

Jan. 12, 1943.

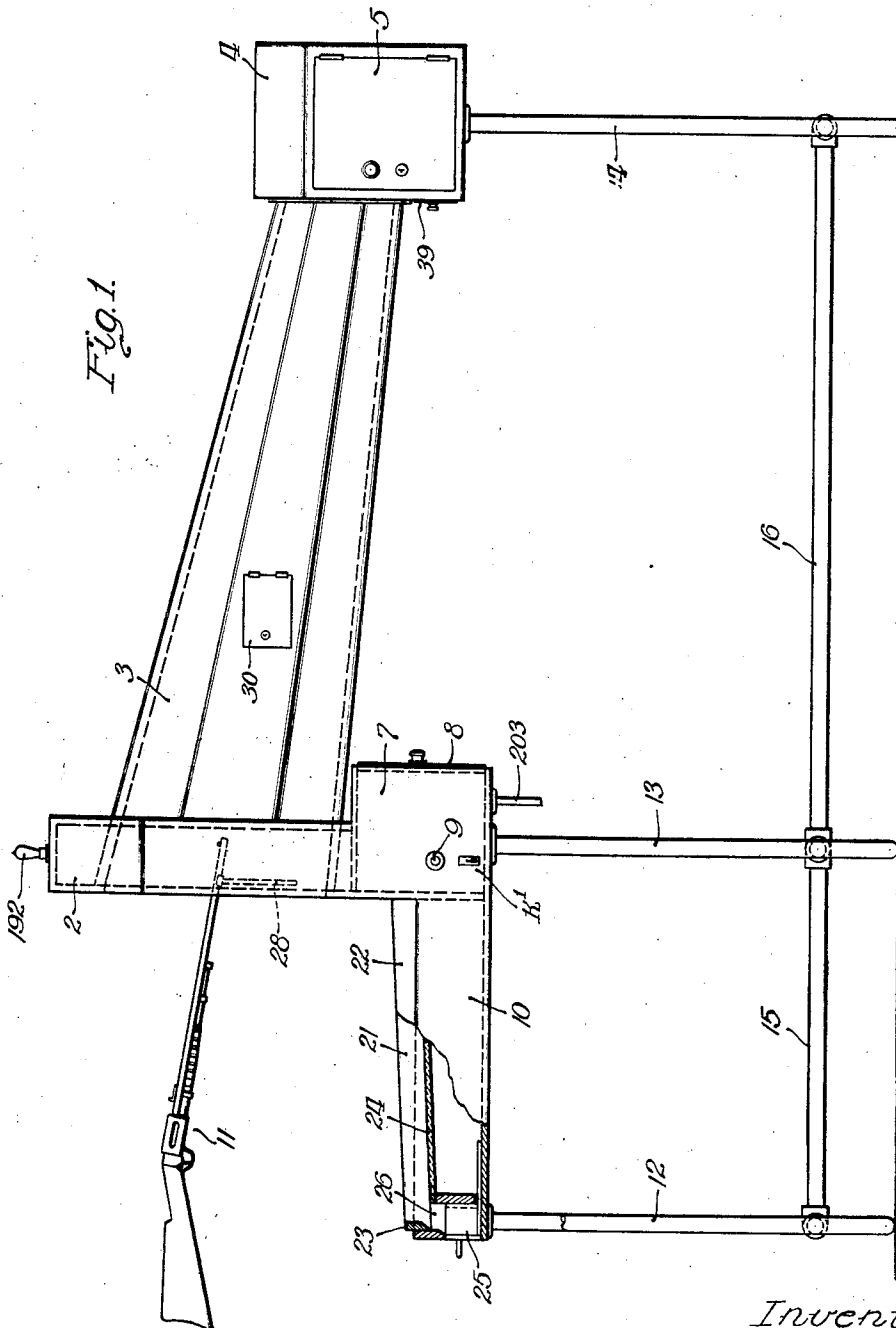
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2,307,958

SHOOTING GALLERY.

Filed Oct. 10, 1938

4 Sheets-Sheet 1



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SHOOTING GALLERY

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4 Sheets-Sheet 2

Fig. 2.

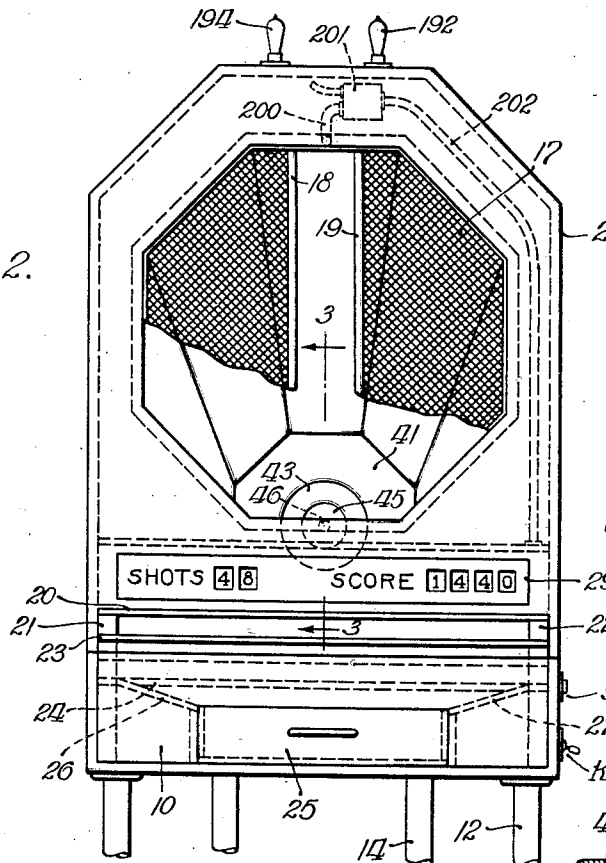


Fig. 5.

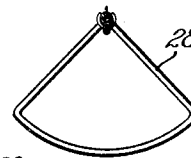


Fig. 4.

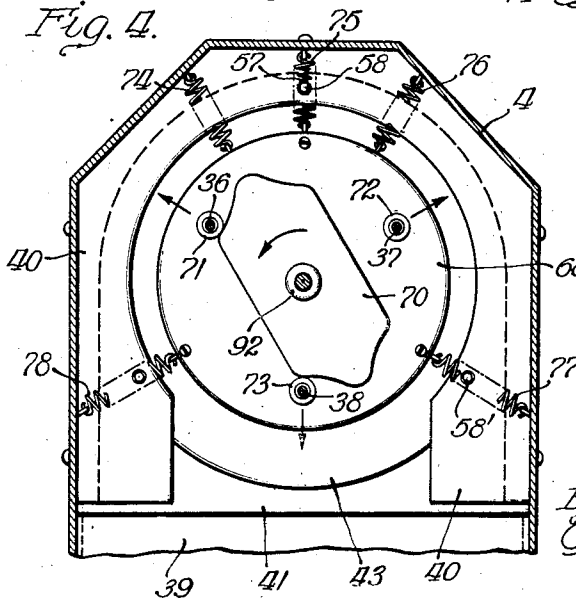
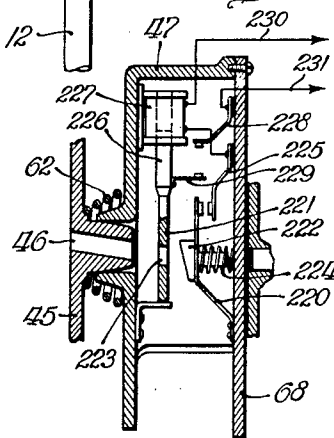


Fig. 6.



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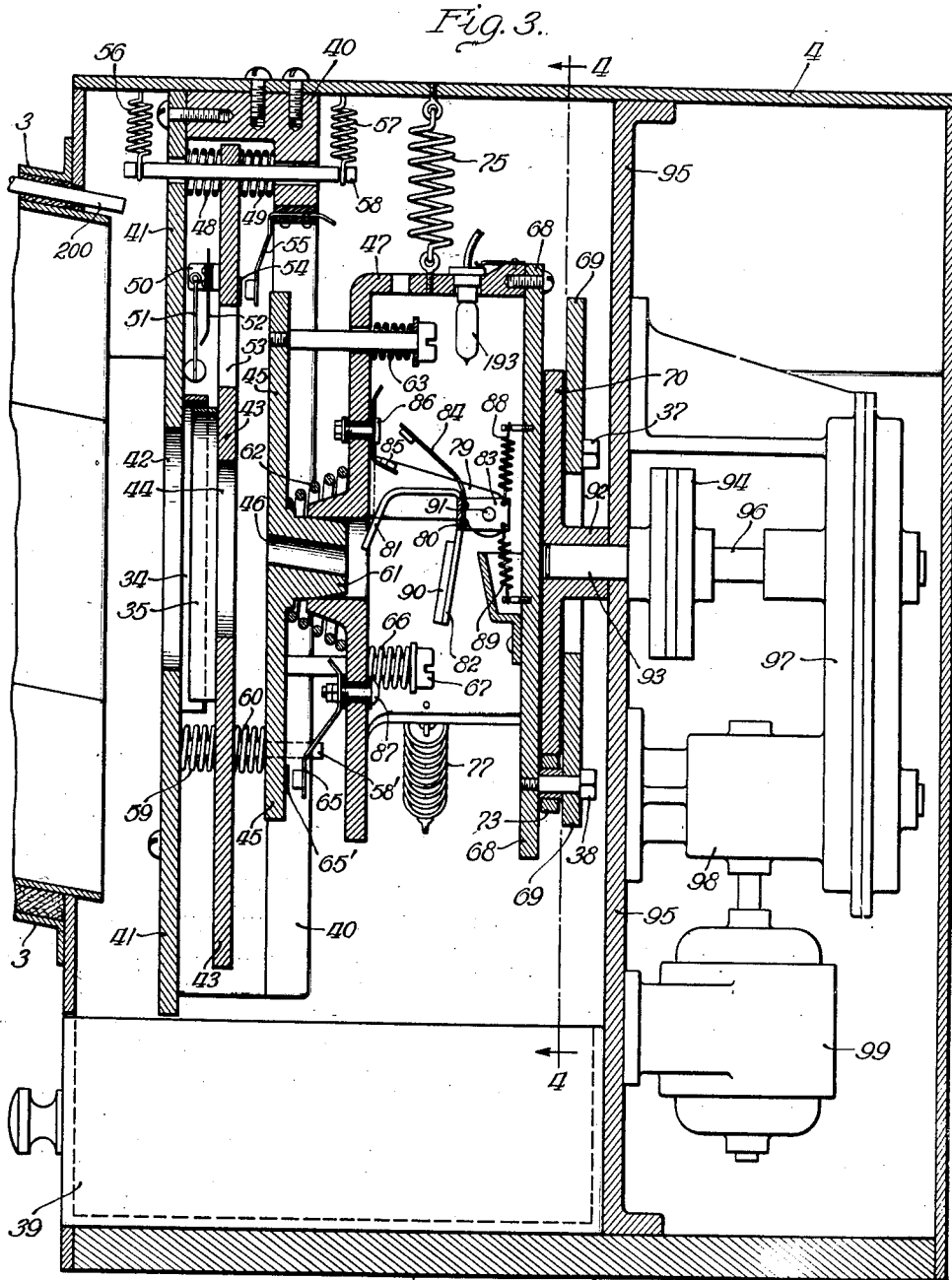
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SHOOTING GALLERY

Filed Oct. 10, 1938

4 Sheets-Sheet 3



14

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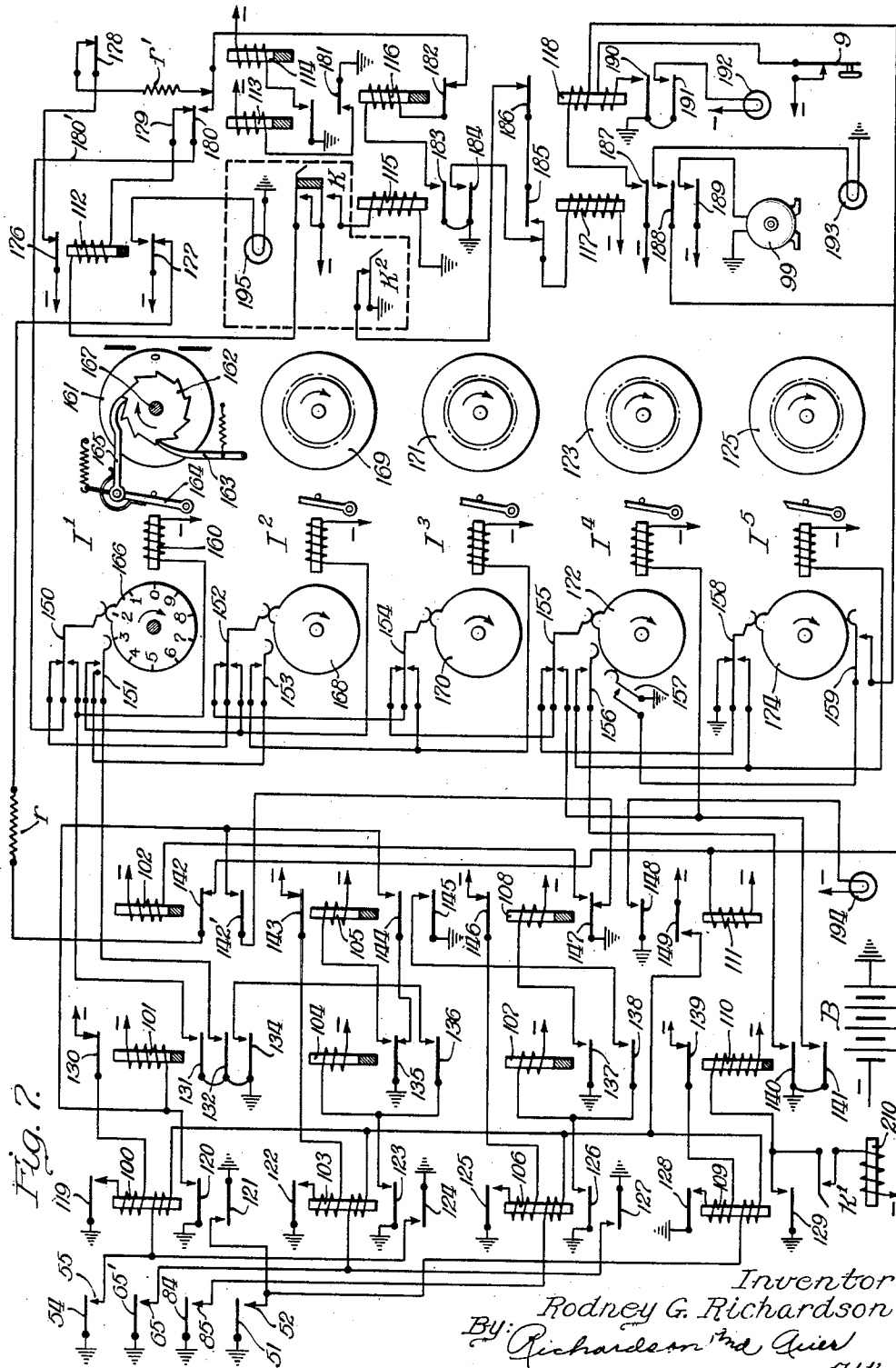
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SHOOTING GALLERY

Filed Oct. 10, 1938

4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,307,958

SHOOTING GALLERY

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Application October 10, 1938, Serial No. 234,088

46 Claims. (Cl. 273—102.2)

The present invention relates in general to shooting galleries, but more in particular to miniature indoor shooting galleries for rifle or pistol; and the general object of the invention is to provide an economical and high efficient apparatus of this character.

A special object of the invention is a shooting gallery of the foregoing character which includes score and shot registers and bullet-actuated electromagnetic means for controlling such registers.

A further object of the invention is the provision of register control means responsive to bullet-actuated contact devices, which exercises accurate and reliable control of the register notwithstanding uncertain or erratic operation of the contact devices.

A further object of the invention is the provision of register control means responsive to bullet-actuated contact devices, which accurately controls the register notwithstanding that two contact devices may at times be actuated by a single bullet.

A further object of the invention is the provision of a shooting gallery having remote control and supervisory features whereby the same may be operated and supervised from an attendant's station.

Other objects and features of the invention will be pointed out in the course of the description of the invention and its operation, which will now be proceeded with, reference being made to the accompanying drawings.

In the drawings,

Fig. 1 is a side view of the complete shooting gallery;

Fig. 2 is a front view, showing the opening into the silencer chamber, the shot and score indicators, and other details;

Fig. 3 is a section through the target on the line 3—3, Fig. 2;

Fig. 4 is another section through the target on the line 4—4, Fig. 3;

Fig. 5 is a detail drawing of the guard for preventing withdrawal of the rifle from the gallery;

Fig. 6 is a fragmentary view of a portion of the target showing a modified arrangement for preventing fraudulent manipulation of the bull's-eye contact device; and

Fig. 7 is a diagrammatic circuit drawing of the recording and indicating mechanism.

Referring to the drawings, the reference character 2, Fig. 1, indicates an upright front casing which surrounds the forward end of the silencer chamber 3. This casing is enlarged at the bottom to form a compartment or chamber 7 for housing

the recording and indicating mechanism. A door 8 having a suitable lock provides for access to this compartment. Extending forward from the compartment 7 is an extension indicated generally by the reference character 15. This extension includes bottom, side, and end members, as shown, and also a top 24, which may be of glass, and which is preferably sloping toward the front. Resting on the glass top 24 is a railing composed of side members 21 and 22 and end members 20 and 23. This railing, together with the glass member 24, forms a large, shallow, open receptacle in which empty shells are accumulated and from which they may be brushed off from time to time into a drawer 25. This latter is centrally located at the front of the extension 15, as seen in Fig. 2, which also shows the railing members. Two sloping guide members 26 and 27 may be provided to direct the shells into the drawer. Game apparatus may be located beneath the glass top 24, if desired, and sufficient space is left at either side of the drawer 25 for installation of control devices, including a propelling device if a ball and pin game is used. The invention is not concerned with the nature of such game apparatus and hence it is not shown in the drawings.

Fig. 2 also shows the arrangement at the forward end of the silencer chamber 3. Two heavy metal rods 18 and 19 extend vertically across the opening, and the space to the sides of these rods is preferably closed by means of wire screen such as 17. This screening partially closes the opening and affords a certain degree of protection against ricochets. The muzzle of a rifle such as 11, Fig. 1, may be inserted between the bars or rods 18 and 19, and is prevented from being withdrawn by a guard 23, shown also in Fig. 5. This guard may be attached to the rifle barrel by small screws, or by a more permanent arrangement if desired. For convenience in detaching and attaching the guard so that the rifle can be removed for cleaning, a small door 30 may be provided. This door, of course, is kept locked.

Beneath the opening into the silencer chamber is a panel or escutcheon plate 29, in which openings are provided through which may be seen the number wheels of the shot and score indicators. The indicator at the left, labeled "Shots," shows the number of shots fired, while the one at the right, labeled "Score," shows the accumulated score as firing proceeds. The indicator apparatus is, of course, mounted in the compartment 7 in the proper position so that the number wheels will register with the openings. This apparatus will be explained shortly.

The silencer chamber 3 extends to the rear from the casing 2 and terminates in the target housing 4. The target is located in this housing. To facilitate inspection and adjustment of the target, a door 5 may be provided, fitted with a proper lock.

The apparatus may be mounted on the floor by any suitable means. As shown, there are three U-shaped pipes 12, 13, and 14, braced together at the bottom by horizontal pipes 15 and 16. This affords a rigid support for the parts.

Reference may now be made to Figs. 3 and 4 for a description of the target. Inside the housing 4 there is secured a horseshoe-shaped member 40, which acts as a support for the front or miss plate 41 and for other parts. The front plate 41 is secured to member 40 by a number of machine screws, as shown, and forms a partition across the entire front of the housing except for a space at the bottom where the lead drawer is located. At the center of plate 41 there is an opening 42.

Spaced away from plate 41 to the rear is a plate or disk 43, which is supported by means of a rod 53 and two springs 56 and 57. The rod 53 passes through openings in the plate 41 and in the member 40, in which it fits loosely. Surrounding the rod 53 on opposite sides of plate 43 are coil springs 48 and 49, which bear against the plate 41 and the member 40, respectively. These springs are under a slight tension. The plate 43 carries two other rods similar to rod 53, of which one, rod 53', is shown in Fig. 3. These other rods fit loosely in openings in the member 40 but do not extend as far forward as the plate 41. Associated with each of these other rods is a pair of springs such as 59 and 60. The pair of springs 48 and 49 and the two pairs of springs including the pair 59—60 constitute a resilient positioning means for the plate 43, which permits it to yield and move rearwardly under the impact of a bullet. The opposing springs of the respective pairs serve to overcome the effect of the inertia of the plate, which would otherwise tend to prevent its movement in response to a sudden impact. The plate 43 has a central opening 44, which is somewhat smaller than the opening 42 in plate 41.

In order to operate the recording mechanism when a bullet strikes the front or miss plate 41, a number of contact devices are employed. One of these is shown in the drawings and comprises an L-shaped bracket 50, secured to the plate 43 by two small screws, a pendulum 51 the weighted end of which rests against the back of plate 41, and an insulated contact spring 52. When a bullet strikes the plate 41 in the vicinity of the pendulum the weight will swing to the rear, into an opening 53 in plate 43 which is provided to allow this action, and will make contact with the contact spring 52 momentarily. The other contact devices associated with the plate 41 are distributed around the opening 42. As they are all the same only one has been shown in the drawings.

There are also a plurality of contact devices associated with the plate 43, in order to record shots which are sufficiently accurate to enter the opening 42, but which do not enter the opening 44. These devices could be like the ones associated with the plate 41, but in view of the way the plate 43 is supported a more simple arrangement can be used. As shown, a contact spring 55 is mounted between insulators on the member 40 and is adjusted so that it will be engaged

by the contact 54 on the back of plate 43 when the plate moves slightly to the rear under the impact of a bullet.

Behind the plate 43 is located a movable head comprising the plate 68, a cup-shaped housing member 47, the lower side of which is cut away, and a plate 45. The latter has a central hub 61 fitting in a flanged opening in the housing member 47. The bull's-eye opening is indicated at 46. The plate 45 is pressed away from the member 47 by a coil spring 62, and is pulled toward it by three springs, of which two, springs 63 and 66, appear in Fig. 3. This arrangement is somewhat similar to the arrangement for resiliently supporting plate 43, and permits the plate 45 to yield to the impact of a bullet. The hub 61 is tapered slightly to permit a rocking movement of plate 45 in one direction or another depending on where the bullet strikes. The plate 45 carries a plurality of contacts 65' on the back side, and there are a plurality of cooperating contact springs such as 65 mounted on the housing member 47. As shown, the spring 65 is held in position by means of suitable insulators and a small bolt 87. These contact springs are so adjusted that a slight retrograde movement of plate 45 will cause one or more of them to be engaged by the associated contacts on the plate.

The cup-shaped housing member 47 encloses the bull's-eye contact mechanism. This includes a supporting bracket 79, at the end of which is fixed a stud 91. The reference character 80 indicates a member comprising a downwardly-extending portion 82, a curved forwardly-extending arm 81, and two ears such as 83. One of these ears is cut away in the drawings. The two ears have openings drilled through them to receive the stud 91, whereby the member 80 is pivotally supported on this stud. Attached to the member 80 is a contact spring 84, adapted to cooperate with the contact spring 85. The latter is mounted on the member 47 by means of the small bolt 86 and suitable insulators. The member 80 is held in position by means of two springs 88 and 89, which permit it to rotate on the stud 91 under the impact of a bullet and bring contact spring 84 into engagement with contact spring 85. The reference character 90 indicates a striker plate fixed to the part 82 and covering the bull's-eye opening 46.

It will be seen that a bullet passing through the bull's-eye opening 46 will effectively operate the member 80, whereas if an attempt is made to fraudulently operate the member 80 by means of an implement inserted from the front, such attempt will be defeated. A long wire or rod, for instance, could be passed down the silencer chamber 3 and through the bull's-eye opening 46 into engagement with the plate 90. When the plate 90 is pressed back, however, the end of arm 81 will move down and will grip the wire or rod being used in ample time to prevent the closure of contact at 85.

The movable head described in the foregoing is supported on five springs 74—78, as shown in Fig. 4. Two of these springs also appear in Fig. 3. The head is normally held in the position shown in the drawings, but when the target is actually in use it is given an erratic motion which causes the bull's-eye 46 to traverse back and forth in different directions within the confines of the opening 44.

The arrangement for moving the head is supported on a vertical cross member 95, and comprises a motor 99, suitable gearing within the

housing 93—97, a shaft 98, a shaft 93, and a cam 70. The shaft of motor 99 is provided with a worm cooperating with a worm gear on a countershaft in housing 98. This countershaft carries a pinion engaging a spur gear on shaft 96, the pinion and spur gear being located in housing 97. Shaft 96 drives shaft 93, which has a bearing in 95, by means of a coupling 94. The cam 70 is mounted on shaft 93 by means of a hub 92. Any other suitable arrangement for driving the shaft 93 can be employed. Small motor units are available which comprise a motor and suitable speed-reducing gears all in one housing.

The cam 70 lies between the plate 68 of the movable head and a plate 69, which is secured to the former plate by means of three studs 36, 37, and 38, Fig. 4. The construction is best understood from inspection of Fig. 3, which exposes the parts associated with the stud 38. As shown here, the plate 69 is clamped against the plate 68 with an intervening cylindrical spacer which is slightly thicker than the cam 70. This spacer acts as a bearing for the roller 73. The other studs are similarly equipped with spacers which afford bearings for rollers 71 and 72. The cam therefore fits loosely between the plates 67 and 69, but at the same time it maintains the spring suspended movable head in position by preventing movement thereof to right or left, as seen in Fig. 3. The springs normally hold the movable head in the position shown, with the bull's-eye 46 centrally disposed behind the opening 44, but when the motor 99 is in operation the cam 70 rotates, and the two lobes of the cam successively engage the rollers such as 71 and move the head, causing the bull's-eye 46 to move toward the margin of the opening 44 and then return to the center. Each roller, when engaged by the cam, moves the bull's-eye in a different direction, as shown by the arrows in Fig. 4. The simple form of cam shown in the drawings may be replaced by other and more complicated forms if desired.

From the foregoing description of the target it will be seen that bullets fired at the target will either strike the front plate 41, the plate 43, the plate 45, or the plate 90. These plates should be made of steel, although special ammunition can be used which is not very destructive. Attention is called to the fact that the parts are so arranged that bullets and fragments thereof can readily fall from the plates into the lead drawer 39, which avoids clogging up the target. The entire front of plate 41, for instance, is unobstructed, and bullet fragments fall directly into the drawer. As regards plates 43 and 45, these plates can only be struck near the center, that is, by bullets passing through opening 42, and the two pairs of springs such as 59 and 69 are spaced apart at a distance which is considerably more than the diameter of opening 42. No contact devices are mounted in this space either, so that bullet fragments can also fall directly from plates 43 and 45 into the drawer. As regards bull's-eye shots which strike the plate 90, the lower side of the cup-shaped member 47 is cut away, as shown, to permit the bullets and fragments thereof to fall down out of the housing into the drawer. Due to the fact that the silencer chamber 3 is positioned at an angle to the horizontal, while the target plates are vertical, all shots striking the target will be deflected downward to a certain extent,

which facilitates disposal of the lead, as described.

If soft lead bullets are used of such a character that they will flatten out on striking the target but will not break up, no further provision is required for handling the lead. However, if bullets are used of the type which break up or disintegrate on impact against the target, it is advisable to use guards to prevent spattering, which might otherwise cause trouble with the various other parts, particularly the contact devices. Two of these guards, shaped like an inverted U, are shown in Fig. 3, where they are indicated by reference characters 34 and 35. These guards may be spot welded to plates 41 and 43, respectively, in the position shown, where they are effective to prevent upward and side spattering of bullet fragments. Similar guards may be used between plates 43 and 45, but in this case they should be spaced far enough apart so as not to interfere with the movement of the bull's-eye. If necessary, suitable guards may also be associated with the plate 90, and may take the form of a rim around the sides and top of this plate.

Reference may now be made in the diagrammatic circuit drawing, Fig. 7, which shows the recording and indicating apparatus. There are five indicators, indicated by reference characters I¹ to I⁵, respectively. These indicators may be of any well known type which is suitable for the purpose, and hence are shown in diagrammatic form. The indicator I¹ comprises a shaft 167 on which is mounted a ratchet wheel 162, a number wheel 161, and a cam 166. There is also a stepping magnet 160, which drives the shaft 167 by means of the armature 164 and pawl 165, the latter cooperating with the ratchet wheel 162. The number wheel is advanced when the stepping magnet deenergizes. A detent 163 prevents backward movement of the number wheel. Associated with the cam 166 is a spring assembly comprising the two working contact springs 150 and 151 and the associated make and break contact springs. The other indicators I² to I⁵, inclusive, may be of the same construction, except for differences in the arrangement of contact springs associated with the cams, which will be explained subsequently.

The indicators I¹ to I³, inclusive, are score indicators. Indicator I¹ is the tens indicator; that is, this indicator shows the tens digit of the score. The indicators I² and I³ are the hundreds and thousands indicators, respectively. As will appear subsequently, the lowest value assigned to any shot which counts in the score is ten, and consequently the units digit of the score is always zero. No units indicator is required, therefore, a dummy indicator wheel carrying the digit 0 being provided in the units position. Fig. 2 shows the indicators from the front, or rather the number wheels, as they appear through the windows of the plate 29. As shown here, the digit 1 is set up on the thousands indicator, and the hundreds and tens indicators are both set for the digit 4, thereby displaying the number 1440.

The indicators I⁴ and I⁵ are shot indicators; that is, they record and display the total number of shots fired. Indicator I⁴ displays the units digit and indicator I⁵ the tens digit. Fig. 2 shows the number wheels of these indicators set to display the number 43.

The indicators are controlled or set by means of relays 100 to 111, inclusive, which in turn

are controlled by the contact devices at the target. These contact devices are shown diagrammatically at the upper left-hand corner. The relays used may be ordinary telephone type relays of well known construction. Additional relays 112 to 116, inclusive, are of the same type and are used for controlling the restoration of the indicators and for general control and supervisory purposes, as will be explained.

A number of lamps are shown which will be briefly described. Lamp 193 is the bull's-eye lamp and is located in the housing 47, as seen in Fig. 3. Lamp 194 is a special display lamp and is lit up momentarily every time a shot strikes the bull's-eye. Lamp 192 is lit upon the completion of a round comprising a predetermined number of shots. These last two lamps may be located on top of the casing 2, as shown in Fig. 2. Lamp 195 is a supervisory lamp, and with the keys K and K² may be located at a control point where the galleries are assigned to shooters and the ammunition is sold.

As explained heretofore, the indicators and the controlling relays are suitably mounted in the compartment 7, shown in Fig. 1, which makes it necessary to run a number of wires back to the target. Six conductors are required altogether, four for the contact devices of the target and one each for the motor 99 and the lamp 193. It should be pointed out here that the entire frame of the gallery and all the metal parts are grounded; that is, they are connected to the positive terminal of the battery B which supplies the operating current. One terminal of the motor and one terminal of lamp 193 may therefore be grounded on the frame in any convenient manner. The same is true of the contact devices, and contact members 54, 65', 84 and 51 are grounded on the frame. The six wires extending to the target may leave the compartment 7 in a conduit 202, shown in Fig. 2, which also carries a pair of wires for the lamps 192 and 194. The conduit 202 extends to a junction box 201, where the wires for lamps 192 and 194 branch off. The target wires continue on in a conduit 203 which is enclosed within the wall of the silencer chamber 3. The far end of this conduit can be seen in Fig. 3 where it enters the target housing. As the battery B is preferably not located in the compartment 7 with the indicator apparatus, two additional wires must be run from this compartment to the battery, wherever it is located. Also, four wires extending to the lamp 195 and keys K and K² at the control point. These wires may leave by way of a conduit 203, Fig. 1.

The shooting gallery shown and described herein is adapted for use in a variety of situations, and may be operated entirely automatically, being provided in that case with coin-operated mechanism for dispensing ammunition and for placing the target in operation, and with automatic mechanism for printing and issuing tickets showing the score. Certain features already mentioned have been designed, in fact, with automatic operation in view. Among these features may be mentioned the arrangement for preventing fraudulent bull's-eye manipulation, the concealed wiring to the target, the locked indicator compartment and target housing, and the guard for the rifle, which prevents theft as well as dangerous handling in the gallery. In order not to unduly complicate the present application, however, the coin-operated dispensing mechanism and the ticket-issuing mechanism have not

been shown, and it will be assumed, therefore, that the gallery is used in a somewhat different situation where it is subject to a certain degree of manual control and supervision.

There may be, for instance, a number of individual shooting galleries like the one disclosed herein, arranged side by side in a row in a suitable indoor location open to the public. These galleries may all be operated from a common battery, and are connected with a centrally located control station, where one or more attendants sell ammunition and assign the galleries for use. There may also be one or more attendants on the floor to assist or instruct beginners and to check and mark scores if competition is taking place. It will be understood that in this layout the control station will be equipped with a lamp such as 195 and keys, such as K and K², for each individual gallery.

In order to describe the operation, it will be assumed that the gallery shown herein is installed as one of the galleries mentioned in the foregoing paragraph. It will be assumed further that the gallery is being used for shooting rounds in competition with other shooters, each round comprising forty-eight shots. The target and indicator are so arranged that each bullet striking the plate 43 counts 10, each bullet striking plate 45 counts 20, and each bullet entering the bull's-eye 46 counts 30. The maximum possible score per round of forty-eight shots is therefore 1440.

When a person desires to enter the competition, he will purchase forty-eight cartridges at the control station and will be assigned to an individual gallery not in use, being given also a ticket upon which may be entered the name of the shooter and the number of the gallery. The shooter then proceeds to this particular gallery, the one shown herein, for example, to begin his round. At the same time, the attendant will operate the key K of the assigned gallery and will observe the lamp 195. Although the indicators of galleries which have been previously used normally show the last score, as will be explained, the indicators are shown in Fig. 7 in zero or restored position for convenience, and accordingly the explanation will proceed with this understanding.

When the key K is operated, a circuit is completed for relay 112 which extends from ground by way of cam spring 158 of indicator I⁵, through the cam springs 155, 154, 152, and 150 of the other indicators, conductor 180', contact spring 180 of relay 113, and winding of relay 112 to negative battery at key K. Relay 112 accordingly energizes and closes a circuit for the lamp 195, which lights up. It will be understood that the closure of the above circuit for relay 112 is contingent upon the indicators all being restored to zero position, which was assumed to be the case, and accordingly the lighting of the lamp 195 indicates this fact to the attendant.

The operation of key K also closes a circuit for relay 115, which energizes and at contact spring 183 attempts to close a circuit for relay 116, which is, however, opened at the same time at contact spring 176 of relay 112. Relay 116 therefore does not energize at this time. Relay 115 also closes a circuit at contact spring 184 for relay 117, which energizes and closes a locking circuit for itself at contact spring 185. At contact spring 188 relay 117 prepares a circuit for the bull's-eye lamp 193, and at contact spring 189 it closes a circuit for the motor 99. The motor accordingly begins to operate and by means of the cam 70

sets the bull's-eye in motion. The closure of contact 132 in the lamp circuit, although it does not light the lamp 193, does energize and operate the relay 111, which at contact spring 149 supplies negative battery to relays 100, 103, 106, and 109. Relay 111 has a high resistance winding and does not take enough current to light lamp 193.

When the attendant observes the lighting of lamp 195, he will restore the key K, which permits relays 112 and 115 to fall back. Relay 112 is slightly slow to release, which permits relay 115 to fall back first and avoids any chance of operating relay 116. Relay 117 remains locked up. When relay 112 falls back, the resistance *r* is connected in the circuit of lamp 193 in parallel with relay 111, this parallel circuit being established at contact spring 177, and lamp 193 receives sufficient current to cause it to light up and illuminate the bull's-eye.

The foregoing operations take place very rapidly, and when the shooter arrives at the gallery he finds it ready for use. The rifle 11 will be resting on the extension 10. It is loaded and fired in the usual manner. However, as explained before, the shooter is kept at the proper distance from the target by the extension 10, and although there is nothing to interfere with proper aiming of the rifle, it cannot be withdrawn from from the gallery. This avoids the possibility of injury to others by an inexperienced or careless person who is unacquainted with or oblivious to the dangerous nature of firearms.

It will be assumed that on the first shot the bullet strikes the plate 41. This is a "miss" and does not count in the score, but does operate the shot indicator mechanism. When the bullet strikes plate 41, the impact causes one or more of the pendulums such as 51 to swing to the rear and engage the associated contact springs. These contact springs, including spring 52, are all connected in multiple. Assuming pendulum 51 is actuated, a ground is placed on contact spring 52, which energizes relay 109, over a circuit including the lower winding of the relay. On energizing, relay 109 locks itself at contact spring 128 and closes a circuit for relay 110 at contact spring 129. The latter relay, on energizing, closes a circuit at contact spring 141 for the stepping magnet of the units shot indicator 14. Relay 110 also breaks the locking circuit of relay 109 which accordingly deenergizes and breaks the circuit of relay 110, which falls back and breaks the circuit of the stepping magnet of indicator 14. The operation of the indicators will be described more in detail in the case of indicator I¹. Suffice to say at this point that the energization and deenergization of the stepping magnet of indicator I⁴ causes the number wheel 173 to be advanced one step to display the digit 1. Cam 172 is of course advanced one step also, but the shifting of the cam springs has no effect at this time.

It will be observed here that the arrangement including the locking relay 109 insures that the shot will be recorded even though only one contact device responds, perhaps producing a very short impulse, and that only one shot will be recorded regardless of erratic operation of one or more of the control devices. The operated contact device or devices, although usually very reliable, may vibrate and close and open the circuit of relay 109 several times. The relay is so adjusted, however, that contact spring 128 makes before contact spring 129, and the relay locks

itself on the first closure of its circuit. From this point on the operation is independent of the target contact devices. Relay 110 is made slightly slow acting by means of a copper slug, so as to delay the unlocking of relay 109 until after any possible vibration of the target contact devices has ceased.

It will be assumed that on the next shot the bullet strikes the plate 43. In other words, the shot is sufficiently accurate so that the bullet passes through the opening 42 in plate 41, but it does not pass through the opening 44 in plate 43. The plate 43 yields somewhat to the impact of the bullet, and one of the contacts such as 54 is pressed momentarily into engagement with the associated contact spring such as 55. As all the contact springs such as 55 are connected in multiple, the contact spring 55 will be grounded, either directly or indirectly through another similar contact spring, and a circuit will be completed through the lower winding of relay 100. On energizing, relay 100 locks itself at contact spring 119, and at contact spring 120 closes a circuit for relay 101. On energizing in turn, relay 101 closes a circuit for the stepping magnet 160 of the indicator I¹ at contact spring 131, and at contact spring 130 the relay opens the locking circuit of relay 109. The latter relay accordingly falls back and breaks the circuit of relay 101 at contact spring 120, whereupon the relay 101 falls back also and breaks the circuit of the stepping magnet 160. It will be observed that the same arrangement employing a locking relay and a slow-acting relay is used for responding to the actuation of the contact devices 54—55 as was used in the case of contacts 51—52 operated by bullets striking the plate 41. This arrangement, as explained before, obviates any possibility of an incorrect registration due to vibration or other erratic operation of the contact devices.

Continuing now with the operation of the indicator I¹, when the circuit of the stepping magnet 160 is closed by the operation of relay 101, the magnet energizes and attracts its armature 164, which causes the pawl 165 to fall into the next adjacent notch in the ratchet wheel 162. When the magnet circuit is broken by the deenergization of relay 101, the armature 164 is retracted under the power of the spring shown and the pawl 165 advances the ratchet 162 and the associated number wheel 161 one step, which causes the digit 1 to be displayed. As the digit 1 appears in the tens position of the complete score indicator, this indicator now registers a score of 10.

It will be understood that the cam 166 rotates with the number wheel so that when the indicator is advanced as explained, the operating point on the cam passes out from under the end of contact spring 150 and allows this contact spring to break away from its upper contact and engage its lower contact. This operation, however, has no effect for the time being.

The momentary operation of relay 109 as described in the foregoing closes a circuit at contact spring 121 for the lower winding of relay 109. This relay and the associated relay 110 accordingly are operated in the manner previously explained to step the units shot indicator I⁴ ahead one more step.

It will be assumed that the next shot is accurate enough so that the bullet will pass through the opening 44 in plate 43, but does not enter the bull's-eye opening 46, and accordingly the

bullet will strike against the plate 45. The plate 45 yields or tilts slightly under the impact of the bullet and one or more contacts such as 65' will engage their associated contacts such as 65. Responsive to the grounding of contact 65, a circuit is completed for the lower winding of relay 103. On energizing, relay 103 locks itself at contact spring 122, at contact spring 124 closes a circuit for relay 100, and at contact spring 123 closes a circuit for relay 104. Relay 100 energizes and locks as previously explained, and closes a circuit at 120 for relay 101, which energizes. Relay 104, on energizing, prepares a locking circuit for itself at contact spring 136, and at contact spring 135 closes a circuit for relay 105. On energizing, the latter relay breaks the locking circuit of relay 103 at contact spring 143. Relay 103 accordingly falls back and breaks the circuit of relay 104 at contact spring 123, but relay 104 remains temporarily locked up through its own contact spring 136 and the contact spring 134 of relay 101. Relay 103 also breaks the circuit of relay 100 at contact spring 124, and this relay now deenergizes, for its locking circuit has already been broken by relay 101. When relay 101 was energized it of course closed the circuit for the stepping magnet 160 at contact spring 131, and it now falls back to break this circuit. The resulting operation of the stepping magnet 160 causes the number wheel 161 to be advanced one step into the second position, thereby displaying the digit 2 instead of the digit 1 and causing the score indicator to show a total score of 20. When relay 101 deenergizes, it also breaks the locking circuit of slow acting relay 104 at contact spring 134, and relay 104 accordingly deenergizes after an instant, breaking the circuit of relay 105 at contact spring 135. Relay 105 is also slow acting, however, and remains operated for an instant after its circuit is broken, with the result that a circuit is established for reoperating relay 101, which extends from ground by way of contact spring 135 in retracted position, contact spring 144 in attracted position, and the winding of relay 101 to negative battery. This circuit is broken after an instant by the deenergization of relay 105, but is effective to energize relay 101 again to transmit another impulse to the stepping magnet 160, advancing the number wheel 161 one more step. This causes the score indicator to display a total score of 30.

When relay 100 operates as described in the foregoing, it closes the circuit of relay 109, as in the previous case, and relays 109 and 110 are operated to advance the units shot indicator I⁴ an additional step, to register the third shot. The shot indicator will accordingly now display the digit 3.

It will be assumed now that the next shot is accurate enough to cause the bullet to enter the bull's-eye opening 46. Passing through this opening, the bullet impacts against the plate 90 and rotates the member 80 on its pivot 91, causing contact spring 84 to engage contact spring 85 momentarily. This operation places a ground on contact spring 85 and closes a circuit through the lower winding of relay 106. On energizing, relay 106 locks itself at contact spring 125, and at contact spring 127 closes a circuit for relay 103. The latter relay energizes and at contact spring 124 closes an energizing circuit for relay 100. The energization of relay 103 is followed by the energization of relays 104 and 105, while relay 100 causes the energization of relay 101, all as previously explained. Relay 106, on en-

energizing, also closes a circuit at contact spring 126 for relay 107, which energizes, and at contact spring 137 closes a circuit for relay 108. Relay 108 closes a circuit at contact spring 147 for relay 102, which energizes, and at contact spring 146 relay 108 breaks the locking circuit of relay 106. This latter relay accordingly falls back and at contact 126 breaks the circuit of slow acting relay 107, which remains locked up temporarily through its contact spring 138 and the contact spring 145 of relay 105, which energizes at about the same time that relay 105 falls back. On deenergizing, relay 106 also breaks the energizing circuit through the lower winding of relay 103, and as this relay is just now unlocked by the operation of relay 105, it falls back and breaks the circuit of relay 104. This relay, however, remains locked up temporarily through the contact spring 134 of relay 101. On falling back, relay 103 also breaks the circuit of relay 100, which now deenergizes, since its locking circuit has been broken by the operation of relay 101. Relay 101 now falls back and breaks the circuit of stepping magnet 160, which circuit was previously established by the energization of relay 101. The stepping magnet accordingly retracts its armature 164 and advances the number wheel 161 an additional step. Relay 101 also breaks the locking circuit of relay 104, whereupon relays 104 and 105 deenergize in succession. In the interval between the falling-back of relay 104 and the falling-back of relay 105 an impulse is transmitted to relay 101 in the manner previously explained, whereupon magnet 160 is again energized and deenergized and the number wheel 161 is advanced one more step. When relay 105 deenergizes it breaks the locking circuit of relay 107 and accordingly relays 107, 108, and 102 fall back in succession. Relay 107 falls back at the same time or an instant later than relay 101, as their circuits are broken simultaneously by relay 105. After a short interval, relay 108 falls back and closes another circuit for relay 101, the circuit including contact spring 142' of relay 102. This circuit is broken shortly by the falling-back of relay 102. Thus it will be seen that another impulse is transmitted to relay 101, which causes magnet 160 to again energize and deenergize, with the result that the number wheel 161 will be advanced one more step. This number wheel has been advanced three steps altogether responsive to the bull's-eye hit and displays a total score of 60.

During the foregoing relay operations initiated by relay 106, relay 109 is energized once and brings about the operation of relays 109 and 110, as previously explained, to advance the number wheel 173 of the units shot indicator I⁴ one additional step. This indicator will now display the digit 4, indicating that four shots have been fired.

Reviewing the operations briefly at this point, it will be seen that all of the four shots fired so far have produced different results. The first shot was a miss and, although it caused the operation of the shot indicator, it did not operate the score indicator and hence was not counted in the score. The next shot caused the operation of relays 109 and 101 and advanced the tens score indicator I¹ one step, also advancing the shot indicator. The next shot caused the operation of relays 103, 104, and 105, and also relays 100 and 101. The latter relays performed their function of advancing the tens score indicator I¹ one step and relay 100 also caused the advance of the shot indicator as usual. In addition, re-

lays 104 and 105 functioned to reoperate relay 101 to advance the tens score indicator I¹ an additional step. The last shot, the bull's-eye hit, caused the operation of relays 103, 107, 108, and 102. Relay 103 brought about the operation of relay 102, resulting in a series of relay operations the same as those occurring responsive to the previous shot. Relays 103 and 102 also cooperated in sending an additional impulse to relay 101, causing the advance of the tens score indicator one step in addition to the two steps brought about by the operation of relay 103.

The thing to be observed here is that a hit against the plate 45, which has a value of 20, is scored by operating the same relays used to score a hit on plate 43, having a value of 10, and by reoperating the relay 101 to add 10 more to the score. The same principle is used in scoring a bull's-eye hit, having a value of 30, which is done by operating the same relays used to score 20 for a hit on plate 45 and by causing an additional operation of relay 101 to score 10 more. The principle thus employed obviates any danger of incorrect scoring due to a bullet striking the edge or rim of opening 44, for instance, and actuating a contact device associated with plate 43 and also one associated with plate 45. It can be seen that this will frequently happen, also simultaneous actuation of contacts 65'-65 and 64-65, or 64-52 and 54-55. Such marginal shots are always scored at the highest value, but cannot be scored twice, as would be the case if entirely separate controlling relays were employed for the different possible hits. For instance, a single bullet may operate contact device 54-55 and also contact device 65'-65, but only 20 is scored and not 20 plus 10, because relay 103 is operated anyway in the scoring of 20, and it makes no difference whether it is operated from relay 103 or from the contact device 54-55.

Attention may now be directed to certain incidental operations taking place when the bull's-eye is hit. Relay 103, on energizing, closes a circuit at contact spring 143 for the lamp 104. This lamp, located on top of casing 2, lights up for a short interval while the relay remains energized, mainly for the edification of the shooter and to add interest to the round, although it also may serve as a supervisory signal to the attendant at the control station. Relay 102, on energizing, opens the branch circuit through resistance *r* by means of which the bull's-eye lamp 103 is lit, thus extinguishing the lamp. This operation is not strictly necessary, but is designed to delay the next shot sufficiently to allow time for registering the score.

Continuing with the explanation, the tens score indicator I¹, which has now been advanced to display the digit 6, will be further advanced one step at a time as shooting of the round goes on until it shortly displays the digit 9, showing a cumulative score of 90. When the number wheel advances to display the digit 9, the cam 166 also advances into position to actuate the cam spring 151, thus preparing a circuit for the stepping magnet of the hundreds score indicator I². Upon the next energization of relay 101, therefore, when an impulse is transmitted to the stepping magnet 160 by contact spring 131, an impulse will also be transmitted to the stepping magnet of the indicator I² by contact spring 132. Thus the number wheel 161 of indicator I¹ is advanced to display the digit 0, while the number wheel 169 of indicator I² is advanced to display the digit 1.

The score indicator now shows a cumulative score of 100.

From the foregoing it will be understood that the hundreds indicator I² is advanced one step for each complete rotation of the tens indicator I¹. Eventually the hundreds indicator will be advanced to display the digit 9, for a score of 900, and simultaneously cam 168 will prepare a circuit for the stepping magnet of thousands indicator I³ by actuating cam spring 153. The next time the number wheel 161 displays digit 9, score 990, and cam 166 arrives in position to actuate cam spring 151, this spring will not only prepare a circuit for the stepping magnet of indicator I², but will also prepare a circuit for the stepping magnet of indicator I³ in cooperation with the cam spring 153. The next time the relay 101 operates, all three of the score indicator stepping magnets are energized, and indicators I¹ and I² are advanced from 9 to 0, while indicator I³ is advanced from 0 to 1. The score indicator now shows a score of 1000. As the maximum score for forty-eight shots is 1440, the thousands indicator will never be advanced more than once per round, and hence the number wheel 171 need have only the digits 0 and 1. To permit longer rounds, however, it may have the full complement of digits.

The relays 109 and 110 which control the shot indicators I⁴ and I⁵ are operated responsive to each shot, as previously explained, and accordingly the units shot indicator is stepped ahead once per shot. When the number wheel 173 is advanced to display the digit 9, the cam 172 will actuate cam spring 156 and prepare a circuit for the stepping magnet of tens shot indicator I⁵. Upon the next operation of relay 110, therefore, indicators I⁴ and I⁵ will be advanced simultaneously, the former from 9 to 0, and the latter from 0 to 1.

Indicator I⁵ is thus advanced one step for each complete rotation of indicator I⁴, and after forty shots have been fired will display the digit 4. In this position cam 174 actuates the cam spring 159. As further shots are fired, the indicator I⁴ is advanced step by step, and when exactly eight more shots have been fired, the number wheel 173 will display the digit 8, and cam 172 will actuate cam spring 157. A circuit is now completed for relay 110, extending from ground by way of cam spring 157, cam spring 159, upper winding of relay 110, and contact spring 187 to negative battery. On energizing, relay 110 establishes a locking circuit for itself at contact spring 190, closes a circuit for lamp 192 at spring 191, and breaks the locking circuit of relay 117 at contact spring 186. Relay 117 falls back and opens the motor circuit at contact spring 189, also the circuit of the bull's eye lamp 123 at contact spring 193. This stops the motor and extinguishes the bull's-eye lamp. The breaking of the lamp circuit also deenergizes relay 111, which falls back and cuts off the battery supply to relays 100, 103, 106, and 109.

From the foregoing, it will be seen that upon the completion of the round of forty-eight shots the gallery is automatically taken out of service and rendered inoperative for further shooting. The lamp 192 is lighted at this time to attract the attention of an attendant, who will come over and enter the total score on the shooter's ticket, having it verified if necessary. The button 9 is then depressed momentarily to unlock relay 112, and the lamp 192 is extinguished. The gallery

remains in this condition until it is assigned for use on another round.

It will be assumed now that this particular gallery is reassigned, in order that the operation of restoring the indicators may be explained. When the attendant at the control station again actuates the key K, no circuit is completed for relay 112 because several or all of the indicators are out of zero position and the chain circuit extending to ground at cam spring 153 is broken at a number of points. Lamp 195, therefore, does not light up immediately. Relay 115 is energized, however, and closes a circuit for relay 117 with results as previously explained. Relay 115 also closes a circuit for the interrupter relay 116 at contact spring 183, said circuit extending from ground by way of contact spring 183, winding of relay 116, contact spring 182, a pair of contacts associated with contact spring 180, resistance r' , contact spring 178, and contact spring 176 to negative battery. Relay 116 is slow acting and operates as an interrupter to break its own circuit at the rate of about ten times per second. On the first energization of relay 116, it closes a circuit for slow acting relay 113, which energizes and remains operated thereafter as long as relay 116 continues to operate. On energizing, relay 113 closes a circuit for the slow acting relay 114 and at contact spring 180 disconnects the interrupter relay 116 from the resistance r' and connects it instead to the conductor 180', at the same time disconnecting this conductor from relay 112. The conductor 180' extends to the cam spring 150 of indicator I¹ and interrupter relay 116 therefore operates in series with the stepping magnet 160, which advances the number wheel 161 rapidly to zero. When this position is reached the cam 163 arrives at the position where it is shown in the drawings and transfers the restoring circuit from the stepping magnet of indicator I¹ to the stepping magnet of indicator I² in an obvious manner, assuming that this next indicator is not in zero position. The indicator I² is next restored and on reaching zero position the restoring circuit is transferred to the stepping magnet of indicator I³.

It will be understood therefore that the indicators are restored to zero successively, beginning with the indicator I¹. When the indicator I³ becomes restored, the restoring circuit is connected to ground at cam spring 153, and the interrupter relay 116 cannot operate again and remains deenergized. After a short interval the slow acting relay 113 falls back and breaks the circuit of slow acting relay 114 and also re-establishes the normal connection of conductor 180' to relay 112 and relay 116 to resistance r' . Relay 112 accordingly energizes and at contact spring 176 disconnects negative battery from the initial energizing circuit of relay 116. Relay 114, being slow acting, holds this circuit open long enough at contact spring 178 so that relay 116 cannot energize again over its initial energizing circuit.

Relay 112 also lights the lamp 195, which notifies the attendant that all the indicators have been restored to zero. The key K is accordingly restored, which allows relay 112 to fall back and light the bull's-eye lamp, as previously explained. If lamp 195 fails to light up, the attendant knows that something is wrong and will assign another individual gallery for use. At the same time the gallery shown may be stopped and taken out of service by restoring key K and by momentarily operating key K², which unlocks relay 117. The last mentioned key

is an emergency key which can be used not only in the unusual situation mentioned, but also to unlock relay 117 in the event a round is not completed for some reason. It can be used to restore relay 117 after the firing of test shots, or after a number of shots have been fired purely for amusement.

In Fig. 6 a modified bull's-eye contact device has been shown. Describing this arrangement briefly, it includes a member 222 adapted to be impacted by a bullet entering the bull's-eye opening 46, which is mounted against the plate 63 by means of a spring 220. This spring is given tension toward plate 63, which is opposed by a coil spring 224. These springs hold member 222 in the position in which it is shown. Above the bull's-eye opening and inside the housing 47 there is mounted a solenoid 227, having a movable core 226. The latter carries an extension 221, in which there is an opening 223, normally positioned in alignment with the bull's-eye opening so that a bullet passing through the latter will pass through opening 223 also. The solenoid core has attached to it a contact spring 229 adapted to engage a contact spring 228. The spring 229 also serves as a contact spring and is adapted to engage contact spring 225.

When the member 222 is hit by a bullet it moves to the rear and contact spring 220 engages contact spring 225, closing a circuit from the grounded frame through springs 220 and 225, winding of solenoid 227, and over conductor 230 to negative battery. On energizing, the solenoid 227 attracts the core 226 and raises it sufficiently to cause contact spring 229 (grounded on the frame) to engage contact spring 228, thereby closing a circuit for relay 106, Fig. 7, of the indicating apparatus. Contact spring 228, it will be understood, corresponds to contact spring 85 of the modification shown in Fig. 3. If a wire or other implement is inserted through the openings 46 and 223, and member 222 is pressed back to ground contact 225, the solenoid will be energized the same as when member 222 is impacted by a bullet, but the wire or other implement will prevent any more than a partial raising of the core of the solenoid and the movement will be arrested before spring 229 engages spring 228. Thus the attempt to fraudulently operate the bull's-eye contact device is defeated.

As intimated previously, the shooting gallery shown herein may be used purely as an amusement device. In this case arrangements may be made for operating the game device in extension 10 in conjunction with the gallery in order to add interest to the use of the latter and thereby promote the sale of ammunition. The arrangement may be such, for example, that each shot fired at the target brings about the release of a ball in the game device. After a number of shots have been fired, therefore, the game device may be played; or if desired, the firing at the target and playing of the game device may alternate, the ball released upon the firing of each shot being played before the next shot is fired. In order to carry out the foregoing, a magnet 210, Fig. 7, is provided together with a key K¹. Magnet 210 may be included as part of the game device and controls the ball-releasing mechanism. Key K¹ is for changing the gallery into an amusement device, and when actuated, connects up the magnet 210 so that the latter will be operated each time the relay 109 is energized. The key K¹ may also perform other switching operations if considered

necessary or desirable, and of course the arrangement whereby magnet 210 is controlled by relay 109 may be modified. In a given case, for instance, it might be desirable to make the number of balls rendered available dependent on the accuracy of the shots fired, and to accomplish this an additional pair of contacts would be provided on relay 101 to control magnet 210. Or it might be thought best to release a ball only if the bull's-eye is hit, in which case the magnet 210 could be placed under the control of relay 108. It will be understood also that the magnet 210 is not necessarily included as part of a game device, but may be used to control apparatus for dispensing to the shooter merchandise or prizes in accordance with the number or accuracy of the shots fired.

It will be seen that I have devised a highly improved shooting gallery having many advantages over previous devices of this character, which render it useful not only as an amusement device but as a pure game of skill in which the results secured depend wholly on the ability of the shooter. My improved gallery is especially valuable in this latter field, where its accuracy and reliability afford facilities for competitive shooting not heretofore available. In this field in particular, the foolproof design of the target and its freedom from the usual troubles inherent in prior bullet-actuated mechanisms tend to broaden the prospects from the commercial angle, and with the described arrangements for preventing fraud and tampering, render possible the development of unsupervised competitive shooting on a highly organized scale, state-wide or national in extent.

While I have described herein a certain specific embodiment of my invention, it will be understood that this was done merely to facilitate the explanation, and that the invention and the various features thereof may be used in other ways and in different organizations of apparatus and equipment. Modifications may also be made, including those already suggested. Under these circumstances, therefore, I do not desire to be limited to the exact form of my invention disclosed herein, but desire to include and have protected by Letters Patent all forms and modifications thereof that come within the scope of the appended claims.

I claim:

1. In a shooting gallery, a bullet-actuated contact device, a relay operated by said contact device, a locking circuit for said relay to prevent repeated operation thereof by vibration of said contact devices, a second relay energized by said first relay and effective to break said locking circuit after said vibration has ceased, and a register controlled by one of said relays.

2. In a shooting gallery, a plate forming part of a target, a contact device actuated by movement of said plate under the impact of a bullet, a relay energized by said contact device, a register controlled by said relay, means responsive to energization of said relay for holding it energized a predetermined time to prevent false registration due to vibration of said contact device, and means for automatically deenergizing said relay at the expiration of said time.

3. In a shooting gallery, a target including contact devices selectively actuated in accordance with the accuracy of shots fired at the target, a cumulative score register, a cumulative shot register, means including relays controlled by said contact devices for variably operating said

score register responsive to each shot, and means including one of said relays for operating said shot register responsive to each shot.

4. In a shooting gallery, a target, a score register, a shot register, electromagnet means responsive to each shot within predetermined accuracy limits for variably operating said score register depending on the accuracy of the shot, and means responsive to each shot including shots outside said predetermined accuracy limits for operating said shot register.

5. In a shooting gallery, a target comprising a plurality of spaced members having openings therein which progressively decrease in size from the front of the target to the rear, a score register, means responsive to the impact of bullets on said members for selectively operating said score register, and means for preventing a false registration due to a single bullet impacting two of said members.

6. In a shooting gallery, a target including a plate member leaving an opening therein constituting a bull's-eye, contact devices adapted to be operated, respectively, by bullets striking said plate member and passing through the bull's-eye opening therein, a register, means controlled by said contact devices for variably operating said register, and means for preventing a double registration due to a bullet striking the edge of said opening and actuating both contact devices.

7. In a shooting gallery, a score register, a target, means responsive to a bullet impacting a certain area of said target for operating said register, means responsive to a bullet impacting a different area of said target for operating said register, means whereby said first means is also operated each time said second means is operated, and means whereby the operation of the register by the second means is delayed until after the operation thereof by the first means.

8. In combination, a shooting gallery including a target and automatic score and shot registers, an attendant's station, means responsive to actuation of a switch at the attendant's station for restoring said registers, a signal at the attendant's station for indicating when the restoration is complete, means responsive to restoration of said switch for illuminating said target, means controlled by said shot register on completion of a round for rendering said last means inoperative, and another signal for indicating the completion of the round.

9. In a shooting gallery, a target, a plurality of registers, means in the target for setting said registers, an attendant's station, a circuit extending between said station and registers, means responsive to closure of said circuit at the station for successively restoring said registers, and a signal at the attendant's station controlled over said circuit responsive to restoration of the last register.

10. In combination, a shooting gallery including a target and a bullet-actuated score register, an attendant's station, remote control means whereby the attendant at said station can restore said register to normal, and a signal at said station operated responsive to the completion of the restoring operation.

11. In combination, a shooting gallery including a target and a bullet-actuated score register, an attendant's station, means controlled from said station for rendering said register operative, a bullet-actuated shot register, and means controlled by said shot register for rendering the

score register inoperative after a predetermined number of shots have struck the target.

12. In a shooting gallery, a target with a movable bull's-eye, a motor for operating said bull's-eye, manually actuated means for starting said motor, and automatic means responsive to a predetermined number of bullets impinging on said target for stopping said motor.

13. In a shooting gallery, a target having a bull's-eye, a lamp for illuminating said bull's-eye, manually operated means for closing a circuit for said lamp, and automatic means responsive to a predetermined number of bullets impinging on said target for opening the circuit of said lamp.

14. In a shooting gallery, a target including selectively actuated contact devices responsive to the impact of bullets on said target, there being also a bull's-eye and an associated contact device actuated by the impact of bullets thereon, a score register controlled by said contact devices, a lamp for illuminating said bull's-eye, and means responsive only to said bull's-eye contact device and effective each time the bull's-eye contact device is actuated for momentarily extinguishing said lamp for a predetermined time and for automatically relighting it.

15. In a shooting gallery, a target, a score totalizer comprising a plurality of registers, each for registering a different digit in the score, means including contact devices in the target for operating said registers, a circuit for restoring said registers, said circuit terminating in the first register when the registers are off normal, means for transmitting impulses over said circuit, and means in each register effective upon restoration thereof for transferring said circuit to the next register.

16. In a shooting gallery, a target, a lamp for illuminating said target, a relay for closing the circuit of said lamp, means under manual control for energizing said relay, a locking circuit for said relay, means responsive to a predetermined number of bullets impacting said target for breaking said locking circuit, and manually operated means for breaking said locking circuit at will.

17. In a shooting gallery, a bullet actuated contact device, a relay operated by said device, a locking circuit for said relay, a second relay energized by said first relay and effective to break said locking circuit, and means for rendering said second relay slow to deenergize to thereby prevent the reclosure of said locking circuit by a second energization of the first relay within a predetermined time.

18. In a shooting gallery, a bullet actuated contact device, a relay operated by said device, a locking circuit for said relay, a second relay energized by said first relay to break said locking circuit, and a locking circuit for said second relay controlled by said first relay.

19. In a shooting gallery, an electrical contact device, a relay operated by said device, a locking circuit for said relay, a second relay energized by said first relay to break said locking circuit, a locking circuit for said second relay closed at one point by energization thereof, and means controlled by said first relay for closing the locking circuit of the second relay at another point and for opening it after a predetermined time.

20. In a shooting gallery, a target, a plurality of relays, each responsive to a bullet impinging on a different area of said target, and means whereby one of said relays, on energizing, causes the energization of another of said relays.

21. In a shooting gallery, a target, a plurality of relays, each responsive to a bullet impinging on a different area of said target, means whereby one of said relays, on energizing, causes the energization of another of said relays, and means for deenergizing the last energized relay while the first energized relay remains energized.

22. In a shooting gallery, a target, a plurality of relays, each responsive to a bullet impinging on a different area of said target, and means whereby one of said relays, on energizing, causes the successive energization of all the other relays.

23. In a shooting gallery, a target, a plurality of relays, each responsive to a bullet impinging on a different area of said target, means whereby one of said relays, on energizing, causes the successive energization of all the other relays, and means for deenergizing said relays in reverse order.

24. In a shooting gallery, a target, two relays energized and deenergized in response to a bullet striking said target, one of said relays being deenergized a predetermined time after the other relay, a score register, and a control circuit for said register completed by joint action of said relays during said predetermined time.

25. In a shooting gallery, a target, a relay energized and deenergized in response to a bullet striking said target, a slow releasing relay controlled by said first relay, a circuit including a back contact on said first relay and a front contact on said slow relay, and a register controlled over said circuit.

26. In a shooting gallery, a target, a score register, a relay, a circuit over which said relay transmits impulses for operating said register, and means for energizing said relay a variable number of times responsive to a single bullet striking said target, the number of times said relay is energized depending on the accuracy of the shot.

27. In a shooting gallery, a target, two relays energized in response to bullets striking different areas of said target, respectively, means whereby one of said relays, on energizing, energizes the other relay, and a score register controlled by said relays, respectively, in the reverse order of their energization.

28. In a shooting gallery, a target, two relays energized in response to bullets striking different areas of said target, respectively, means whereby one of said relays, on energizing, energizes the other relay, a score register operated by said other relay, and means controlled by said first relay and effective after the score register has been operated by the other relay to advance said score relay again.

29. In a shooting gallery, a target, a plurality of relays, means for energizing all said relays in response to a single bullet striking said target, the last one of said relays being energized before the first is deenergized, means for deenergizing said relays successively in the reverse order of their energization, a score register, and means including said relays for advancing said register a plurality of times each time the relays are energized and deenergized.

30. In a shooting gallery, a target, two contact devices of different value arranged to be operated by bullets striking different areas of said target, respectively, a register, means responsive to the operation of the contact device of lower value for operating said register, and means responsive to the operation of the contact device of higher value for operating said register a plurality of times, including means whereby the first of said plurality

of operations is effected by operating said first means.

31. In combination, a shooting gallery including a target, control relays normally non-responsive to bullets impinging on said target, a cumulative score register adapted to be controlled by said relays, an attendant's station, and means in said gallery operated by remote control from said station for rendering said relays responsive to bullets impinging on said target.

32. In combination, a shooting gallery including a target and a bullet actuated score register, a control and supervisory station for said gallery, control means in said gallery operated by remote control from said station, and a supervisory signal at said station controlled from said gallery.

33. In combination, a shooting gallery including a target and a bullet actuated cumulative score register, an attendant's station, a conductor extending from said gallery to said station, a circuit including said conductor and controlled from said station for restoring said register to normal, and a supervisory lamp at said station controlled over said conductor.

34. In combination, a shooting gallery including a target and a bullet actuated cumulative score register, an attendant's station, a conductor extending from said gallery to said station, and means at said station for transmitting impulses over said conductor to advance said register step by step to normal position.

35. In combination, a shooting gallery including a target and a bullet actuated cumulative score register, said register comprising a plurality of digit counters, an attendant's station, means at the station for indicating whether said register is in normal or set position, a conductor over which said indicating means is controlled, means for sending impulses over said conductor to advance said counters to normal, and means in each counter operative to transfer said circuit to the next counter.

36. In combination, a shooting gallery including a target, said target having a bull's-eye, a lamp for illuminating said bull's-eye, an attendant's station, means at said gallery responsive to operation of a switch at said station for preparing a circuit for said lamp, and means responsive to restoration of said switch for completing said circuit.

37. In combination, a shooting gallery including a target having a bull's-eye, a bull's-eye lamp, a local circuit for said lamp controlled from an attendant's station, said circuit including a high resistance relay, and a lower resistance circuit for said lamp also controlled at said station.

38. In combination, a shooting gallery including a target having a movable bull's-eye, a motor for moving said bull's-eye, a self-locking relay, means at an attendant's station for initially energizing said relay, a circuit for said motor completed by said relay, and means at the said station for unlocking said relay.

39. In combination, a shooting gallery including a target having a bull's-eye, a bull's-eye lamp, a self-locking relay for closing a circuit for said lamp, manual means for initially energizing said relay, a second relay for unlocking said first

relay, bullet actuated means for energizing said second relay, a locking circuit for said second relay, a signal controlled by said second relay, and manually operated means for opening the locking circuit of said second relay.

40. In a shooting gallery, a target, a lamp for illuminating said target, means for automatically extinguishing said lamp in response to a predetermined number of bullets impacting said target, means for signalling an attendant when said lamp is extinguished, said last means including a self-locking relay, and manually operated means for unlocking said relay.

41. The combination, with a shooting gallery having a bullet actuated score register, of an attendant's station, an interrupter, means at said station for starting the operation of said interrupter, and means controlled by said interrupter for connecting itself in circuit with said register to restore the same.

42. The combination, with a shooting gallery having a bullet actuated score register, of a combined restoring and supervisory circuit extending from said gallery to an attendant's station, means at said station for closing said circuit through a supervisory relay, an impulse sender started by actuation of said means in case said relay does not energize, and means controlled by said sender for connecting itself in said circuit in place of said relay.

43. The combination, with a register restoring circuit for the score register of a shooting gallery, of an impulse sender, a local circuit for starting the operation of said sender, means controlled by the sender for connecting itself in said restoring circuit, said means being operative to disconnect the sender after the restoration operation is completed, and means for preventing said sender from re-operating over its local circuit after it is disconnected from said restoring circuit.

44. In a shooting gallery, a target, a relay responsive to the impact of a bullet on a certain area of said target, a score register controlled by said relay, a relay responsive to the impact of a bullet on a different area of said target, a shot register controlled by said second relay, and means whereby each time said first relay is operated it causes the operation of said second relay.

45. In a shooting gallery, a target, a bullet actuated score register, a bullet actuated shot register, each of said registers comprising a plurality of digit counters, an individual stepping magnet for each counter, a restoring circuit common to all said stepping magnets, and means for connecting said magnets in said circuit successively.

46. In a shooting gallery, a target, a score register including two digit counters, means responsive to the impact of bullets on said target for actuating the first of said counters, a cam on the shaft of said first counter, a circuit closed in one position of said cam for operating the second counter the next time the first counter is operated, a restoring circuit for the first counter, and means operated by said cam in another position thereof for transferring said restoring circuit to the second counter.

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