Jan. 19, 1943. M. W. KENNEY ET AL 2,308,814

ELECTRIC RIFLE RANGE

Filed Jan. 20, 1940 4 Sheets-Sheet 1

Fig. 1

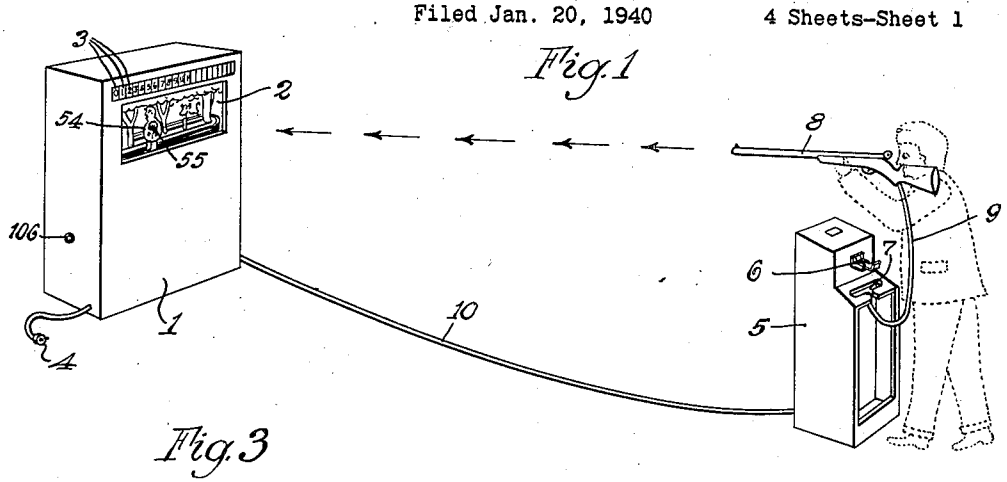
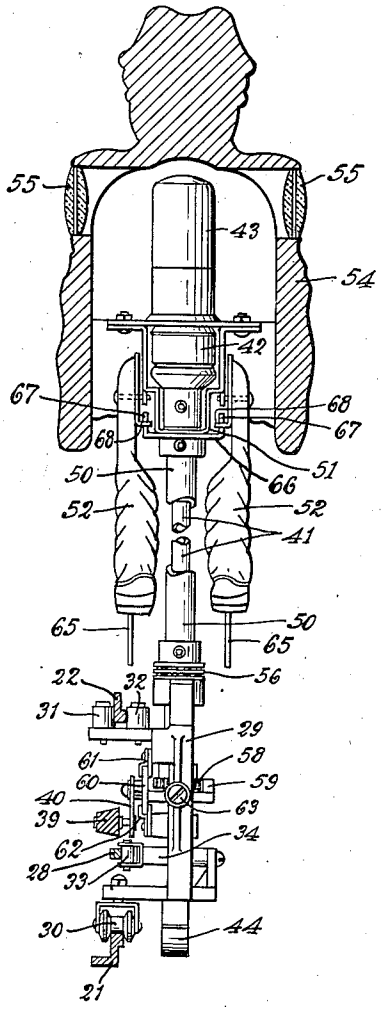


Fig. 3



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ELECTRIC RIFLE RANGE

Filed Jan. 20, 1940 4 Sheets-Sheet 2

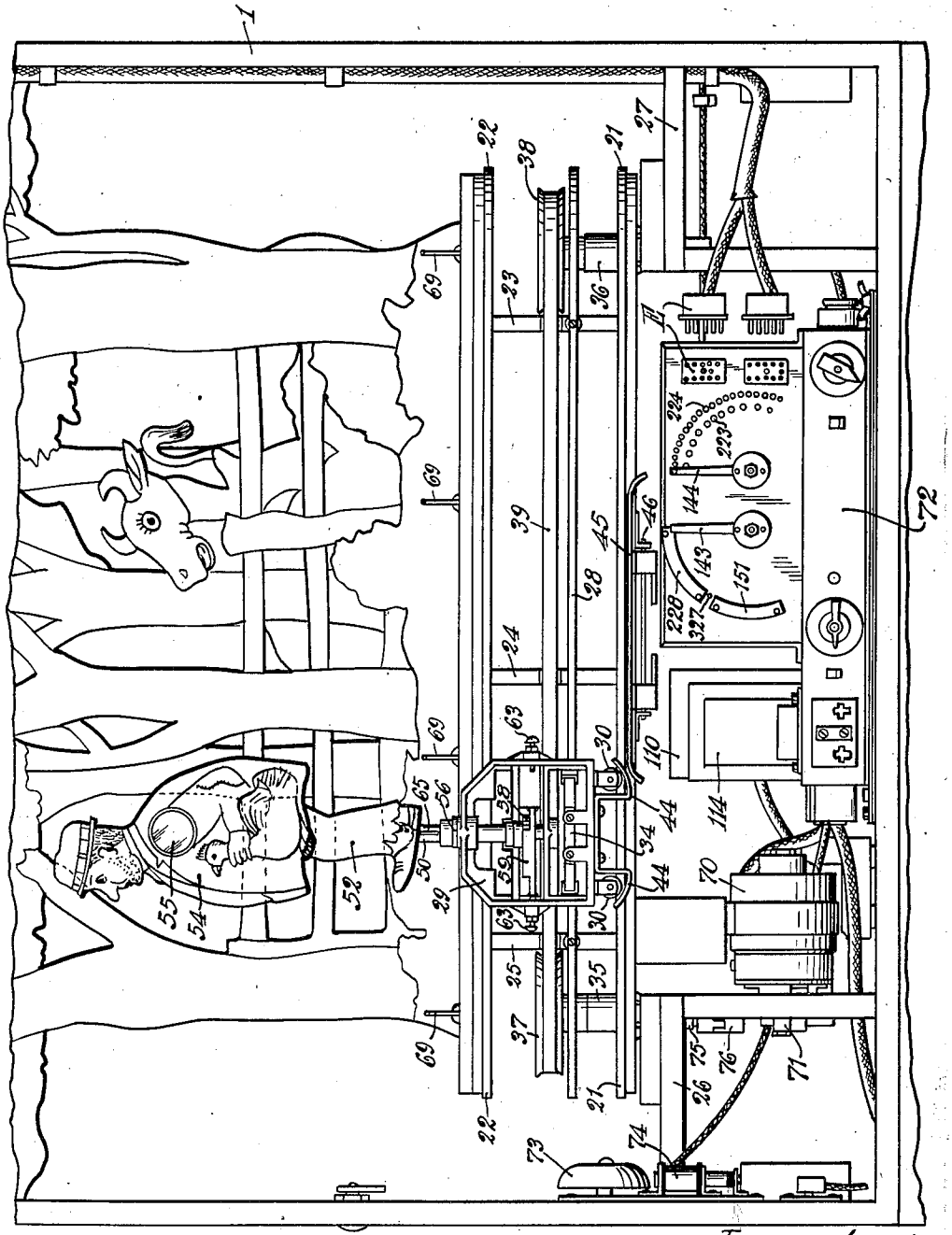

Fig. 2

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ELECTRIC RIFLE RANGE

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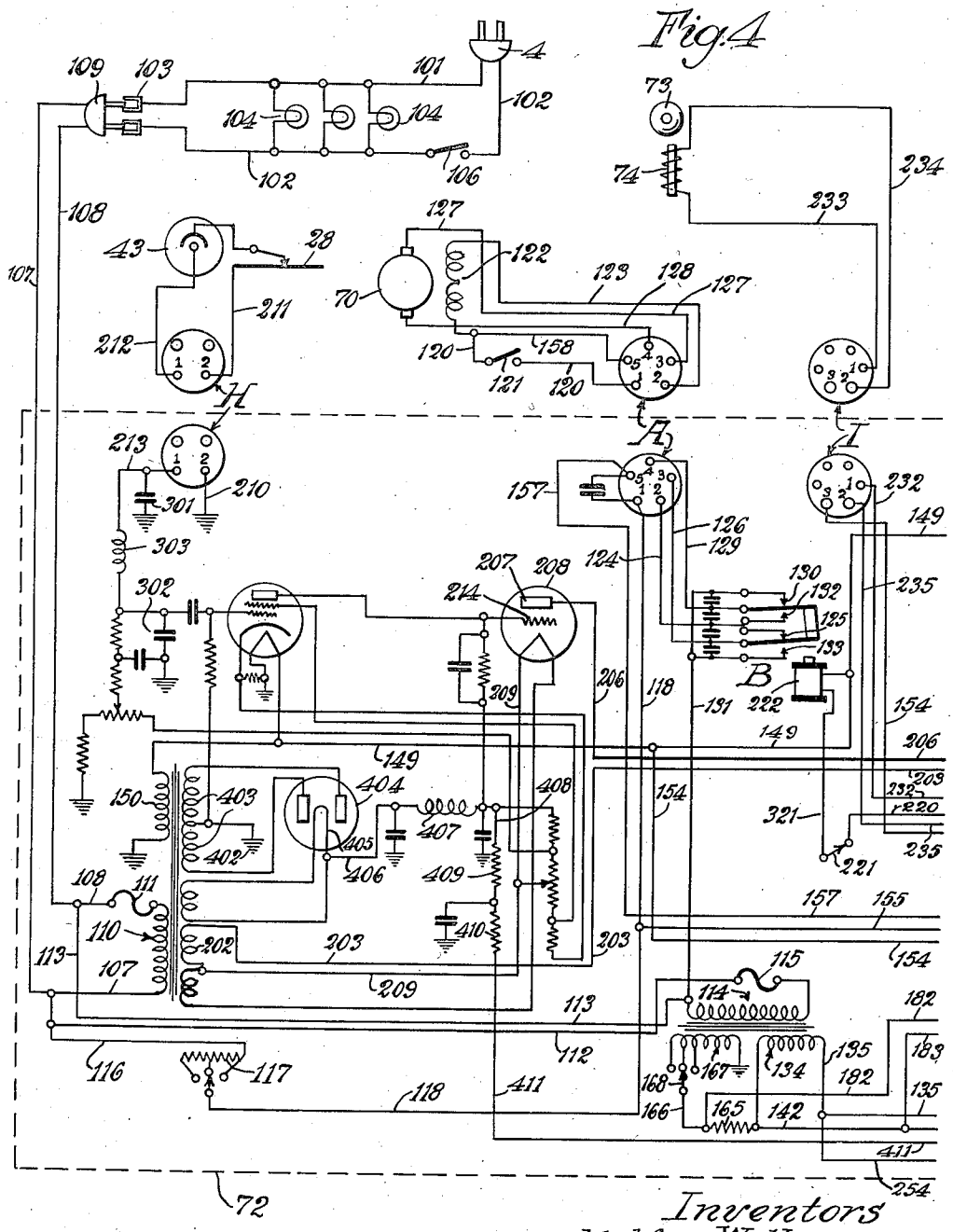
Fig. 4



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ELECTRIC RIFLE RANGE

Filed Jan. 20, 1940 4 Sheets-Sheet 4

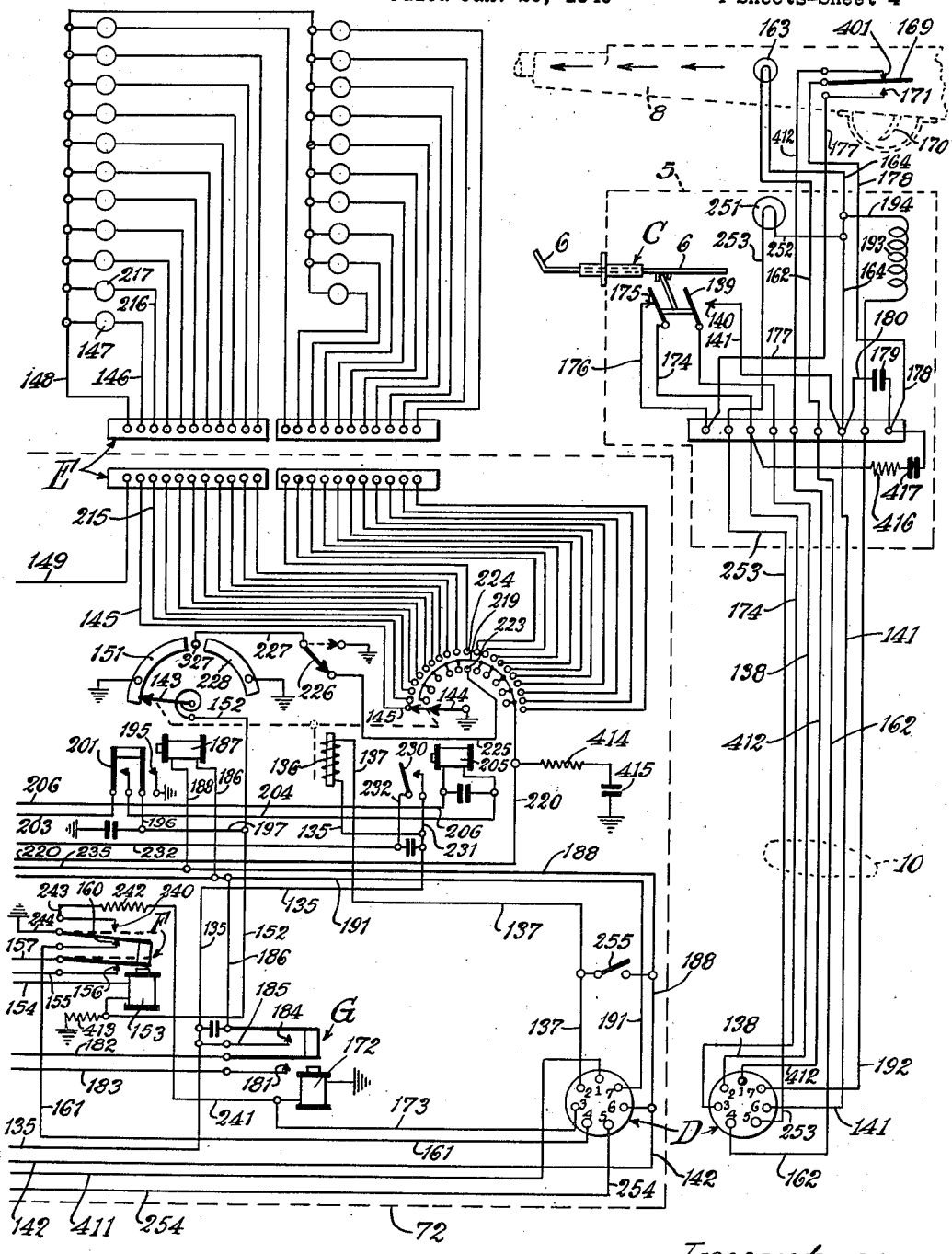

Fig. 5

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UNITED STATES PATENT OFFICE

2,308,814

ELECTRIC RIFLE RANGE

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Application January 20, 1940, Serial No. 314,828

12 Claims. (Cl. 273—101.1)

Our invention relates to improvements in shooting galleries, and has for one object to provide a new and improved shooting gallery and target device wherein a light-projecting member may be used to simulate the effect of a gun discharging a metallic bullet. Other objects are to provide a new and improved type of target which will be interesting and make possible the development of a high degree of skill on the part of the shooter; to provide a traveling target which will reverse its direction of travel when hit; to provide an electrical and mechanical control means, especially well adapted to adjust, control, and operate the device; and to provide a device which may be easily renewed, repaired, and maintained.

Other objects of our invention will appear from time to time in the specification and claims.

Figure 1 is a perspective view of the device in operation.

Figure 2 is a detail view of the target device on an enlarged scale with parts omitted.

Figure 3 is a section through the target itself.

Figures 4 and 5 are diagonals of the electrical circuits, Figures 4 and 5 being complementary in order that the drawings may be large enough for easy reading.

Like parts are indicated by like characters in the various figures.

1 is a cabinet containing a target visible through the window 2. 3 includes a series of hit-indicating windows adapted to be illuminated by electric lights as will hereinafter appear. 4 is an electric plug by which the apparatus may be connected to a suitable electric power source, such as a house lighting circuit. 5 is a gun cabinet, having a coin slide 6, a gun rack 7 adapted to receive the gun 8, and cables 9 and 10 joining the gun 8, the gun cabinet 5 and the target cabinet 1.

21 and 22 are endless track members. They are supported by stanchions 23, 24, and 25 on the frame members 26 and 27 in the cabinet 1. These tracks have two parallel sections joined at each end by curved sections. 28 is a conductor or third rail insulated from and carried by the stanchions 23, 24, and 25, and curved to conform with the contour of the tracks 21 and 22. 29 is a target carriage having wheels 30 adjacent each end thereof and adapted to travel along the track 21 and support the weight of the carriage. 31 and 32 are rollers, engaging opposite sides of the track 22 to maintain the carriage in upright position. 33 are contact rollers supported on an insulated spring 34 and yieldingly pressed against the rail 28. 35 and 36 are sleeves projecting upwardly from the frames 26 and 27 upon which are rotatably mounted grooved pulleys 37 and 38. An endless belt 39 travels about these pulleys and is connected to the carriage 29 by a drive plate 40. 41 is a hollow shaft, projecting upwardly from the carriage 29 and supporting the socket 42 which carries a photoelectric cell 43. The shaft 41 is hollow so that a suitable electric conductor may extend therethrough from the phototerminal of the photoelectric cell being grounded.

Spring fingers 44 on the carriage 29 are adapted to engage the bar 45, which is pivoted on the bracket 46 on the track 21. Contact of the spring fingers 44 with this bar serves to rotate it to actuate a limit switch 121 to insure that the target will stop in the central front position and remain visible when the device is out of play. The spring contact of the fingers with the bar also has a braking effect to yieldingly stop the target.

Encircling the shaft 41 and mounted for rotation thereabout is a hollow shaft 50, upon which is rigidly mounted a bracket 51 having pivoted thereon two legs 52. The bracket 51 also carries the target body 54. This target body simulates a tramp or other comic character. In this case, lenses 55 are located in each shoulder of the tramp in such position as to concentrate the light ray from the gun upon the photoelectric cell 43.

The hollow shaft 50 is rotatably mounted in the bearing 56 on the carriage 29. The lower end of the hollow shaft carries a gear 58 in mesh with the rack 59. This rack is carried by the slide plate 60 slidably held in the channels 61 and 62 on the carriage 29, and the slide plate 60 also supports the drive plate 40 above referred to.

The longitudinal excursion of the plate 60 and the rack 59 with respect to the carriage is limited by adjusting screws 63 so that whenever the direction of travel of the belt is reversed, it moves the plate and rack longitudinally along the carriage, a distance sufficient to rotate the target through an angle of 180 degrees before the carriage gets under way so that the target will face forwardly no matter in which direction the carriage is traveling.

The belt 39 coincides in contour and position to the two tracks 21 and 22, so that as it travels it propels the carriage along the tracks.

Pins 65 depend downwardly from the legs 52. 66 is a rotary plate having upwardly turned ears

67 to pivotally support pins 68 on the legs 52, so that the pin 65 on one leg engages a series of spaced stop members 69, moving that leg back and causing the other leg to move forwardly so as to simulate a walking action.

70 is a motor, 71 is a speed reducing gear, 76 is a flexible coupling, 75 is a shaft whereby the motor 70 drives the pulley 37 and so the belt 39. 73 is a bell adapted to be rung by the solenoid 74 when a hit is made.

In a number of instances in this application we have illustrated conventionally certain plug and socket connections. In each case, the mating elements are given the same number, which number is not referred to in the specification but is provided through the plug and socket connector.

Conductors 101 and 102 lead from the plug 4 to the socket 103. Lights 104 within the target cabinet are connected between the conductors 101 and 102 for the purpose of illuminating the target and scenery. 106 is a master switch which may be used to control the entire system. Conductors 107 and 108 lead from the plug 109 associated with the socket 103 to the primary coil of the transformer 110, through the fuse 111. Conductors 112 and 113 connect respectively with the conductors 107 and 108 and lead to the primary coil of the transformer 114 through the fuse 115. A circuit extends through conductor 116, an adjustable rheostat or resistor 117, conductor 118, separable connector A, conductor 120 to limit switch 121 controlled by bar 45, thence through the field coil 122 of the motor 70, conductor 123, connector A, conductor 124 to the relay switch point 125.

In the position shown in Figure 4, the circuit continues through the conductor 126, connector A, conductor 127 to the armature of the motor 70, thence through the conductor 128, connector A, conductor 129 to the relay switch point 130, in this case shown closed, thence through the conductor 131, conductor 113, conductor 108, plug 109, conductor 102 back to the source of power.

When the switch parts in relay B are in the lower position as shown in Figure 4, the circuit is the same as in the preceding paragraph to and including conductor 124 and then is as follows: relay switch point 132, thence through the conductor 129, connector A, conductor 128, the armature of the motor 70, conductor 127, connector A, conductor 126, relay switch point 133, conductor 131, conductor 113, conductor 108, back to the source of power, thereby reversing the direction of current flowing through the armature, and so reversing the motor. The elements 125, 130, 132, 133 are all part of a reversing relay assembly, which is identified by the master letter B.

Since the usual house lighting circuit carries 110 volt current, the preferred form of our device is wired so far as the transformer 114 and all the elements and circuits above described are concerned for 110 volt A. C., though if a different voltage must be used, the wiring will be changed accordingly. In either event, no matter what the power voltage is, the remaining elements of the device now to be described operate on a different voltage, hence the necessity of transformers above referred to.

Until a coin is inserted in the coin slide and the slide is pushed in, the apparatus is inoperative. The target is at rest near the middle of the window in the target box, and pulling the trigger of the gun will have no effect except when the master switch 106 is open. The light 104 illuminating the target and scenery will be on and the amplifier will be in operation maintaining the heaters of the tubes in operative condition so that when the device goes into operation, there will be no delay.

When a coin is inserted and the coin slide is pushed in, the apparatus is as a result conditioned for operation and manipulation, the gun light heater current comes on to keep the filament at a cherry red, and the target commences to travel. The numeral zero (0) at the left-hand side of the target cabinet is illuminated and so remains until the operator makes a hit.

When the trigger is pulled a flash of light is projected from the barrel of the gun upon the target. A sound is heard similar to the report of a gun, and if the target is hit by the flash of light, the gun being properly aimed, a bell will ring and the target will immediately turn around and reverse its direction of travel along the track, the light behind the numeral zero (0) will go out and the light behind the number one (1) will be illuminated.

This continues until ten shots have been fired. If all ten shots are hits, then the user without further charge and without further manipulation of the coin slide may fire ten more shots. However, if the first ten shots are not all hits, if even a single one is a miss, then after the ten shots have been fired, the apparatus goes out of play, the gun light heater current is turned off, the trigger becomes ineffective, and a light remains behind the window indicating the number of hits made. This light continues to be visible until the coin control mechanism is again manipulated, whereupon the zero (0) window indicating the start of a new string is illuminated.

This sequence of operations is brought about as follows:

The insertion of a coin releases the coin control mechanism so that the slide may be pushed in to actuate a switch to make operation possible. The following circuits then go into operation:

From one of the secondary coils 134 of the transformer 114 through the conductor 135 to the reset coil 136, thence through the conductor 137, connector D, conductor 138, to the coin controlled switch 139, the switch point 140, conductor 141, connector D, conductor 142 to the other terminal of the secondary coil 134. This energizes the coil 136 and causes actuation of the reset mechanism, now here shown in detail, because its details form no part of the present invention, but illustrated diagrammatically by dotted lines. This returns the wiper arm 143 of the shot counter and the wiper arm 144 of the hit counter to the starting position, thus illuminating the zero (0) light at the left-hand side of the target box. The hit-counting circuit is then from the ground through the wiper arm 144, conductor 145, connector E, conductor 146, zero (0) light 147, conductor 148, connector E, conductor 149, secondary coil 150 of the transformer 110 to ground. This illuminates the zero (0) light and indicates to the player that the apparatus is in starting position.

The reset mechanism also allows a circuit from the ground through the shot-counting segment 151, wiper arm 143, conductor 152, magnet coil 153, conductor 154, conductor 149, secondary transformer coil 150 to ground. This energizes the magnet coil 153 of the play control relay F

to close a circuit through the play control relay contacts as follows:

From the original power source through conductor 118, conductor 155, relay switch point 156, conductor 157, connector A, conductor 158, through the field coil 122 of the motor, conductor 123, connector A, conductor 124, relay switch point 125 in the relay B, conductor 126, connector A, conductor 127, armature of the motor 70, conductor 128, connector A, conductor 129, relay switch point 130, conductor 131, conductor 113, conductor 198, back to the original source of power.

The circuit is thus completed and the motor commences to operate, continuing so to do until the correct number of shots have been fired, the various cycles of operation have been completed and the device is returned to the end condition. In connection with this operation, however, it is essential that the target shall stop at or near the central position so that it may remain visible even though the device is not conditioned for operation, and this is accomplished by means of the limit switch 121 in parallel with the circuit through the relay B, just described.

The limit switch remains closed until the target approaches the central position, and at that time the spring fingers 44 engage the limit switch lever 45 to open the limit switch 121, break the circuit, and insure that the target will stop in the central position.

The actuation of the magnet 153 operates relay F to also close a circuit from ground, through conductor 244, switch point 160, conductor 161, connector D, conductor 162, gun lamp 163, conductor 164, conductor 141, connector D, conductor 142, resistor 165, conductor 166, contact 168, secondary coil 167 of transformer 114 to ground.

This circuit keeps the gun lamp in heated condition, but it is not sufficiently energized to appreciably affect the photoelectric cell, as will hereinafter appear.

This is desirable because experience teaches that frequently recurrent application of a current to a cold gun lamp materially reduces the life thereof, and current surges may be set up in the system to up-set other of the circuits and cause improper operation. So means are provided, first for maintaining the lamp hot at all times during operation, and second, for further heating the lamp when the gun trigger is pulled to project the necessary beam of light to actuate the mechanism responsive to the impingement of the beam on the photoelectric cell 43.

When the mechanism is conditioned for operation by the marksman, as above indicated, with the hit-indicator showing zero (0), and the target moving along the track so as to make its periodic appearance and disappearance, the operator takes the gun in hand, aims at the target, and pulls the trigger, whereupon the sound of a shot is heard. The shot counter, invisible to the operator, counts each shot. If the gun is properly aimed and the flash of light impinges upon the lens 55 and so produces its effect upon the photoelectric cell, a bell rings, the target reverses its direction of travel and a hit is indicated by the illumination of the next number window in sequence. If, however, a hit is not made, then there is no change in the hit-counting indicator, the target continues its travel in the same direction and the bell does not ring. However, the shot-counter functions nevertheless.

We will first describe the sequence when no hit is made:

When the trigger is pulled, the switch arm 169, controlled by the trigger 170, through mechanism not here shown, as it forms no part of our present invention, engages switch point 171. This closes a circuit from ground through magnet 172, conductor 173, connector D, conductor 174, switch 175, conductor 176, conductor 177, switch point 171, switch arm 169, conductor 178, condenser 179, conductor 180, conductor 141 thence through connector D, conductor 142 to resistor 165, conductor 166, tap 168, secondary transformer coil 167 to ground. The charge in the condenser 179 momentarily energizes the magnet 172 to actuate the relay G to close the switch 181 and complete a circuit to shunt out the resistor 165, as follows:

From ground through secondary coil 167, tap 168, conductor 166, conductor 182, relay switch point 181, conductor 183, conductor 142, connector D, conductor 141, conductor 164, lamp 163, conductor 162, connector D, conductor 161, relay switch point 160, conductor 244 to ground. This gives full available current to the gun lamp as a substitute for the lesser heating current, and causes the lamp to project a flash of light sufficient to affect the photoelectric cell.

The energization of the magnet 172 also closes the switch point 184 in the relay G, to complete the following circuit to actuate the shot counter:

From the secondary coil 134 of the transformer 114, conductor 135, conductor 185, relay switch point 184 in relay G, conductor 186, magnet 187, conductor 188, conductor 142, back to the secondary coil 134 of the transformer 114, then the magnet 187, by a mechanical connection not here shown, moves the wiper 143 one step forward along the segment 151 as part of the shot-counting operation.

The actuation of the magnet 172 in relay G upon pulling the trigger 170 also causes a sound to be made simulating the explosive sound of a gun. The circuit that does this is as follows:

From the secondary coil 134 of transformer 114, conductor 135, conductor 185, relay switch point 184, in relay G, conductor 186, conductor 191, connector D, conductor 192, solenoid coil 193, which solenoid, by mechanical means not here shown, actuates the gun sounder, conductor 194, conductor 164, conductor 141, connector D, conductor 142, back to the secondary coil 134, thus every time the trigger is pulled the sound of a shot is heard.

The above description covers what happens when the trigger is pulled, and if no hit is made. Each time this occurs the wiper 143 goes forward one step along segment 151 until it has made ten forward steps, and leaves the segment whereupon the machine is dead, and no further firing can be done without the insertion of another coin and a further operation of the coin slide.

While the various circuits and the mechanisms controlled by them operate at great rapidity, nevertheless a holding circuit is provided which gives time enough for the completion of all the necessary functions after the last shot is fired and the wiper has left the segment 151 to allow all circuits time to assume the end position. The holding circuit keeps the magnet 153 in relay F energized during the full operation of the magnet 187. This circuit extends from the ground, through switchpoint 195, conductor 196, conductor 197, conductor 152, to magnet 153 in relay F, conductor 154, conductor 149, the secondary coil 150 of the transformer 110, back to the ground. The residual magnetism or lag in the electromagnet 187 holds the switch 195 closed

long enough even after the wiper 143 has passed beyond the segment 151 to give time for the completion of the various cycles of operation.

If, however, one or more hits are made, the situation changes somewhat and other circuits are energized and other operations take place, as follows:

Assuming that the marksman on any one of his shots of the first ten makes a hit, this is, assuming the gun is aimed correctly in that upon pulling the trigger a light flash impinges upon the lens 55 and is directed thereby upon the photosensitive cell 43, the following sequences occur:

In the first place, it is necessary to protect the machine against improper manipulation, for instance, the apparatus must be protected against actuation simulating a hit when some light source other than the gun is used. In other words, a dishonest marksman might strike a match, use a flashlight, or deflect the light from some other source into the photo-sensitive member or photoelectric cell. Means are provided to make this ineffective unless and until the trigger is pulled.

These means for protecting the apparatus against actuation by anything except a light ray projected from the gun are also controlled by the magnet 187. When that magnet is energized by a pull on the trigger, the switch 201 is closed, completing a circuit as follows:

From one of the secondary windings 202 of transformer 110, conductor 203, switch 201, conductor 204, hit-counter magnet 205, conductor 206, plate 207 of one of the tubes 208 of the photoelectric amplifier. This puts voltage on the plate and permits this tube to function. If voltage were not on the plate, it would not function, and therefore a light beam merely impinging on the photoelectric cell without the closure of the switches controlled by the trigger and associated circuits will produce no effect on hit-counter coil 205 because the tube cannot function unless voltage is impressed on the plate 207. When the tube is energized as a result of light impinging on the photoelectric cell, as will hereinafter appear, the circuit goes on through the tube 208, conductor 209, to the other terminal of the coil 202.

The photoelectric cell is diagrammatically shown. However, for the purpose of illustration, a circuit extends from the ground through conductor 210, connector H, conductor 211, third rail 28, photoelectric cell 43, conductor 212, connector H, conductor 213, into the amplifying system, which in turn energizes the grid 214, so that the circuit through the magnet 205 above described is energized when a hit is made, to cause the wiper 144 to take one forward step, thus indicating a hit. That brings the wiper to the second contact in the outer group of arcuately arranged hit-counting circuit buttons, as indicated in Figure 5. This closes a circuit from ground, through wiper 144, conductor 215, connector E, conductor 216, light 217, conductor 148, connector E, conductor 149, secondary coil 150 of transformer 110, thence to the ground. This energizes light 217 which illuminates the numeral one (1) on the target box shown in Figure 1.

This movement of the wiper 144 also causes it to engage the first of the target-reversing contact points in the inner arcuately arranged groups of contacts associated with conductor 219, closing a circuit from ground, through wiper 144, conductor 219, conductor 220, switch 221, conductor 321, magnet 222, associated with the relay B, conductor 149, secondary coil 150 of the transformer 110, to ground. This actuates the relay B to reverse the motor as previously pointed out, and causes the target to reverse and travel in the opposite direction.

The next hit moves the wiper to engage the third of the outer contacts to light the number two (2) light, but does not move it far enough to engage the second of the contacts associated with conductor 219. The result of this is that the circuit through magnet 222 is opened, and the relay switch B automatically opens, as is characteristic of the conventional type of relay switch. This again reverses the motor and causes the target to travel in the opposite direction.

This sequence continues, a new light being illuminated for each hit made, until the wiper 143 has traveled beyond the end of the segment 151, at which time the machine is turned off. As previously pointed out, the wipers 143 and 144 are automatically returned to the starting position when the coin switch is actuated for a new string of shots.

The exception to this is that, if a marksman gets ten hits with his first ten shots, then the wiper 144 goes around to the contact 223, engaging that at the same time as it engages the tenth contact point 224 to light up the number ten (10) light. There is then a circuit closed from the ground, through wiper 144, contact point 223, conductor 225, switch 226, conductor 227, contact point 327, wiper 143, conductor 152, magnet 153, conductor 154, conductor 149, secondary coil 150, to the ground. This keeps the electromagnet associated with the relay F energized so that operation may continue. The next shot moves the wiper 143 into engagement with the segment 228, so that the magnet 153 now continues to operate relay F to permit further operation, so that the marksman may get ten more shots. The segment 228 is grounded, just as was the segment 151, and ten shots more can be fired. The scoring continues around the arc of indicating light contacts previously referred to, associated with the wiper 144 until ten more shots have been fired, when the wiper 143 runs off the further end of the segment 228, and the apparatus goes out of operation, just as it would have gone out, had contact not been made with terminal point 223. If it is desired to give the marksman twenty shots without reference to the number of hits, then the switch 226 is grounded, as indicated in dotted lines in Figure 5, thus substituting for the effect of the contact point 223. In effect, this would be the same as a continuous segment instead of 151, 327, and 228.

Another function of the magnet 205 is that every time a hit is made, it closes the switch 230, which results in closing a circuit from secondary coil 134, through conductor 135, conductor 231, switch 230, conductor 232, connector I, conductor 233, bell-ringing solenoid 74, conductor 234, connector I, conductor 235, conductor 188, conductor 142, back to the secondary coil 134. This rings the bell every time a hit is made.

In a number of instances we have shown condensers across the switches for the purpose of preventing sparking and the like. Their use is the conventional and usual use in such circumstances, and no further description of them, it is thought, is required, as their functioning and operation is standard in the art.

In order to protect the gun against use without the insertion of a coin, a safety circuit is provided, which, while it does not mechanically interfere with the pulling of the trigger, makes trigger manipulation of no avail, and insures

that there will be no functioning of the apparatus, no operation of any of the important circuits, and no projection of a light, unless a coin has been inserted and the coin slide manipulated before the trigger is pulled.

As previously pointed out, during normal operation when the trigger is pulled, current passes from conductor 173 through the magnet 172 to ground, thereby actuating the timing switch G, without which pulling the trigger can have no effect and the gun cannot be operated. After the last shot of a complete series is fired, the magnet 153 as previously pointed out no longer holds the relay F in open position, relay F therefore after the last shot remains in the dotted line position and closes a circuit at the switch point 240. Under these circumstances, if the trigger is pulled in an effort to cheat the machine, the current passing along the conductor 173 will take the line of least resistance to ground, following the circuit from 173 through conductor 241, resistance 242, conductor 243, switch point 240, conductor 244 to ground. Perhaps a little current will pass through the magnet 172 but it will not be enough to actuate the magnet. The low-resistance short-circuit above referred to thus insures that pulling the trigger will not cause operation of the device.

The condenser 179, whenever the trigger is pulled, discharges. It is bad for the condenser to discharge it through a dead short-circuit, and that is why the resistance 242 is placed in the live short-circuiting the magnet 172. The resistor 242 gives the circuit enough resistance so that the condenser will not be harmed when it discharges, but the resistance is still low enough so that the magnet 172 will not be actuated.

It is important that unless the apparatus has been conditioned for correct operation, pulling the trigger will have no useful effect. This can be accomplished by providing a short circuit around the magnet coil 172, but if that were done, the dead short circuit would in time damage the condenser because experience teaches that the trigger is frequently pulled when the device is not conditioned for operation.

The presence of the resistor 242 in the short circuit in parallel with the magnet coil 172 insures that not enough current will pass through the magnet coil to cause operation of the device because the current will be divided between the coil and the resistor, and the condenser will thus not be subjected to the deleterious effect of a dead short circuit.

The light 251 in the gun cabinet is lighted by a circuit from the secondary coil 134, conductor 142, connector D, conductor 141, conductor 164, conductor 252, lamp 251, conductor 253, connector D, conductor 254, conductor 135, thence to the coil 134.

The switch 255 is a reset switch in the target cabinet by the use of which the serviceman may reset the apparatus for adjustment and manipulation without using the coin control mechanism. This switch, of course, will be enclosed in the cabinet so that the customers will not have access to it. It is connected between conductors 137 and 188 and shorts out the switch and control mechanisms operated by the coin slide.

The condenser 301, condenser 302, and choke 303 are provided to serve as a filter to prevent outside disturbances picked up by the third rail 28 from getting into the amplifier. It might happen that just as the operator pulled the trigger, but missed the target, some outside disturbance might be picked up by the third rail 28, acting as a radio antenna which would cause target operation, that is, an apparent hit. The filter assembly makes that impossible.

The condensers, associated with the relay switches, are, of course, for the obvious purpose of preventing transient impulses being produced at the various points.

The condenser 179 is charged by the following circuit, which is closed when the operator does not have his finger on the trigger. It is closed through switch point 401 associated with the gun switch lever 169, when the trigger is released. The circuit is as follows:

From the ground at 402 through coil 403 of the transformer 110, rectifier tube 404, conductor 405, conductor 406, choke coil 407, conductor 408, resistor 409, resistor 410, conductor 411, connector D, conductor 412 to switch point 401, then through switch arm 169, conductor 178, condenser 179, conductor 180, conductor 141, connector D, conductor 142, through resistor 165, conductor 166, tap 168, coil 167 to ground. The purpose of this arrangement is to charge the condenser 179 at a sufficiently slow rate that no impulses will be set up in the system which might cause premature or improper operation of any of the other circuits.

The discharge of the condenser 179 provides the force to operate the relay G. This in turn causes sufficient current to be applied to the gun lamp to energize it so that when the trigger is pulled and the lamp is energized, if the gun is properly aimed, the resultant flash of light upon the photo-electric cell will cause the operation of the hit-counting device and associated circuits and mechanisms.

The two switches associated with the coin control mechanism are important because when the coin control slide is pushed in, which is possible only when a coin is inserted, the circuit is closed between 139 and 140 to permit operation of the device. However, the circuit must always be broken at 175, as otherwise it would be possible to hold the coin slide in, keep the switches 139 and 140 closed, and make continuous operation possible. These two switches together cooperate to insure that the machine can not be continuously operated by holding in the coin slide.

We have mentioned above the rectifier tube 404. This apparatus operates on alternating current. However, three different uses for direct current appear in this device: one, to charge the condenser 179; another, to provide direct current for the photo-electric cell; and another, to provide direct current for the amplifying tubes.

The resistance element 413 grounded from the conductor 152, shown adjacent the magnet coil 153 of relay F is for the purpose of preventing excessive arcing at the wiper 143, it is in parallel with the wiper 143 and grounded at segments 151. Thus, for example, if we assume that it takes ten amperes to close relay F, and that the circuit is broken at 143, then if the resistor 413 draws four amperes to ground, only six amperes are available to form an arc and so the resistor protects the circuit against any excessive arcing which might set up impulses to be picked up on the third rail, for instance, to cause the actuation of the hit-counting mechanism when no hit had been made.

The resistor 414 and the condenser 415, grounded from the conductor 220 are for the same purpose of protecting the circuit through the wiper 144. The filter consisting of a resistor 416 and condenser 417 is also for the same purpose of quenching any arc at the switches 169.

We claim:

1. In a target device, a target, a gun, means for counting the number of shots fired by the gun, and separate means for counting the number of hits made on the target, the shot counting means including fixed and movable conductors, the latter being adapted to travel along the former as the shots are counted while remaining continuously in contact therewith and to be disengaged therefrom after a predetermined number of shots have been counted, a contact member adapted to be engaged by the movable conductor upon its disengagement from the fixed conductor, the hit counting means including a switch member adapted to close a circuit through the contact member when a predetermined number of hits have been made whereby the circuit through the movable conductor remains closed.

2. In a target device, a target, a gun, means for counting the number of shots fired by the gun, and separate means for counting the number of hits made on the target, the shot counting means including fixed and movable conductors, the latter being adapted to travel along the former as the shots are counted while remaining continuously in contact therewith and to be disengaged therefrom after a predetermined number of shots have been counted, a contact member adapted to be engaged by the movable conductor upon its disengagement from the fixed conductor, the hit counting means including a switch member adapted to close a circuit through the contact member when a predetermined number of hits have been made whereby the circuit through the movable conductor remains closed, a second fixed conductor in the path of and adapted to be engaged by the movable conductor as it continues its travel responsive to the counting of successive additional shots.

3. In a target device, a target, a gun, means for counting the number of shots fired by the gun, and separate means for counting the number of hits made on the target, the shot counting means including fixed and movable conductors, the latter being adapted to travel along the former as the shots are counted while remaining continuously in contact therewith and to be disengaged therefrom after a predetermined number of shots have been counted, a contact member adapted to be engaged by the movable conductor upon its disengagement from the fixed conductor, the hit counting means including a switch member adapted to close a circuit through the contact member when a predetermined number of hits have been made whereby the circuit through the movable conductor remains closed, and manually controlled means for closing the circuit through the contact member independent of the hit counting means.

4. In combination, a gun, a target, shot counting means including an electric connector adapted normally to close a circuit during the operation of the device for a predetermined number of shoes only, and after such number of shots have been fired to open the circuit to prevent further operation, a hit counting means adapted only when a number of hits equal to the aforesaid predetermined number of shots have been made to keep the circuit closed independent of the circuit opening effect of the shot counting means, and an additional shot counting means adapted for operation only when said predetermined number of hits have been made.

5. In a target device, a target, a gun, shot counting means including a plurality of aligned fixed conductor plates, a lockout contact member located between them, a wiper adapted to engage and travel along the plates, means actuated in response to each shot for moving the wiper step by step along one of the plates to bring it into engagement with the lockout contact member, a hit counting means including a plurality of separate hit-indicating contact members, a wiper adapted to travel along them, means responsive to each hit on the target for moving the wiper step by step from one hit-indicating contact member to the next, a control contact member in the path of the wiper and a circuit including the control contact member and the lockout contact member adapted when closed by the simultaneous contact of each wiper with its respective contact member to condition the apparatus for further operation.

6. In a target device, a target, a gun, shot counting means including a plurality of aligned fixed conductor plates, a lockout contact member located between them, a wiper adapted to engage and travel along the plates, means actuated in response to each shot for moving the wiper step by step along one of the plates to bring it into engagement with the lockout contact member, a hit counting means including a plurality of separate hit indicating contact members, a wiper adapted to travel along them, means responsive to each hit on the target for moving the wiper step by step from one hit-indicating contact member to the next, a control contact member in the path of the wiper and a circuit including the control contact member and the lockout contact member adapted when closed by the simultaneous contact of each wiper with its respective contact member to condition the apparatus for further operation, and adapted when not so closed to prevent further operation.

7. In a target device, a target, a gun, shot counting means including a plurality of aligned fixed conductor plates, a lockout contact member located between them, a wiper adapted to engage and travel along the plates, means actuated in response to each shot for moving the wiper step by step along one of the plates to bring it into engagement with the lockout contact member, a hit counting means including a plurality of separate hit-indicating contact members, a wiper adapted to travel along them, means responsive to each hit on the target for moving the wiper step by step from one hit-indicating contact member to the next, a control contact member in the path of the wiper and a circuit including the control contact member and the lockout contact member adapted when closed by the simultaneous contact of each wiper with its respective contact member to condition the apparatus for further operation, and adapted when not so closed to prevent further operation, and manual means in the circuit adapted to close it to condition the device for operation independent of the hit-indicating wiper.

8. In a target device, a target, a gun, shot counting means including a plurality of aligned fixed conductor plates, a lockout contact member

located between them, a wiper adapted to engage and travel along the plates, means actuated in response to each shot for moving the wiper step by step along one of the plates to bring it into engagement with the lockout contact member, a hit counting means including a plurality of separate hit-indicating contact members, a wiper adapted to travel along them, means responsive to each hit on the target for moving the wiper step by step from one hit-indicating contact member to the next, a control contact member in the path of the wiper and a circuit including the control contact member and the lockout contact member adapted when closed by the simultaneous contact of each wiper with its respective contact member to condition the apparatus for further operation, and means for moving the hit-counting wiper being adapted after such conditioning of the apparatus for further operation to move the wiper step by step along the second conductor plate and at the last shot to move it out of contact therewith, whereby the circuit is closed to prevent further operation of the device.

9. In a target device, a target and an electric gun adapted to be aimed and fired thereat, a plurality of score indicating lights, a wiper blade and means responsive to the operation of the gun for rotating the blade step by step about a center of rotation, a plurality of contact members in the path of the blade arranged in two concentric arcs about the center of rotation thereof, electric circuits joining each of the contact members in one arc with an associated score indicating light, a target controlling circuit including a contact member in the other arc, the blade being adapted at one time to simultaneously engage contact members in both arcs and at another time to engage a contact member in one arc only.

10. In a target device, a target and an electric gun adapted to be aimed and fired thereat, a plurality of score indicating lights, a wiper blade and means responsive to hits made by the gun on the target for rotating the blade step by step about a center of rotation, a plurality of contact members in the path of the blade arranged in two concentric arcs about the center of rotation thereof, electric circuits joining each of the contact members in one arc with an associated score indicating light, a target controlling circuit including a contact member in the other arc, the blade being adapted at one time to simultaneously engage contact members in both arcs and at another time to engage a contact member in one arc only.

11. A skill testing game comprising, in combination, a moving target, an aiming element, a trigger on said aiming element, a motor for driving said target, means for initiating operation of said motor including a relay, a first step up switch, means for advancing said switch with each effective operation of said trigger, a second step up switch, means for advancing said second step up switch with each hit scored, and a control circuit for said relay including said step up switches in series.

12. A game comprising, in combination, an objective to be attained, means manipulable by an operator of the game in an attempt to attain the objective, means including a relay for conditioning the game for operation, a first step up switch, means for advancing said switch with each attempt made, a second step up switch, means for advancing said second step up switch with each attainment of the objective, and a control circuit for said relay including said step up switches, said switches operating upon the attainment of a predetermined relative position to arrest operation of the game through said relay.

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