rope or cable 37. The opposite ends of the cable 37 pass over guide pulleys 38 secured to the upper ends of the vertical portions of the operating lever 34, through registering openings 39 and 40 in the floor of the aviator's support 23 and platform 20 respectively, and are secured to the truck 18 as most clearly shown in Fig. 4.

To rock the aviator's support 23 about a transverse axis, namely, about the line of the trunnions 22, a cable 41 connected to each of the lower ends of the lever 34, is led forwardly of the aviator's support 23, passed about pulleys 42 journaled in openings in the floor of the aviator's support 23, and secured to the platform 20, and similarly disposed cables 41^a connect the lower ends of the lever 34 with the rear portion of the platform 20.

In the present illustrative disclosure of my invention I have shown the aviator's support as being constructed to accommodate an observer or sighting member and a pilot but it is to be understood that the observer may be dispensed with and with slight modifications in the structure, the pilot, in addition to steering the machine, may sight the target and drop the missile. Preferably, however, the arrangement herein shown is used. The sighting device may be of any suitable construction, but it is shown conventionally as being constructed along the same general lines as the bomb sight shown in the application for Letters Patent of the United States, filed November 18, 1918, by Arthur H. Boettcher, Serial No. 263,102. As stated in said application, it is found by experience that the most effi-

cient type of bombing craft is that in which the observer's cockpit is in the bow with the pilot's cabin in the waist of the body for the reason that the observer is relieved of other duties at the time of sighting, while the pilot merely manipulates the aircraft. The device disclosed in said Boettcher application comprises briefly a sighting device located in front of the observer's cockpit, and an indicating device in front of the pilot, the parts being so positioned and arranged that after the observer locates the target, he thereafter continues to point the sighting device thereon, and the relative position of the sighting device with respect to the longitudinal axis of the machine will be transmitted to the indicating mechanism. In the drawings herewith the sighting device is shown conventionally as having a vertical bar 65 calibrated for altitude and rotatable about its own axis, a line sighting member 66 pivoted for movement on the vertical bar, a drift bar 67 adapted to be set in the direction of actual flight of aircraft over the earth and being calibrated for ground speed, a point sighting member 68 adapted to be adjusted on the drift bar according to ground speed, and a compass 69 associated with the drift bar and point sighting member, as described in said application. The indicating device, designated by the numeral 70 and connected to the sighting device by the connections 71 (see Fig. 1) may comprise a series of electric lamps on which the position of the sighting member is indicated.

In actual practice, the direction and the velocity of wind having been determined, the drift bar is maintained by the observer in the right direction to indicate the actual line of flight of the craft. The sight member 68 is automatically corrected for ground speed and the vertical bar 65 for altitude. In a real bombing plane, the drift bar will, of course, be at an angle to the longitudinal axis of the craft when the wind is in a direction to cause the craft to drift. When the line sighting member 66 is in line with the point sighting member 68, the time at which the bomb is to be dropped is indicated.

In the present illustrative disclosure of my invention, since the aeroplane is moved transversely to the direction of travel of the targets, and at the time of dropping the missile representing the bomb, the target will be in alinement with the longitudinal axis of the aviator's support, the drift bar 67 may be maintained at all times in alinement with the longitudinal axis of the aviator's support. This, however, will permit the observer to operate the sighting device in the same manner as if an actual flight were being made. It will thus be seen that my improved structure will be of great advantage in training bombers in the use of aircraft where a sighting device of this kind is employed.

As my device is on a miniature scale, the bow of the aircraft is not at a great elevation above the belt 10 and as, in actual practice, an appreciable space of time elapses between the release of the bomb and the time it strikes the ground or surface of the water, means is provided for prolonging the length of time which it takes for the missile to drop after it is released. This means, in the present instance, comprises a spiral hollow tube 44 connected to the forward end of the truck 18, with its upper end located adjacent the sighting device. The upper end of the guide or tube 44 carries a missile receiving receptacle 45 having a releasing mechanism 46, which, when operated by the observer, permits a missile, in the present illustrative disclosure, a small ball 47 to pass from the receptacle 45 into the spiral tube 44. The lower end of the spiral tube 44 is led over to the center of the front of the aviator's support 23 so that this end of the tube overhangs the belt 10 and is immediately beneath the sighting device, as most clearly shown in Fig. 4. For the purpose of varying the time of flight of missiles so as to correspond to the assumed heights of the aviator's support, the tube 44 has a plurality of branches 43 and gates 43[a] for changing the course of the missiles, as most clearly shown in Fig. 6.

As in actual warfare the target frequently changes its course, this being particularly true when the target is a vessel such as a submarine vessel, means for changing at will, the course of the miniature submarine vessels 14 on the belt 10 is provided and this means comprises a horizontally disposed rod 48 carried by a pair of standards 49, the height of the rod being such that when placed over the belt 10, it is in close proximity with the surface of the upper run thereof so that it will be engaged by the targets 14. The rod 48 has a bent up portion 50 which is of sufficient height to permit the target to pass therethrough. The rods 48 are adjustable, as shown in Fig. 5, so that they may be placed at any angle across the belt. These rods are camouflaged so that the bomber will be unable to predict the course. It is of course understood that any other suitable means for changing the courses of the targets 14 may be employed. Any number of the rods 48 may be used and placed at will so as to cause the targets to follow a tortuous or other selected path. The targets 14 are placed on the end of the belt remote from the aviator's support 23, and as they are moved forwardly they engage the rods 48, which are diagonally positioned

and are guided thereby diagonally of the belt until they reach the bowed portions 50 through which they pass.

The operation of my improved device will be fully understood from the foregoing description taken in connection with the following explanation:—

The pilot having taken his seat in the aviator's support and the observer his position in the forward end of the craft, and the belt 10 having been set into operation with the rods 48 positioned to change the course of the targets, a miniature submarine vessel 14 is placed upon the moving belt at the end remote from the aviator's support. The observer trains the line sighting member 66 of the sighting device on the target and as the target changes its course, the observer, in maintaining the sight on the target, communicates to the pilot the direction in which the aviator's support is to be moved, and thereupon the pilot rotates the steering wheel 28 thereby taking up one end of the cable 31 and playing out the other end to cause the aviator's support to move upon the trackway 16 transversely of the direction of travel to the belt 10. At the same time, the pilot, by turning the wheel 35 and moving the lever 34 to and fro, causes the aviator's support to rock and sway so that the observer will meet substantially the same difficulties in maintaining the sight on the target as is experienced in actual warfare. The aviator's support having been brought by the pilot under the direction of the observer to the position where the sighting device is at the "dropping angle," that is, when the sight bar 66 is lined up with the lead 68, the observer operates the releasing mechanism 46 whereupon the ball 47 passes into the tube 44 through which it rolls onto the belt 10. The gates 43ª, of course, have been positioned to cause the missile to require the proper time in falling. The ball 47 falls onto the target 14 making a direct hit, if the estimations and directions of the observer are correct. An instructor may be positioned adjacent the belt so as to observe the point on the bolt on which the missile drops, and the distance which the missile misses the target so that the errors made by the observer may be pointed out to him. The device may be used to instruct a large number of men at the same time and to this end seats or bleachers may be constructed along either side of the belt 10. In Fig. 1, bleachers, designated by the numeral 51 and shown in dotted lines, are illustrated positioned alongside one side of the belt.

What I claim is:—

1. In an aviator's training device, the combination of means for moving the same, an aviator's support mounted thereon, and means for causing the support to simulate airplane movements with a moving target, means for moving the target toward the device, and means on the support for controlling the dropping of bombs onto the target.

2. In an aviator's training device, the combination of means for moving the same, an aviator's support mounted thereon, means for moving said support laterally, means for moving the target relative to said support and means for controlling the dropping of bombs onto the target, said last mentioned means including means whereby the rate of fall may be varied.

3. In an aviator's training device, the combination of means for moving the same, an aviator's support mounted thereon, means for moving said support laterally, means for moving the target relative to said support, means for controlling the dropping of bombs onto the target, said means comprising a spiral path through which the bombs are dropped and means for regulating the rate of passage of the bomb through said means.

4. In an aviator's training device, the combination of an aviator's support, means for causing the support to move to simulate aeroplane movement, a target, a movable support for said target whereby the target moves relatively toward the aviator's support, means for dropping bombs onto the target and means for causing a relatively lateral movement of the target with respect to its support.

5. In an aviator's training device, the combination of an aviator's support, means for causing the support to move to simulate aeroplane movement, a target, a movable support for said target whereby the target moves relatively toward the aviator's support, means for dropping bombs onto the target, means for causing a relatively lateral movement of the target with respect to its support and means for varying the rate of fall of the bomb to the target.

6. In an aviator's training device, the combination of an endless belt, means for moving same, a target mounted on said belt and adapted to move therewith, an aviator's support adjacent one end of the belt, means for causing said support to simulate aeroplane movement with respect to the target and means on the support for controlling the dropping of bombs onto the target.

7. In an aviator's training device, the combination of an aviator's support, means whereby said support may be moved laterally and tilted in a direction fore and aft of the support thereby to simulate aeroplane movement, a movable support positioned relatively in front of said aviator's support, a target carried by said support movable relatively to the aviator's support and means on the aviator's support for controlling the dropping of bombs onto said target.

8. In an aviator's training device, the

combination of an aviator's support, means whereby said support may be moved laterally and tilted in a direction fore and aft of the support thereby to simulate aeroplane movement, a movable support positioned relatively in front of said aviator's support, a target carried by said support movable relatively to the aviator's support, means on the aviator's support for controlling the dropping of bombs onto said target and means for varying the rate of fall of bombs according to the pretended height of the aeroplane above the target.

Signed at Washington, District of Columbia, this 26th day of November, 1918.

EDWARD H. BARRY.