

1,266,348.

W. I. THOMPSON.
TARGET APPARATUS.
APPLICATION FILED MAR. 12, 1917.

Patented May 14, 1918.
3 SHEETS—SHEET 1.

Fig. 1.

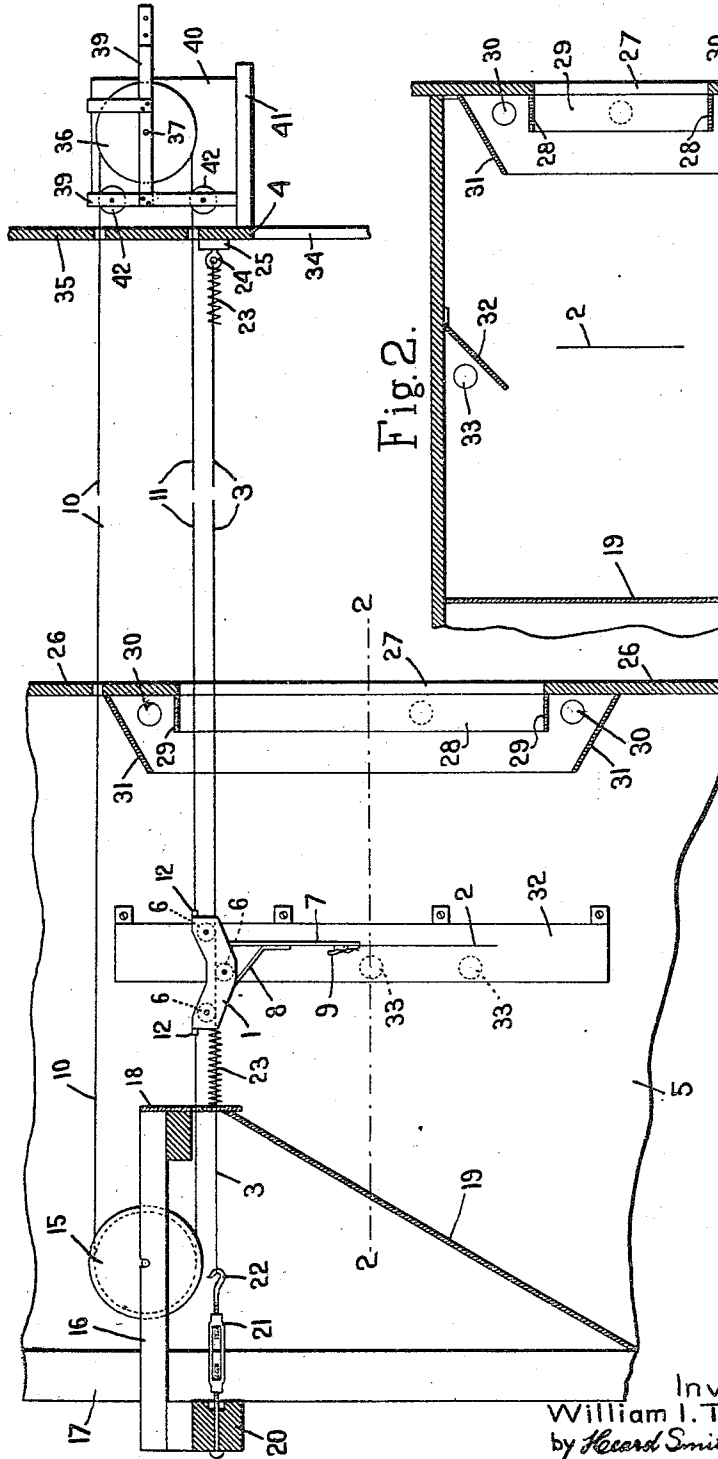
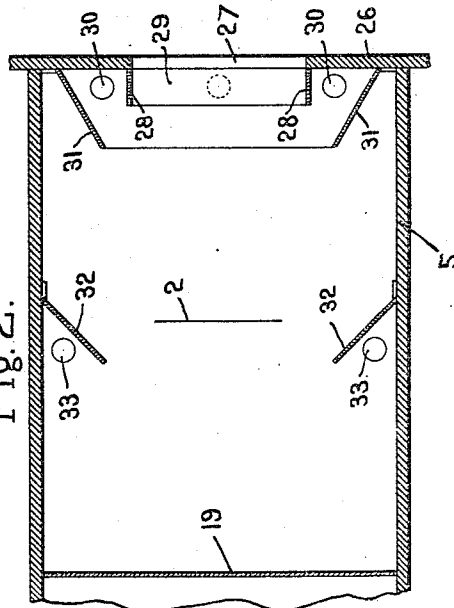


Fig. 2.



Inventor.
William I. Thompson
by *Reed Smith & Tennant*
Attys.

W. I. THOMPSON.

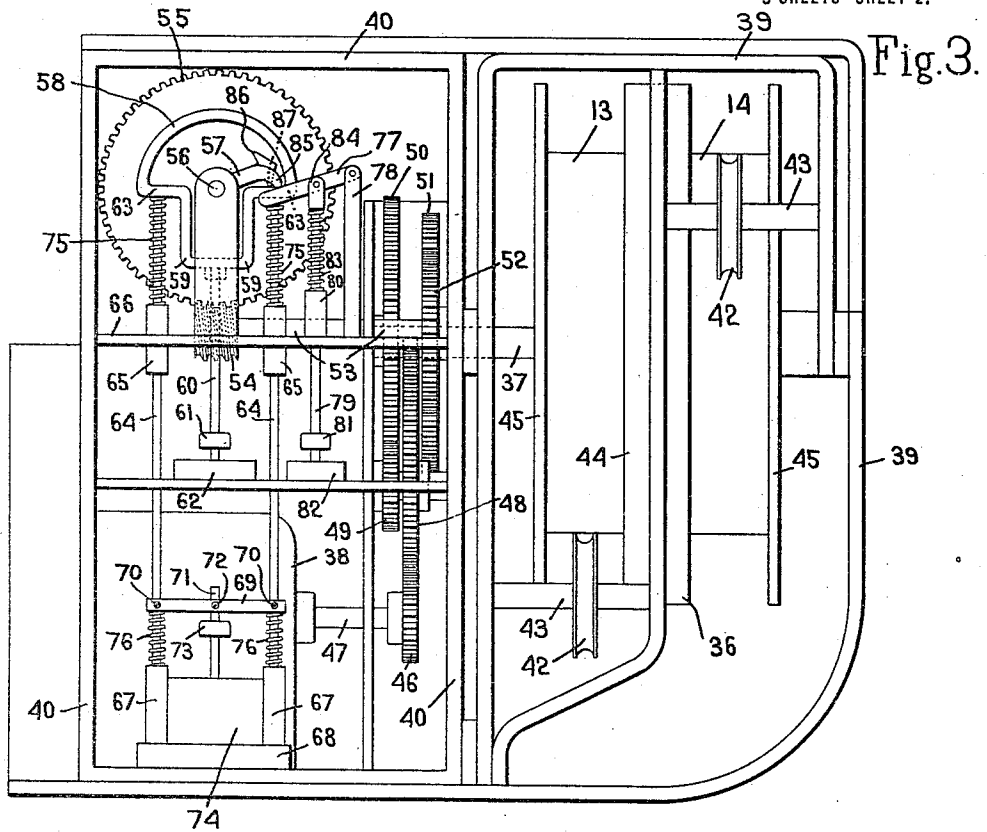
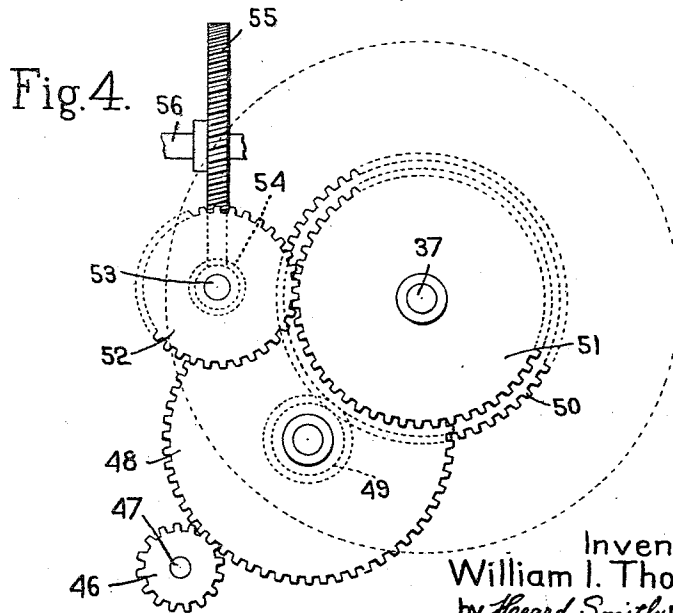
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3 SHEETS—SHEET 2.

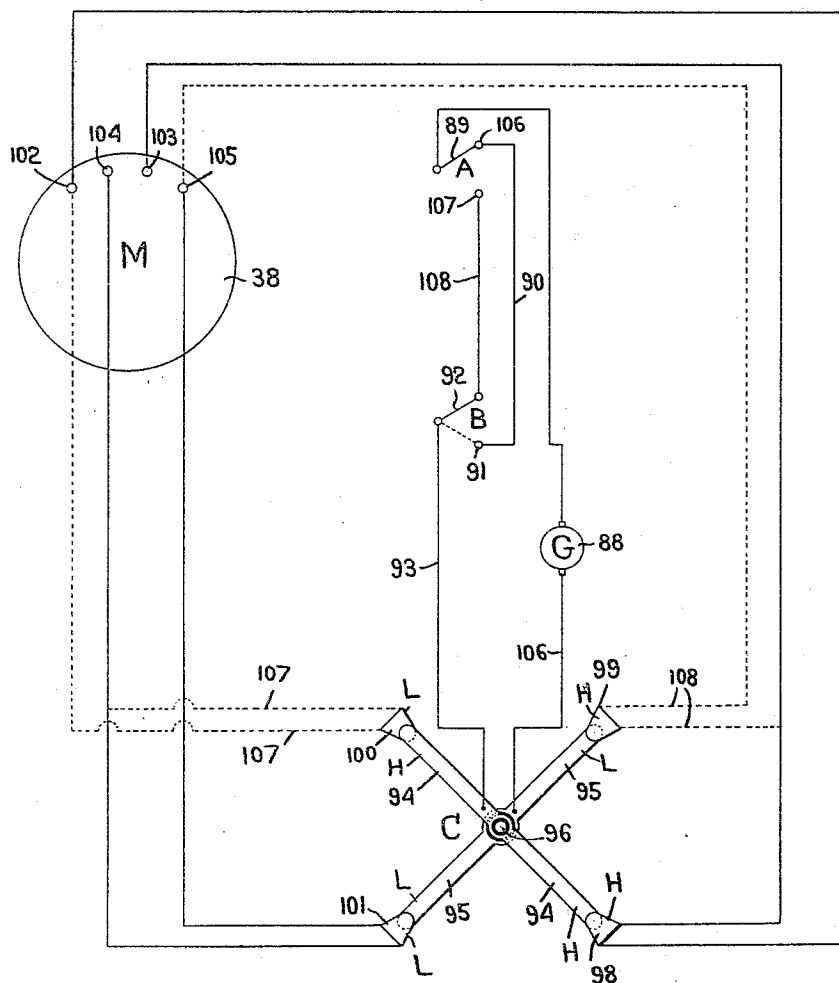


Inventor.
William I. Thompson
by Heard Smith & Tennant.
Attys.

1,266,348.

Patented May 14, 1918.
 3 SHEETS—SHEET 3.

Fig. 5.



Inventor.
 William I. Thompson
 by *Harold Smith & Tennant.*
 Attys.

UNITED STATES PATENT OFFICE.

WILLIAM I. THOMPSON, OF STONEHAM, MASSACHUSETTS.

TARGET APPARATUS.

1,266,348.

Specification of Letters Patent.

Patented May 14, 1918.

Application filed March 12, 1917. Serial No. 154,080.

To all whom it may concern:

Be it known that I, WILLIAM I. THOMPSON, a citizen of United States, and resident of Stoneham, county of Middlesex, State of Massachusetts, have invented an Improvement in Target Apparatus, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention relates to an apparatus for use in rifle ranges, armories, and shooting galleries wherein projectiles are fired at a target. This apparatus functions generally to carry a target, usually of paper, paper-board or card-board, from the firing station to an accurate position at a target station and thereafter, at the will of the marksman or an attendant at the firing station, to return the same target to the firing station for inspection and scoring where it may be removed from the carrier. As the apparatus is electrically controlled wholly from the firing station there is no opportunity or necessity for any being to be in or near the line of fire and hence danger of accidental injury by the projectiles is eliminated. The novel electric control is such that the carrier in which the marksman places a target is moved by means of a motor, upon the closing of an electric circuit, to the target station. At a predetermined point in timed relation to the carrier travel, the circuit is automatically broken so that the target-carrying member comes to rest at an accurate and definite position at the target station; and, not only is the circuit automatically broken at such predetermined point, but also, the circuit connections are automatically changed so that the motor may be reversely actuated upon the subsequent closing of the changed circuit at the firing station. Similarly, at a predetermined point in the travel of the carrier returning the same target to the firing station, the same automatic operations are effected so that the carrier is ready to travel again to the target station upon closing of the shifted circuit. A target lighting circuit and lights are also provided herein so that the target may be automatically lighted upon arrival in its position and the lights extinguished upon its departure. Furthermore, a novel means of inspection of the target when punctured by a bullet is provided

and consists broadly in causing light rays to pass through the projectile apertures.

The general object of this invention is to provide a new, improved and simplified target controlling apparatus.

Other objects of the invention will more fully appear from the following description and the accompanying drawings and will be pointed out in the annexed claims.

In the accompanying drawing, there has been disclosed a structure designed to carry out the objects of the invention, but it is to be understood that the invention is not confined to the exact features shown, as various changes may be made within its reasonable scope.

In the drawing:

Figure 1 is a sectional view of the apparatus, being broken away in the middle,

Fig. 2 is a section on the line 2—2 of Fig. 1;

Fig. 3 is a front elevation of the box containing the mechanism for controlling the apparatus, the cover being removed;

Fig. 4 shows the box gear train actuated by the motor shaft;

Fig. 5 is a diagrammatic view of the wiring.

A selected embodiment of the general structure of apparatus designed to carry out the invention is shown in Fig. 1 wherein is shown the carrier 1 which is adapted to have the usual paper target 2 secured thereto. This carrier may be of any general type and is preferably provided with a way upon which it may travel rather than to permit it to be suspended from a movable flexible carrier which would permit excessive sag. The way here shown consists of a wire 3 which is suspended in taut position between the firing station 4 and the target station 5. The carrier 1 may slide on the wire or may be provided with small trolley wheels 6 which are grooved as is common in order to traverse the wire 3. The carrier here shown has a depending arm 7, suitably braced by bar 8, to which the target 2 may be manually attached by means of a holding clamp 9.

The immediate cause of the movement of the carrier is a flexible connection and the mediate cause is an electric motor. This flexible connection is here shown as cords 10 and 11. One end of each of these is secured to a shoulder 12 on each end of the carrier.

The opposite ends of these cords are secured to different but simultaneously rotatable members such as drums 13 and 14, see Fig. 3, which are preferably located at the firing station 4. These cords have their drum end portions wound in opposite directions about the drums 13 and 14 in order that, as cord 10 is being wound up and the carrier pulled to the position at the target station shown in Fig. 1, the cord 11 is being unwound at substantially the same rate of speed and the two cords are thus maintained taut and tendency to sag reduced to a modicum. The difference in rate of winding and unwinding is relatively inappreciable and is due to the different effective diameters of the two drums on account of the varying number of cord convolutions thereon. At the target station is placed a single pulley 15 about which runs the cord 10 from its drum to its fastening on the end of the carrier. The pulley 15 is journaled in a bracket 16 projecting from the frame 17 of the target station and bears at its outer end a plate 18 which slightly overhangs the top edge of the oblique rear wall 19 of the bullet-proof inclosure of the target station. A beam 20 extends across the frame 17 of this station and supports the turn-buckle 21 (adjustable to assure the tautness of the wire 3) having a terminal hook 22 engaging the target station end of the carrier wire 3. The buffer plate 18 is apertured to permit the free passage therethrough of the carrier wire 3 and of the actuating cord 10. A helical spring 23 is positioned about the wire 3 adjacent this plate 18 and serves to take up any shock of stoppage of the carrier at the target station. The opposite end of the wire 3 is secured to a ring screw 24 fastened to a block 25 on the front frame of the firing station. Another helical spring 23 is similarly positioned at the firing station and takes the shock of stoppage of the carriage at this station.

The target inclosure is preferably metallic at all points which are exposed to direct fire. The front wall 26 has an opening 27 within which the carrier and depending target enter to the exposed target position shown in Fig. 1. The upper portion of the front wall has an aperture to permit the free passage of the movable cord 10. The edges of the opening 27 are provided with vertical plates 28 and horizontal plates 29, desirably metallic. These function to protect the target lights 30 from the projectiles. The oblique plates 31 are also preferably positioned to protect these forward target lights. In order to obviate the disadvantage of being compelled to pull forward the target carrier in order to make it emerge from the opening 27 and thereby cause the light rays to be reflected through any bullet holes therein, an additional lighting unit is provided. The

pulling forward of the target not only involves delay incident to carrier movement but also the disadvantage of causing the target to waver or vibrate. Therefore, behind the rear plates 32, which are oblique to the line of fire, are positioned rear lights 33. Hence, without movement of the target, the front or target lights 30 may be switched off from the firing station and the rear lights then turned on. Upon inspection of the hit, the lighting may be restored to initial target illuminating status.

The control of this apparatus is located at the firing station and thus is obviated the necessity of the presence of a being at the target station with the attendant dangers of accidental or careless injury. As stated, the control and actuation of this apparatus is electrical, and the switches are located adjacent the opening 34 of the front wall 35 of the firing station and within easy reach of the marksman while the general mechanism is located overhead and out of the way.

A pulley 36 having the two cord drums 13 and 14, above referred to, is fast on the shaft 37 which is actuated by the reversible electric motor 38 through a gear train shown in Fig. 4. The shaft 37 of the pulley 36 is journaled in a frame work, the parts of which are generally designated by the numeral 39. This framework 39 is supported by the housing or box 40 of the actuating mechanism, the box 40 being secured to a support 41 fastened to the front wall 35 of the firing station. The sheaves 42, which guide the cords 10 and 11 to their respective drum portions of the pulley 36, are rotatable upon stud shafts 43 which are borne by the framework 39. While the drums 13 and 14 are referred to as separate units, they structurally are preferably a single drum divided by the broad flange 44 and having marginal flanges 45. The pulley shaft 37 is driven by the motor 38 by means of a spur gear 46 fast on the motor shaft 47. The spur 46 meshes with a gear 48 fast on a stud shaft which also has fast thereon a gear 49 which in turn drives the gear 50 fast on the pulley shaft 37.

While various means may be employed to effect the automatic functions of this apparatus, the disclosed structure has proved itself, durable, accurate and efficient. And, in attaining perfect coordination of the travel of the carrier and the actuation of the circuit controlling mechanisms, a portion of this same gear train is employed to drive the shaft 56 upon which is mounted so as to move therewith a finger 57 which actuates the parts functioning, at predetermined points of carrier travel, to break and change automatically the control and lighting circuits. As above noted, the spur 46 meshes with the gear 48 with which is rotatable the gear 49 meshing with

the gear 50 of the shaft 37 of the pulley. The gear 51 is also fast on this pulley shaft and in turn meshes with the gear 52 which latter is fast on the worm shaft 53 bearing the worm 54 meshing with the worm gear 55. The worm gear 55 is fast on the finger shaft 56 bearing fast thereto the finger 57.

A cross-head 58 is slidably mounted in the box 40 and is preferably of the general shape shown in Fig. 3. The depending U-shaped portion 59 has secured thereto a stem 60 carrying a head 61 which acts in conjunction with the switch in the box 62 to break and shift the motor circuit. The cross-head 58 has also a pair of offset portions 63 to which are secured the stems 64. These stems freely reciprocate in sleeves 65, positioned in the platform 66 of the box 40, and terminate adjacent the floor of the box where they are slidably received within sleeves 67 secured to a base 68 on the box floor or base. A cross-bar 69 is retentively secured to each of the stems 64 as by set screws 70. And a rod 71 is adjustably attached to this cross-bar by means of the set screw 72. A head 73 is carried by the lower end of this rod 71 and coöperatively functions with the switch box 74 to shift the connections of the motor 38 in the power circuit. In this embodiment the power stroke of the cross-head and stems is downwardly only and to effect the movement of the parts to elevated position a plurality of helical springs 75 and 76 are provided. The springs 75 are coiled about the portions of the stems 64 comprehended between the offset portions 63 and the sleeves 65, while the springs 76 are coiled about the portions of the same stems comprehended between the cross-bar 69 and the sleeves 67. The downward forcing of these stems and the cross-head 58 causes the compression of these four springs with the resultant upward forcing of the stems and cross-head when such movement is permitted. The automatic make and break of the lighting circuit is preferably effected by means of a lever 77 pivotally mounted upon the stand- and 78 supported by the platform 66. A stem 79 is pivotally secured to the lever 77 and downwardly extending freely passes through a sleeve 80. The lower end of the stem 79 bears a head 81 coöperating with the switch-box 82 to close the lighting circuit when in lowered position and to break the same when in elevated position. A helical spring 83 is coiled about the stem 79 between the pivot yoke 84 and the sleeve 80 and thereby places the stem 79 and outer end of the lever 77 under a tension tending to hold them in elevated position.

The power depression of the cross-head 58 and of the lever 77 is preferably effected by means of the rotation of the shaft 56

through actuation by the motor through the intervening train of gears. The finger 57 which is fast on the shaft 56 directly achieves these functions and, to that end, is provided with a plurality of shoulders. The path of finger 57 is somewhat less than the arc of a semi-circle and in this path the finger reciprocates under actuation in alternate directions by the motor driven shaft 56. The curved shoulder 85 of the finger contacts with and serves to depress the outer end of the lever 77 and thus depress the stem 79 to close the lighting circuit switch. When moved from the position shown in Fig. 3, this shoulder releases the lever and the helical spring 83 exerts its tension to raise the stem 79. The shoulders 86 and 87, here shown as substantially pointed projections opposedly formed on a portion of the finger end, function to depress the cross-head 58 at each traverse of the finger. The shoulder 87, shown in dotted lines behind the curved shoulder 85, depresses the cross-head at one limit of rotation of the shaft 56 by contact with the upper face of the adjacent offset portion 63. The pointed shoulder 86 depresses the cross-head by bearing downwardly upon the opposite portion 63 at the other limit of reciprocation of the shaft 56.

The purpose, broadly, of this wiring is to provide an electrical circuit whereby, upon the manual closing of a switch the current will run from the source of supply to the motor and thereby cause the carrier to travel from one station to another, and, automatically at a predetermined point, to open the circuit and change the circuit connections so that the carrier may alternately come to rest at a station and upon subsequent closing of the changed circuit, may travel to the other. A simple means of accomplishing this result is shown diagrammatically in Fig. 5 wherein A designates the switch located in the box 62 of Fig. 3, B a manually operated switch (such as a push button), and C designates a reversing switch which is inclosed within the box 74, shown in Fig. 3. The source of electrical energy is shown as a generator 88 in circuit with the motor 38. The several switches are interposed in the circuit between the generator and the motor.

In Fig. 5 the circuit is shown in the position corresponding to the position of the carrier in Fig. 1 and to the control mechanism shown in Fig. 3. Upon the manual changing of the arm 92 of the switch B to its dotted line position, the circuit will be closed and the current will run from the generator 88 through the arm 89 of the switch A to the wire 90, to the contact point 91 of the switch B, then across the closed arm 92, and along the wire 93 to the arm 94 of the reversing switch. In this embodiment of such a switch, there are provided a pair of bars mounted

at their middle points upon a rotatable post. These bars are insulated from each other and are in different horizontal planes and will be referred to as high and low arms.

5 The high arm 94, to which the current flows from the wire 93, is in a plane above the low stationary contact point 100 and therefore the current finds outlet through the opposite high, stationary contact point 98. From this

10 contact the current flows to terminals 102 and 103 of the motor. From the motor terminals 104 and 105, the current will return to the generator via the wires to the low contact 101 in electrical engagement with the low

15 arm 95 and thence to the wire 106 and the generator 88. For convenience, in the drawings the plane of the low switch contacts 100 and 101 and of the bar 95 is indicated by the letter L, while the higher plane of the con-

20 tacts 98 and 99 and of the bar 94 is indicated by the letter H.

Such a circuit closure will cause the carrier to be returned to the firing station and, at a predetermined point in its travel to such

25 station, the plunger or stem 60 throws the arm 89 of the switch A from contact with the point 106 of the wire 90 into contact with the point 107 of the wire 108. And therefore as the push button switch B is in the

30 dotted line position, the circuit will be opened and immediately prepared for manual closing by means of the movement of the arm 92 of the switch B to its position disclosed in full lines in Fig. 5. Substantially

35 at the same time that the stem 60 throws the arm 89 the rod 71 functions to rotate the post 96 so that the arms 94 and 95 are given a quarter clock-wise turn so that the low arm 95 will make contact with the low contact

40 100 while the opposite low arm 95 will be spaced below the high stationary contact 98. The high arm 94 previously held above the low contact 100 will be turned and will engage the high stationary contact 99. The

45 shifted or changed circuit will then be from the wire 93 to the high arm 94 to the high contact 99, to the wires 108 and then to the terminals 103 and 105 of the motor. Returning the changed circuit runs from the

50 motor terminals 102 and 104 to the wires 107 and then to the low contact 100 and then across the low arm 95 to the wire 106 and then to the generator.

The lighting circuit is not diagrammed, it

55 being of any simple form well known to electricians and is such that it is only closed by the plunger or stem 79 when the carrier is near the target station. A supplementary switch is cut in the circuit so that either

60 the front target lights 30 or the rear inspection lights 33, may be lighted at the will of the marksman.

Operation: The target is placed within the clamp 9 of carrier. The switch B is

65 moved by the marksman to close the circuit.

The motor 38 is actuated and causes the cord 10 to be wound upon one of the drums while the cord 11 is simultaneously unwound from the other drum. The carrier is thus

70 pulled to the target station. The motor also actuates the gear train which in turn moves the finger 57. At a predetermined point shortly before the carrier reaches the target station the cross-head is depressed by the

75 finger 57 and the stem 60 functions to shift the arm 89 of the switch A from contact with the point 107 to contact with the point 106. The circuit is thus opened and ready to be manually closed by another operation

80 of the switch B by the marksman. But shortly after (to avoid arcing) the switch A is shifted, the switch C is changed. Change in this time interval may be effected by

85 means of adjustment of the set screw which holds the rod 71 to the bar 69. This change of switch C is effected by rotation of the post 96 by the plunger or stem 71.

90 Upon the rotation of the post 96, a different pair of contacts is made through the switch C so that the motor may be actuated in a reverse direction. Therefore, as the power

95 is shut off, the carrier 1 will come to rest at the target station. The momentum of the parts is sufficient to carry it the short distance. The spring 23 of the carrier wire

100 effectually takes up the shock of stoppage and the target is then in position at the target station. Shortly before the carrier reaches the target station and before the circuit is broken, the rod 79 functions to close

105 the lighting circuit, through the switch 82, so that the target is illuminated by means of the target lights 30. Firing may then take place. In order to perceive the results of the shots, it is neither necessary to return

110 the target to the firing station for examination, nor, is it necessary to move the target in front of the target light. The marksman by means of a switch, located at the

115 firing station and in the lighting circuit, simply cuts off the lights 30 and cuts in the rear lights 33. The rays of light from the rear lamps pass through any bullet apertures in the target and permit their number and substantially accurate location on the

120 target to be viewed from the firing station. After inspection, the marksman restores the lights to initial status and firing may continue. By this arrangement the delays and

125 inconveniences of target shifting are avoided as is also the usual wavering or vibration of the target due to its movement.

After having discharged his shots the marksman again throws the switch B. This

130 movement carries the arm 92 to the position shown in dotted lines in Fig. 5 wherein it makes contact with the point 91. The circuit from the generator through the motor is thus completed and the carrier is pulled from the target station to the firing station.

135

As the carrier leaves the target station the shoulder 85 of the finger 57 permits the raising of the rod 79 and thus to the interruption of the lighting circuit. Therefore, while the carrier is traveling between stations the light circuit is broken. As the carrier with the used target nears the firing station the circuit is again automatically broken through the switch A and the motor connections are again automatically reversed in order that upon the subsequent manipulation of switch B the carrier may return to the target station. Upon arrival of the carrier with the used target at the firing station the marksman grasps the clamp 9 and removes the target 2 from the carrier and may thereafter insert a fresh target.

There is thus provided a target-controlling apparatus which functions to carry a target from the firing station to exposed position at a target station by electrical means which is set in operation at the will of the marksman. In this apparatus the target is fixedly held to the carrier by the clamp 9, from the time when it is so placed by the marksman, through the firing operation and inspection, until removed therefrom by the marksman upon return of the carrier to the firing station. This organization provides a simple, durable and efficient target mechanism.

Having fully described my invention what I claim as new and desire to secure by Letters Patent is:

1. In a target apparatus the combination of a firing station, a target station, a carrier adapted to have a target secured thereto and to carry the same between stations, an electric motor actuable upon the closing of a circuit to cause the carrier to travel from one station to another, and means operable automatically as the carrier nears a station to break the electric circuit and to change the circuit connections so that the carrier may alternately come to rest at a station and upon subsequent closing of the changed circuit may return the target to the other.

2. In a target apparatus, the combination of a firing station, a target station, a carrier adapted to have a target secured thereto, a carrier way connecting said stations whereby the carrier may travel therebetween, a flexible connection extending between said stations and fastened to said carrier, a rotatable member at each station carrying the flexible connection, an electric motor actuable to drive one of the rotatable members and thereby actuate the carrier, switching means in the motor circuit whereby the motor may be reversed and thereby actuate the driven rotatable member in alternate directions so that the carrier may similarly travel, circuit closing means at the firing station, and means for automatically causing said switching means at a predetermined point of

carrier travel to break the closed circuit and reverse circuit connections whereby the carrier comes to rest at a station and upon subsequent closing of the changed circuit may be actuated to travel to the other station.

3. The apparatus as specified in claim 1 in combination with target lights and means for automatically lighting the target lights as a target nears exposed position and for automatically extinguishing the target lights as the target is carried therefrom.

4. In a target apparatus the combination of a firing station, a target station, a carrier adapted to have a target secured thereto and to carry the same between stations, an electric motor actuable upon the closing of a circuit to cause the carrier to travel from one station to another, a plurality of switches automatically operated by said motor in timed relation to the carrier travel to the target station, first to light the target lights, thereafter to open said motor circuit and to change the circuit connections so that the target may come to rest in exposed illuminated position at the target station.

5. In a target apparatus the combination of a firing station, a target station, a carrier adapted to have a target secured thereto and to carry the same between stations, an electric motor actuable upon the closing of a circuit to cause the carrier to travel from one station to another, a plurality of switches in said circuit, a plurality of plungers for actuating said switches, a reciprocable member to actuate said plungers, and means for causing the motor to reciprocate said member in timed relation to the carrier travel, whereby as the carrier nears a station the circuit is automatically broken and the connections changed so that the carrier may come to rest at a station and, upon subsequent manual closure of the circuit, will travel to the other station.

6. In a target apparatus the combination of a firing station, a target station, a carrier adapted to have a target secured thereto and to carry the same between stations, an electric motor actuable upon the closing of a circuit to cause the carrier to travel from one station to another, a plurality of switches in said circuit, plungers for actuating said switches, yieldable means for holding said plungers in tensioned elevated position, a reciprocable member automatically operable in timed relation to the travel of the carrier to depress or permit the elevation of said plungers whereby as the carrier nears a station the circuit is automatically broken and the connections automatically changed by each movement of the plungers by each of said plunger movements.

7. In a target apparatus the combination of a firing station, a target station, a carrier adapted to have a target secured thereto and to carry the same between stations, an elec-

5 tric motor actuable upon the closing of a circuit to cause the carrier to travel from one station to another, a plurality of switches in said circuit, plungers for actuating said switches, yieldable means for holding said plungers in tensioned elevated position, a movable cross-head for controlling the movement of said plungers, a reciprocable member automatically operable in timed relation

to the travel of the carrier to depress or permit the elevation of said cross-head whereby as the carrier nears a station the circuit is automatically broken and the connections automatically changed by each movement of the cross-head. 10 15

In testimony whereof, I have signed my name to this specification.

WILLIAM I. THOMPSON.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."