Sept. 7, 1943. H. C. FOSTER 2,328,796

SELF-ANGLING TARGET TRAP

Filed Aug. 3, 1940 3 Sheets-Sheet 1

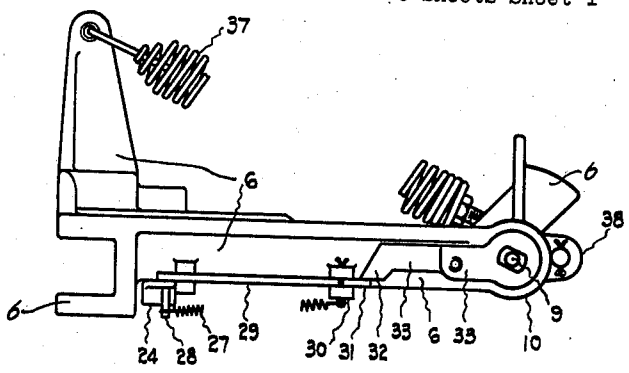


FIG. 2

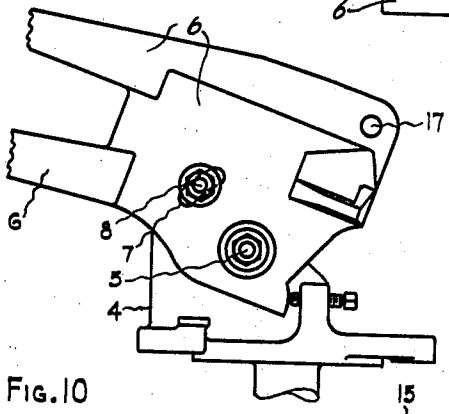


FIG. 10

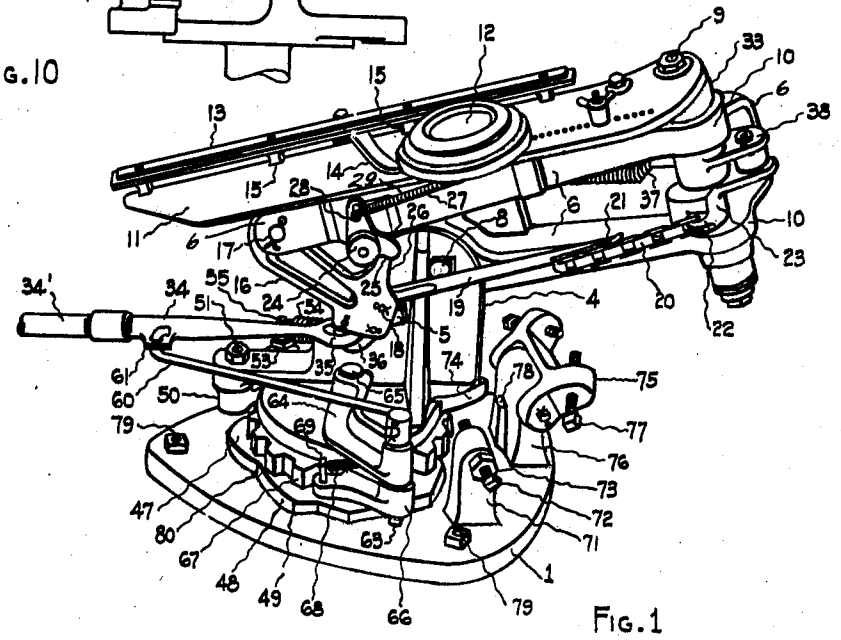


FIG. 1

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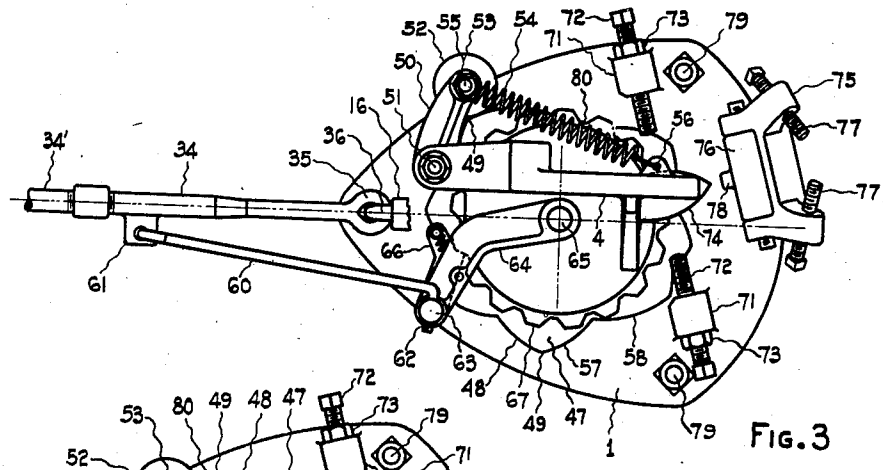


FIG. 3

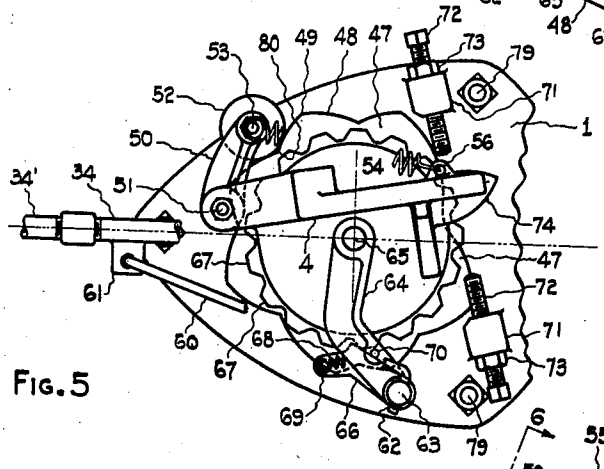


FIG. 5

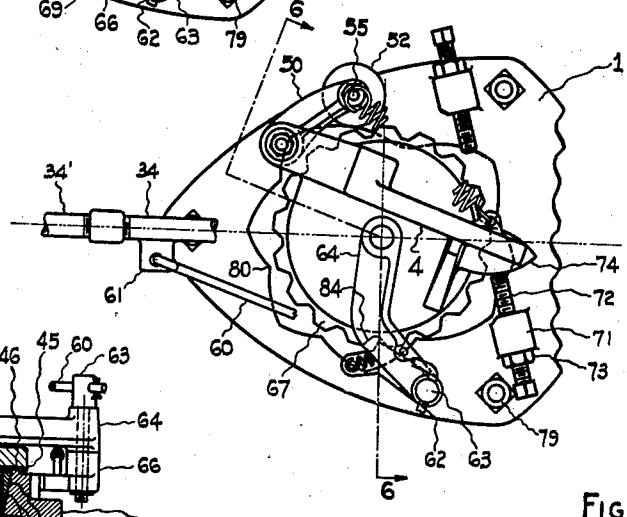


FIG. 4

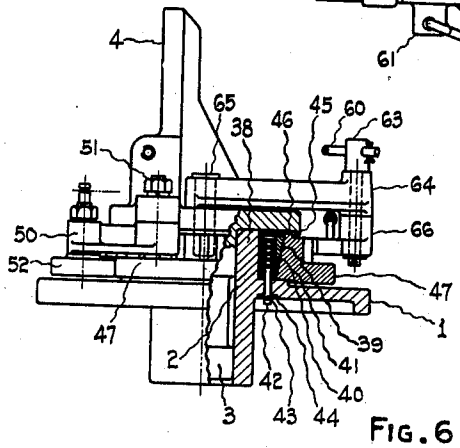


FIG. 6

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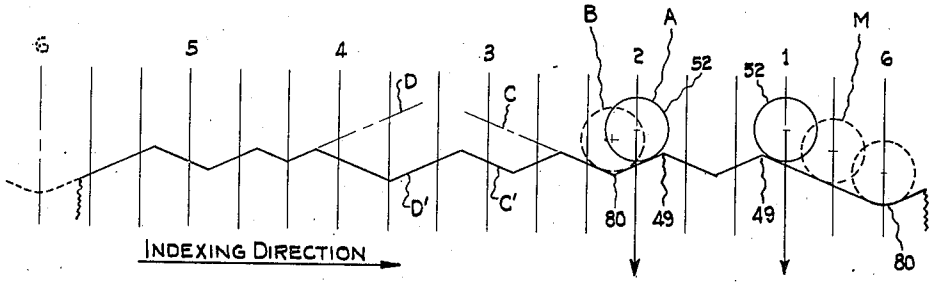


FIG. 7

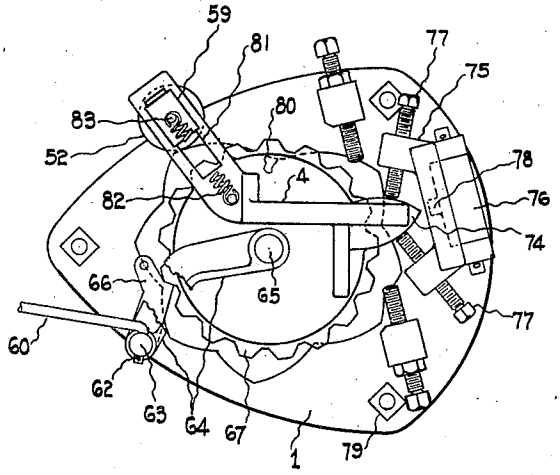


FIG. 8

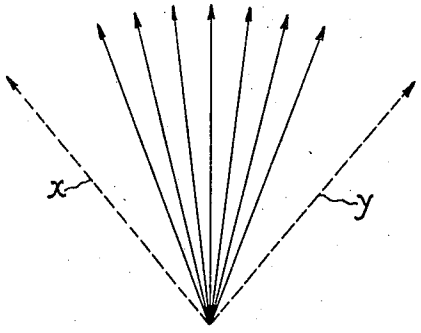


FIG. 9

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UNITED STATES PATENT OFFICE

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SELF-ANGLING TARGET TRAP

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Application August 3, 1940, Serial No. 350,416

10 Claims. (Cl. 124—9)

This invention pertains to target traps, such as are used for throwing targets known as clay pigeons, and more particularly to target traps adapted to vary automatically the throwing angle.

In order to test the skill of marksmen engaged in the sport of shooting targets of the clay pigeon type, it is desirable that the selection of the direction of flight of successive targets be removed from the influence and judgment of the trap operator and be concealed from the shooter until the target leaves the trap on its flight over the shooting area. Traps have been constructed which automatically change the direction in which the target is launched. In most of these traps, the target launching direction is selected in an indeterminate manner. Some of these traps employ a chance wheel for this purpose and others depend upon the random motion of certain of the trap elements themselves or of mechanisms other than chance wheels to effect an indeterminate selection of the target launching direction. All of these devices are subject to the defect that the distribution of targets over the flight zone is not or cannot be balanced evenly. As a consequence, some of the shooters will have an advantage over others in that the former will have more targets concentrated in a given section of the flight zone while the latter may have targets distributed widely over the entire flight zone. This condition not only results in an unequal testing of the skill of respective shooters but is a source of great dissatisfaction among shooters generally. Uniform distribution of targets over the whole of the flight zone in directions unpredictable for respective targets by the shooters would be the most desirable combination for the game of trap shooting and the new game known as "grouse." Prior devices have failed to provide this combination. Those which depend for direction change upon a certain cycle have the defect that an experienced marksman working with a given trap is often able with little effort to learn the sequence of directions peculiar to that trap. This enables him to predict with some degree of certainty the direction in which the next target is to be launched, affording him thereby an advantage over competitors.

In those prior art traps which vary automatically the throwing angle, the trap mechanism is moved from one target launching position directly to the next position. This arrangement has in most instances necessitated an intricate and massive combination of many elements and has resulted in a trap possessing limited possibilities for adjustment and for adaptation to specific shooting conditions.

In many of the prior art traps, the support for the target throwing mechanism is yieldingly maintained in one direction against the action of an angle changing mechanism. This gives rise to a predominance of angle change positions in one direction of movement of the target throwing mechanism and a scarcity of such positions in the opposite direction, resulting thereby in an unbalanced distribution of target launching positions.

In general, the traps of the prior art which automatically vary the target throwing angle are lacking in simplicity and ruggedness of construction, and in versatility of performance.

One of the objects of this invention is to provide a target trap with means for varying the direction of throw such that this variation involves the selection of the direction of flight of successive targets with a maximum of variety in this respect over substantially the entire flight zone in a balanced but not readily predictable sequence for one shooter or a plurality of successive shooters.

One of the objects of this invention is to provide a target trap with means for varying the direction of flight of successive targets such that the targets will be directed over the entire flight zone in a balanced distribution for a number of successive targets launched.

Another object of this invention is to provide a target trap with means for establishing a series of target launching directions in a thoroughly mixed sequence which in itself is exceedingly difficult to predict and equally difficult to follow over a substantial period of operation of the trap.

Another object of this invention is to provide simple and novel means whereby a spindle and trap frame mounted thereon are brought into alignment with the operating rod concomitantly with the resetting of angle selecting means whereupon means in cooperation with said spindle and said angle selecting means are provided with a turning moment to subsequently rotate said spindle to a definite position determined by the position of the angle selecting means.

Another object is to provide a target trap with means for selecting target launching positions and means cooperating therewith but independent of the throwing means for causing the target throwing means to assume said positions.

Another object is to provide in a target trap

a constant length of operating stroke for all operations in order to prevent variations in cocking load, to avoid signals to the operator resulting from variations in length of stroke and in cocking load and to insure equal indexing of angle selecting means.

Another object is to provide angle changing means which imposes a torque upon the sub-base to cause it to rotate either clockwise or counterclockwise depending upon the position of the angle selecting means.

Another object is to provide a target trap with an angle changing mechanism in which the pawl indexes the angle selecting unit on the rearward or cocking stroke rather than on the return stroke to the firing position to avoid obscuring the feel of resistance near the end of the latter stroke when the sear is contacted preparatory to moving the sear to release the throwing arm.

Another object is to provide a means for altering the extreme right and left target launching positions independently in order to correct for wind direction or to modify the spread of target launching directions without disturbing the sequence of positions or the balance of target distribution over the flight zone.

Another object is to provide a means for rendering the angle changing mechanism ineffective with respect to the target throwing mechanism without disconnecting the angle changing mechanism or disturbing the operation of the angle selecting mechanism, thereby affording a simple and effective method for locking the trap for initial setting of distance, elevation and direction of targets.

Another object is to provide means for locking the trap for the purpose of throwing two targets simultaneously in known directions and means in conjunction therewith for equalizing said known directions.

Another object is to provide a target trap of simple and rugged construction with a minimum of parts to effect an automatically varied throwing angle.

Another object is to provide an angle changing unit of simple and rugged construction with a minimum of parts to which may be attached a target throwing mechanism adapted for the purpose.

Further objects will appear from the following description taken in connection with the accompanying drawings in which:

Figure 1 is a perspective view of a target trap embodying this invention.

Figure 2 is a partial plan view showing the sear mechanism which retains the throwing arm and carrier in cocked position.

Figure 3 is a plan view showing the relative positions of the angle changing and the angle selecting mechanisms at the instant the trap is cocked.

Figure 4 is a plan view similar to Figure 4, showing the position of parts with the angle changed clockwise but limited in the amount of such change by abutment of the bracket against one of the angle limit screws.

Figure 5 is a plan view similar to Figure 4, showing the angle selecting and angle changing mechanisms in one of the counterclockwise positions within the limits of the angular spread.

Figure 6 is a rear view in part section on line 6—6 of Figure 4.

Figure 7 is a diagram of the periphery of the angle selecting cam surface opened into a linear form, showing the angle changing roller in start and finish positions of angles selected in Figures 3, 4 and 5.

Figure 8 is similar to Figure 3, showing a modified form of an angle changing roller guide.

Figure 9 is a diagram of the flight zone showing the distribution of balanced target launching positions.

Figure 10 is a part section showing a detail of the arcuate slot and bolt for pivotal adjustment of elevation.

In these drawings, 1 designates a base upon which the entire mechanism is mounted. This base is provided with a central bearing 2, in which is swiveled the spindle 3 of a bracket 4. The bracket 4 is thus enabled to rotate on the base 1. Pivoted at 5 on the bracket 4 is a support 6 for the target throwing mechanism of which one type is shown in Figure 1. The support 6 is provided with an arcuate slot 7 (Figure 10) engaging a bolt 8 on the bracket 4. This connection permits pivotal adjustment of the support 6 about the pivot 5 so as to adjust the vertical angle at which the target is launched.

In the target throwing mechanism shown in Figure 1, a shaft 9 is mounted in suitable bearings 10 at the upper end of the support 6. This shaft 9 carries at its upper end a target throwing arm 33 and carrier plate 11 of the type known as a shovel carrier. A target 12 is shown positioned on the carrier 11 in contact with a carrier rail 13 mounted on the carrier. The target is held in position against a target finger 14 mounted on the support 6 and extended through a slot formed by lugs 15 on the carrier plate 11 to which the carrier rail 13 is secured. A toggle 16 mounted at one end in a slot in support 6, to swing on a toggle shaft 17, is secured at its other end by a toggle pin 18 to a connector rod 19. A cocking chain 20, shown in slack condition in Figure 1, is attached at one end thereof to the end of the connector rod at 21 and at the other end thereof to a boss 22 on a chain drum 23. A trigger and shaft 24 are mounted on support 6. A lug 25 on the trigger is engaged by a lug 26 on the toggle 16 to actuate the trigger against the tension of a spring 27 mounted at one end to the support 6 and at the other end to a pin 28 in trigger 24. Pin 28 is fixed in the end of a sear bar 29 which is adapted to slide through a journal 30. The forward end or sear 31 of the sear bar engages an abutment 32 on an arm 33 fixed on the shaft 9 and to which the carrier plate 11 is secured. The engagement of the sear 31 with the abutment 32 locks the carrier plate 11 in position for subsequent discharge of the trap. A pipe connection 34 provided with an eye 35 is attached by means of a toggle loop 36 to the under side of the toggle 16. To pipe connection 34 is attached the operating pipe 34'. A strong spring 37 mounted on the support 6 is adjustably connected at its other end to a crank arm 38 on the shaft 9. This spring is adapted to tension the carrier plate 11 for rotary movement with the shaft 9 in order to launch the target. By pulling the operating pipe 34', the operator may tension the cocking chain 20 so as to rotate the shaft 9 in order to swing the carrier plate 11 rearwardly to its set position as shown in Figure 1 and at the same time stretch the spring 37. When the carrier plate 11 reaches its set position, the abutment 32 engages the sear 31 on the support 6 to retain the arm in set position. At this point, by pushing the operating pipe 34' toward the right in Figure 1, the toggle 16 contacts and actuates the trigger which in turn draws the sear

bar 29 to the left, thereby removing the sear 31 from its engagement with the abutment 32, whereupon the carrier arm 11 is released. The target throwing mechanism as described is not included in the present invention. Any suitable mechanism adapted for this purpose may be mounted upon the bracket 4.

The present invention is concerned with the self angling mechanism for selecting the direction of flight of targets and for launching successive targets in a balanced distribution over the entire flight zone. Mounted upon bearing 38, Figure 6, is a holding cone 39, fabricated of bronze or other metal or alloy or other material suitable for the purpose. The holding cone 39 is formed with an interior cylindrical surface and an exterior conical surface. Three holes are provided in the wall of the friction member 39 equally spaced parallel to the cylinder axis and counterbored from the large end of the friction member. Compression springs 41 are seated in these counterbores and are held under compression by holding cone pins 42 extending through each of the three holes in the holding cone and corresponding holes in the base 1. The holding cone pins 42, Figure 6, are secured in position by cotter pins 43 inserted through holes in the ends of said holding cone pins. Shallow counterbores 44 are provided on the under surface of the base, Figure 6, to receive the cotter pins 43, thereby insuring a uniform compression of spring length. Other suitable means for securing the holding cone pins may be provided, such as nuts or horseshoe washers. Rotation of the holding cone is prevented by the holding cone pins or by other suitable means such as keying the cone to the center bearing. The function of said holding cone 39 is to provide friction against the internal bearing surface of the angle selecting cam 47 substantially in excess of the torque created by the cam slope on the spindle through the medium of the roller and spring, thereby preventing rotation of the angle selecting cam except by the positive action of the indexing pawl 66.

The bearing 38, Figure 6, extends above the level of the top of the holding cone 39. The under side of the bracket 4 rests on the top of the bearing 38, clears the holding cone 39 and has a downward extending flange portion 45 which together with a raised flange 46 on the angle selecting cam wheel 47 forms a labyrinth to limit the access of grit and other foreign matter to the holding cone 39.

In an alternative embodiment of the holding cone 39, cavities may be formed in the interior cylindrical surface of the holding cone by removing a substantial portion of the material thereof except for those portions surrounding the three equally spaced counterbores 40, thereby providing surface contact between the holding cone and the bearing 38 at three equally spaced positions rather than over the entire surface of the bearing.

An angle selecting cam 47, Figures 1 and 3, comprising a number of cam lobes 48 with tips 49 thereof concentric to the center of the wheel but unequally spaced around the periphery of the cam wheel is mounted on base 1 for rotation against the friction of the holding cone. An angle changing arm 50 is pivoted at 51 on the bracket 4. At the opposite end of said angle changing arm 50 an angle changing roller 52 is rotatably mounted thereon by means of a stud 53. A spring 54 attached at 55 to the angle changing arm and at 56 to the bracket 4 enables the angle changing roller 52 to exert substantial pressure against the surface of the angle selecting cam 47. The pressure thus exerted causes said roller to move in a direction from a position A, Figure 7, on said cam toward position B on said cam, the direction of said motion being determined by the placement of the angle changing roller initially to the right or the left of one of the cam tips 49, Figures 3 and 7. As the angle changing roller rolls down the slope of the angle selecting cam 47, the said roller describes an arc relative to bracket 4 having a center at the pivot 51. The significance of this feature will be discussed subsequently in more detail in conjunction with the function of the angle selecting cam. The movement of the angle changing roller 52 over the angle selecting cam 47 exerts a torque on the spindle 3, causing the spindle and the bracket 4 together with the trap support mounted thereon to rotate in the direction taken by the angle changing roller 52 on the cam surface. When the carrier plate 11 swings in launching a target 12, the angle changing roller 52 resiliently held in an angle selected position in one of the valleys 80, Figure 5, of the angle selecting cam 47 serves to absorb the shock of the carrier plate swing by permitting an oscillating movement of the trap frame as the roller 52 is forced up toward the respective tips of adjacent cam lobes by the impulse transmitted to the roller by the swinging carrier arm.

An indexing link 60 hooked at one end in an ear 61 on the pipe connector 34 is connected for oscillation at 62 to a stud 63 in an indexing arm 64. The indexing arm is fulcrumed on the bracket 4 by means of a pivot 65. An indexing pawl 66 pivoted to the under side of the indexing arm 64 on the stud 63 engages ratchet teeth 67 formed in a plane above the cam lobes 48 on the angle selecting cam wheel 47 on the rearward or cocking stroke of the pipe connector 34 and passes over said ratchet teeth on the forward or return stroke of the pipe connector. A spring 68 attached at one end to a post 69 on the indexing pawl 66 and at the other end to a post 70 on the under side of the indexing arm 64 holds the indexing pawl against the ratchet teeth 67. The pawl 66 indexes the ratchet wheel 47 on the rearward or cocking stroke rather than on the return forward stroke to avoid obscuring the feel of resistance near the end of the forward stroke when the trigger 24 is contacted by the lug 26 preparatory to moving the sear 31 to release the throwing arm.

Threaded in lugs 71 positioned on opposite sides of the angle selecting cam wheel 47 on the fore part of the base are angle limit screws 72. These angle limit screws are adjustably locked in position on said lugs by means of nuts 73. As the bracket 4 swings in either direction to an extreme angle, the forward end 74 of said bracket contacts the end of one of the angle limit screws 72, thereby stopping the rotation of the bracket in that direction. The end 74 of the bracket 4 is provided with a curvature which insures contact of said angle limit screws therewith substantially normal to said curved surface at any position of adjustment of said screws.

For the purpose of locking the bracket 4 in a position of alignment with the pipe connector 34, and the operating pipe 34', a double-stop 75 pivoted on a lug 76 on the extreme forward end of the base 1 is provided with lock screws 77 which serve to confine the forward end 74 of the bracket

4 when the double-stop 75 is moved into engagement therewith, thereby preventing movement of bracket 4 and the trap support mounted on said bracket. When the double-stop 75 is in its operating position, it rests against the top end of a rib 78 on the base 1. When the double-stop 75 is in its operating position, the angle changing roller 52 is prevented from exercising its function of imparting motion to the spindle 3 and bracket 4 and the trap throwing mechanism will then throw targets only from a fixed position. This function is desirable in some instances for the purpose of throwing two targets at one time, that is, a so-called "doubles." Thus, with the double stop 75 in its operating position the bracket and spindle are locked in position and two targets may be simultaneously thrown by the target throwing mechanism in known directions. The known directions may be equalized by adjusting the respective positions of lock screws 77 against the forward end 74 of the bracket 4. The operation of the double stop renders the angle changing mechanism ineffective with respect to the target throwing mechanism without disconnecting the angle changing mechanism or disturbing the operation of the angle selecting mechanism, thereby affording a simple and effective method for locking the trap for initial setting of distance, elevation and direction of targets when the trap is set up for a shooting period.

The base 1 may be secured to a suitable foundation by means of base bolts 79 passing through holes in said base.

The respective slopes of a cam lobe are such that the force perpendicular to the cam lobe surface gives rise to a mechanical moment about the center of the spindle. The resolution of this moment affords an applied torque which causes the spindle and bracket to turn in the direction of the applied torque. Since the tension of the spring which holds the angle changing roller against the cam wheel varies for respective positions of the roller on the cam lobes, the torque which gives rise to movement of the spindle and bracket will vary. To render this torque substantially uniform for any given position of the angle changing roller on the cam wheel, each cam surface is provided with a curvature which is adapted to vary the effective moment around the center of the cam wheel with the force resulting from the spring tension at substantially every position of the roller on the cam wheel. Since the cam lobe tips are shown equidistant from the center of the cam wheel, the curvature selected for one lobe slope or surface is applicable for each slope of like direction, as at C, C' and D, D' in Figure 7. An adjustment of curvatures may be made to compensate for a difference in applied torque resulting from the fact that the angle changing roller moves in an arc with respect to the angle changing lever pivot. Thus a respective left-hand slope 57, Figure 3, will have a slightly shorter arc than a respective right-hand slope 58.

If the spring tension on the roller arm is too great, the torque imposed upon the cam may cause it to jump ahead of the pawl, thereby disrupting the normal sequence of operations. This is avoided by limiting the spring tension on the roller to that which is sufficient to actuate the movement of the spindle and bracket by way of the roller operating on the cam surface; also the friction of the holding cone 39 counteracts the torque applied to the cam, making said torque effective only in turning the spindle.

As an alternative embodiment of the angle changing mechanism, Fig. 8, the roller may be mounted on a block 59 sliding in a slot 81 in an extension on the bracket 4 instead of at the end of the arm 50, Figure 3. The roller, Figure 8, may be held against the angle selecting cam wheel by any suitable means, such as a spring 82 mounted at one end on the roller stud 83 and secured at the other end to a post on the bracket 4. In this arrangement, the roller will move in a radial path with respect to the center of rotation of the cam, thereby eliminating the need for a dissimilarity in right- and left-hand cam surface curvatures in order to equalize the torque imposed by the roller pressure on the cam lobes.

The successive positions of the cam lobes 48 with respect to any stationary point on the base 1 are determined by the indexing of the ratchet teeth 67. The ratchet teeth 67 are positioned on the cam wheel with respect to the cam lobes in a manner such as to avoid the initial positioning of the angle changing roller 52 on the tip 49 of a cam lobe at the instant the trap is cocked and the trap throwing mechanism is in alignment with the operating pipe 34', Figure 3. If the roller were to be positioned initially on a cam tip at such a time, at the subsequent release of tension in the operating pipe 34' the roller 52 could either remain on said cam tip or could roll down either slope of the cam lobe. This would impart an indeterminate factor to the cycle of angle-selecting sequences. This feature can be used for the purpose of providing an indeterminate factor but it is not preferable to do so, since the balance of distribution of target-launching directions would be seriously disturbed thereby.

The ratchet teeth 67 are also positioned on the cam wheel with respect to the cam lobes to provide a suitable variety of roller starting positions. The roller starting positions are those points on the cam lobes at which the roller rests on the cam surface at the instant the trap is cocked. These points are determined by the number of ratchet teeth 67 indexed by the indexing pawl 66 and the positioning of the ratchet teeth with respect to the cam lobes. Since the number of ratchet teeth indexed is maintained constant and the relation of the ratchet teeth to the cam lobes is fixed at the time the cam wheel is designed, these two factors are determinants of the cycle of target-launching positions. The number of lobes and the spacing of the lobes from tip to tip are factors in determining the maximum number of roller starting positions between cam lobe tips and the angular limits, x and y of the flight zone, of Figure 9. While the actual number of roller starting positions is determined by the number of teeth in the ratchet wheel, the location of roller starting positions on any one cam lobe, Figure 7, is determined by the position of the cam lobe with respect to the ratchet teeth.

After the cocking stroke, when the tension of the operating pipe is released during the forward stroke, the angle changing roller 52, Figure 7, starting from an initial position on a cam lobe, rolls down the cam surface to a valley 80 where it comes to rest at the start of the adjacent cam lobe slope in the upward direction. At this point the target throwing mechanism mounted on the bracket 4 is in a selected position of the sequence or cycle for release of a target. The indexing of the ratchet teeth 67, Figure 3, determines the positions of the valleys between cam lobes with

respect to a stationary point on the base 1 and thereby the angle selected positions except for a definite number of instances in which the initial roller position coincides with the indexed position of a valley, or the abutment of the forward end 74 of the bracket 4 against one of the limit screws 72 prevents further movement of the bracket and concomitantly of the roller 52, thereby interrupting the movement of the roller on its inward path along the cam lobe surface. The frequency with which a given valley or tip will appear in a given position with respect to any point on the stationary base is determined by the length of the cycle which in turn is determined by the number of teeth selected in designing the ratchet on the cam and the number of teeth indexed at one stroke of the indexing pawl 66. Thus, for a ratchet wheel having nineteen teeth of which four are indexed at one indexing stroke of the pawl 66, the number of selected positions in the cycle would be nineteen and the cycle would repeat in four complete revolutions of the ratchet wheel. If the number of ratchet teeth chosen is a number divisible by the number of teeth indexed at one indexing stroke of the pawl 66, the number of selected positions in the cycle would be reduced to the value of the resulting factor. For example, if fifteen teeth are used and three are indexed at one time, the number of selected positions would be reduced to five. It is advisable, therefore, to use a prime number of teeth, selecting a number which is not a multiple of the number of teeth indexed at one time.

The spacing of adjacent tips determines the extreme angular target-launching positions and is also a factor in determining the grouping of selected positions. The number of teeth indexed determines the number of revolutions of the ratchet wheel for one cycle. The number of cam lobes chosen and the spacing thereof determines the number and sequence angularity, of the angles at which targets are thrown. From a practical standpoint, the size of the cam wheel serves to limit the number of lobes feasible.

In order to correlate the functions of the respective mechanisms which comprise the self-angling target trap disclosed herein, the operation of a trap embodying the features described herein will be outlined briefly. Starting with the operating pipe 34' in full forward position, the pipe is moved rearward to place the target-throwing mechanism in cocked position during which movement the indexing pawl 66 indexes the angle selecting cam 47 to an angle selecting position and at the same time the bracket 4 is pulled under tension to a position in alignment with the operating pipe 34' and also the angle changing roller 52 is concomitantly moved to a starting position, Figure 3. As the operating pipe 34' is moved forward to discharge the trap, the tension on the bracket is released, permitting the angle changing roller 52 to move clockwise or counterclockwise, depending upon whether the roller is in contact with a right or left cam slope, toward a cam valley until it comes to rest therein as in Figure 5, or is stopped before it reaches the valley, as at M in Figure 7, by the abutment of the forward end 74 of the bracket 4 against one of the angle limit screws 72 as in Figure 4. During the forward stroke, the angle selecting cam 47 is held stationary by the friction of the holding cone 39 and the indexing pawl 66 merely slides over the ratchet teeth. The last portion of the forward stroke of the operating pipe 34' causes the toggle 16 to push the trigger 24 which withdraws the sear 31 and permits the carrier 11 to swing and discharge the target 12. At this point the indexing pawl 66 is beyond the ratchet tooth 84, Figure 4, which the pawl will engage on the next rearward movement of the operating pipe 34'.

The angle selecting and angle changing mechanisms provide a definite balanced sequence of target launching directions which can readily be made highly complicated so that the sequence is exceedingly difficult to determine and equally difficult to follow once it has been determined. In addition, if a defective target should break before or after being launched, as occasionally happens, the sequence, as far as an observer is concerned, would be disrupted but the balance of target distribution over the flight zone would still be maintained.

The self-angling unit of this invention has fewer parts than most of the prior art traps which attempt to vary automatically the throwing angle of the targets and which do not provide a balanced distribution of targets over the flight zone. The parts of the device of this invention are designed for ruggedness and hard usage. The self angling unit is capable of ready and accurate adjustment for a variety of shooting conditions. Above all, the self angling unit of this invention insures a thorough testing of the skill of each shooter regardless of how many shooters are engaged in a given competitive match. Furthermore, each shooter's skill is tested over the entire flight zone. The self-angling target trap disclosed herein also provides a ready adjustment of the angular extremes of the flight zone to alter the angular spread of the flight zone, thereby producing a different flight zone without disturbing the balance of distribution of target launching directions but, instead, regrouping said directions under the same over-all distribution.

This invention thus accomplishes its objects in providing a self-angling target trap with significantly improved features of utility over any which have heretofore been known.

While in describing the operation of this trap, a certain theory of operation has been advanced, it is understood that such theory has been used only to assist in clarifying the description. This theory, however, is not advanced as the only true theory nor is the invention, as defined by the appended claims, to be restricted to any particular theory of operation.

It is obvious that various changes in details of construction and operation may be made, within the scope of the appended claims, without departing from the spirit of this invention and that the invention is not to be limited to the specific details shown and/or described.

Having thus described the invention, what is claimed is:

1. In a target trap having a target throwing element mounted for movement about a vertical axis on a base element, and means for cocking and discharging said target throwing element, the combination comprising means carried by one of said elements adapted for rotating said target throwing element to successive positions about said vertical axis, means carried by the other element and operating against said rotating means for varying the direction and amount of rotation of said target throwing element so that said successive positions are substantially unpredictable, and means operated by said cocking means for controlling said rotating and varying means so

that said successive positions follow a determinate cycle of positions substantially evenly balanced between the extreme positions of said target throwing element.

2. In a target trap having a base element and a target throwing element adapted to pivot about a vertical axis thereon, the combination comprising a cam wheel carried by one of said elements; means for rotating said cam wheel through a definite angle; a device carried by the other element operating against the said cam wheel for successively varying the angular relation between said elements; and means for successively returning said target throwing element to a constant starting position whereby the force necessary for actuating said target throwing element is maintained substantially constant.

3. In a target trap having a target throwing element adapted to pivot about a vertical axis on a base element, the combination comprising a cam wheel having a plurality of unevenly spaced cam lobes carried by one of said elements and adapted to successively select substantially unpredictable horizontal angular positions for said target throwing element, means for successively rotating said cam wheel through a definite angle to provide a determinate sequence of said positions for said target throwing element, and means carried by the other element and resiliently urged against said cam wheel for turning said target throwing element to the said successive positions selected by said cam wheel.

4. In a target trap having a base element and a target throwing element adapted to pivot about a vertical axis thereon, the combination comprising a lobate cam wheel carried by one of said elements for selecting substantially unpredictable horizontal angular positions for said target throwing element; means for successively rotating said cam wheel through a definite angle to provide a determinate cycle of said positions; a roller device carried by the other element operating on the lobular surface of said cam wheel for successively varying the angular relation between said elements; and means for successively returning said target throwing element to a constant starting position whereby the force necessary for actuating said target throwing element is maintained substantially constant.

5. A target trap comprising the combination of a base, a target throwing mechanism movably mounted for pivoting about a vertical axis thereon, means for actuating said mechanism, a cam wheel adapted to select a horizontal angular position for said mechanism, means for rotating said cam wheel through a definite angle to provide a determinate sequence of horizontal angular positions for said mechanism, a roller resiliently in contact with the edge of said cam wheel, and means for translating the movement of said roller along the edge of said cam wheel into a pivotal movement of said target throwing mechanism about said vertical axis whereby said mechanism is turned to the horizontal angular position selected by said cam wheel.

6. A target trap comprising the combination of a base, a target throwing mechanism adjustably mounted for pivoting about a vertical axis on said base, means for cocking said target throwing mechanism, an angle selecting cam wheel on said base, means operated by said cocking means for rotating said cam wheel through a definite angle, said cam having a number of unevenly spaced lobes, a roller carried by said mechanism, means resiliently urging said roller into contact with the edge of said cam wheel whereby said roller is moved into a position between adjacent cam lobes thereby turning said target throwing mechanism, said mechanism being discharged by a reverse movement of said cocking means, and means operated by said cocking means for returning said mechanism to a constant starting position during a cocking movement.

7. A target trap comprising the combination of a base, a sub-base mounted for movement about a vertical axis on said base, a target throwing device adjustably mounted for movement about a horizontal axis on said sub-base, means for cocking said device, a lobate cam wheel carried by said base, ratchet and pawl means operated by said cocking means for rotating said cam wheel through a definite angle during a cocking stroke, means for holding said cam wheel in position after said rotation, a roller carried by said sub-base, means resiliently urging said roller into a position between adjacent cam lobes on said cam wheel thereby turning said sub-base, means for discharging said device upon a reverse movement of the cocking means and means operated by said cocking means for returning said sub-base to a constant starting position during a cocking movement.

8. In a target trap having a base, a sub-base pivoted about a vertical axis on said base, a target throwing device adjustably mounted for movement about a horizontal axis on said sub-base and a trap actuating mechanism, the combination comprising an angle selecting cam wheel having a plurality of cam lobes and a ratchet disc coaxial with and rigidly connected to said cam wheel adapted to select successively from a determinate complex sequence one of a series of horizontal angular positions of said sub-base with respect to said base, means adapted to rotate said sub-base from a previous horizontal angular position to a constant starting position whereby the force necessary for actuating said device is maintained substantially constant, and means resiliently urged against said cam wheel adapted to rotate said sub-base from the constant starting position to said selected angular position.

9. In a target trap having a base, a sub-base mounted for movement about a vertical axis on said base, and a target throwing device adjustably mounted for elevation on said sub-base, the combination comprising a cam wheel having a plurality of cam lobes carried by said base for successively selecting horizontal angular positions for said sub-base in a complex determinate cycle of positions substantially evenly balanced between the extreme positions of said sub-base, cocking means for said device, means operated by said cocking means for turning said cam wheel through a definite angle and for returning said sub-base to a constant starting position during a cocking stroke, friction means for holding said cam wheel in position after operation of said turning means, roller means carried by said sub-base and operating on the lobular edge of said cam wheel for rotating said sub-base from said constant starting position to the position selected by said cam wheel, means for discharging said device and adjustable means for changing the extreme angular positions of said sub-base relative to said base.

10. In a target trap comprising a base, a sub-base pivoted on a vertical axis in said base, a target throwing device mounted adjustably for pivoting on a horizontal axis on said sub-base and an ac-

tuating mechanism for said target trap, the combination of an angle selecting cam wheel movably mounted on said base coaxial with said subbase, a ratchet wheel coaxial with said cam wheel and forming an integral part thereof, a pawl arranged to engage the teeth of said ratchet wheel, means to index a definite number of said teeth on the rearward stroke of the actuating mechanism, a swinging lever mounted at one end on said subbase movable about a vertical axis, a roller pivoted on the other end of said swinging lever, and a spring tensioning the roller against said cam wheel.

HARRY CLARK FOSTER.

CERTIFICATE OF CORRECTION.

Patent No. 2,328,796. September 7, 1943.

HARRY CLARK FOSTER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, line 62, for "Figure 4" read --Figure 3--; page 3, first column, line 17, after "holes" insert the numeral --40--; page 5, first column, line 42, for "number and sequence angularity, of the" read --number, angularity and sequence of the--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 21st day of December, A. D. 1943.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)