A. FRISCH.

DEVICE FOR THROWING SUCCESSIVELY A SERIES OF PROJECTILES BY CENTRIFUGAL ACTION.

APPLICATION FILED JUNE 13, 1917.

1,293,075.

Patented Feb. 4, 1919.

3 SHEETS—SHEET 1.

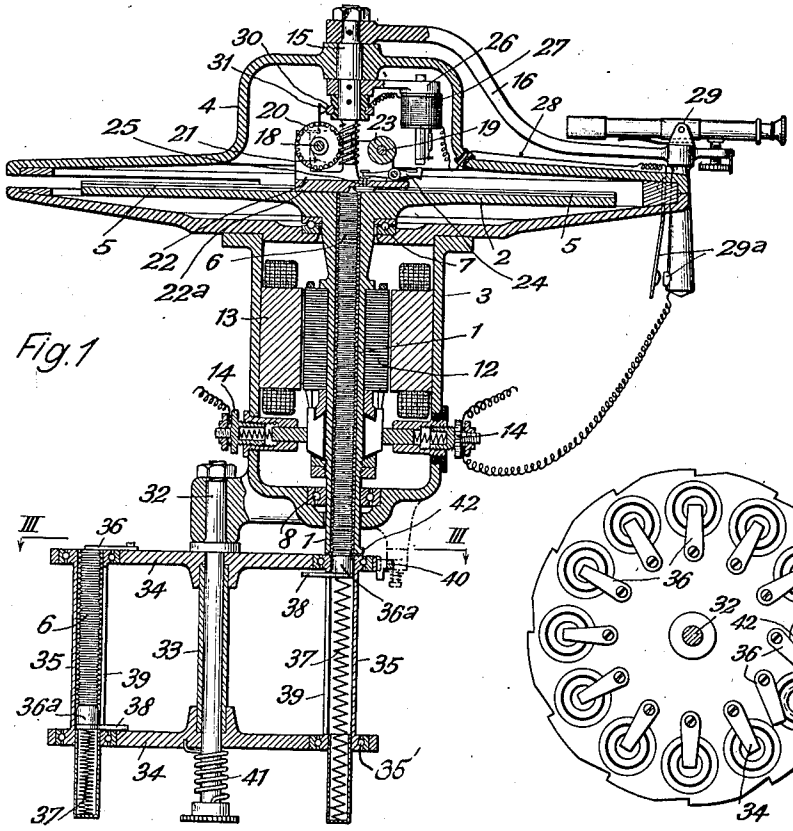


Fig. 1

Fig. 3

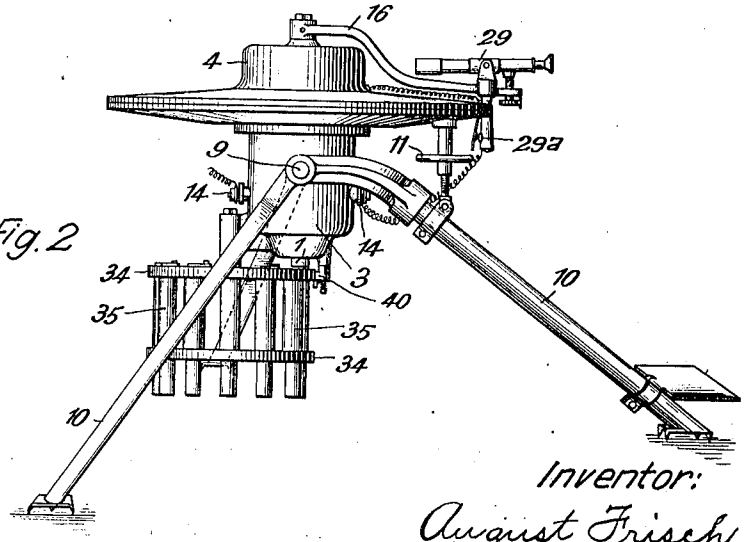


Fig. 2

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3 SHEETS—SHEET 2.

Fig.4

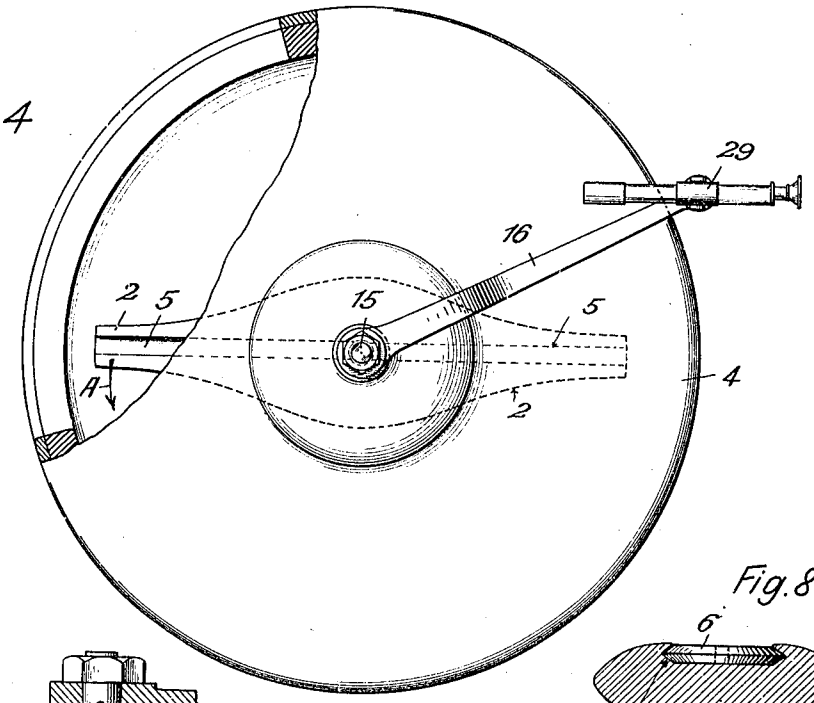


Fig.8

Fig.5

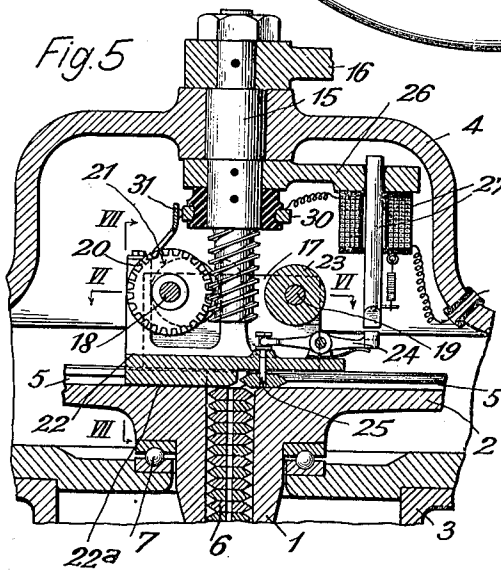


Fig.6

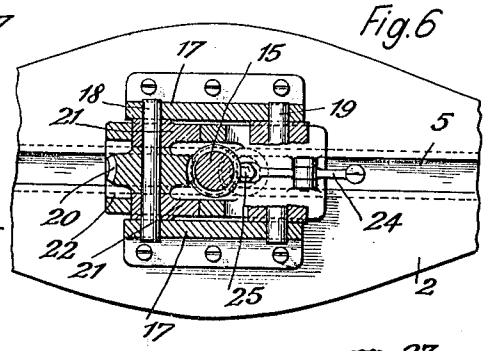


Fig.9

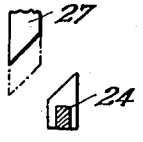
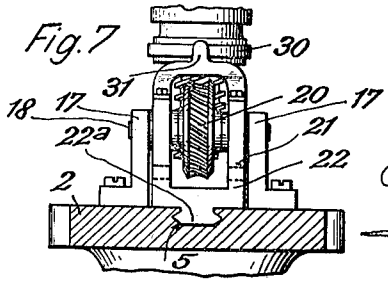


Fig.7



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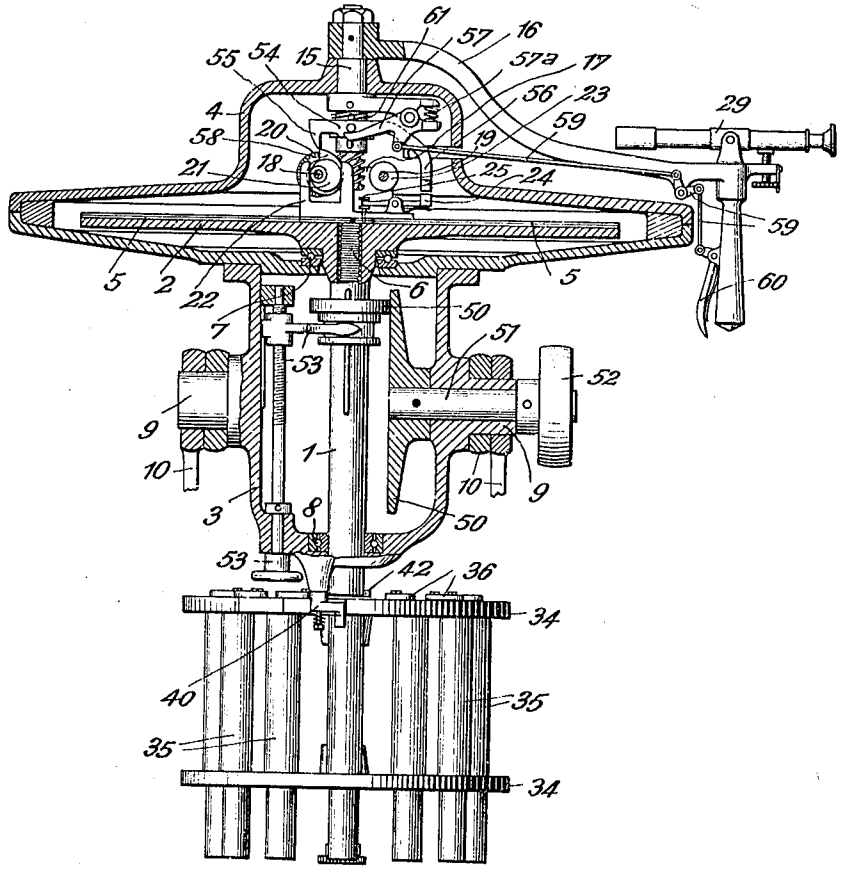
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3 SHEETS—SHEET 3.

Fig. 10



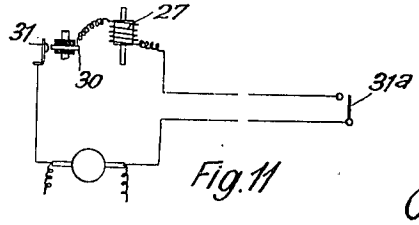


Fig. 11

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UNITED STATES PATENT OFFICE.

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DEVICE FOR THROWING SUCCESSIVELY A SERIES OF PROJECTILES BY CENTRIFUGAL ACTION.

1,293,075. Specification of Letters Patent. Patented Feb. 4, 1919.

Application filed June 13, 1917. Serial No. 174,557.

To all whom it may concern:

Be it known that I, AUGUST FRISCH, a citizen of the Republic of Switzerland, residing at Zurich, Switzerland, have invented certain new and useful Improvements in Devices for Throwing Successively a Series of Projectiles by Means of Centrifugal Action; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention consists in devices for throwing or slinging successively a series of projectiles in a mechanical manner by means of centrifugal action.

The object of the invention is to provide a device of the character referred to adapted to impart to a projectile a radial and tangential velocity gradually increasing from the velocity zero by introducing the projectile at that point into a guide race revolving about an axis where the peripheral velocity of this race is low and by discharging said projectile at a point where the peripheral velocity of the guide race reaches its maximum value.

To the attainment of other new and useful objects, as will appear, the invention consists also in the features of novelty in the construction, combination and arrangement of the several parts hereinafter more fully described and claimed and shown in the accompanying drawings, illustrating several exemplifications of the invention, and in which:

Figure 1 is a vertical cross section of a first embodiment.

Fig. 2 is a perspective view of this embodiment.

Fig. 3 is a cross section on the line III—III of Fig. 1.

Fig. 4 is a plan partly in section of this embodiment.

Fig. 5 shows the device for feeding the projectiles into the guide race on an enlarged scale.

Fig. 6 is a section on the line VI—VI of Fig. 5.

Fig. 7 is a section on the line VII—VII of Fig. 5.

Fig. 8 is a section through the wing, showing at the same time a projectile guided in the race provided in this wing.

Fig. 9 shows a detail, and

Fig. 10 shows a second embodiment of the invention.

Fig. 11 shows diagrammatically a system of connection for controlling the throwing of the projectiles from any desired point.

In the exemplification of the invention shown in Figs. 1–9, 1 denotes a vertical, hollow shaft ending at its upper end in a wing 2 of uniform strength. These parts 1, 2 are arranged centrally in a casing 3 the upper end of which is formed by a detachable cover 4. The wing 2 is provided with a V-shaped guide race 5 for the projectiles 6 and the hollow shaft 1, in which the projectiles are fed toward said race, runs in ball bearings 7, 8 arranged in the casing 3. The latter is also provided with lateral gudgeons 9 resting in a tripod 10, so that the casing 3 may be oscillated about a horizontal axis. 11 denotes an adjusting device for effecting a fine adjustment of the wing 2 and the shaft 1 relatively to a horizontal plane.

To the shaft 1 is rigidly connected a rotor 12 of an electromotor. The stator 13 of this motor is fixed to the casing 3. 14 denotes members feeding an electric current from a source of electricity not shown on the drawings to the rotor 12.

In the cover 4 is loosely mounted a bolt 15 provided on its lower end with a screw-thread. To this bolt 15 is rigidly connected an arm 16 carrying an aiming device 29.

17 denotes two plates fixed to the wing 2. The plates 17 carry two pivotally mounted shafts 18, 19. To the shaft 18 is fixed a worm wheel 20 coöperating with the screw-threaded part of the bolt 15 and two eccentrics 21. Each of the latter is adapted to revolve between two vertical extensions of a carriage or slide 22 guided in the guide race 5 referred to by means of an extension 22^a provided on its bottom. This carriage 22 is reciprocated in the guide race 5 upon a rotation of the eccentrics 21, which strike against the vertical extensions of this carriage. 23 denotes a counter weight mounted on the shaft 19 and counter balancing the weights carried by the shaft 18.

The carriage 22 carries a pivotally mounted lever 24 one end of which is adapted to coöperate with a member described later on, while the other end of this lever is forked

and adapted to coöperate with a vertically movable pin 25.

An arm 26 fixed to the bolt 15 carries a solenoid 27 which is arranged in such a manner, that the beveled end of lever 24 (Fig. 5) strikes against the lower beveled end of the core of this solenoid upon a rotation of the carriage 22—which is forced to rotate together with the wing 2—when said core is in its lower position, the beveled end of the lever 24 being adapted to move past said core owing to the oscillation imparted to said lever when the two beveled ends are moving past one another. The winding of the solenoid 27 is connected at one end to a conductor 28 leading to a contact device 29ª mounted on the aiming device 29. The other end of said winding is connected to a ring 30 fixed to the bolt 15 and coöperating in such a manner with a contact member 31 mounted on the carriage 22, that an electric current flowing through the winding of the solenoid is closed as soon as said member 31 comes in contact with this ring 30, it being thereby assumed, that the contact 29ª is closed.

The excitation of the solenoid 27 may also be controlled by means of a contact device 31ª arranged at any desired distance from the casing 3. Such an arrangement is shown in a diagrammatic manner in Fig. 11.

32 denotes a vertical, stationary bolt fixed to the lower end of the casing 3. On this bolt are loosely mounted two disks 34 separated by a distance sleeve 33. In these disks 34 are mounted magazines 35 for the projectiles 6 adapted to rotate about their vertical axis on ball bearing 35′. The magazines 35 are arranged in such a manner in the disks 34, that when a revolving movement of these disks 34 about the bolt 32 is brought about owing to the action of a torsional spring 41, said magazines are moved successively into a position, in which the vertical axis of the magazines falls into the prolongation of the axis of the shaft 1. On the upper disk 34 I provide in connection with each magazine 35 a pivotally mounted member 36. One end of these members extends normally in the manner shown in Fig. 3 over the upper opening of the corresponding magazine 35. In each magazine 35 is further provided a movable bottom 36ª; a spring 37 acts upon the lower end of each such bottom. Each bottom 36ª has also an extension 38 projecting out of the magazine 35 and adapted to move in a vertical slot 39 of the latter. On the lower end of the casing 3 is also provided a pawl 40 acted upon by a spring and coöperating with recesses provided on the circumference of the upper disk 34. This pawl 40 is set out of action by the projection 38 of that magazine 35, which is just in a coaxial position beneath the shaft 1. The projection 38 is continually rotated together with the corresponding magazine 35 owing to the friction produced between the bottom 36ª, connected to said extension 38, and the column of projectiles resting on said bottom, and as soon as said projection 38 reaches its uppermost position, the torsional spring 41 effects a rotation of the disks 34 to the amount required for moving the next following magazine coaxially beneath the hollow shaft 1. A projection 42 provided on the lower end of this shaft 1 moves the pivotal member 36 of that magazine 35 which is just moved coaxially beneath the shaft 1 away from the upper opening of this magazine in order that the projectiles 6 may pass from the magazine into the shaft 1.

Fig. 8 shows on an enlarged scale a projectile 6 which may be used in such a device. This projectile has the form of a flat round disk provided with a sharpened edge and a central hole.

The manner of operation for the device hereinbefore described is as follows:

The hollow shaft 1 and consequently also the wing 2 are rotated at a very high velocity in the direction of the arrow A by means of the electromotor 12, 13, the projectiles 6 contained in the shaft 1 being moved upward owing to the action of the spring 37 of that magazine which is just situated coaxially beneath this shaft 1. The carriage 22 guided in the wing 2 is thereby reciprocated in the guide race 5 owing to the meshing of the worm wheel 20 with the screw-threaded part of the stationary bolt 15, a complete to and fro movement of said carriage 22 taking place once during several revolutions of the wing 2. As soon as the part 22ª of the carriage 22 is moved clear off the upper opening of the shaft 1, a projectile 6 is pressed against the lower side of the carriage 22. The pin 25 is thereby moved into the central opening of this projectile 6, while the carriage part 22ª prevents the column of projectiles in the shaft 1 from pressing upon said projectile. During the reciprocating movement of the carriage 22 the projectile is then moved somewhat outward in a radial direction, so that its axis no longer coincides with the axis of the shaft 1, to which axis neither a radial nor a tangential velocity is imparted. Upon the closing of the current exciting the solenoid 27 by the contact member 31 and the contact device 29ª the pin 25 releases the projectile which is then moved in the guide race 5 at a gradually increasing velocity toward the outer edge of the wing 2, in order to leave the latter at the point where the peripheral velocity of this wing reaches its maximum value. During this movement of the projectile along the race 5 of the wing 2 a revolving movement is imparted to this projectile owing to its rolling movement along

the path of the projectile in the wing, so that the projectile is balanced, *i. e.* is kept as long as possible in a horizontal position, after it has left the guide race 5.

When the aiming device 29 is turned about a certain angle, a corresponding revolving movement is also imparted to the solenoid 27, so that the point at which the projectile leaves the guide race 5 is not shifted relatively to the aiming line owing to such a movement of the aiming device 29. As soon as the magazine 35, from which the projectiles are fed into the shaft 1 and to which a revolving movement about its axis is imparted during its emptying in consequence of the weight of the projectiles situated above it, is emptied, the projection 38 moves the pawl 40 for a short moment into a position, where it is prevented from coöperating with the recesses on the circumference of the upper disk 34, so that the disks 34 may be rotated, as already stated, to the amount required for moving the next following magazine coaxially beneath the shaft 1.

Fig. 10 shows a second embodiment of the invention. Parts of this exemplification corresponding to parts of the first embodiment have the same reference numerals as the last mentioned parts. The hollow shaft 1 of this device receives its drive from a friction gearing 50. One disk of this gearing is fixed to a shaft 51 carrying a pulley 52. 53 denotes a device for adjusting the position of one of the disks of the gearing 50 in order to vary the speed of rotation of the shaft 1.

In this construction the lever 24 is not caused to oscillate owing to its coöperation with the core of a solenoid, but owing to the influence of a mechanical mechanism. This mechanism comprises a sleeve 54 keyed to the bolt 15 and adapted to be adjusted in the longitudinal direction of the latter. The sleeve 54 is provided on one side with a nose 55 and on the opposite side with an arm 56 and it may be kept in the position shown in Fig. 10 by means of a lever 57, in which case it is not influenced by the eccentric disk 58 fixed to the shaft 18. The lever 57 is acted upon by a spring 57^a and it is also operatively connected to rods 59 adapted to be moved by means of a handle 60. A pressing upon the handle 60 effects an oscillation of the lever 57, whereupon the sleeve 54 is shifted in the axial direction of the bolt 15 as it is also acted upon by a spring 61. Upon such a downward shifting of the sleeve 54 the nose 55 of the latter starts to coöperate with the disk 58, so that the sleeve 54 is lifted during a certain period of time and falls then suddenly downward as soon as the nose 55 leaves the highest part of the disk 58. When this takes place the pin 25 suddenly releases the projectile which had been moved by said pin somewhat outward, *i. e.* away from the vertical axis of the shaft 1, so that this projectile is now moved outward along the guide race 5 under the action of the centrifugal force acting upon it.

As for the rest this second embodiment is identical to the first one described.

What I claim now as my invention is:

1. In a device for throwing or slinging successively a series of flat projectiles in a mechanical manner, a hollow shaft constituting a feed member for the projectiles, a wing formed integral with said hollow-shaft and provided with a horizontal guide-race extending from the middle of the wing to its periphery, the inner end of said race lying above the bore of the hollow shaft, means for imparting to the hollow shaft and the wing formed integral therewith, a revolving movement about a vertical axis, and means for moving the projectiles singly from the hollow shaft into said guide race, the projectiles being caused by friction to roll, upon rotation of the wing, along a side of the race thereby receiving a revolving movement, while they are moved by a centrifugal action from the inner to the outer end of the race.

2. In a device for throwing or slinging successively a series of projectiles in a mechanical manner, a feed member for the projectiles, a member provided with a guide race for the projectiles to be thrown, means for imparting to this last mentioned member a revolving movement, means for moving the projectiles singly from said feed member into said guide race at a point where the peripheral velocity of this race is small, the latter being so shaped that the projectiles are expelled at a point where the peripheral velocity of the race is highest, an adjustable aiming device and means adapted to influence said means for introducing the projectiles into the guide race in such a manner upon a movement of the aiming device, that the projectiles are always expelled from the guide race at the same point relatively to the aiming line.

3. In a device for throwing or slinging successively a series of projectiles in a mechanical manner, a feed member for the projectiles, a member provided with a guide race for the projectiles to be thrown, means adapted to impart to these members a revolving movement and means adapted to move the projectiles singly from the feed member into said race at a point where the peripheral velocity of this race is small, the latter being so shaped, that the projectiles are expelled at a point from this race where its peripheral velocity is highest, a drum, means for imparting to this drum a rotating movement, magazines for the projectiles arranged in said drum, a movable bottom in each of these magazines and springs acting

upon these bottoms, the magazines being adapted to be brought successively coaxially beneath said feed member for the projectiles.

4. In a device for throwing or slinging successively a series of projectiles in a mechanical manner, in combination, a feed member for the projectiles, a member provided with a guide race for the projectiles to be thrown, means for imparting to these two members a revolving movement, means operatively connected to said member provided with a guide race for introducing the projectiles singly from the feed member into this guide race at a point, where the peripheral velocity of the latter is small, the arrangement being such, that a new projectile is introduced into said race only after a determinate number of revolutions have been carried out by the member provided with the race, the latter being shaped in such a manner, that the projectiles are expelled from this race at a point, where its peripheral velocity is highest, an adjustable aiming device, means adapted to influence said means for introducing the projectiles into the guide race in such a manner upon a movement of the aiming device, that the projectiles are always expelled from the guide race at the same point relatively to the aiming line and means for supplying said feed member with projectiles.

5. In a device for throwing or slinging successively a series of projectiles in a mechanical manner, in combination, a shaft ending at its upper end in a wing of uniform strength, means for rotating this shaft, the shaft and this wing being provided with a central continuous hole, said wing being further provided with a race extending in two diametrical directions from said central hole to the circumference of the wing, this race acting as a guide for the projectiles to be thrown, a carriage guided in said race, a member arranged coaxially to said hollow shaft and remaining normally stationary, this member being adapted to coöperate with said carriage for the purpose of imparting to the latter a reciprocating movement, a member carried by said carriage adapted to move the uppermost projectile in the hollow shaft into said guide race, hand operated means for controlling the movement of this last mentioned member, an adjustable aiming device, means adapted to influence said member for introducing the projectiles into the guide race in such a manner upon a movement of the aiming device, that the projectiles are always expelled from the guide race at the same point relatively to the aiming line and means for supplying said hollow shaft with projectiles.

6. In a device for throwing or slinging successively a series of projectiles in a mechanical manner, in combination, a shaft ending at its upper end in a wing of uniform strength, means for rotating this shaft, the shaft and this wing being provided with a central continuous hole, said wing being further provided with a race extending in two diametrical directions from said central hole to the circumference of the wing, this race acting as a guide for the projectiles to be thrown, a carriage guided in said race, a member arranged coaxially to said hollow shaft and remaining normally stationary, this member being adapted to coöperate with said carriage for the purpose of imparting to the latter a reciprocating movement, a member carried by said carriage adapted to move the uppermost projectile in the hollow shaft into said guide race, an arm fixed to said member which coöperates with the carriage, an aiming device fixed to the free end of this arm, the arrangement being such, that an angular movement of this arm effected for the purpose of adjusting the aiming device causes a displacement of the angular position, in which the projectile is moved into the guide race, hand operated means fixed on the aiming device for controlling the movement of said member moving the projectiles into the guide race and means for supplying the hollow shaft with projectiles.

In testimony that I claim the foregoing as my invention, I have signed my name.

AUGUST FRISCH.