

Dec. 23, 1941.

W. R. KEMP

2,267,525

TARGET LOADING DEVICE FOR THROWING MACHINES

Filed Oct. 21, 1940

4 Sheets-Sheet 1

FIG. I.

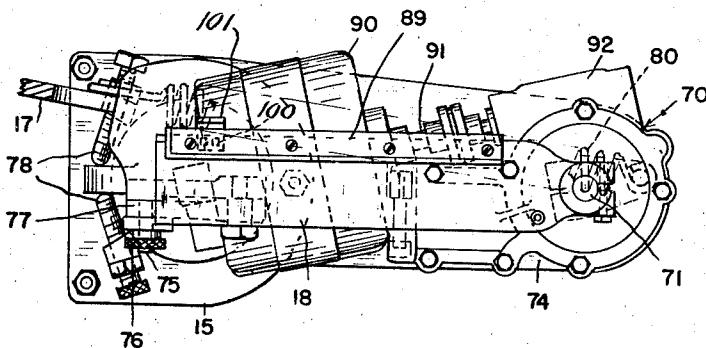
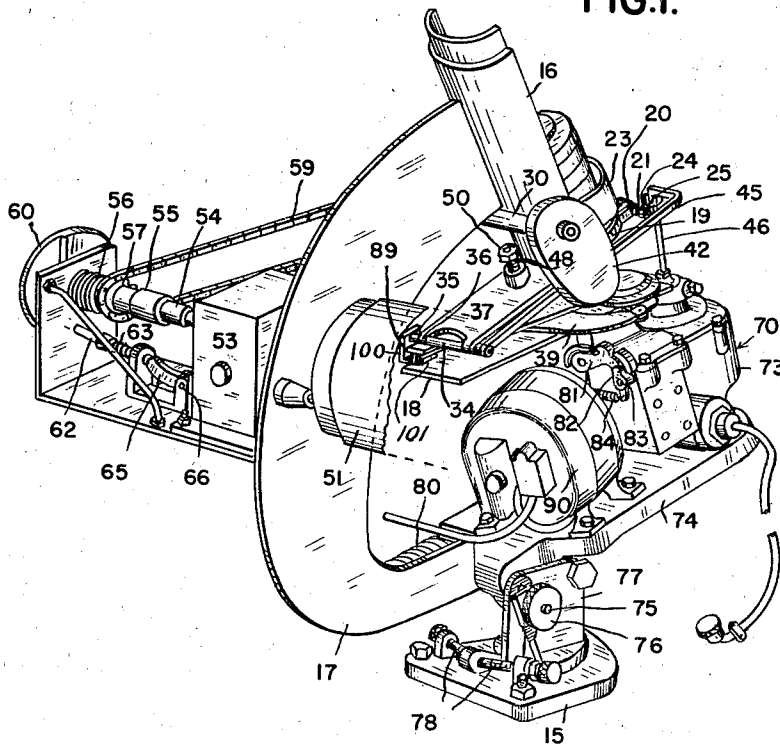


FIG. I4.

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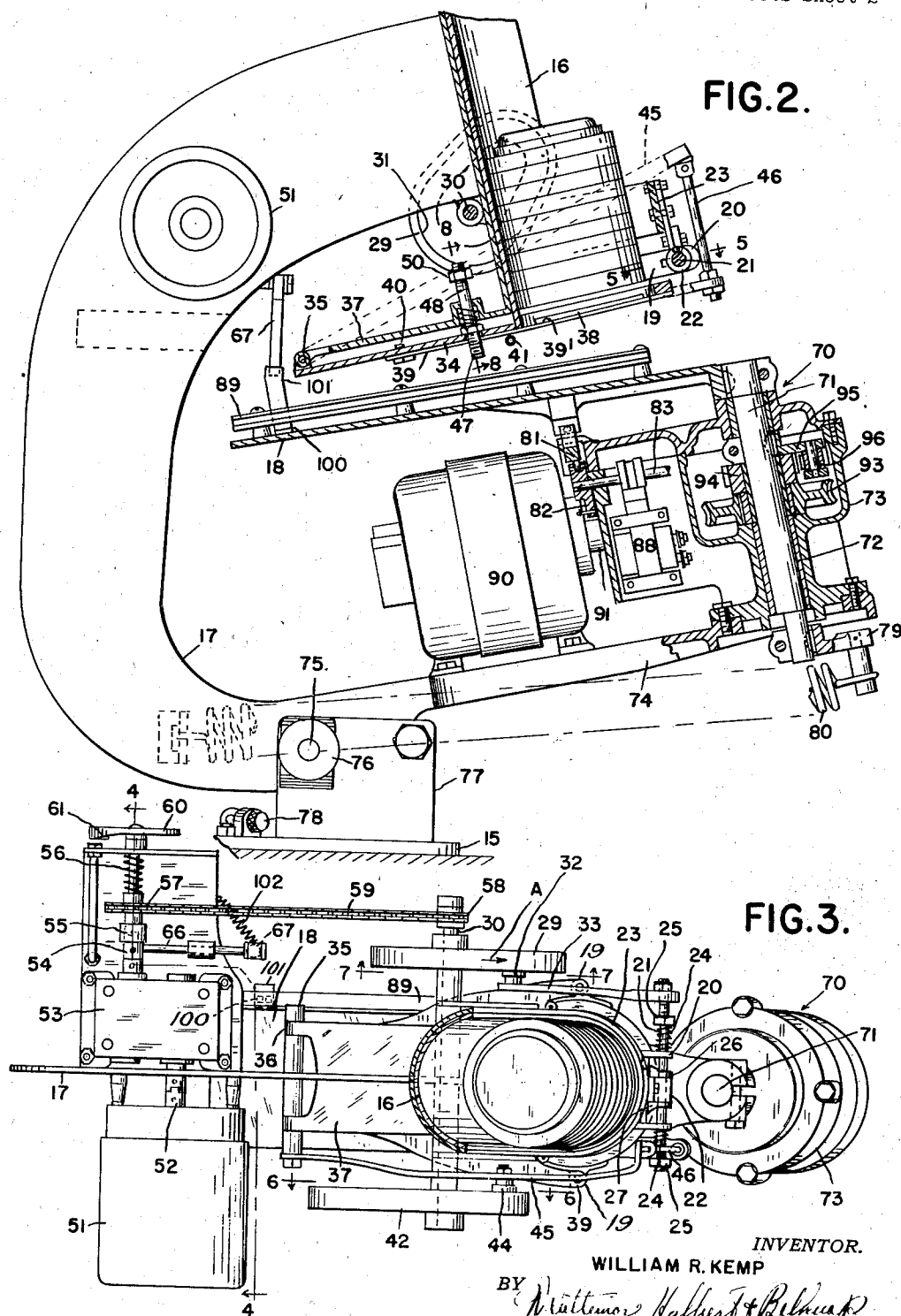
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TARGET LOADING DEVICE FOR THROWING MACHINES

Filed Oct. 21, 1940

4 Sheets-Sheet 2



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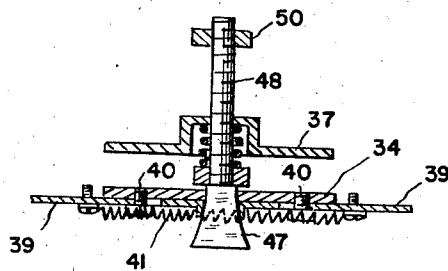
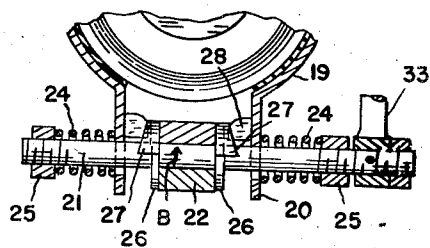
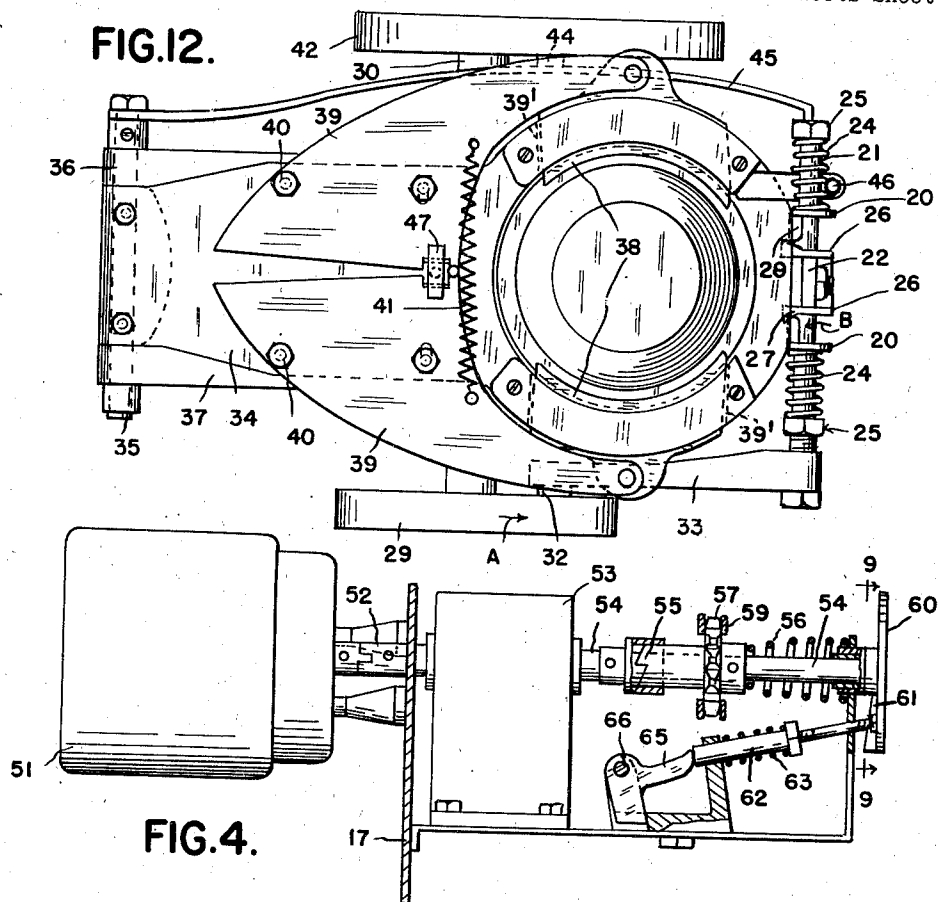
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TARGET LOADING DEVICE FOR THROWING MACHINES

Filed Oct. 21, 1940

4 Sheets-Sheet 3



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TARGET LOADING DEVICE FOR THROWING MACHINES

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4 Sheets-Sheet 4

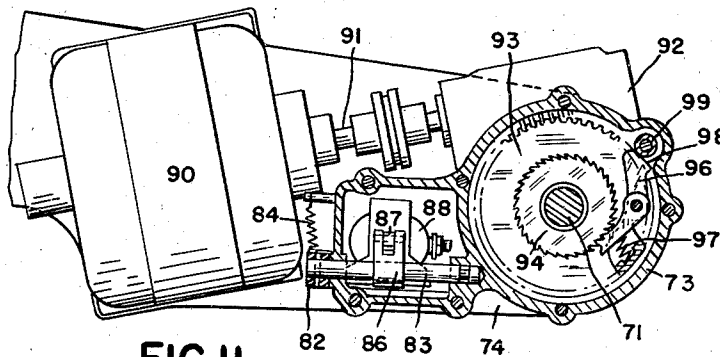


FIG. II.

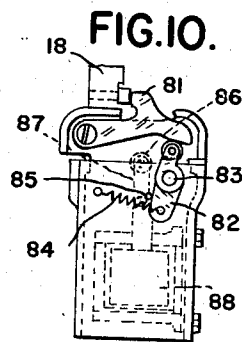


FIG. IO.

FIG. 6.

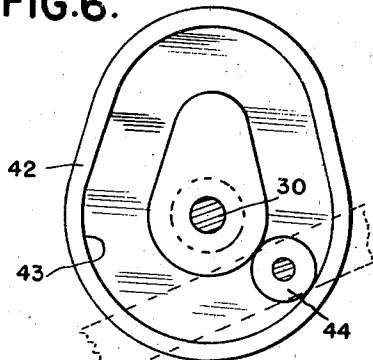


FIG. 7.

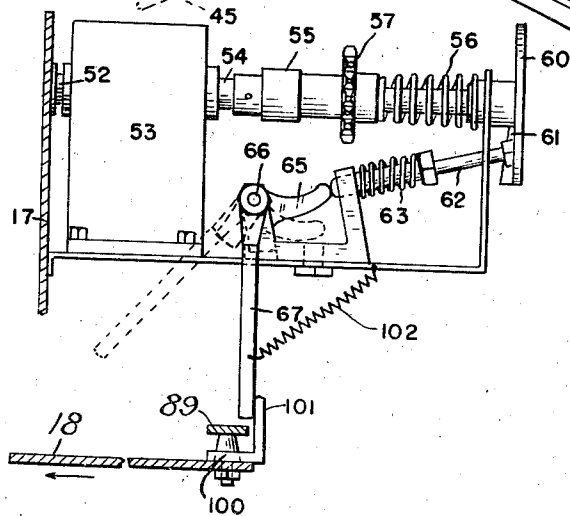
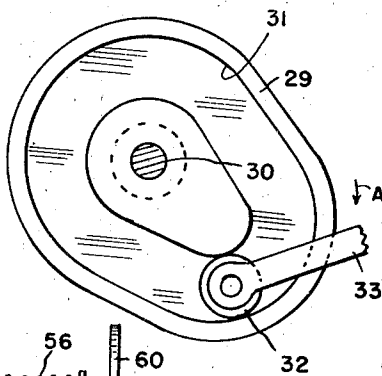
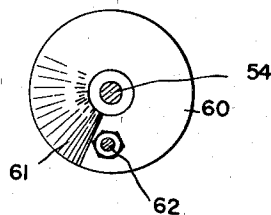


FIG. 13.

FIG. 9.



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## UNITED STATES PATENT OFFICE

2,267,525

## TARGET LOADING DEVICE FOR THROWING MACHINES

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Application October 21, 1940, Serial No. 362,171

16 Claims. (Cl. 124-46)

This invention relates generally to target loading apparatus and refers more particularly to a device for supplying targets to a throwing machine of the type employed in trap or skeet shooting.

It is one of the principal objects of this invention to provide a relatively simple inexpensive loading device which will operate automatically to deposit a target in its proper position on the swinging arm of a throwing machine prior to movement of the arm to throw the target.

Another feature of this invention consists in the provision of a loading device capable of being operated in conjunction with a throwing machine and having means for depositing a target on the throwing arm of the machine each time the arm is returned to its retracted or cocked position.

A further object of this invention resides in the provision of a loading device wherein the target is supported throughout its movement toward the throwing arm and is not released until it assumes a position in close proximity to the arm. As a result, the target is placed gently on the throwing arm by the loading device, and this is important in cases where the targets are formed of a fragile material since it reduces breakage to a minimum.

A still further feature of this invention consists in providing a loading device capable of being used with throwing machines of the type wherein the throwing arm is returned to its retracted or cocked position by power means and, to this end, the invention contemplates means operated in timed relation to movement of the throwing arm to initiate operation of the loading device.

The foregoing as well as other objects will be made more apparent as this description proceeds, especially when considered in connection with the accompanying drawings, wherein:

Figure 1 is a perspective view showing a loading device constructed in accordance with this invention as applied to a throwing machine;

Figure 2 is a vertical sectional view through the apparatus illustrated in Figure 1;

Figure 3 is a plane view of the apparatus shown in Figure 1;

Figure 4 is a sectional view taken substantially on the plane indicated by the line 4-4 of Figure 3;

Figure 5 is a sectional view taken substantially on the plane indicated by the line 5-5 of Figure 2;

Figure 6 is a sectional view taken substantial-

ly on the plane indicated by the line 6-6 of Figure 3;

Figure 7 is a sectional view taken substantially on the plane indicated by the line 7-7 of Figure 3;

Figure 8 is a sectional view taken substantially on the plane indicated by the line 8-8 of Figure 2;

Figure 9 is a cross sectional view taken substantially on the plane indicated by the line 9-9 of Figure 4;

Figure 10 is a rear elevational view illustrating the latching means provided on the throwing machine for holding the throwing arm in its retracted position;

Figure 11 is a fragmentary elevational view partly in section of the power means for operating the throwing arm;

Figure 12 is a bottom elevational view of a part of the target loading apparatus shown in Figure 1;

Figure 13 is a fragmentary elevational view of the driving mechanism for the loading device;

Figure 14 is a plane view of the throwing machine.

As shown in the several figures of the drawings, my improved target loading device comprises a base 15 and a magazine 16 supported in spaced relation to the base by means of a bracket 17. It will be noted from Figure 1 that the bracket is shaped to provide clearance for the swinging end of a target throwing arm 18, and the free end of the bracket supports the magazine with its delivery end spaced a substantial distance above the pivoted end of the arm 18. As will be more fully hereinafter set forth, the arm 18 forms a part of a target throwing machine and the pivot or axis of swinging movement of the arm 18 is inclined with respect to the vertical in a rearward direction at an angle predetermined in dependence upon the elevation at which it is desired to throw the targets.

The magazine 16 is in the form of a semi-circular elongated member inclined with respect to the vertical in the direction of the axis of the throwing arm so as to permit the targets stacked in the magazine to be placed substantially flat on the throwing arm 18. In the present instance, the targets are in the form of discs which are commonly referred to as "birds" and are fragile so as to "powder" when hit squarely. In fact, the targets are so fragile that they are often broken or cracked when placed on the throwing arm, and it is one of the important fea-

tures of this invention to reduce the breakage occasioned by loading to a minimum.

Briefly, the above results are obtained by placing the targets substantially flat on the throwing arm and by supporting the targets throughout movement thereof from the discharge end of the magazine to a position in such close proximity to the throwing arm 18 that the distance the targets fall by gravity, when released from the supporting means, is so slight that the resulting impact will not crack or break the targets.

With the above in mind, reference will now be made to Figure 3 of the drawings wherein, it will be noted that the stack of targets are held in the magazine by a pair of shoes 19 respectively pivotally mounted at opposite sides of the magazine at the lower end of the latter for swinging movement transversely of the magazine toward and away from each other. The shoes are normally urged in directions toward each other into gripping relation with opposite sides of the two bottom targets and are forcibly moved in directions away from each other to release the targets. In detail the free ends of the shoes are provided with lugs 20 spaced from each other and having aligned openings therethrough for receiving a rock shaft 21. The portion of the rock shaft 21 between the lugs 20 is supported in a bearing 22 carried by a semi-circular strap 23 having the ends respectively secured to the opposite edges of the semi-circular magazine 16 above the rock shaft 21.

The width of the shoes is sufficient to grip the two bottom targets in the magazine 16, and the shoes are yieldably urged into gripping relationship with the targets by means of a pair of springs 24 surrounding the rock shaft 21 at opposite sides of the lugs 20 on the shoes. As shown in Figure 5, the inner ends of the springs 24 abut the lugs 20 and the outer ends of the springs are engageable with suitable stops 25 in the form of nuts threaded on the rock shaft 21. Secured to the rock shaft 21 at opposite sides of the bearing 22 is a pair of cam members 26 having cam portions 27 on the outer surfaces thereof respectively engageable with cam portions 28 formed on the lugs 20 of the shoes to spread the shoes apart upon rotation of the rock shaft 21 in one direction.

The rock shaft is operated by means of a cam 29 secured to a cam shaft 30 extending transversely of the magazine 16 in rear of the latter and journaled in bearings carried by the bracket 17. Upon reference to Figure 7, it will be noted that the cam 29 is provided with a cam groove 31 on the rear surface thereof of sufficient width to receive a roller 32 carried by the free end of an arm 33 having the opposite end secured to the rock shaft 21. The contour of the cam groove 31 is such that rotation of the cam 29 in the direction of the arrow A rocks the shaft 21 in the direction of the arrow B a sufficient distance to engage the cam portions 27 on the cams 26 with the cooperating stationary cam portions 28 on the shoes and spread the latter against the action of the springs 24 to release the targets. Continued rotation of the cam 29 in the direction of the arrow A rocks the shaft 21 in a reverse direction to disengage the cam portions 27 from the cam portions 28 and permit the springs 24 to return the shoes into gripping relation with the targets.

When the shoes are released from the targets, the latter are advanced by gravity and the low-

ermost target is deposited upon the free end of a swinging arm 34. The opposite end of the arm is hingedly connected to a pivot pin 35 supported in bearings 36 carried by the rear end of a plate 37 having the forward end welded or otherwise fixedly secured to the rear side of the magazine 16. The forward or swinging end of the arm 34 is provided with an annular portion having an internal diameter sufficiently greater than the exterior diameter of the targets to permit the same to pass therethrough. However, as shown in Figure 12, the lowermost target is normally prevented from falling through the annular portion of the arm 34 by means of a pair of supporting members 38 respectively positioned in slots 39 formed through opposite sides of the annular portion on the arm 34 and adapted to project into the annular portion a sufficient distance to intercept the bottom target. Referring again to Figure 12, it will be noted that the supporting members are respectively pivoted to the forward ends of suitable links 39 having the rear ends pivoted to the arm 34 by means of pivot pins 40 in the form of bolts. The supporting members 38 are normally held in their innermost or target supporting positions by means of a coil spring 41 having the opposite ends secured to the links 39 so as to urge the latter toward each other.

It should be understood at this time that the construction is such that when the lowermost target is supported on the members 38 in the annular outer end portion of the arm 34, the next succeeding target remains in the confines of the shoes 19 so as to be gripped by the latter and held in position in the magazine 16. As stated above, the arm 34 is pivoted at its rear end to provide for swinging movement of the annular outer end portion relative to the lower end of the magazine 16. After the lowermost target in the magazine is deposited on the supporting members 38 in the annular portion at the swinging end of the arm 34, the latter is swung downwardly to a position in close proximity to the adjacent end of the throwing arm 18.

Upon reference to Figure 6, it will be noted that the arm 34 is swung by a cam 42 secured to the cam shaft 30 in opposed relationship to the cam 29. In detail it will be noted that the cam 42 is provided with an annular groove 43 in the inner face thereof of sufficient width to receive a roller 44 carried by an arm 45 pivoted at its rear end on the pin 35 and having the forward end connected to the corresponding end of the arm 34 by means of a link 45. The cam groove 43 is predeterminedly contoured with respect to the cam groove 31 in the cam 29 so as to delay movement of the arm 34 downwardly until the cam 29 has operated to release the shoes and permit the lowermost target to assume a position on the supporting members 38.

When the swinging end of the arm 34 approaches a position directly above the pivoted end of the throwing arm 18 in close proximity to the latter end, the supporting members 38 are moved in directions away from each other against the action of the spring 41 to permit the target to drop onto the throwing arm. Upon reference to Figure 8, it will be noted that the above is accomplished by means of a cam 47 having a wedge-shaped contour and extending between the links 39 forwardly of the pivots 40. The cam 47 is secured to the lower end of a threaded stud 43 which extends freely through

the plate 37 and is provided at the upper end with an adjustable stop 50. The arrangement is such that the cam 47 moves downwardly with the arm 34 until the stop 50 abuts the top of the plate 37 whereupon, continued downward movement of the arm is effected relative to the cam 47. As a result, the oppositely inclined sides of the cam engage the adjacent edges of the links 39 to move the same in directions away from each other against the action of the spring 41. Hence, the target resting on the supporting members is released and is dropped onto the throwing arm. It will be noted that the distance that the target drops onto the supporting arm is so small that the resulting impact is not sufficient to crack or break the target.

The cam shaft 30 is driven by a suitable prime mover 51 in the form of an electric motor having a drive shaft operatively connected to a power-take-off shaft 52 through the medium of suitable gear reduction mechanism 53. As shown in Figure 4, the shaft 52 is operatively connected to a driven shaft 54 through the medium of a clutch 55 normally urged into engagement by means of a spring 56. It will, also, be noted that the driven shaft is provided with a sprocket wheel 57 adapted to be connected to a corresponding sprocket wheel 58 on the cam shaft by means of a chain 59.

Referring again to Figure 4, it will be noted that the action of the spring 56 to engage the clutch is counteracted by means of a cam 60 driven by the driven shaft 54 and having a cam face 61 engageable with one end of the plunger 62. The plunger is mounted for sliding movement toward and away from the cam 60 and is normally urged toward the cam by means of a relatively weak spring 63. The spring 56 is of considerably greater strength than the spring 63 and, as a result, the cam 60 together with the driven shaft 54 and the plunger 62 is urged in a direction to engage the clutch. However, the action of the spring 56 to accomplish the above result is prevented by means of a dog 65 mounted on a rock shaft 66 in a position to abut the inner end of the plunger 62.

The above arrangement is such that when the dog 65 is rocked out of engagement with the inner end of the plunger, the spring 56 engages the clutch, and the driven shaft is rotated. Initial rotation of the driven shaft moves the cam surface 61 on the cam beyond the outer end of the plunger 62 and permits the spring 63 to move the plunger outwardly a sufficient distance to allow the dog 65 to return to its operative position in abutting engagement with the inner end of the plunger. In this connection, it will be noted that the dog is returned to its operative position by the weight of the trip lever 67 secured to the rock shaft 66. As the cam 60 continues its rotation, the cam face 61 again comes in contact with the outer end of the plunger and, since the latter is prevented from moving inwardly by the dog 65, it follows that the driven shaft is moved against the action of the spring 56 to disengage the clutch 55. From the foregoing, it will be observed that operation of the loading device is initiated by moving the trip 67 in an upward direction to swing the dog 65 out of abutting engagement with the inner end of the plunger 62.

For the purpose of illustration, I have shown my improved target loading device as employed in combination with a target throwing machine designated generally in Figure 1 by the reference character 70. The throwing machine 70 selected

for illustrating the invention is practically identical in construction to the machine illustrated in the Schwerin Patent 2,078,166 dated April 20, 1937, and accordingly, need not be described in detail herein. However, it is to be understood that the loading device previously described is by no means limited to the particular type of throwing machine shown, and may be advantageously employed in connection with practically any type of throwing machine having a throwing arm, regardless of whether the latter is manually or power driven.

In general, the machine 70 includes the target throwing arm 18. As shown in Figure 2, the end of the arm 18, directly beneath the magazine 16, is secured to the upper end of a substantially vertical shaft 71. The shaft 71 is journaled in bearings 72 carried by a housing 73 which, in turn, is mounted upon the base portion 74 of the bracket 17. In this connection, it will be noted that the bracket 17 is pivotally connected to the base 15 by means of a horizontal pin 75 and is normally held from swinging movement about the axis of the pin by means of a locking knob 76. As a result of this construction, the angular inclination of the shaft 71 with respect to the vertical may be varied to change the elevation at which the targets are thrown into the air. It may also be pointed out at this time that the bracket is rotatably supported on the base by means of a fixture 77, and is normally held against rotation by the cooperating set screws 78. The set screws 78 comprise manually operated means for controlling the direction in which the targets are thrown by the arm 18.

The lower end of the shaft 71 has a crank 79 secured thereto and the free end of the crank arm is connected to one end of a strong spring 80 having the opposite end suitably anchored on the bracket 17. As shown in Figure 14, the crank 79 is secured to the lower end of the shaft 71 in such relation that when the throwing arm is in its retracted position, the crank is slightly beyond dead center and holds the throwing arm against the trip latch 81. Upon reference to Figure 10, it will be noted that the latch 81 is supported for swinging movement in a downward direction relative to the throwing arm out of the path of travel of the latter and is normally held against downward swinging movement by a rock arm 82 secured to a rock shaft 83. The upper end of the rock arm 82 is held in engagement with the latch 81 by means of a spring 84 normally urging the lower end of the rock arm against a fixed stop 85. Referring now to Figure 11 of the drawings, it will be noted that an arm 86 is secured to the rock shaft 82 intermediate the ends thereof and is connected by means of a link 87 to a solenoid 88 connected in an electric circuit with a suitable push button control (not shown).

The above arrangement is such that when the solenoid 88 is energized, the rock shaft 83 is rotated in a counterclockwise direction to move the upper end of the arm 82 out of the path of travel of the latch 81. As a result, the latch 81 drops by gravity out of the path of travel of the throwing arm 18 and the latter is swung through its throwing angle to hurl the targets into the air with a high rate of speed. In this connection, it will be noted that the throwing arm is provided with a rail 89 which engages the peripheral edges of the targets and imparts a high speed of rotation thereto as they are thrown by the arm into the air.

The throwing arm 18 is returned to its cocked position by means of an electric motor 90 suitably supported upon the base 74 of the bracket 17 and having a drive shaft 91 operatively connected to the shaft 71 through the medium of reduction gearing 92. As shown in Figures 2 and 11, the reduction gearing includes a gear 93 secured to the hub of a suitable ratchet wheel 94 which, in turn, is freely rotatably mounted on the shaft 71. As a result, the reduction gear 93 and ratchet 94 are rotated by the motor 90 relative to the shaft 71.

The shaft 71 is operatively connected to the motor 90 by means of a cage 95 keyed to the shaft 71 and having a pawl 96 pivotally connected thereto. A spring 97 compressed between the pawl 96 and the end of the cage 95 urges the pawl into engagement with the teeth of the ratchet wheel. A cam surface 98 on the tail of the pawl contacts with a roller 99 located in a recess in the housing 73 and serves to cam the pawl out of engagement with the teeth of the ratchet wheel just after the crank 79 passes its dead center position. In other words, the shaft 71 is released from its driving connection with the motor 90 when the crank 79 assumes its operative position. The arm 18 moves at a much faster speed than the rotative speed of the ratchet wheel 90 during the throwing movement of the arm and, as a result, the pawl ratchets over the teeth of the ratchet wheel. However, when the rotative speed of the throwing arm 18 and the shaft 71 slows down to the speed of the ratchet wheel, the pawl engages the ratchet teeth, and the shaft 71 is rotated with the ratchet wheel to again tension the spring 80 and move the throwing arm 18 back to its cocked position.

In order that my improved target loading device will operate in timed relation to return movement of the arm to its cocked position to deposit a target on the arm, I provide means for actuating the trip 67 to initiate the operation of the throwing device as the arm is returned to its cocked position. The above may be accomplished in a relatively simple manner by providing a bracket 100 on the swinging end of the arm having an abutment 101 located to engage the free end of the trip 67 when the arm approaches its retracted position. In Figure 13, the arm 18 is shown in a position wherein the abutment 101 engages the free end of the trip 67, and it will be noted from this figure that continued movement of the arm to its cocked position causes the abutment 101 to swing the trip 67 against the action of the spring 102 to the dotted line position shown. As a result, the dog 65 releases the plunger 62 and permits the spring 56 to engage the clutch 55 and start the loading mechanism. As soon as the arm 18 reaches its cocked position, the spring 102 returns the trip to its full line position shown in Figure 13 and the dog again assumes its position in engagement with the free end of the plunger 62.

#### Operation

With the above construction, it will be noted that as the throwing arm approaches its cocked position, the abutment 101 engages the free end of the trip 67 and rocks the shaft 66 to swing the lug 65 out of engagement with the inner end of the plunger 62. As a result, the plunger is free to move inwardly under the action of the spring 56 and the latter engages the clutch 55 to connect the driven shaft with the electric

motor 51. It will be apparent from the above description that rotation of the driven shaft effects a corresponding rotation of the cam 60 and cam shaft 30. As previously stated, initial rotation of the cam 60 moves the cam surface 61 out of engagement with the outer end of the plunger 62 with the result that the plunger is moved axially outwardly by the spring 63. Displacement of the plunger 62 axially outwardly permits the spring 102 to rock the shaft 66 in a direction to return the lug 65 in engagement with the inner end of the plunger 62. Thus, when the cam surface 61 on the cam again engages the outer end of the plunger 62, the latter is prevented from inward movement, and the driven shaft 54 is displaced axially against the action of the spring 56 to release the clutch 55.

Rotation of the cam shaft 30 by the driven shaft 54 effects a corresponding rotation of the cams 29 and 42. As the cam 29 is rotated, the cam groove 31 cooperates with the link 33 to release the shoes 19 from the two bottom targets in the magazine 16. As a result, the targets in the magazine are dropped by gravity and the lowermost target is intercepted by the supporting members 38 carried by the swinging end of the arm 34. As soon as the lowermost target in the magazine is dropped into engagement with the supporting members 38, the shoes are returned by the springs 24 into gripping relationship with the next succeeding target so as to again support the stack of targets in the magazine 16.

After the shoes are returned into clamping engagement with the targets directly above the target previously released, the cam 42 lowers the swinging end of the arm 34 to a position wherein the target carried thereby is in close proximity to the throwing arm 18. As the swinging end of the arm 34 approaches the throwing arm, the cam 47 operates to release the supporting members 38 from the target and thereby permits the latter to drop onto the supporting arm. It should be understood that the cam 47 does not release the supporting members from the target until the target assumes a position in close proximity to the throwing arm so that there will be no danger of cracking or breaking the target when the latter is deposited on the throwing arm. Continued rotation of the cam 42 returns the swinging end of the arm 34 to its initial starting position adjacent the discharge end of the magazine 16. As the arm 34 is swung upwardly, the cam 47 releases the supporting members 38 and the spring 41 returns the supporting members to positions wherein they will again intercept a target released by the shoes.

When the swinging end of the arm is returned to its position adjacent the discharge end of the magazine 16, the cam surface 61 on the cam 60 engages the outer end of the plunger 62 and moves the driven shaft 54 axially against the spring 56 a sufficient distance to disengage the clutch 55. It will be understood that as soon as the target is deposited upon the throwing arm, the throwing machine may be operated to swing the arm and hurl the target into the air. In other words, the throwing machine may be operated during the interval the loading device is restored to its initial starting position.

While describing this invention, particular stress has been placed on the use of my target loading device in connection with an automatic throwing machine of a particular design, nevertheless, it will be noted from the construction of the loading device that the latter is equally ap-



plicable to practically any type of target throwing machine regardless of whether the later is manually operated or power driven. It may, also, be pointed out at this time that while I have shown two motors for respectively operating the throwing machine and loading device, nevertheless, it will be apparent that both machines may be operated from a single source of power if desired.

What I claim as my invention is:

1. In a loading device for throwing machines having a target throwing element, means for supporting a stack of targets above the throwing element in spaced relation thereto, means for periodically releasing the target from the supporting means, means positioned in close proximity to the lowermost target on the supporting means for intercepting the target released from the supporting means and for supporting the target above the throwing element and means for moving the target intercepting means from a position adjacent the target supporting means to a position in close proximity to the throwing element.

2. In a loading device for throwing machines having a target throwing element, a magazine having the delivery end spaced above the throwing element and adapted to contain a stack of targets, means for periodically releasing a target from the delivery end of the magazine, a member positioned in close proximity to the delivery end of the magazine for intercepting the target released from the latter, means for moving said member with the target thereon from a position adjacent the delivery end of the magazine to a position in close proximity to the throwing element, and means operable upon movement of said member to a position in close proximity to the throwing element to release the target from said member.

3. In a loading device for throwing machines having a target throwing element, a magazine having the delivery end spaced above the throwing element and adapted to contain a stack of targets, means for periodically releasing the lowermost target in said stack to permit the same to drop by gravity from the delivery end of the magazine, an arm mounted for swinging movement from a position adjacent the delivery end of the magazine to a position in close proximity to the throwing element, means carried by the arm for intercepting the target released from the delivery end of the magazine and for supporting said target during the movement of the arm toward the throwing element, and means responsive to swinging movement of the arm to a position in close proximity to the throwing element to release said supporting means and deposit the target on said throwing element.

4. In a loading device for throwing machines having a target throwing element a magazine having the delivery end spaced above the throwing element and adapted to contain a stack of targets, means for releasing the lowermost target in the stack to permit the same to drop by gravity from the delivery end of the magazine, a pair of members positioned at opposite sides of the delivery end of the magazine to intercept the target released from the delivery end of the magazine and adapted to support said target, said members being movable from a position adjacent the delivery end of the magazine to a position in close proximity to the throwing element and also being movable away from each other to release the target, means operating in timed relation to releasing the lowermost target in the magazine to

move said members to a position in close proximity to the throwing element, and means responsive to movement of the members to a position in close proximity to the throwing element to move the members away from each other and release the target.

5. In a loading device for throwing machines having a target throwing element, a magazine having the delivery end spaced above the throwing element and adapted to contain a stack of targets, means for periodically releasing the lowermost target in said stack to permit the same to drop by gravity from the delivery end of the magazine, a pair of members positioned at opposite sides of the delivery end of the magazine for intercepting a target released from the delivery end of the magazine and for supporting said target, said members being movable from a position adjacent the delivery end of the magazine to a position in close proximity to the throwing element and also being movable in directions away from one another to release the target, yieldable means resisting movement of the members away from each other, and a cam responsive to movement of the members to a position in close proximity to the throwing element to engage the members and move the latter away from each other sufficiently to release the target therefrom.

6. In a loading device for throwing machines having a target throwing element, a magazine having the delivery end spaced above the throwing element and adapted to contain a stack of targets, means for periodically releasing the lowermost target in the stack to permit the same to drop by gravity from the delivery end of the magazine, an arm pivotally supported for swinging movement from a position adjacent the delivery end of the magazine to a position in close proximity to the throwing element, a pair of links pivoted to the arm for swinging movement transversely of the arm toward and away from each other and having members at the free ends thereof positioned adjacent opposite sides of the delivery end of the magazine to intercept a target released from the magazine and to support said target, yieldable means normally urging the links in directions toward each other to hold said members in target supporting position, means operating in timed relation to the target releasing means to swing the arm to a position in close proximity to the throwing element, a cam located between the links and responsive to movement of the arm to a position in close proximity to the throwing element to move the links in directions away from each other a sufficient distance to release the target from the supporting members, and means for adjusting the cam means to vary the interval at which the latter operates to release said target from the supporting members.

7. In a loading device for throwing machines having a target throwing element, a magazine having the delivery end spaced above the target throwing element and adapted to contain a stack of targets, means at the lower end of the magazine engageable with the lowermost targets to support said targets in the magazine and releasable to permit the targets to drop by gravity, cam controlled means for periodically releasing the target holding means to permit a target to be dropped from the delivery end of the magazine, a pair of members positioned at opposite sides of the delivery end of the magazine for intercepting and supporting a target dropped from the delivery end of the magazine, said members

being movable from a position adjacent the delivery end of the magazine to a position in close proximity to the throwing element and also being movable in directions away from each other to release the target supported thereby, cam controlled means for moving the members from the delivery end of the magazine to a position in close proximity to the throwing element in timed relation to the operation of the first named cam controlled means to release a target from the magazine, and additional cam controlled means operating in timed relation to movement of the members to a position in close proximity to the throwing element to move said members away from each other and release the target therefrom.

8. In a loading device for throwing machines having a target throwing element, a magazine having the delivery end spaced above the throwing element and adapted to contain a stack of targets, a pair of shoe members pivotally supported at opposite sides of the magazine adjacent the delivery end thereof and normally urged into engagement with the lowermost target in the stack for supporting the latter, means for periodically moving the shoe members away from each other to successively release the targets in said stack, means movable from a position immediately adjacent the delivery end of the magazine to a position in close proximity to the throwing arm and operable in the first named position to intercept the targets released by the shoe members, and means for releasing the targets from the last named means when the latter assumes a position in close proximity to the throwing element.

9. In a loading device for throwing machines having a target throwing element, a magazine having the delivery end spaced above the throwing element and adapted to contain a stack of targets, a pair of shoe members pivotally supported at opposite sides of the magazine adjacent the delivery end of said magazine and normally urged into engagement with the lowermost targets in the stack to support the latter, means for periodically moving the shoe members away from each other to release the targets, a member positioned adjacent the delivery end of the magazine to intercept the lowermost target and support the latter during return movement of the shoes toward each other into clamping engagement with the next adjacent target, said member being movable from a position adjacent the delivery end of the magazine to a position in close proximity to the throwing element, and cam means for operating the shoes and said member in timed relation to each other.

10. In a loading device for throwing machines having a target throwing element, a magazine having the delivery end spaced above the throwing element and adapted to contain a stack of targets, a pair of shoes pivotally supported at opposite sides of the magazine adjacent the delivery end of the latter and yieldably urged into clamping engagement with the lowermost target in the stack to support the latter, means for periodically moving the shoes in directions away from each other to release the lowermost target in the stack, an arm supported for swinging movement from a position adjacent the delivery end of the stack to a position in close proximity to the throwing element, a pair of members carried by the arm at opposite sides of the latter in positions to intercept the target released by the shoes and movable relative to the arm away from

each other, yieldable means normally resisting movement of the members away from each other, means operating in timed relation to the shoe releasing means to swing the arm to a position in close proximity to the throwing element, and means responsive to movement of the arm to a position in close proximity to the throwing element to move said members away from each other and release the target therefrom.

11. In a loading device for throwing machines having a target throwing element movable between retracted and extended positions, a magazine having the delivery end spaced above the throwing element and adapted to contain a stack of targets, means for periodically releasing the targets to permit the lowermost target in the stack to drop from the delivery end of the magazine, means for intercepting the target released from the stack and for supporting said target in a position spaced above the throwing element, means for moving the target supporting means to a position in close proximity to the throwing element in the retracted position of the latter and for depositing the target on the throwing element, and means controlled by the throwing element as the latter is moved to its retracted position to operate the target releasing and supporting means in timed relationship.

12. In a loading device for throwing machines having a target throwing element movable between retracted and extended positions, a magazine having the delivery end spaced above the throwing element and adapted to contain a stack of targets, means for periodically releasing the targets to permit the lowermost target to drop from the delivery end of the magazine, a member positioned to intercept the target released from the magazine and supported for swinging movement from a position adjacent the delivery end of the magazine to a position in close proximity to the throwing element, means operating in timed relation to movement of the member to a position in close proximity to the throwing element to release the target supported hereby, and means operated by the target throwing element as the latter is moved to its retracted position to operate said member and the first named target releasing means in timed relationship.

13. In a loading device for throwing machines having a target throwing element movable between retracted and extended positions, a magazine having the delivery end spaced above the throwing element and adapted to contain a stack of targets, means for periodically releasing the targets to permit the lowermost target to drop from the delivery end of the magazine, means for intercepting the target dropped from the delivery end of the magazine and for conveying said target to a position in close proximity to the throwing element, a revoluble cam shaft having a pair of cams respectively operatively connected to the target releasing means and the conveying means for operating the latter means in timed relationship, and means controlled by movement of the throwing element to its retracted position for effecting rotation of the cam shaft.

14. In a loading device for throwing machines having a target throwing element movable between retracted and extended positions, a magazine having the delivery end spaced above the throwing element and adapted to contain a stack of targets, means for periodically releasing the targets to permit the lowermost target to drop from the delivery end of the magazine, means for

intercepting the target dropped from the delivery end of the magazine and movable between the delivery end of the magazine and throwing element for conveying said target to a position in close proximity to the throwing element, a rev- 5  
oluble cam shaft having a pair of cams respectively operatively connected to the target releasing means and the conveying means for operating the latter means in timed relationship, a drive shaft operatively connected to the cam 10  
shaft through the medium of a clutch, means operated by the throwing element as the latter approaches its retracted position to engage the clutch and drive the cam shaft, and means operating in timed relation to return movement of 15  
the conveying means to a position adjacent the delivery end of the magazine for disengaging said clutch.

15. In a loading device for throwing machines having a target throwing element movable between retracted and extended positions, a magazine having the delivery end spaced above the throwing element and adapted to contain a stack of targets, means at the delivery end of the magazine for releasing the targets to permit the 20  
lowermost target to drop from the delivery end of the magazine, means for intercepting the target dropped from the delivery end of the magazine and movable between the delivery end of the magazine and throwing element for conveying 25  
the target to a position in close proximity to the throwing element, means operated by the throwing element as the latter approaches its retracted position to operate the target releasing means and the target conveying means in timed 30  
relationship, and means responsive to return 35

movement of the conveying means to a position adjacent the delivery end of the magazine to discontinue the operation of said last named means.

16. In a loading device for throwing machines having a target throwing element movable between retracted and extended positions, a magazine having the delivery end spaced above the throwing element and adapted to contain a stack of targets, means for periodically releasing the targets to permit the lowermost target to drop from the delivery end of the magazine, means for intercepting the target dropped from the delivery end of the magazine and movable between the delivery end of the magazine and throwing element for conveying said target to a position in close proximity to the throwing element, a revolvable cam shaft having a pair of cams respectively operatively connected to the target releasing means and the conveying means for operating the latter means in timed relationship, a continuously rotating drive shaft, a driven shaft operatively connected to the cam shaft, a clutch between the driven shaft and drive shaft, yieldable means normally urging the clutch into engagement, trip mechanism normally preventing the operation of the yielding means to effect engagement of the clutch and operated by the throwing element as the latter approaches its retracted position to permit engagement of the clutch by the yieldable means, and means responsive to return movement of the conveying means to a position adjacent the delivery end of the magazine for releasing said clutch.

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