Aug. 20, 1935. L. A. SHERMAN 2,011,830

TARGET TRAP

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Fig. 1.

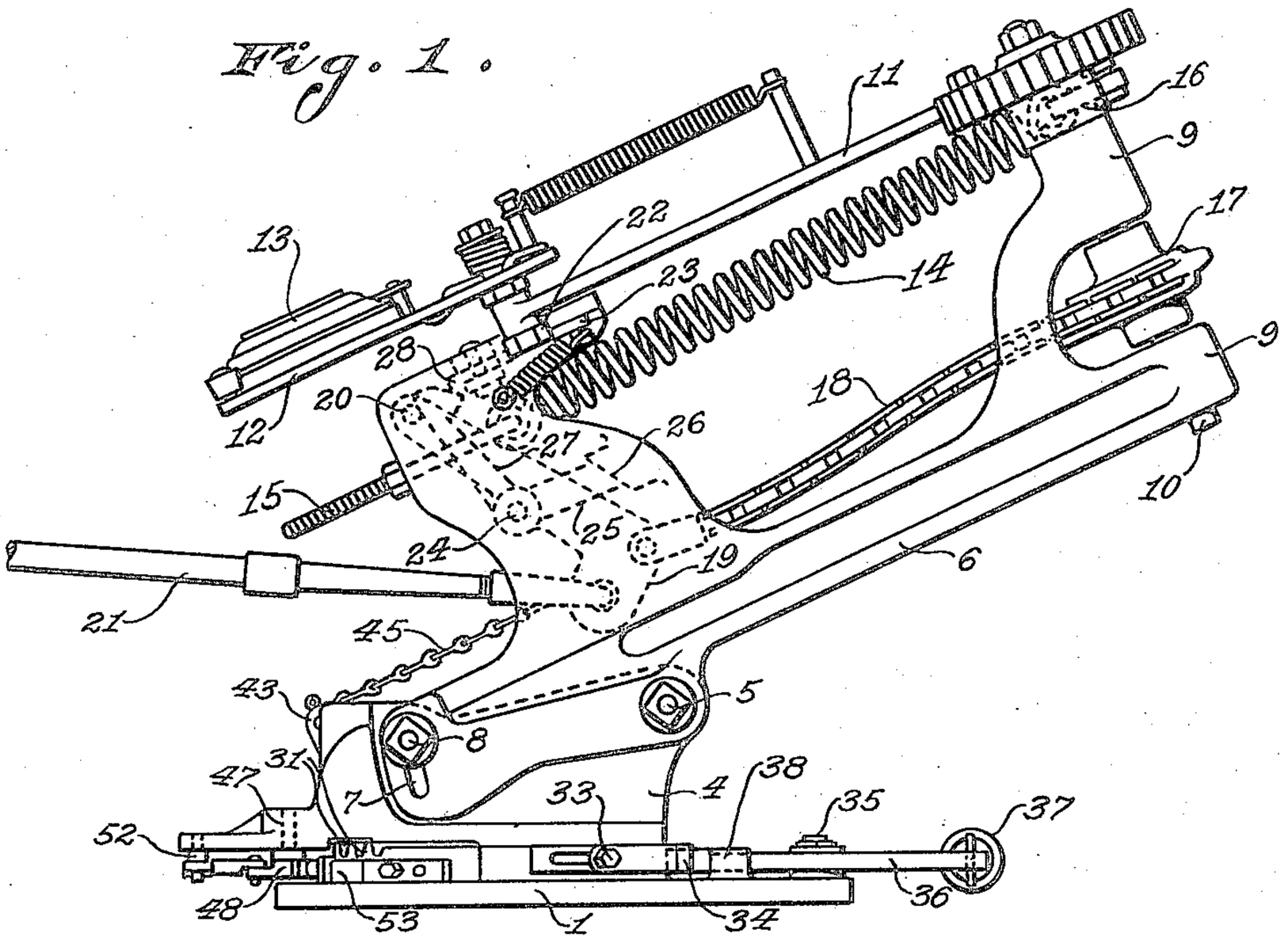

Fig. 2.

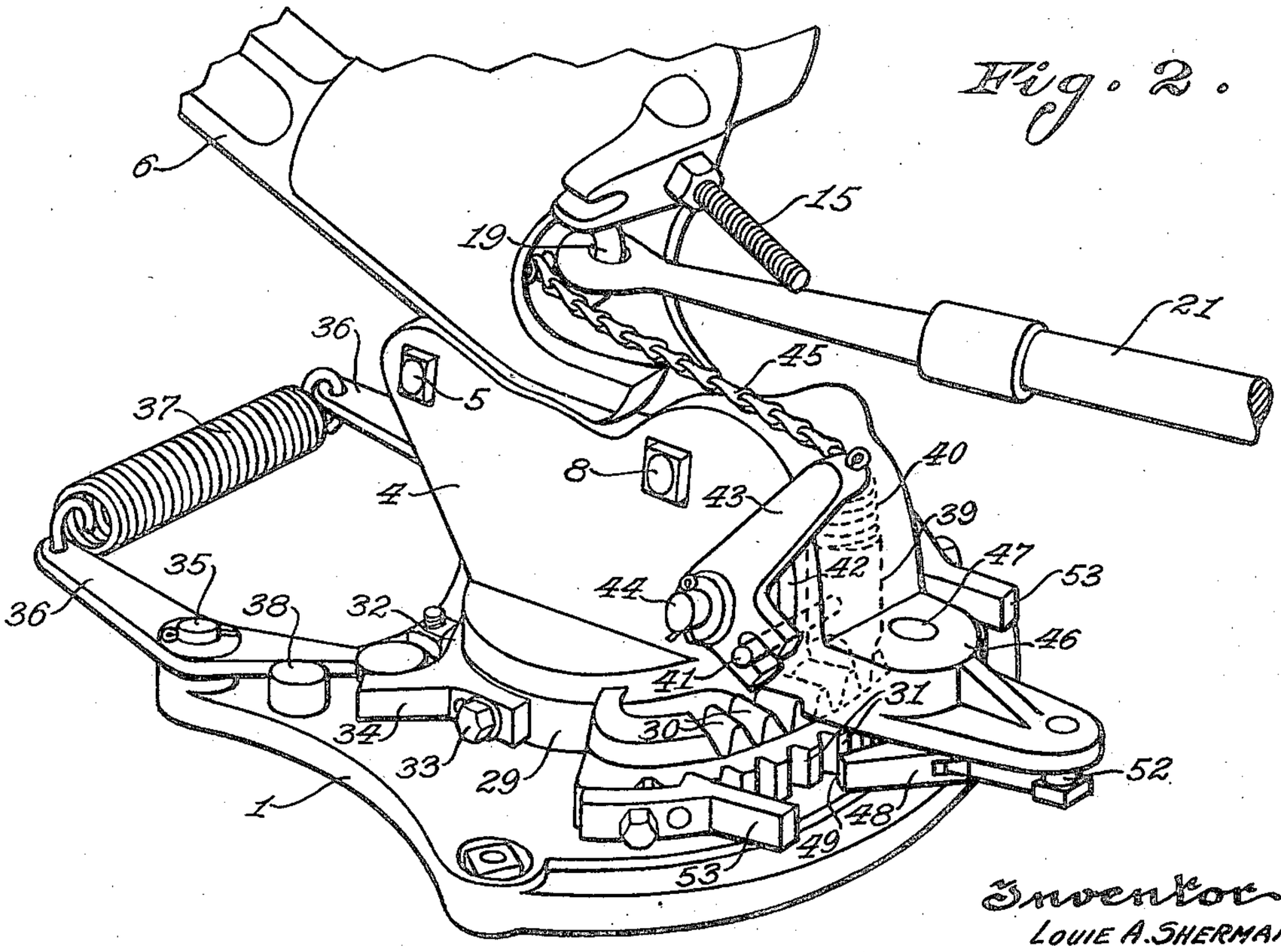

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Fig. 3.

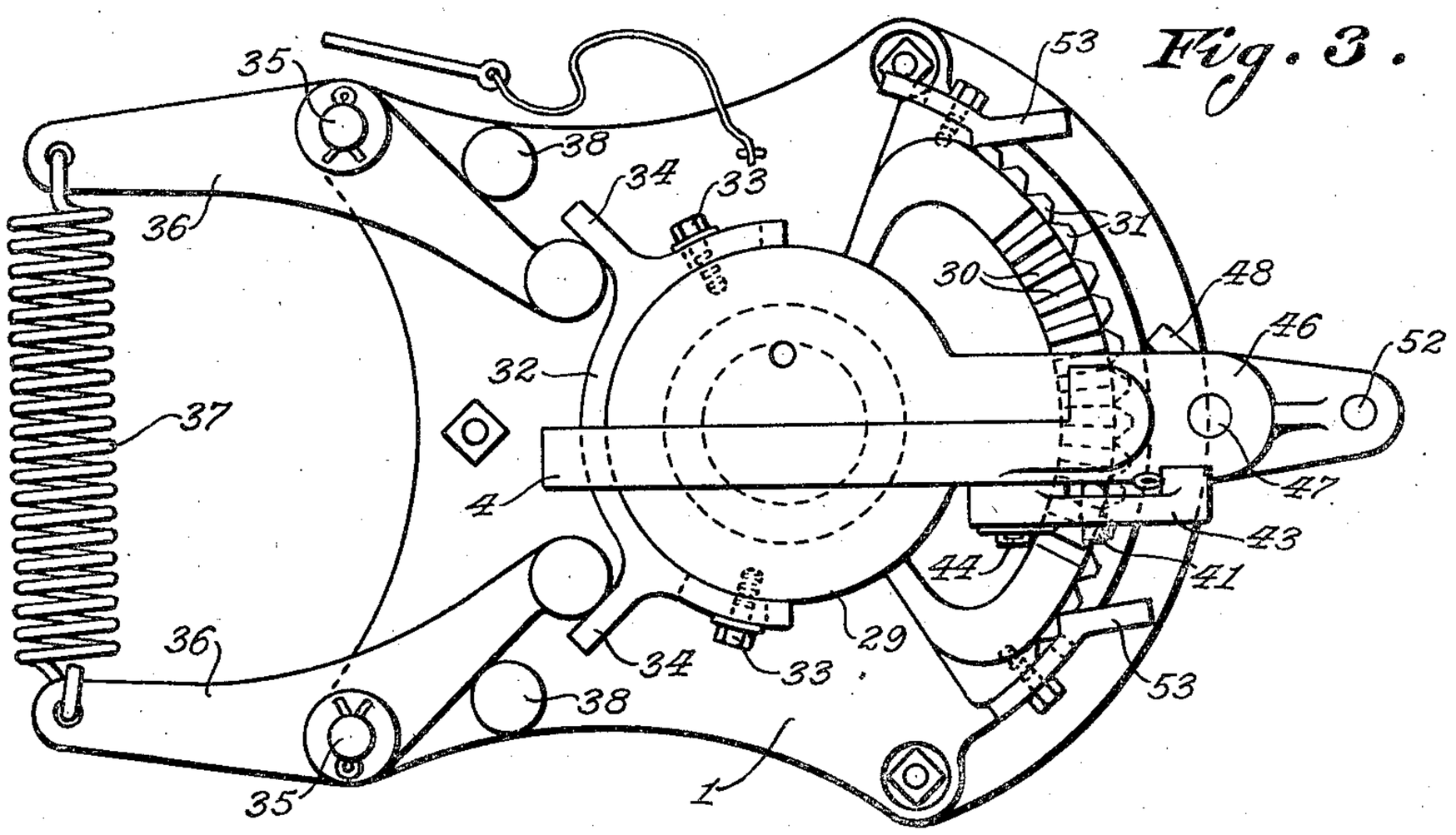
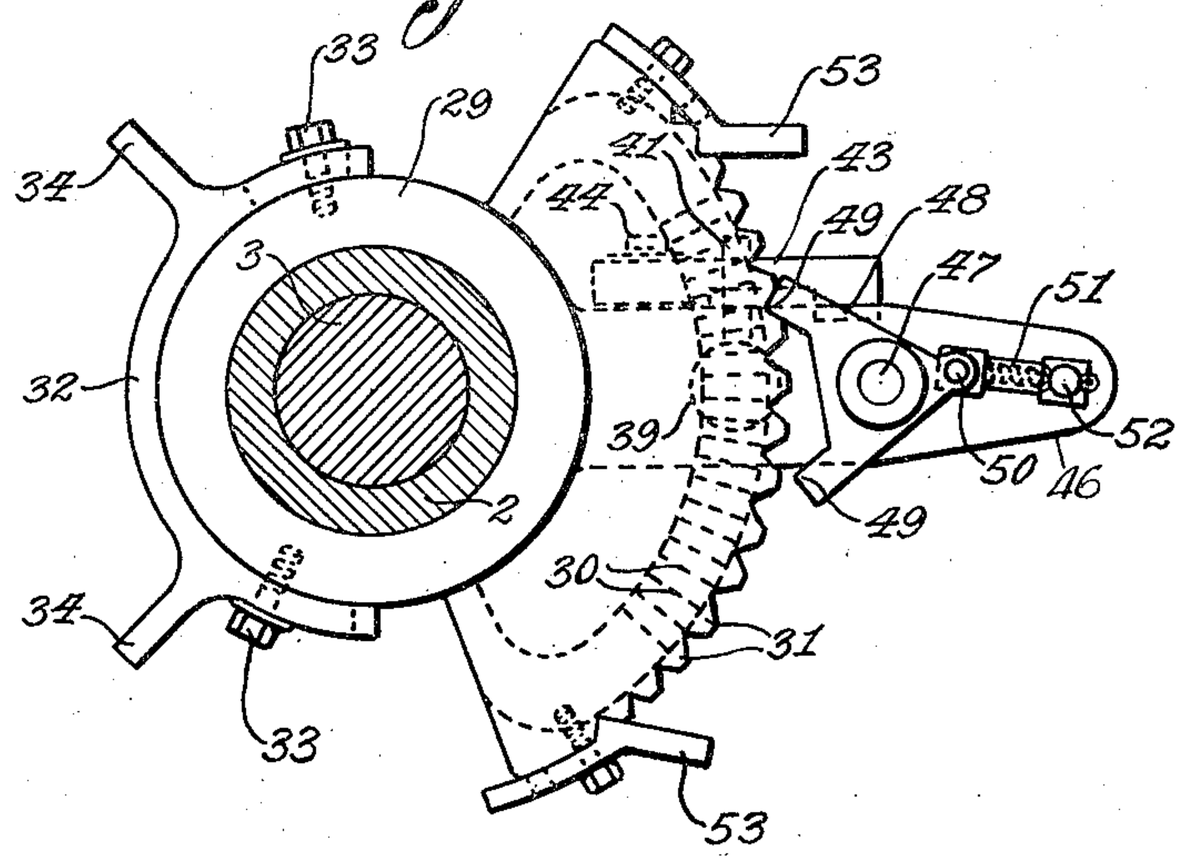


Fig. 4.



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UNITED STATES PATENT OFFICE

2,011,830

TARGET TRAP

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Application September 30, 1932, Serial No. 635,550

18 Claims. (Cl. 124—3)

This invention pertains to target traps, such as are used for launching targets known as clay pigeons for trap shooting.

It is desirable that the direction of flight of the target be uncertain so that the marksman's skill in judging the flight and quickly adjusting his aim may be put to the test. Attempts have been made heretofore to construct target traps which will automatically change the direction in which the target is launched between throws. Most of these devices are subject to the defect that the automatic mechanism for adjusting the direction of throw is so constructed that its operations follow a certain cycle. Accordingly an experienced marksman working with a given trap is often able to learn the sequence of directions peculiar to that trap. This enables him to forecast with some certainty the direction in which the next target is to be launched and, therefore, gives him an advantage over a competitor.

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 takes place in a haphazard manner and without in any way following a definite cycle.

Another object of this invention is to provide such a trap whereby the energy of swing of the throw arm is applied to changing the direction of the next throw.

Another object is to provide mechanism whereby the energy of swing of the throw arm is applied for this purpose and by which the phase of application of that energy may be varied in an irregular manner.

Another object is to provide means whereby this energy may be applied in different directions.

Another object is to provide such mechanism capable of adjustment as to the breadth and direction of the field within which the targets are launched.

Another object is to provide such mechanism with means whereby the setting and releasing of the throw arm may be carried out without interfering with the adjustment of the direction of throw.

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

Figure 1 is a side view of a target trap embodying this invention;

Figure 2 is an enlarged perspective detail of the swivel mounting of the trap;

Figure 3 is a plan view of the base with the ratchet plate and the supporting bracket in place thereon, and

Figure 4 is a detail bottom view of the ratchet mechanism.

Referring now to the drawings 1 designates a base upon which the entire mechanism is mounted. This base is provided with a central bearing 2, see Figure 4, in which is swiveled the spindle 3 of a bracket 4. The bracket 4 is thus enabled to swivel on the base 1. Pivoted at 5 on the bracket 4 is a support 6 for the target throwing mechanism. The support 6 is provided with an arcuate slot 7 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.

Mounted in suitable bearings 9 at the upper end of the support 6 is a shaft 10. This shaft carries at its upper end a target throwing arm 11. The arm 11 carries at its swinging end a target holder 12 adapted to receive a target 13. A strong spring 14 adjustably anchored by a bolt 15 or the like to the support 6 is connected at its other end to a crank arm 16 on the shaft 10. This spring is adapted to tension the arm 11 for rotary movement on the shaft 10 in order to launch the target. The shaft 10 has fixed thereto a drum 17 on which rides a chain 18 attached to a setting lever 19 pivoted at 20 on the support 6. By pulling a rod 21 attached to the lever 19 the operator may tension the chain 18 so as to rotate the shaft 10 in order to swing the arm 11 rearwardly to its set position as shown in Figure 1 and at the same time stretch the spring 14. When the arm 11 reaches its set position a catch 22 on the arm 11 engages a sear 23 on the support 6 to retain the arm in set position. The lever 19 has pivoted thereto at 24 a trigger having arm 25 positioned for engagement with a solid abutment 26 on the support 6 when the lever 19 is moved to the right, Figure 1. The other arm 27 of the trigger is adapted for engagement with the rear end 28 of the sear 23. Accordingly when the operator pushes to the right, Figure 1, on the rod 21 the lever 19 forces the trigger arm 25 into engagement with the abutment 26. This causes the trigger to pivot at 24 so as to bring the arm 27 against the end 28 so as to move the sear 23 to disengage the catch 22 and release the throwing arm 11. The entire above throwing mechanisms are not included in the present invention. A more detailed description of the mechanism will be found in the patent to Walling, 1,520,215, issued December 23, 1924.

The present invention concerns itself with the devices for changing the direction of throw as will now be described. Mounted for rotary adjustment on the bearing 2 is a plate 29 provided with a rearward projection of sector form provided with teeth 30 on the horizontal face thereof and with a series of ratchet teeth or notches 31 on the circumferential edge thereof. Mounted for circumferential adjustment on the opposite end of the plate 29 is a half collar 32 secured by studs 33 to the plate 29 and equipped with a pair of outwardly projecting horns 34. Pivoted

at 35 on the base 1 is a pair of levers 36 whose outer ends are connected by a tension spring 37 and whose inner ends are positioned to engage the horns 34 as illustrated in Figure 3. A pair of stops 38 on the base 1 limits the movement of the levers 36 so as center the same with reference to the base 1. It will be seen that by engagement of the levers 36 with the horns 34 the plate 29 is yieldingly centered on the base 1 by said levers. The exact position in which said plate is centered may be varied by adjustment of the collar 32.

The bracket 4 is provided with a vertical bore in which is mounted for sliding movement a pawl 39 adapted to engage the teeth 30. A spring 40 presses this pawl into engagement with said teeth. The pawl 39 has fixed thereto a pin 41 projecting through a slot 42 in the bracket 4. This pin is engaged between the forked ends of a bell crank lever 43 pivoted at 44 on the bracket 4. The upper end of the bell crank 43 is connected by a chain 45 to the lever 19. With the parts in normal position the spring 40 forces the pawl 39 into engagement with the teeth 30 so as to lock the bracket 4 to the plate 29. When the rod 21 is pushed to the left, Figure 2, in order to release the throw arm 11 the chain 45 operates the bell crank 43 to raise the pawl 39 out of engagement with the teeth. Under these conditions the bracket 4 is free to swivel on the base 1.

The bracket 4 has a rearwardly projecting lug 46 on the underside of which is pivoted at 47 a double end pawl 48. This pawl has projecting teeth 49 adapted for engagement in the notches of the ratchet 31. Pivoted at 50 to the rear of the pawl 48 is a spring pressed keeper 51 whose other end is pivoted at 52 to the rear tip of the lug 46. The keeper 51 is thus adapted to press one of the teeth 49 of the pawl yieldingly into engagement with the ratchet 31. By rotating the pawl 48 on its pivot 47 the keeper 51 may be forced past its dead center position so as to press the other one of the teeth 49 into engagement with the ratchet. Accordingly the direction of action of the pawl 48 may be reversed in this manner. Whichever tooth 49 is in engagement with the ratchet, movement of the bracket 4 relative to the plate 29 in one direction will be prevented while movement in the opposite direction will be permitted by dragging of the pawl over the ratchet teeth. At each end of the ratchet 31 there is adjustably mounted a dog 53. These dogs are positioned to be engaged by the pawl 48 at the limit of its travel. The ends of the dogs are sloped in such a manner as to force the tooth 49 inwardly so as to snap the keeper 51 past its dead center and reverse the action of the pawl 48. It will be seen that this arrangement provides that the bracket 4 may be shifted angularly with respect to the plate 29 in one direction only until the limit of movement in that direction has been reached. After that the action of the pawl is reversed and the bracket 4 may be shifted in the opposite direction until the other limit is reached when the action is again reversed.

The operation of this mechanism to vary the position of the trap may now be described. In the normal positon of the parts the pawl 39 is in engagement with the teeth 30. This fixes the position of the trap with reference to the plate 29. The plate 29 is yieldingly centered by the action of the spring 37 on the levers 36. The trap is, therefore, set to launch the target in a definite direction. In order to set the throw arm 11 the operator now pulls to the right, Figure 2, on the rod 21. If the bracket 4 is not in alinement with the direction of this pull, it will be swiveled on the base in response to the pull, one or the other of the levers 36 yielding to permit the plate 29 to turn. Accordingly the trap is pulled into alinement with the rod 21 until the throw arm 11 is set. The bar 21 is now released and the spring 37 actuates the levers 36 to recenter the plate 29. This returns the trap to its original throwing position.

In order to spring the trap the operator now pushes to the left, Figure 2, on the rod 21. This releases the sear 23 as above described and permits the arm 11 to swing on the shaft 10 in response to the pull of the spring 14. It will be understood that the arm 11 when released sweeps forward with a considerable force. Its movement is a quick rotation about the shaft 10. In this movement the arm changes from the position shown in Figure 1 to a position substantially in prolongation of the frame 6 on the opposite side of the pivot shaft 10. It is believed that a somewhat complicated set of forces is active between the arm 11 and the frame 6 during this swing. These forces include not only the centrifugal force of the arm 11 but an inertia reaction due to the very rapid acceleration of the arm 11.

The direction of action of each of these forces is variable according to the swing of the arm so that it is difficult to trace completely their interaction. Suffice it to say that the net reaction results in a force tending to swing the frame 6 clockwise in Figure 2. This force is delivered to the frame as a sudden kick. There may also at times be a force acting to swing the frame in the opposite direction as the arm 11 is arrested in extended position at the end of its swing. In either case there is a strong force which acts to kick the frame in a clockwise direction as seen in Figure 2. Accordingly the energy of swing of the arm 11 delivers this lateral impulse to the frame so as to shift it on the base. Such a shift would take the form of a rotation about the pivot 3 if the frame were not restrained by the ratchet mechanism.

The releasing movement of the rod 21 which springs the trap causes the chain 45 to operate the bell crank 43 so as to lift the pawl 39 out of engagement with the rack teeth 30. Accordingly the bracket 4 is unrestrained by this pawl as far as its swiveling movement is concerned. Said bracket is, however, still under the control of the pawl 48. This pawl prevents movement in one direction while permitting movement in the opposite direction. Accordingly when this lateral force above described comes into action in such direction that the pawl 48 will drag over the teeth of the ratchet, the bracket 4 will shift angularly on the plate 29. The extent of such shift will depend upon the strength of the force in action.

Assuming that the pawl 48 is set in such a position as to permit movement of the frame 6 to the right, Figure 2, such movement will cause the pawl 48 to drag over the ratchet teeth. The energy delivered to the frame by the swing of the arm is usually more than sufficient to cause a movement of this pawl over the entire length of the ratchet. Accordingly when the pawl 48 reaches the limit of its movement, it is snapped by center by one of the dogs 53 and the tooth 49 engages the last of the exposed teeth 31. This restrains further movement of the frame in this

direction relative to the plate 29. There is still, however, some energy of movement of the frame 6 to be dissipated before the frame is brought to rest. As the plate 29 is yieldingly centered on its pivot by the levers 36 and the spring 37, this residual energy is now transferred to the spring 37 by the movement of the plate 29 on its pivot under the impact of the pawl 48, against the teeth 31. Accordingly the spring 37 receives and stores up the residual energy of the movement of the frame as the latter is brought to rest at the limit of its movement. As soon as the frame comes to rest, the spring 37 acts to recenter the plate 29 on the base. The result of this is to deliver to the frame 6 an impulse tending to move it in the opposite direction to that in which it has just been moving. Since the action of the pawl 48 with the dog 53, just described, has operated to reverse said pawl, the latter is now in position to permit movement in the new direction. If the energy of the impulse delivered by the spring 37 is sufficient, the frame may now make a complete swing in the opposite direction until the pawl 48 is brought up against the other dog 53, which again acts to reverse the pawl 48 and thereby limit the swing of the frame in this direction.

The original energy of the kick delivered to the frame 6 is usually sufficient to cause the same to swing back and forth several times through the full sweep of the pawl 48 over its ratchet. It will be noted that each time the frame is arrested in its swing, the residual energy of its movement is transferred to a spring 37, whereby it is stored up until the parts have been set for a reversal of movement, whereupon this stored energy is returned to the frame to cause it to move in the opposite direction. It will be clear that this repeated reversal of movement will continue until all the energy of the original kick has been dissipated in the friction of the various moving parts. It will be understood, of course, that if, at the moment of release of the arm, the pawl 48 is set against the direction of movement in which the first kick is delivered, the "residual" energy transferred to the spring 37 may include substantially the entire energy of the original kick. All of these movements take place rapidly and are usually completed before the rod 21 is returned to its neutral position. Upon such return the pawl 39 is reengaged with the rack 30 and the trap is then positioned for the next throw.

It will also be noted that there can be no definite sequence of positions taken by the frame 6. The pawl 48 may come to rest after a given action in any position on its ratchet. The amount of energy delivered to the frame 6 is variable as the throwing arm, of course, does not always deliver precisely the same amount of energy to the frame. The amount of energy lost in friction is variable between one operation and the next. The amount of energy received and stored by the spring 37 varies both with the amount of energy originally delivered to the frame, and with the initial position of the pawl 48 relative to its ratchet. Accordingly the extent of movement back and forth of the frame is uncertain and there can be no definite sequence of positions taken by said frame.

As the frame may come to rest with the pawl 48 in any position on its ratchet, the phase of application of the initial force delivered by the throwing arm to the frame varies in its relation to the phase of movement to the frame. This also renders the exact amount of movement uncertain from one operation to the next.

It will be seen, therefore, that the direction and extent of the shift will depend upon the phase of application of the energy of the swing, upon the direction in which the trap is set to move and upon the initial position of the trap. Thus many factors combine to determine the extent and direction of the shift, and, therefore, the new position from which the next target will be launched. Under such conditions, the sequence of positions taken up by the trap will be very irregular. In fact there is no definite sequence of positions, but they follow one another in a perfectly haphazard manner. The mechanism acts so as to free the trap for shifting movement in either one of the directions during the swing of the throw arm and the arrangements are such that the energy of that swing is applied in a variable manner to shift the trap. After shifting, the trap is yieldingly retained in its shifted position. Accordingly the resetting movement for the throw arm may be carried out without disarranging the setting of the trap for direction.

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.

While this trap has been described as a unitary instrument, it will be understood, of course, that certain individual features or sub-combinations thereof may be useful by themselves without reference to other features or the rest of the combination. It is understood that the employment of such individual features or sub-combinations is contemplated by this invention and within the scope of the appended claims.

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

Having thus described the invention, what is claimed is:

1. A target trap, comprising, a base, target throwing mechanism including a swingable throwing arm shiftably mounted on said base, and controlling means adapted to apply the energy of a single swing of said arm to shift said mechanism on said base through a plurality of full strokes in different directions.

2. A target trap, comprising, a base, target throwing mechanism including a swingable throwing arm shiftably mounted on said base, and controlling means adapted to apply the energy of a single swing of said arm to shift said mechanism on said base through a plurality of strokes alternately in opposite directions.

3. A target trap, comprising, a base, target throwing mechanism shiftable on said base, controlling means for said mechanism movable on said base, means adapted to position said mechanism relatively to said controlling means, and means adapted to center said controlling means on said base.

4. A target trap, comprising, a base, target throwing mechanism shiftable on said base, con-

trolling means for said mechanism movable on said base, means adapted to position said mechanism relatively to said controlling means, and yielding means adapted to center said controlling means on said base.

5. A target trap, comprising, a base, target throwing mechanism including a swingable throwing arm shiftably mounted on said base, controlling means adapted to apply the energy of swing of said arm to shift said mechanism on said base, and shift-delaying means adapted to vary the time phase of application of such energy.

6. A target trap, comprising, a base, target throwing mechanism including a swingable throwing arm shiftably mounted on said base, means adapted to apply the energy of swing of said arm to shift said mechanism, means adapted to limit the extent of movement of said mechanism, and means adapted to receive and store up the residual energy of movement of said mechanism at the limit of movement.

7. A target trap, comprising, a base, target throwing mechanism including a swingable throwing arm shiftably mounted on said base, means adapted to apply the energy of swing of said arm to shift said mechanism, means adapted to limit the extent of movement of said mechanism, and means adapted to receive and store up the residual energy of movement of said mechanism at the limit of movement and thereafter to return such stored energy to said mechanism.

8. A target trap, comprising, a base, target throwing mechanism including a swingable throwing arm shiftably mounted on said base, means adapted to apply the energy of swing of said arm to shift said mechanism, means for changing the direction of shift, and means adapted to receive and store up the residual energy of movement of said mechanism during the change of direction.

9. A target trap, comprising, a base, target throwing mechanism including a swingable throwing arm shiftably mounted on said base, means adapted to apply the energy of swing of said arm to shift said mechanism, means for changing this direction of shift, and means adapted to receive and store up the residual energy of movement of said mechanism during the change of direction and to return such residual energy to said mechanism for movement in the new direction.

10. A target trap, comprising, a base, target throwing mechanism including a swingable throwing arm shiftably mounted on said base, means adapted to apply the energy of swing of said arm to shift said mechanism, controlling means adapted to release said mechanism for movement on said base and thereafter to restrain such movement, and means adapted to receive and store up the residual energy of movement of said mechanism when so restrained.

11. A target trap, comprising, a base, target throwing mechanism including a swingable throwing arm shiftably mounted on said base, means adapted to apply the energy of swing of said arm to shift said mechanism, controlling means adapted alternately to release said mechanism for movement on said base and to restrain such movement, and means adapted to receive and store up the residual energy of movement of said mechanism when so restrained and to return such energy upon release of said mechanism.

12. A target trap, comprising, a base, target throwing mechanism including a swingable throwing arm shiftably mounted on said base, means adapted to apply the energy of swing of said arm to shift said mechanism, means adapted to limit the extent of movement of said mechanism, and a resilient element adapted to receive and store up the residual energy of movement of said mechanism when so restrained and thereafter to return such energy.

13. A target trap, comprising, a base, target throwing mechanism including a swingable throwing arm shiftably mounted on said base, means adapted to apply the energy of swing of said arm to shift said mechanism, means for changing the direction of shift, and a resilient element adapted to receive and store up the residual energy of movement of said mechanism during the change of direction.

14. A target trap, comprising, a base, target throwing mechanism including a swingable throwing arm shiftably mounted on said base, means adapted to apply the energy of swing of said arm to shift said mechanism, controlling means adapted alternately to release said mechanism for movement on said base and to restrain such movement, and a resilient element adapted to receive and store up the residual energy of movement of said mechanism when so restrained and to return such energy upon release of said mechanism.

15. A target trap, comprising, a base, target throwing mechanism including a swingable throwing arm shiftably mounted on said base, means adapted to apply the energy of swing of said arm to shift said mechanism, a pivoted controlling element, means adapted to effect a variable connection between said mechanism and said element, and resilient means for positioning said element.

16. A target trap, comprising, a base, target throwing mechanism including a swingable throwing arm shiftably mounted on said base, means adapted to apply the energy of swing of said arm to shift said mechanism, a pivoted controlling element, means adapted to effect a progressively variable connection between said mechanism and said element, and resilient means for positioning said element.

17. A target trap, comprising, a base, target throwing mechanism including a swingable throwing arm shiftably mounted on said base, means adapted to apply the energy of swing of said arm to shift said mechanism, a pivoted controlling element, means adapted to effect a progressively variable connection between said mechanism and said element, means for reversing the progression thereof, and resilient means for positioning said element.

18. A target trap, comprising, a base, target throwing mechanism including a swingable throwing arm shiftably mounted on said base, means adapted to apply the energy of swing of said arm to shift said mechanism, a pivoted controlling element, means adapted to effect a progressively variable connection between said mechanism and said element, means for reversing the progression thereof, means for locking said mechanism to said controlling element, and resilient means for positioning said element.

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