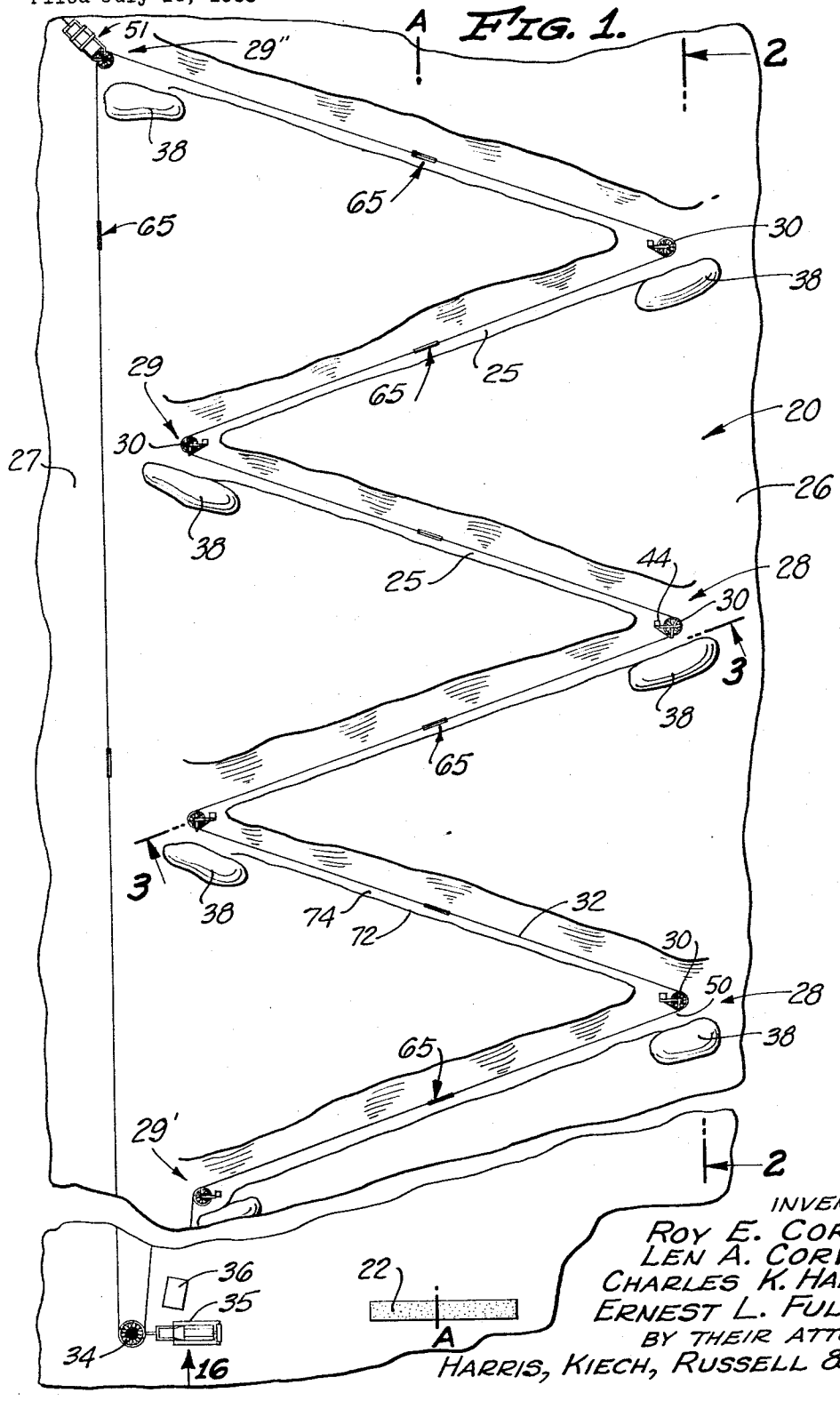
Jan. 10, 1967 R. E. CORWIN ET AL 3,297,326

MOVING TARGET SYSTEM FOR SHOOTING PRACTICE

Filed July 16, 1963 5 Sheets-Sheet 1

FIG. 1.



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MOVING TARGET SYSTEM FOR SHOOTING PRACTICE

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FIG. 2.

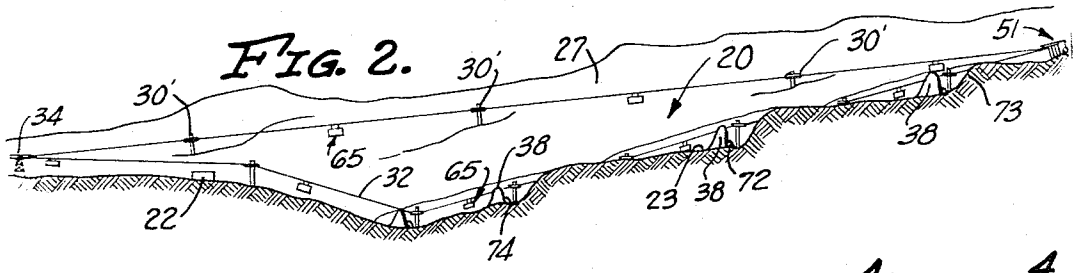


FIG. 3.

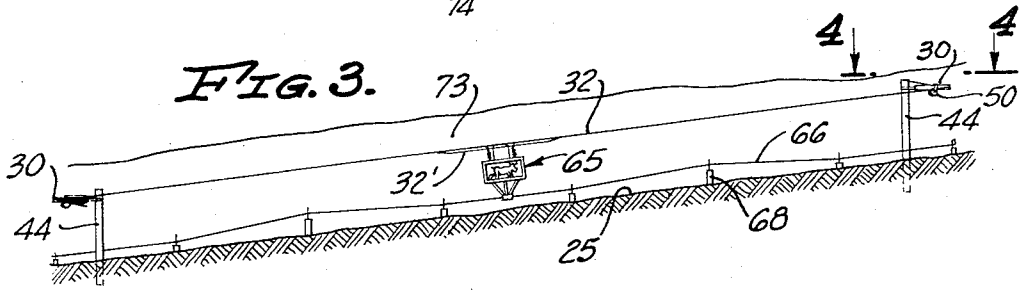


FIG. 6.

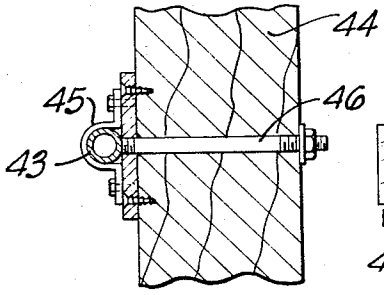


FIG. 4.

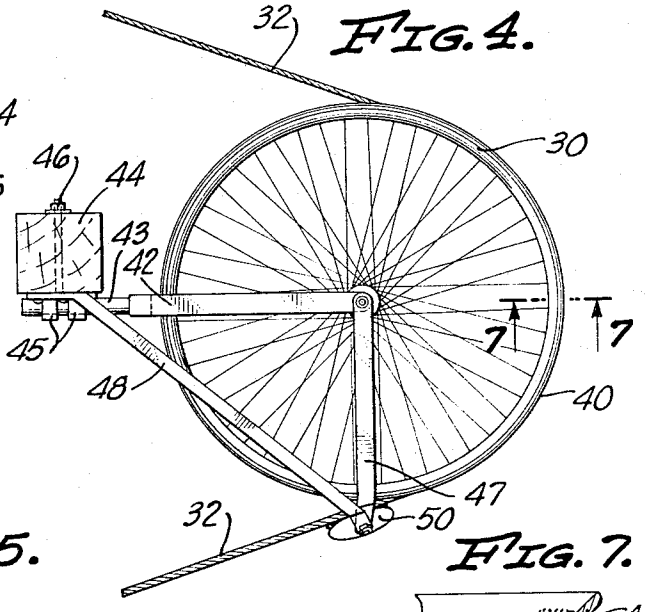


FIG. 5.

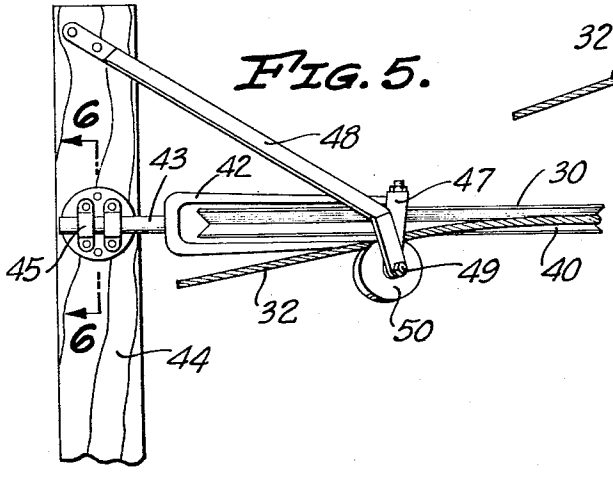
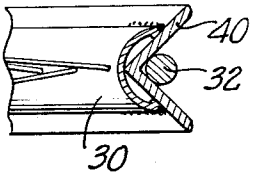


FIG. 7.



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MOVING TARGET SYSTEM FOR SHOOTING PRACTICE

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FIG. 8.

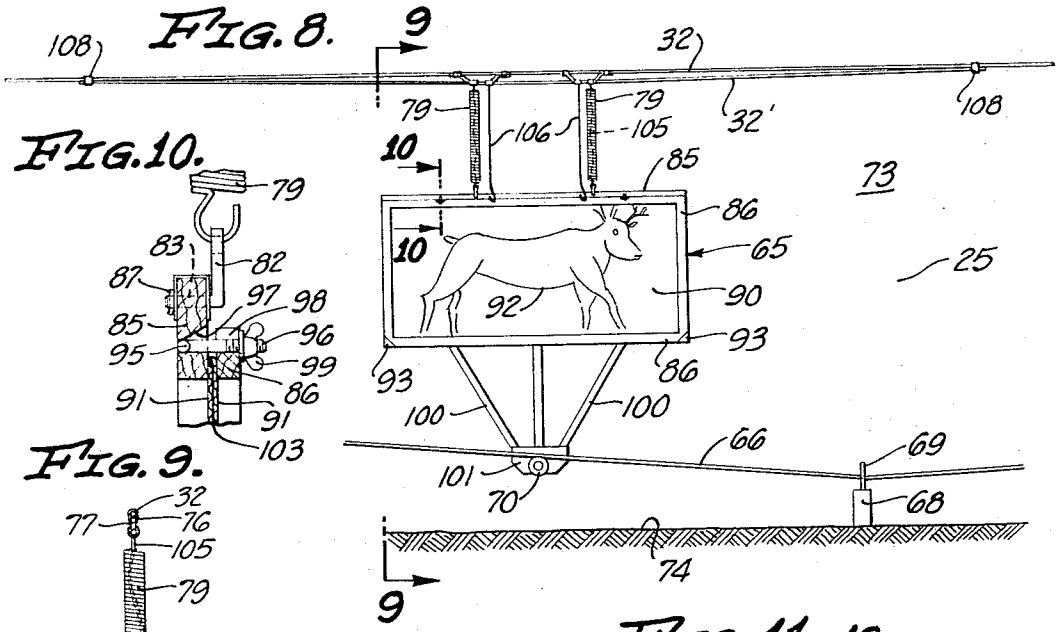


FIG. 10.

FIG. 9.

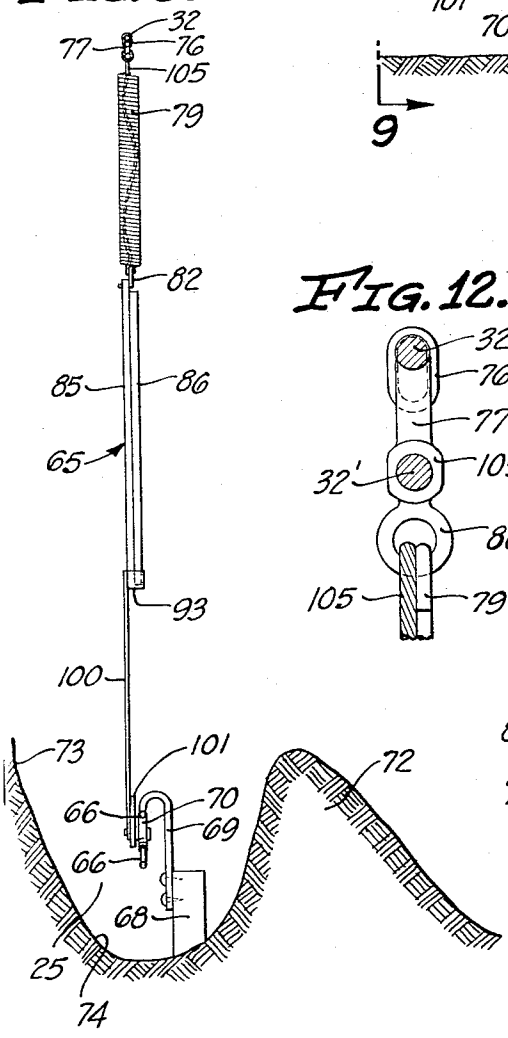


FIG. 12.

FIG. 11

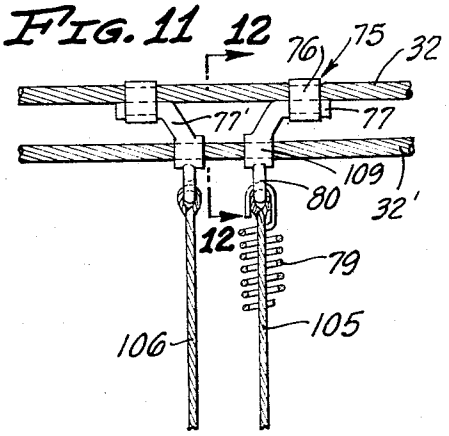
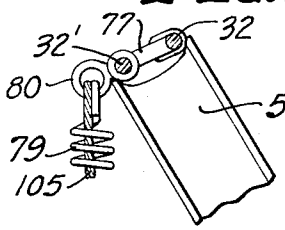


FIG. 13.



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MOVING TARGET SYSTEM FOR SHOOTING PRACTICE

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FIG. 16.

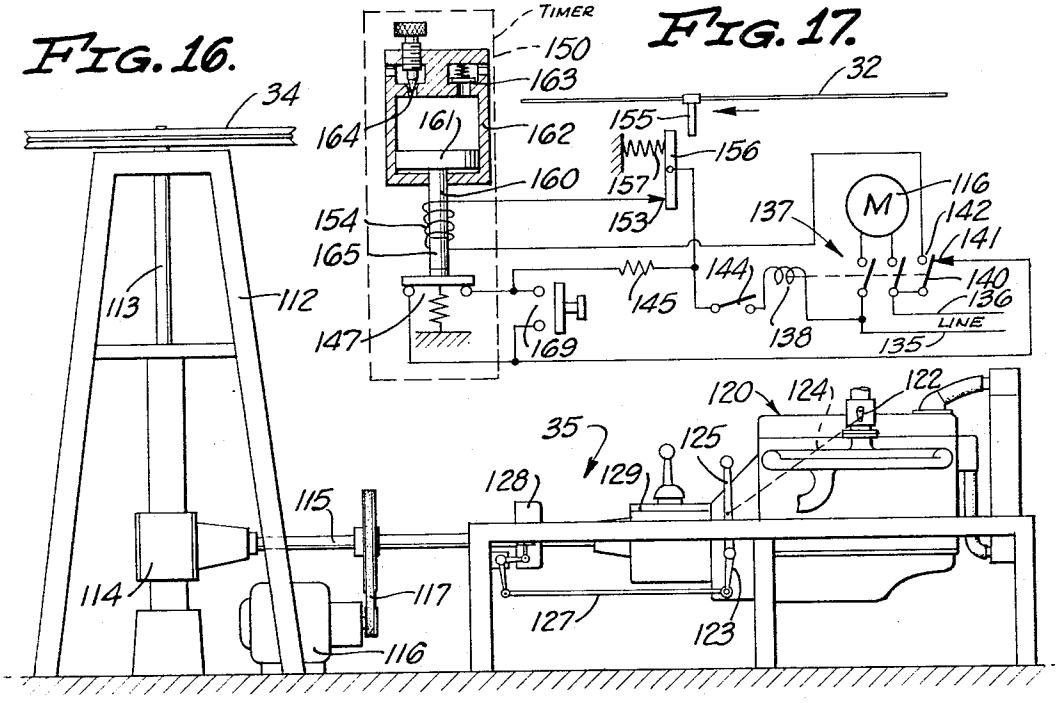


FIG. 17.

FIG. 14.

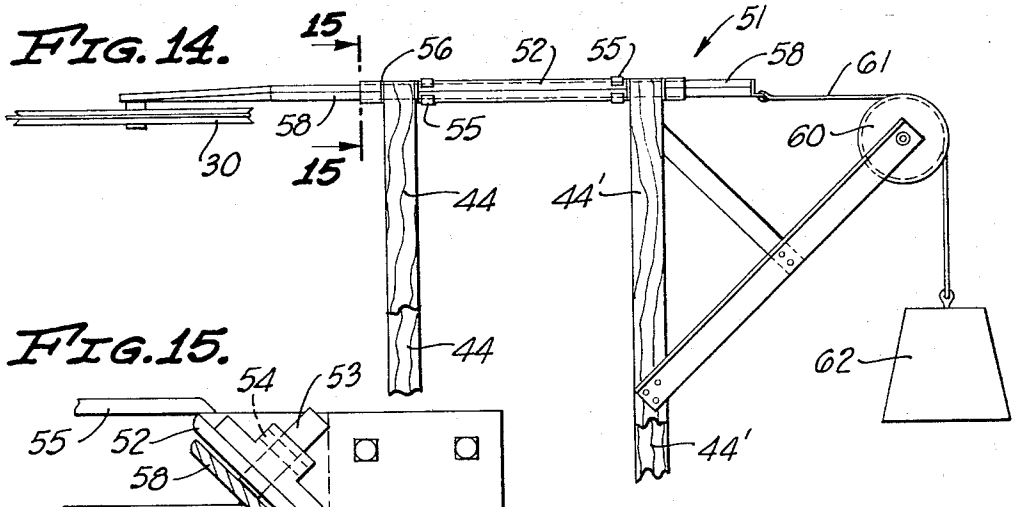
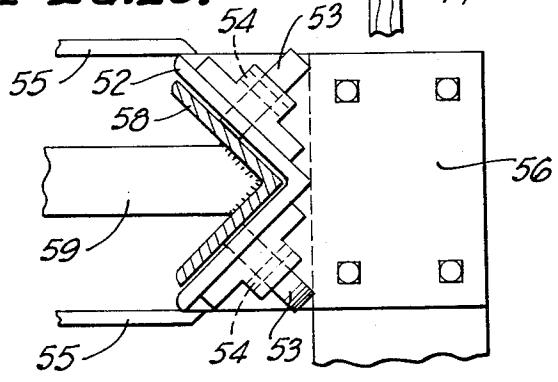


FIG. 15.



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MOVING TARGET SYSTEM FOR SHOOTING PRACTICE

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FIG. 18.

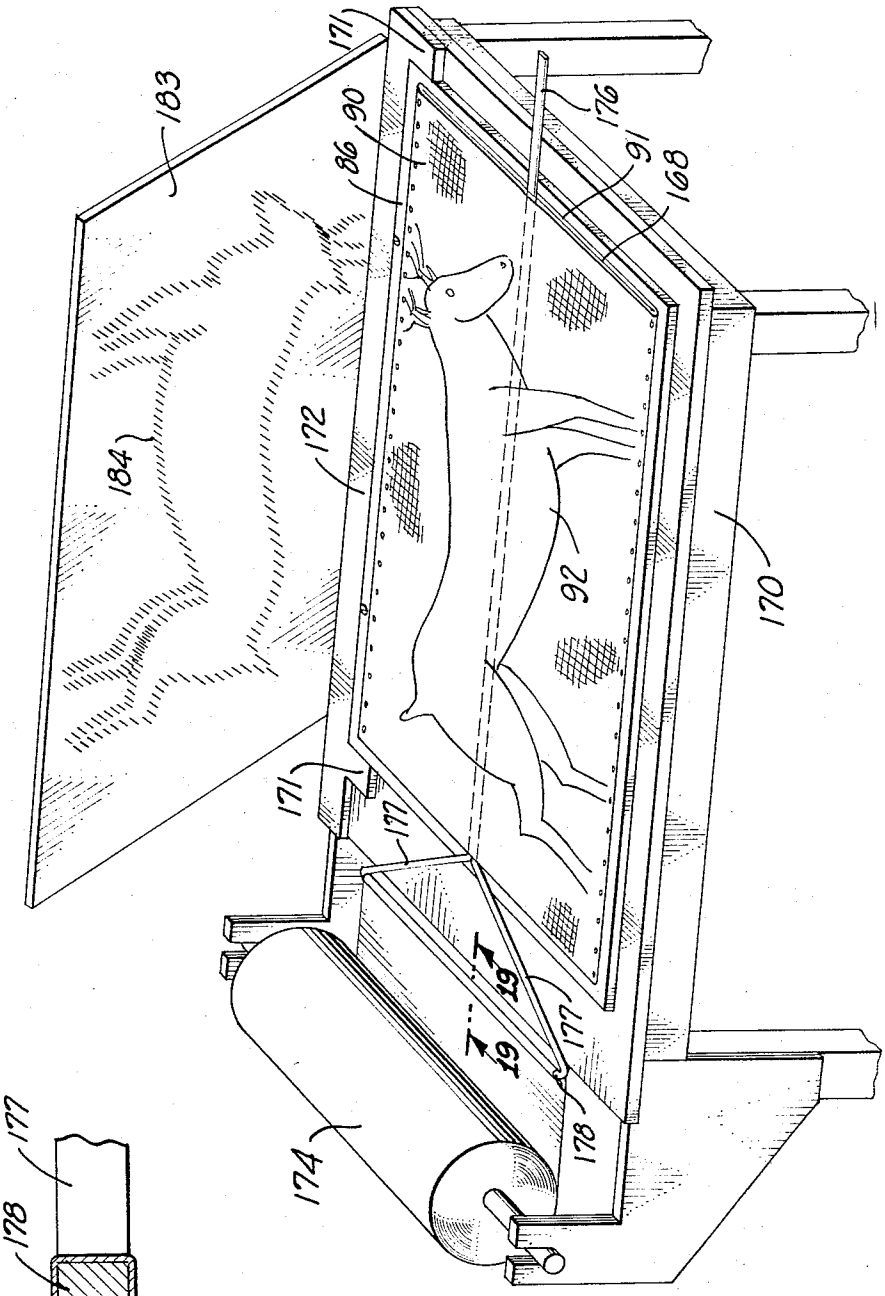
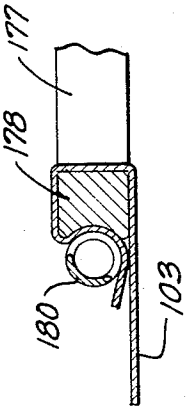


FIG. 19.



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United States Patent Office 3,297,326 Patented Jan. 10, 1967

3,297,326
MOVING TARGET SYSTEM FOR SHOOTING PRACTICE

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Filed July 16, 1963, Ser. No. 295,311
16 Claims. (Cl. 273—105.2)

Our invention relates to moving target systems for shooting practice and more particularly to a target system employing a range capable of presenting moving life-sized animal targets to the marksman.

Moving targets in present shooting ranges are of small size and usually move across the shooting range along a transverse path or run that is a fixed distance from the shooting station. This gives the marksman no practice in adjusting his equipment or technique for the variable distances encounted in actual hunting. Likewise the necessarily small targets simulate only very roughly the actual appearance of game and the movements thereof actually encountered in hunting. It is an object of the present invention to provide a system which presents large or life-sized targets to the marksman at varying distances from the shooting station.

A further object is to provide a novel arrangement for moving the targets in a manner to simulate actual animal movement such as sudden appearance, rapid motion and leaping when pursued. Another object is to provide a target system employing animal facsimile or silhouette targets that move in opposite directions at sequential positions. Another object is to provide for the intermittent movement of targets so that they can move from a stationary concealed position to and through a shooting range at desired times.

Present shooting ranges accommodate only one marksman at a time if there is to be any record or indication of individual performance. It is an object of the invention to provide a shooting range for shooting practice in which several marksmen can participate at the same time while still obtaining information or records as to the accuracy of their respective shots. A further object is to provide a moving target system in which each marksman can shoot successively at the same target while displayed at progressively greater distances from the shooting station.

The invention is best embodied in a shooting range constructed in a terraced canyon or narrow valley with the shooting runs extending from side to side of the canyon walls and arranged in a generally zig-zag pattern in an up-canyon direction. The shooting station may be at a level at or above the lowermost run, the latter being preferred as permitting the marksman to shoot downward at the target when in one position and horizontally and upward at the target when in higher positions. Deer for example often leap from cover on a downslope and rise on an opposite slope. It is an object of the invention to provide a shooting range incorporating such features.

Another object of the invention is to provide novel target systems and ways of suspending targets from a moving cable. Thus it is an object of the invention to provide a target in which an animal facsimile or silhouette is duplicated on opposite sides of the target.

Further objects and advantages of the invention will be apparent to those skilled in the art from the following description of an exemplified embodiment.

Referring to the drawings:

FIG. 1 is a top or airplane view of a shooting range of the invention;

FIG. 2 is a vertical sectional view taken along the line 2—2 of FIG. 1;

FIG. 3 illustrates one of the shooting runs, being taken along the line 3—3 of FIG. 1;

FIG. 4 is a view of one of the guide wheels, taken along the line 4—4 of FIG. 3;

FIG. 5 is a side view of the guide wheel of FIG. 4 taken in the direction of the arrow 5;

FIGS. 6 and 7 are respectively fragmentary views taken along the lines 6—6 and 7—7 of FIGS. 5 and 4;

FIG. 8 is an enlarged elevational view of a target during advancement along a shooting run, viewed as in FIG. 3;

FIG. 9 is a sectional view taken along the line 9—9 of FIG. 8;

FIG. 10 is a fragmentary sectional view of the target taken along the line 10—10 of FIG. 8;

FIG. 11 is an enlarged fragmentary view of the target attachment means of FIG. 8;

FIG. 12 is a fragmentary sectional view taken along the line 12—12 of FIG. 11;

FIG. 13 is a fragmentary sectional view of the target attachment means as it passes over the sheave of FIGS. 4 or 5;

FIG. 14 is a view showing the take-up wheel as viewed in the direction of the arrow 5 of FIG. 1;

FIG. 15 is a fragmentary sectional view taken along the line 15—15 of FIG. 14;

FIG. 16 is a view of the drive mechanism and is taken in the direction of the arrow 16 of FIG. 1;

FIG. 17 is a wiring diagram of a control system for the invention;

FIG. 18 is a perspective view of a target-loading means; and

FIG. 19 is a fragmentary view taken along the line 19—19 of FIG. 18.

Referring particularly to FIGS. 1 and 2 the invention is illustrated as including a terraced shooting range 20 constructed in a canyon extending generally forward of a shooting station 22, the canyon being provided with lateral terraces 23 transverse to the shooting axis A—A of FIG. 1. The terraces 23 provide shooting runs 25 extending between side walls 26 and 27 of the canyon between guide stations 28 and 29 thereon, preferably in a rising zig-zag pattern starting at the lowest guide station 29′ and ending at the highest guide station 29″. In the preferred practice the distance between the lowest and highest guide stations 29′ and 29″ may be 100 yards or more and the shooting runs may be of a length in the neighborhood of about 50–100 feet. The terraces 23 may rise from the shooting station 22 but it is often preferred to have some of the terraces below and above the level of the shooting station to give practice in the downhill and uphill shooting at moving targets.

At each guide station 28 and 29 is positioned a guide wheel 30 suitably inclined to receive a flexible target-carrying cable 32 supported by the guide wheels and having portions thereof extending along the shooting runs 25 in the zig-zag pattern thereof and in the path of bullets shot from the shooting station 22. The cable 32 is continuous and returns to the vicinity of the shooting station 22 to extend around a large drive wheel 34 that is driven by a drive unit 35 constituting a drive means for intermittently advancing the cable. There is a target inspecting or replacing station 36 near the drive wheel 34 and the shooting station 22.

Each guide wheel 30 is preferably back of a barricade 38 protecting it from bullets from the shooting station 22 and concealing targets, to be described, when the cable is at rest position. These barricades may be a part of the canyon walls 26 and 27 or may be screens or shields at-

tached thereto, depending upon the terrain. It is preferred that the shooting runs **25** should be of equal length, as will be the case if successive guide stations are spaced equal distances from each other.

As best shown in FIGS. 4–6 each guide wheel **30** may be a bicycle wheel with a wide circular flange **40** of V-shaped cross section welded to the periphery thereof. The wheel may be supported between the arms of a fork **42** having a shaft **43** attached to an anchor post **44** as by straps **45**. To hold the wheel **30** in the proper angled relation a bolt **46** may be welded thereto and passed through the post **44**. If necessary, arms **47** and **48** connected respectively to the fork **42** and the post **44** may meet beyond the periphery of the wheel and be joined by a bolt **49** which journals a sheave **50** functioning to aid in guiding the approaching cable into the V-shaped groove provided by the flange **40** of the wheel. To serve this function the sheave **50** will ordinarily be journalled on an oblique axis as shown.

At one or more of the guide stations **28** the corresponding guide wheel **30** is biased to keep the cable **32** taut and compensate for expansion and contraction thereof. It is preferable that the biased wheel **51** be at the uppermost or lowermost guide station, the former being illustrated. FIGS. 14 and 15 illustrate a weighted biasing means including opposed V-shaped tracks **52** having rollers **53** journalled on pins **54**. The members **52** may be angle irons spaced by spacing strips **55** and mounted to posts **44** and **44'** by plates **56**. A carriage rolls in engagement with the rollers **53** and may comprise opposed V-shaped members **58** held apart and properly positioned by transverse members **59**. One of the wheels **30** is carried by the forward end of this carriage. A pulley **60** is mounted at the rear of the carriage on the post **44'** and receives a cable **61** attached to a heavy weight **62** which functions to maintain the main cable **32** taut.

The cable **32** provides target stations throughout its length, each adapted to receive an animal-silhouette target of the type to be described. These target stations are preferably spaced from each other a distance substantially equal to the length of each shooting run **25** so that the target stations reach the guide stations **28** substantially simultaneously. The return run of the cable **32** between the guide station **29'** and the drive wheel **34** is preferably a multiple of this spacing to present a target station and its target at the target inspecting station **36** near the drive wheel when other target stations are at the guide stations **28** behind the respective barricades **38**. New targets can be thus connected to the cable **32** at the station **36** during the time that other target stations are at rest behind the barricades **38**. The return run of the cable **32** can be supported at any convenient points by additional wheels **30'** as suggested in FIG. 2 and can be straight or zig-zag as desired. Alternatively it can be returned in a single catenary as suggested in FIG. 1.

A target-attachment means is attached to the cable at each target station and is adapted to suspend a target **65** therefrom. This target can be hung freely from the target-attachment means but is preferably guided at a lower position by a guide means directly beneath the cable. This guide means may comprise any suitable track means or guide element but is shown as including a stationary guide cable **66** (FIGS. 3, 8 and 9) anchored to posts **68** through hook-shaped members **69** permitting a wheel **70** of the target to ride therebeneath. It is preferred to maintain the guide cable **66** and the posts **68** out of the range of bullets from the shooting station **22**. In this connection it is preferable that each terrace **23** should be provided with a forward barrier or mound **72** spaced from an upright bullet-stopping wall **73** forming the back wall of each shooting run **25** so that the guide cable **66** and its supporting structure can be disposed in a trench **74** (FIG. 9). If the posts **68** are made of different length or if the trench **74** is undulating the guide cable **66** can be shaped in an up-and-down or zig-zag pattern. With the target system to be described this will cause the target to raise and lower in conformity with the contour of the guide cable as the target moves along the shooting run. By appropriately shaping the guide cable in an upright zig-zag pattern the animal silhouette on the target will appear to jump from position to position. With other patterns of the guide cable the animal silhouette will appear to leap periodically with intervening horizontal movement simulating running.

One type of target-attachment means, indicated by the numeral **75** of FIG. 11 includes a band-type fastener **76** surrounding the cable **32** and one end of an attachment member **77**, being crimped against both members by a conventional crimping tool. The target **65** hangs from a pair of such attachment members and is removably connected thereto by any suitable means. If provision is to be made for up and down movement of the target **65** relative to the main cable **32** an expansible spring **79** joins each attachment member **77** to a frame of the target. As exemplified in FIGS. 8–12 each attachment member **77** may provide a ring **80** through which the upper hook of the spring **79** can be passed. A hook at the lower end of the spring passes through an opening of a bracket **82** which may have an arm **83** passing through a portion of the target frame, e.g. through a portion of a rear frame member **85** extending above the front frame member **86** of the target frame, see FIG. 10. A cotter pin **87** may extend through the arm **83** to permit easy attachment and detachment to the bracket **82** when it is desired to attach or detach a new rear frame member.

Each target **65** is preferably of the sandwich type and may be constructed as follows. Front and rear sheets **90** and **91** of cheesecloth or other bullet permeable material are tacked, stapled or otherwise connected to the top and bottom horizontal bars of the front frame member **86**. An animal outline, in silhouette, or otherwise, is painted or otherwise marked on each of the sheets **90** and **91**, the outline on each member being directly superimposed in relation to the outline on the other sheet. If a deer silhouette **92** is thus applied the deer will appear to be running forwardly whether the target is advancing from left to right along one shooting run **25** or from right to left on the succeeding run.

With the sheets **90** and **91** thus attached to the front frame member **86** the latter can be removably connected to the rear frame member **85** in any suitable manner. As shown, the bottom bar of the front frame member **86** drops behind corner brackets **93** carried by the lower corners of the rear frame member **85**, providing a drop-in or hinge-type attachment. The top bar of the front frame member **86** may be connected to the top bar of the rear frame member **85** by any quick-attachment means. This is shown as including an L-shaped bolt having one leg **95** lying in a slot at the rear of the top bar of the rear frame member **85** and having a threaded leg **96** extending through a vertically flaring slot **97** of this top bar and through a vertically open slot **98** of the top bar of the front frame member **86**. A wing nut **99** engages the latter and when loosened permits the leg **96** to be swung upward sufficient to displace the leg from the vertically open slot **98**, thus releasing the front frame member **86** to swing forward preparatory to lifting it from the corner brackets **93** with the sheets **90** and **91** attached.

The lower bar of the rear frame member **85** has attached depending arms **100** meeting in a plate **101** carrying a pin to which the wheel **70** is journalled. As the guide cable **66** moves the wheel downward the target follows this motion, as permitted by the expansion of the spring **79** which biases the wheel **70** into upward engagement with the guide cable at all times. For purpose of stability it is desirable to employ two spaced springs **79** and a single wheel **70** for each target frame.

With the arrangement thus far discussed it will be apparent that a marksman can shoot at the same target a plurality of times when in succeeding shooting runs at

progressively further distances away, also that the deer silhouette will appear to be running or leaping first in one direction and then in the other. Bullets may thus traverse the target from either side. The sheets **90** and **91** are such as to be readily penetratable by a very large number of bullets without tearing or disintegrating.. If the marksman is to be given a record of the accuracy of his successive shots a sheet **103** of paper may be held removably between the sheets **90** and **91** as will be later described. When the target is at the station **36** such a sheet can be withdrawn and handed to the marksman. Bullets can be color coded to match the different shooting runs and thus leave color markings on the sheet **103** indicative of the shooting accuracy at different distances from the marksman.

The main or drive cable **32**, while small, offers the remote possibility of being severed by a bullet. It is desirable to construct the system so that any bullet severing this cable or breaking the bars of the rear frame member **85** will still be returned to the target-attachment station near the drive wheel **34** for repair without shut-down of the system to avoid the making of repairs in the area where the mishap occurred. Should a bullet sever one of the springs **79** the corresponding target would remain supported by the other spring and will usually return to the drive wheel without difficulty. In target systems in which the guide cable **66** undulates severely and where severance of one spring might cause such tipping of the target frame as would release the wheel **70** from the guide cable **66** a supplementary support adjacent each spring can be employed. By way of example a safety cable **105** may be loosely looped within each spring **79** with its end loops encircling the same elements as the hooked ends of the spring. The safety cable **105** when taut maximizes the degree to which the target frame can tip. Alternatively or in addition a safety cable **106** may be connected directly between the rear frame member **85** and another atachment member **77'** close to the spring, this cable being looped or loosely coiled so that it maximizes the tip of the target frame when taut. The safety cables **105** and **106** also function to maximize the downward movement of the target frame even if the springs **79** are intact thus preventing any permanent deformation thereof. Additionally the taut safety cables **105** and **106** may be of such length as to pull down the main cable **32** at the extreme low points of the guide cable **66** in which event the increased tension in the main cable adds to the forces exerted by the springs in holding the wheel **70** against the guide cable.

To take care of the situation where a stray bullet might sever the main drive cable **32** we find it desirable to double the cable support at least in the target regions. This is preferably accomplished by employing a short length of supplementary cable **32'** extending throughout the target region and attached to the main cable **32** beyond the ends of such region as by crimp-type fasteners **108** (FIG. 8) similar to the fasteners **76** previously described. Means is preferably provided for separating the supplementary cable **32'** from the main cable **32** by at least a bullet's width, preferably at least one-half inch, in the vicinity of the target frame so that no bullet can sever both cable portions. This means may be incorporated in the attachment members **77** and **77'** as by passing the supplementary cable **32'** through a loop **109** thereof and crimping this loop against the supplementary cable. Should the main cable **32** or the supplementary cable **32'** be severed by a bullet the continuity of the cable would be maintained by the unsevered portion so that the target and the severed portions could be returned to the target-inspection station for repair. The use of the spaced supplementary cable **32'** presents a minor problem as concerns preventing dislodgement of the cable from the guide wheels **30** as the double-cable portion enters the V-shaped peripheral groove formed by the flange **40** thereof. However this can be solved by making this groove of sufficient width to receive the double-cable portion. FIG. 13 illustrates the orientation of the attachment member **77** and the connected cables as they pass over the sheave **50** if the latter is used to guide the cable into the V-shaped groove of the guide wheel.

It is preferred to drive the cable **32** intermittently and to stop it at such position that all of the active targets are simultaneously behind the respective barricades **38**. It is desired also to accelerate the targets rapidly and move them at a fast rate along the respective shooting runs **25**. A drive means suitable for this purpose is suggested in FIG. 16 and 17 although others will be apparent to those skilled in the art. Referring particularly to FIG. 16 the drive wheel **34** is at the top of a derrick type framework **112** firmly anchored to the ground at a control station of the moving-target system. It is mounted on a shaft **113** which is in turn connected by a gear box **114** to a horizontal drive shaft **115** of the drive unit **35**. An electric motor **116** is commonly used to drive the system, being connected to the shaft **115** by a belt **117** or otherwise. Should there be any failure of electric power or in instances where such power is not available the driving force can be supplied by an internal combustion engine **120** equipped with a carburetor having a throttle control **122** and a clutch having a clutch control **123**. These controls can be interconnected by any suitable linkage, indicated by the dotted line **124**, to engage the clutch and increase the engine speed upon advancement in one direction of an operating arm **125** connected to the clutch control **123** or the linkage **124**. Through a linkage **127** this movement releases a brake **128**, which can be actuated upon reverse movement of the arm **125** to aid in the rapid deceleration of the targets when back of the barricades. The same braking action can be utilized when employing the electric motor as the driving device, the transmission **129** of the engine being disengaged, but it is preferred to use a motor **116** with a magnetic brake to serve this function.

The motor **116** can be controlled manually through a suitable switch to give the desired intermittent movement of the cable. In other instances it is desirable to cycle the system automatically and stop the cable when the active targets are back of the barricades and the home target is at the target-inspection station **36** for replacement or inspection. The stop time will ordinarily be at least several seconds and will usually be between about 10 seconds and 40 seconds to give sufficient time for inspecting or replacing the target and to give the marksman sufficient time for reloading preparatory to his next shot.

Various automatic control systems and timers can be employed in this connection, one possible arrangement being diagrammatically shown in FIG. 17. Here the electric motor **116** is energized from a line comprising conductors **135** and **136** through a magnetic contactor **137** which closes upon energization of its control winding **138**. With the contactor in the open position as shown, the main contacts are open and an auxiliary contact arm **140** engages a contact **141**. When the control winding **138** is energized the main contacts connect the motor **116** directly to the line and the auxiliary control arm **140** moves to the left to engage a contact **142**. Upon closing of a master switch **144** a circuit is completed from the line conductor **135** through the control winding **138**, a resistor **145**, an initially-closed pallet switch **147** of a timer **150** and through the contact **141** and auxiliary contact arm **140** to the line conductor **136**. This closes the main contacts of the contactor **137** and moves the auxiliary contact arm **140** into engagement with the contact **142** which completes a holding circuit extending from the conductor **135** through the control winding **138**, the now-closed master switch **144**, a normally-closed cable operated switch **153**, an actuating winding **154** of the timer **150**, the contact **142** and the auxiliary contact arm **140** to the line conductor **136**. The circuit as thus far described is essentially a conventional contactor with the

normally closed pallet switch 147 in the starting circuit and the actuating winding 154 and switch 153 in the holding circuit. The resistor 145 is of substantially the same impedance as the actuating winding 154 so that the voltage across the control winding 138 is the same regardless of the path of the current through the two circuits.

Energization of the motor 116 moves the cable 32 in the direction of the arrow of FIG. 17 until the targets respectively approach or are concealed by their barricades 38. The cable-operated switch 153 opens momentarily at this time to de-energize the holding circuit and open the contactor 137. Any suitable cable-operated switch 153 may be employed. It should be opened at such time that the targets will coast or be braked to a stationary position behind the barricades. In the arrangement shown a minor obstruction, illustrated as an actuator 155, is connected to the cable 32 in predetermined relationship with each target station. These actuators are thus spaced along the cable distances equal to the target spacing. As one of the actuators 155 approaches a switch arm 156 of the normally-closed cable-operated switch 153 it momentarily deflects the switch arm against the action of a compression spring 157 and momentarily opens the switch 153 as the actuator 155 passes beyond the arm 156. This momentary opening of the switch 153 de-energizes the holding circuit and opens the contactor 137 to stop the motor 116. If desired the motor may be equipped with a magnetic brake to decelerate more rapidly the cable and its targets.

The timer 150 may be any device which will later energize the control winding 138 after a predetermined but preferably adjustable time interval. It may be any timing switch, thermal relay, etc. serving this function but is illustrated as a dash-pot-controlled switch closing its contacts, incorporated in the pallet switch 147, after an adjustable time following interruption of the holding circuit. In this connection the switch is shown very diagrammatically as including a rod 160 interconnecting the pallet of the switch 147 and a dash-pot piston 161. Rapid rise of this piston in a cylinder 162 is permitted by rapid escape of air or other fluid through a release valve 163. Downward movement of the piston 161 under the action of its weight or any suitable biasing means is retarded by the use of an adjustable needle valve 164 restricting the inflow of air or other fluid to the cylinder in a well known manner. The rod 160 has an armature portion 165 which is drawn quickly upward into the coil formed by the actuating winding 154 when the aforesaid holding circuit is completed. This movement opens the pallet switch 147 and holds it open throughout the time that the holding circuit is complete and the targets are moving. However the cable-operated switch 153 is connected in series with the actuating winding 154 and de-energizes same as it interrupts the holding circuit to stop the targets. The piston 161 then lowers at a slow rate depending upon the setting of the needle valve 164 and closes the pallet switch 147 after a predetermined time. This again completes the start circuit of the contactor 137 and starts the motor 116 even though the switch 147 remains closed only until the holding circuit is energized, being held open throughout the time that the targets are moving.

The time delay of the timer 150 can be set to correspond with the average time required to inspect or replace the home target at the target inspection station 36 or a time required for the marksman to reload. Should these events be concluded earlier the movement of the cable and its attached targets can be started earlier and manually by momentarily depressing a supplementary start switch 169 connected in parallel with the switch 147. This will energize the start circuit, just as did the initial closing of the master switch 144.

The preferred target system and the method of loading same are best shown in FIG. 18, which illustrates the front frame member 86 and its front and rear sheets 90 and 91 with their deer silhouettes 92 and with their top and bottom edges attached to the frame member to leave an open-ended passage 168 for receipt of the paper sheet 103. The frame member 86 is shown as resting on a table 170 in accurately located position by fitting between stops 171 of a locating bar 172. At one end of the table 170 is mounted a roll 174 from which paper may be unrolled and moved through the open-ended passage 168, being then cut to form the sheet 103 of FIG. 10. To draw the paper through the passage 168 a pull bar 176 is passed therethrough. This bar has diverging arms 177 joined by a transverse bar 178 around which the paper is looped and held in place by any suitable means such as a spring-loaded bar or spring 180 attached at its ends to the ends of the transverse bar 178. If the pull bar 176 is drawn to the right the paper will be drawn into and along the open-ended passage 168 to lie between the two sheets 90 and 91 and the deer silhouettes 92 thereon. The paper is then released from the cross bar 178 and is severed from the roll 174 to form the sheet 103.

It is possible to imprint upon the rolled paper deer silhouettes corresponding to those on the target and to pull the paper to a position in which all of the silhouettes are in alignment. It is preferred however to employ unmarked paper and to perforate same in the outline of the deer silhouette 92 when in position between the sheets 90 and 91. To accomplish this we hinge a perforating plate 183 to the locating bar 172 and extend nails 184 through this plate in the outline of the deer silhouette. As the perforating plate 183 is swung toward the frame member 86 the nails pass through the sheets 90 and 91 and perforate the sheet 103 therebetween in the exact outline of the deer silhouette.

After the composite target has traversed the shooting range the sheet 103 is pulled from the target at the station 36 and handed to the marksman. The bullet holes therein will show the accuracy of his shots in direct relation to the perforations outlining the deer silhouette.

It will be recognized that the showings of the application are exemplary and will suggest various changes and modifications to those skilled in the art and which fall within the scope of the appended claims.

We claim as our invention:

1. A moving-target system for shooting practice from a shooting station, including in combination:

a shooting range terraced upwardly in a direction away from said shooting station along a longitudinal shooting axis extending between the lower and upper portions of said range, said shooting range having on opposite sides of said axis guide stations at progressively higher elevations joined by shooting runs of substantially equal length arranged in a rising zig-zag pattern toward the top of said range, said terraced shooting range providing an upright bullet-stopping wall at the rear of each shooting run;

a plurality of guide wheels respectively at said guide stations;

a continuous cable extending around said guide wheels and along said shooting runs in said zig-zag pattern thereof, said cable having target stations therealong spaced equally from each other a distance substantially equal to the length of each shooting run;

a target attachment means attached to said cable at each target station;

a target removably connected to each of said target attachment means;

a barricade at each guide station forwardly of the corresponding guide wheel and of sufficient height to conceal from view a target at said guide station; and

drive means for driving said cable to bring said targets simultaneously to said guide stations, said drive means including means for intermittently moving said cable and for stopping same at positions in

which said targets are respectively concealed behind said barricades.

2. A moving-target system as defined in claim 1 in which said guide wheels are grooved, and including a sheave engaging said cable and said target attachment means, and an arm means mounting said sheave adjacent the periphery of a corresponding grooved guide wheel to turn about an axis oblique to the rotational axis of said guide wheel to guide said cable and an approaching target attachment means into the groove of said guide wheel.

3. A moving-target system for shooting practice from a shooting station, including in combination:

a shooting range extending from said shooting station along a shooting axis;

grooved guide wheels on opposite sides of said shooting axis at progressively greater distances from said shooting station, there being equal-length shooting runs between said guide stations;

a continuous drive cable extending around said guide wheels with suspended portions of the cable extending along said shooting runs in the path of bullets shot from said shooting station, said drive cable having target stations therealong spaced equally from each other a distance substantially equal to the length of each shooting run;

a target attachment means carried by said cable at each target station thereof;

a target connected to each target attachment means; and

drive means for said cable including means for stopping the movement of said cable at positions in which said targets are respectively adjacent said guide wheels.

4. A moving-target system as defined in claim 3 in which said cable moves past a control station and in which said means for stopping the movement of said cable at said positions includes a plurality of actuators connected to said cable at points spaced equal distances from the respective targets, and means at said control station engageable by such actuators to stop said drive means at said positions.

5. A moving-target system as defined in claim 4 including means for starting said drive means a predetermined adjustable time after said stopping thereof by one of said actuators.

6. A moving-target system as defined in claim 4 in which said drive means includes an electric motor, a magnetic contactor through which said motor is energized, said contactor having a start circuit and a holding circuit, a cable-operated switch in said holding circuit having an actuating means at said control station in the path of movement of said actuators to de-energize said holding circuit as an actuator passes said cable-operated switch, timing means including a switch in said starting circuit, and means for closing said last-named switch to start said motor a predetermined time after interruption of said holding circuit by said cable-operated switch.

7. A moving-target system for shooting practice from a shooting station, including in combination:

a shooting range extending from said shooting station along a shooting axis;

grooved guide wheels on opposite sides of said shooting axis, there being a shooting run between said guide stations;

a continuous drive cable extending around said guide wheels with a suspended portion thereof extending along said shooting run in the path of bullets shot from said shooting station, said cable having two vertically spaced cable portions at each of a plurality of target stations therealong;

a target attachment means carried by said cable at each target station and connected to both of the vertically spaced cable portions at such target station;

a target carried by each target attachment means; and

means for advancing said drive cable.

8. A moving-target system as defined in claim 7 in which said vertically spaced cable portions comprise a portion of said drive cable, a short length of supplementary cable at each target station and means for connecting said supplementary cable to said drive cable in vertically spaced relation therewith, said target-attachment means being fixedly attached both to said drive cable and to said length of supplementary cable.

9. A moving-target system for shooting practice from a shooting station, including in combination:

a shooting range extending from said shooting station along a shooting axis;

grooved guide wheels on opposite sides of said shooting axis at progressively greater distances from said shooting station, there being equal-length shooting runs between said guide stations;

a continuous drive cable extending around said guide wheels with suspended portions of the cable extending along said shooting runs in the path of bullets shot from said shooting station, said cable having target stations therealong spaced equally from each other a distance substantially equal to the length of each shooting run;

a target attachment means carried by said cable at each target station;

means for suspending targets from said target attachment means, said means for suspending said targets from said target attachment means including a spring means connecting the top of each target to a corresponding target attachment means to permit vertical movement of said target relative to said drive cable upon elongation and contraction of said spring means, and means connected to said target for raising and lowering it against the action of said spring means during advancement of said target along said shooting runs; and

means for advancing said drive cable.

10. A moving-target system for shooting practice from a shooting station, including in combination:

a shooting range extending from said shooting station along a shooting axis;

grooved guide wheels on opposite sides of said shooting axis at progressively greater distances from said shooting station, there being equal-length shooting runs between said guide wheels;

a continuous drive cable extending around said guide wheels with suspended portions of the cable extending along said shooting runs in the path of bullets shot from said shooting station, said drive cable traversing said shooting range in a to-and-fro pattern determined by the sizes and positions of said guide wheels, said cable having target stations therealong spaced equally from each other a distance substantially equal to the length of each shooting run;

a target attachment means carried by said cable at each target station;

a stationary guide element and means for fixedly mounting same in said pattern at a position below said drive cable, said guide element providing angled portions sloping upwardly and downwardly with respect to corresponding superimposed portions of said drive cable;

guide members movable along said guide element;

resilient means for suspending targets from said target attachment means and means for connecting said targets respectively to said guide members, said guide members and said target suspending means retaining said targets in upright position in the space between said drive cable and said guide element, each target moving up and down in correspondence with

the angled portions of said guide element during advancement along the corresponding shooting run; and

means for advancing said drive cable.

11. A moving-target system as defined in claim **10** in which said stationary guide element is a guide cable, and in which said fixedly mounting means includes supports fixed to said guide cable at spaced positions to provide unsupported sections therebetween, at least some of said unsupported sections comprising said sloping portions, each guide member comprising a wheel rolling along the underside of said guide cable.

12. A moving-target system for shooting practice from a shooting station, including in combination:

a shooting range having at least one shooting run traversing a shooting axis;

guided wheels at opposite ends of said shooting run;

a drive cable extending around said guide wheels, said cable having target stations therealong;

a target attachment means carried by said cable at each target station;

a plurality of target frames each having upper and lower portions;

resilient suspension means between said target attachment means and the upper portions of said target frames suspending said frames from said target attachment means for vertical movement with respect to said drive cable upon expansion and contraction of said resilient suspension means;

a wheel carried by the lower portion of each target frame;

a guide cable;

posts mounting said guide cable along said shooting run below said drive cable in an up-down pattern with at least one interpost portion of said guide cable sloping upward toward said drive cable and at least one interpost portion of said guide cable sloping downward away from said drive cable, said posts presenting the lower surface of said guide cable for engagement by said wheels, each wheel engaging said lower surface of said guide cable under the resilient upward force exerted on said frame by the corresponding resilient suspension means; and

means for driving said drive cable to move said target frames forwardly along said shooting run, each target frame rising and falling during such forward movement as its wheel rolls along and follows the slopes of said guide cable.

13. A moving-target system as defined in claim **12** in which said resilient suspension means includes a spring suspending said frame from said target attachment means, and including a flexible cable between the upper portion of the corresponding target frame and the corresponding target attachment means, said flexible cable maximizing the elongation of said spring and being of a length greater than the spring length when the spring is contracted.

14. A moving-target system for shooting practice from a shooting station, including in combination:

a shooting range having at least one shooting run traversing a shooting axis;

guide wheels at opposite ends of said shooting run;

a drive cable extending around said guide wheels, said cable having target stations therealong;

two target attachment members carried by said cable at each target station and spaced from each other longitudinally of said drive cable;

a target frame for each target station each target frame having upper and lower frame members joined by side frame members;

two suspension members having upper ends respectively connected to said two attachment members and lower ends connected to said upper frame member of said target frame at longitudinally spaced positions;

pull exerting means including a guide member below said drive cable and means below the lower frame member of said target frame connecting such lower frame member and said guide member exerting a downward pull on said lower frame member, said target frame being tensioned between said two suspension members and said pull-exerting means, said target remaining suspended between one of said suspension members and said pull-exerting means should one of such suspension members be severed by a shot;

a bullet penetrable target sheet carried by said target frame and bearing a target outline; and

means for driving said cable to advance said target frame and its target sheet along said shooting run.

15. A moving-target system for shooting practice from a shooting station near a target-replacing station, including in combination:

a shooting range extending from said shooting station along a shooting axis;

a plurality of grooved side wheels on opposite sides of said shooting axis at progressively greater distances from said shooting station;

a continuous drive cable extending around said guide wheels in a zig-zag pattern with suspended portions of the cable extending along transverse equal-length shooting runs in the path of bullets shot from said shooting station, said cable having target stations therealong spaced equally from each other a distance substantially equal to the length of each shooting run, a portion of said continuous cable passing said target-replacement station near said shooting station, said target-replacing station being at such location that a target station is at such target-replacing station when other target stations are respectively near corresponding side wheels;

target attachment means connected to said cable at each target station;

a target frame and means for connecting same to the target attachment means at a corresponding target station;

means for intermittently driving said drive cable and for stopping same when a number of said target stations are respectively near corresponding side wheels and another target station is at said target-replacing station, said drive means advancing each target frame along said shooting runs in sequence to present opposite sides of said target frame to said shooting station during movement along successive shooting runs; and

a bullet penetrable target sheet carried by said target frame and bearing a target outline.

16. A moving-target system for shooting practice from a shooting station, including in combination:

a shooting range terraced upwardly in a canyon in a direction away from said shooting station along a longitudinal shooting axis extending between the lower and upper portions of said range, there being guide stations on opposite sides of said canyon at progressively higher elevations joined by shooting runs of substantially equal length arranged in a rising zig-zag pattern toward the top of said range, each shooting run being bounded rearwardly by an upright bullet-stopping wall and forwardly by a mound, there being a trench between said mound and said bullet-stopping wall;

barricades at each of said guide stations;

a plurality of guide wheels respectively back of said barricades at said guide stations;

a drive wheel near said shooting station;

a continuous drive cable extending around said drive wheel and around said guide wheels and along said shooting runs in said zig-zag pattern thereof; said cable having target stations therealong spaced equally from each other a distance substantially equal to the length of each shooting run;

a stationary continuous guide cable below and in the same pattern as said drive cable, said guide cable having portions within the trenches of said runs;

posts in said trenches supporting said portions of said guide cable in an upright zig-zag pattern so that some interpost portions angle toward said drive cable and other interpost portions angle downward therefrom;

a plurality of double-faced targets each including a frame;

means for resiliently suspending each target frame from said drive cable at a corresponding target station;

arm means extending downward from each target frame into said trench, said arm means carrying a wheel engaging the lower surface of said guide cable and held resiliently in contact therewith by said resilient suspension means, said resilient suspension means permitting rise and fall of the corresponding target

frame to follow the up and down movement of said wheel as determined by the sloping interpost portions of said guide cable;

drive means for said drive wheel; and

means for automatically stopping said drive means when said targets are back of said barricades.

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