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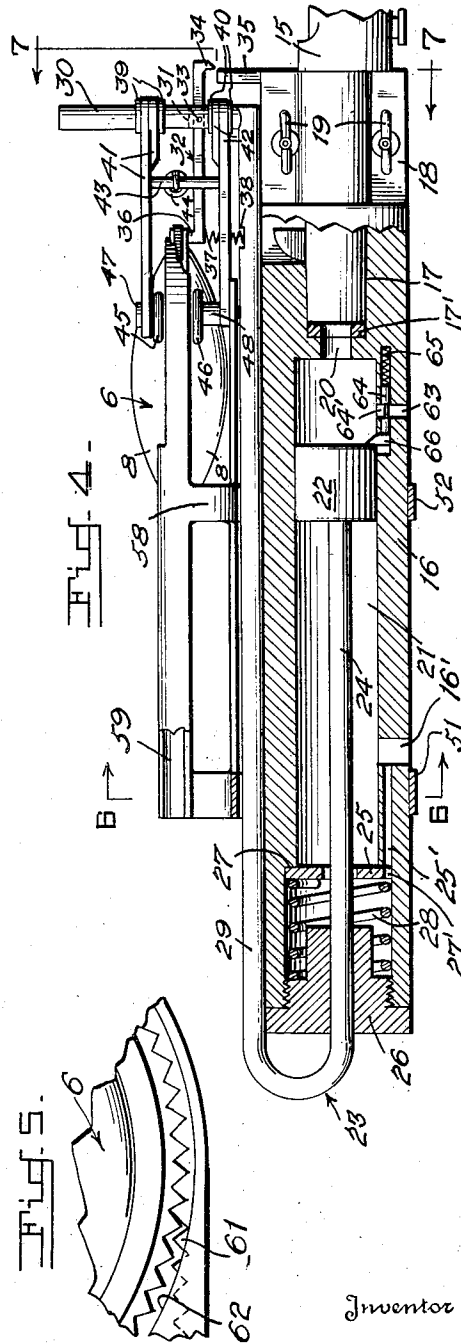
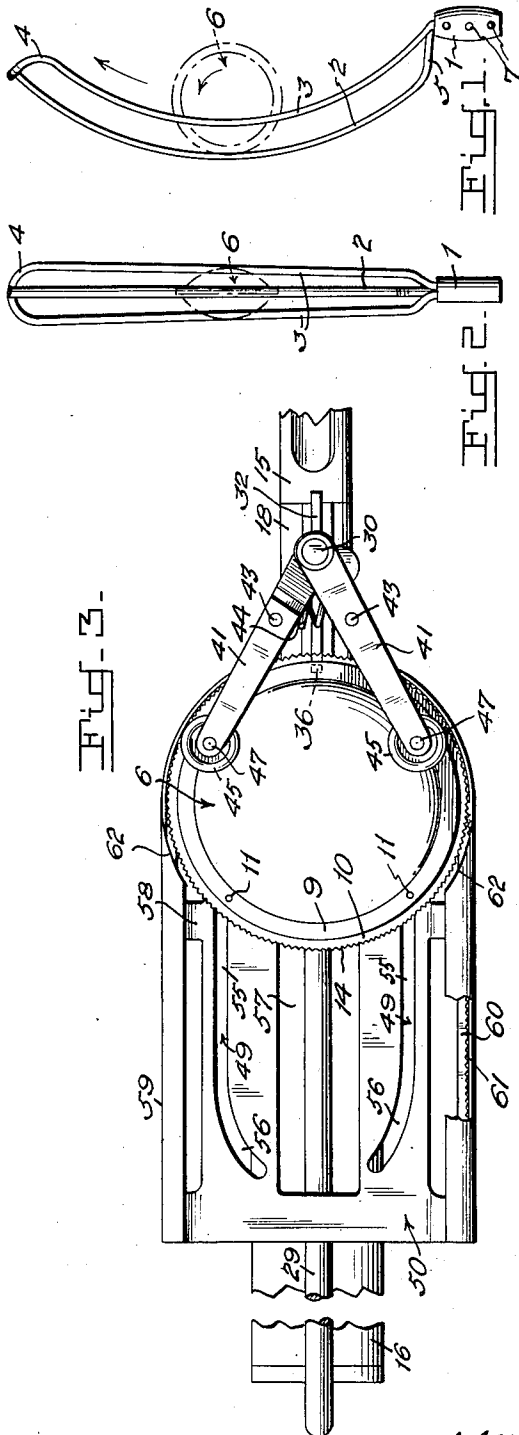
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MISSILE PROJECTOR

Filed Nov. 21, 1946

2 Sheets-Sheet 1



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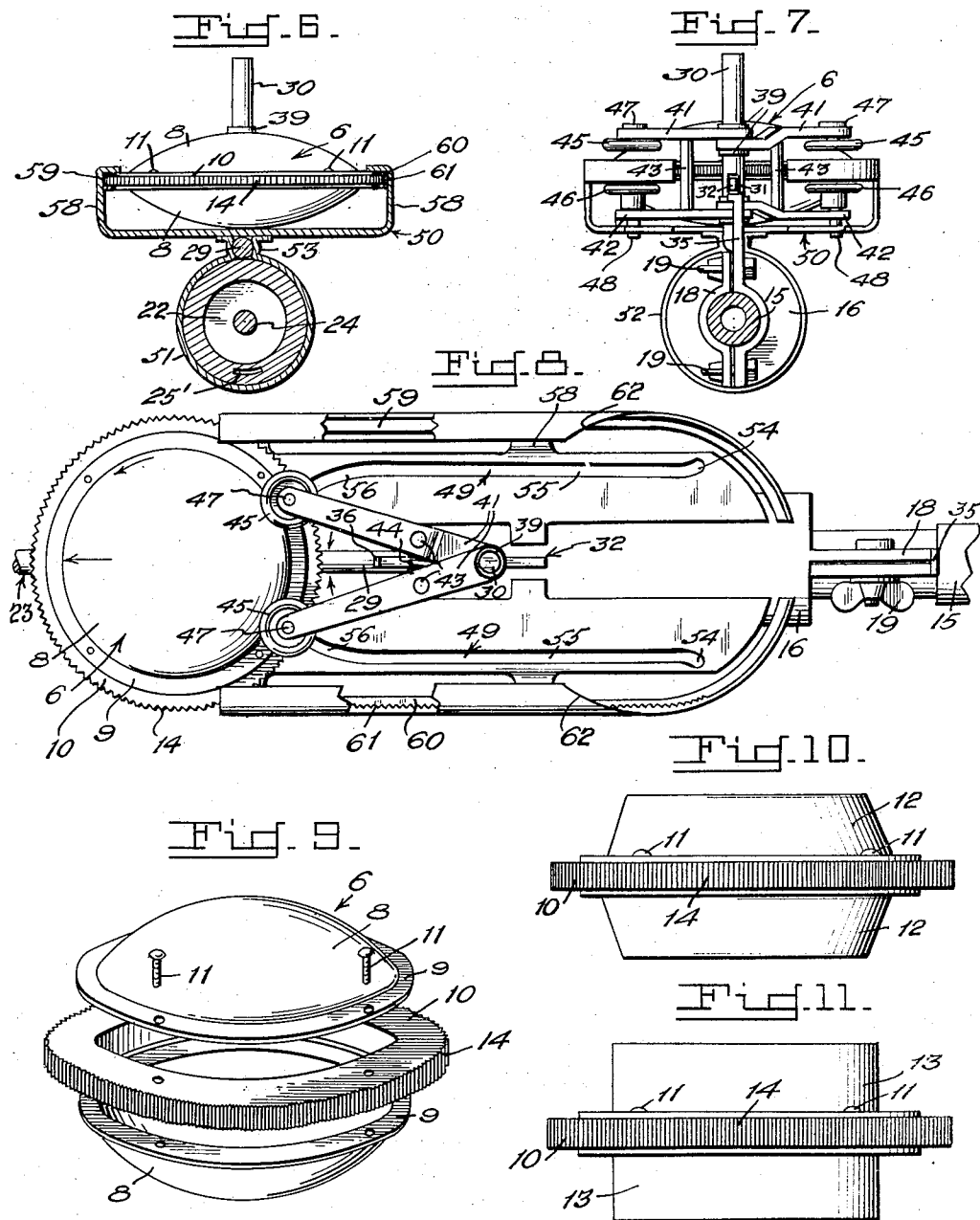
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MISSILE PROJECTOR

William Nicholas, Greenbelt, Md.

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9 Claims. (Cl. 124—11)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment of any royalty thereon.

This invention relates to a device for projecting missiles, particularly a mechanical projector which may be attached to a standard military rifle for accurately hurling objects, such as hand grenades, incendiary grenades and the like, over distances far in excess of that possible by hand, thereby increasing the effectiveness and the usefulness of such objects.

An object of the invention is to provide a device for receiving a hand-thrown missile without modification thereof and without the aid of adapters for throwing the missile much farther than would be possible if thrown by hand.

Another object is to provide a device for accurately and conveniently hurling a missile over relatively great distances.

The foregoing and other objects of the invention as well as the exact nature thereof will be understood by reference to the following description of the accompanying drawings in which:

Figure 1 is a side view of a hand-held propelling device;

Figure 2 is a plan view of Figure 1;

Figure 3 is a plan view of a propelling apparatus adapted to be attached to a rifle;

Figure 4 is an elevational view of Figure 3, but with the operating cylinder thereof shown in section;

Figure 5 is a fragmentary plan view showing the means whereby a spinning motion is imparted to the missile;

Figure 6 is a sectional view through line 6—6 of Figure 4;

Figure 7 is a view taken from line 7—7 of Figure 4;

Figure 8 is a view similar to Figure 3 but showing the propelling apparatus ejecting the missile;

Figure 9 is an exploded perspective view of the missile;

Figure 10 is an elevational view of a modified form of a missile; and

Figure 11 is an elevational view of a further modified form of a missile.

The hand-held projector shown in Figures 1 and 2 has a hand grip 1 in which is secured a wire-frame scoop-like member having a bottom wire element 2 and side elements 3.

The side elements 3 are formed from a wire bent back upon itself with a bight portion 4, being in the form of transversely deflected U-shaped portion, which is attached to the under-

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side of the bottom wire element 2. Adjacent the hand grip 1, the wire elements 3 are bent toward each other to extend alongside each other within the hand grip 1. As shown in Figure 2, the spacing between the wire elements 3 varies from the bight portion 4 toward the hand-grip 1 to form with the bottom wire 2 a trough-like structure of varying cross-section increasing from the handle.

The bottom curved wire element 2 has one end secured to the bight portion and at its other end has a bent portion 5 anchored with the wire element 3 within the hand grip 1. The bight portion 4 and the bent portion 5 serve to space the wire elements relative to each other. The element 2 forms a track upon which a missile 6 rolls, guided by the side wire elements 3, prior to its being hurled by the projector.

The wire elements 2 and 3 are secured within the hand-grip 1 by pins 7, or by welding or other suitable means. The forward end of the bottom element 2 is secured on the bight portion 4 by welding or joined by other suitable means.

Although a wire frame construction is shown, it is obvious to those skilled in the art that the scoop-like member can be formed from strips of wood or sheet metal without departing from the spirit of the present invention.

In operation, the missile 6 is placed in the trough-like scoop near the hand-grip 1 and the device tilted slightly downward causing the missile to roll down the device towards its open wide end. As the missile approaches the open end, it gathers momentum and just prior to its reaching this end, the device is whipped around, propelling the missile. The operator, by taking the proper stance relative to the target, can throw the missile in the desired direction.

The missile 6 may be formed, as illustrated in Figure 9, from a pair of opposed spherical portions 8, each having a circumferential flange 9 attached to a common annulus 10 by threaded elements 11, or by welding, riveting or some other suitable means.

However, in lieu of spherical portions, the missile may, as shown in Figures 10 and 11, be formed from frusto-conical portions 12 or cylindrical portions 13, without affecting the operation or utility of the instant invention, and, as is obvious to those skilled in the art, many other shapes may be utilized.

The periphery of the annulus 10 may be provided with serrations, as shown by 14 in Figure 9, for engaging similar serrations on the projector whereby the missile is given a spinning motion

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about its own axis to add to its stability and accuracy during flight. Also, the annulus 10 acts as a stabilizer airfoil to further increase the stability of the missile during flight. Thus, the spinning motion of the missile, coupled with the disk-like annulus 10, will cause the missile to move somewhat similar to a flat disk skimming through the air.

The missile 6 may be used either as a container for inclosing some particular object so that it may be hurled through space in a definite direction, or it may constitute the object itself, as in the case of an explosive charge. When used as a container, the parts of the missile are detachably secured together, as by the removable members 11, to permit easy and rapid disassembly for enclosing desired items. It is also obvious that the missile 6 can be thrown by hand or by the device shown in Figures 1 and 2 or mechanically projected by the apparatus to be now described.

The apparatus shown in Figures 3 to 8, inclusive, is intended for attachment to the muzzle end of a rifle 15. The apparatus has a cylindrical casing 16 provided with a socket 17 for receiving the end of the rifle 15 which is securely held to the member 16 by a split collar 18 and wing bolts 19.

The socket 17 is in communication through an opening 20 with a cylinder 21 in which is slidable a piston 22 attached to a U-shaped piston rod 23, of which the shorter and lower leg 24 is secured to the piston 22 and passes through a clearance opening in a buffer plate 25 and is slidably supported by an elongated bushing 26 screw threaded into the member 16. A washer 17' of suitable material is provided in the socket 17 to secure a gas-tight connection between the rifle and the opening 20. The buffer plate 25, which is yieldingly held against a shoulder 27 at the end of the cylinder 21 by a coil spring 28, forms a yieldable stop for the piston 22.

The longer and upper leg 29 of the U-shaped piston rod 23 extends rearwardly of and over the cylindrical casing 16 to terminate in an upstanding rod 30 which is slotted at 31 for pivotally supporting a safety lever 32 by a pin 33.

One end of the safety lever 32 is provided with a downwardly-directed lug 34 adapted to be moved behind an upstanding projection 35 formed integral with one of the sections of the split collar 18, to lock thereby the piston 22 against forward movement, for a reason and in a manner to be described. The other end of the lever 32 is provided with an upwardly-directed pin 36 urged upwardly, for a purpose to be explained, by a coil spring 37 seated in a recess 38 in the leg 29.

The rod 30, at each side of the slot 31, is provided with spaced pairs of collars 39 and 40 between which are pivoted pusher arms 41 and 42. Spacer pins 43 rigidly secure corresponding upper and lower pusher arms into units which are biased toward each other by a tension spring 44 attached to the pins 43.

The forward ends of the pusher arms 41 and 42 are provided with stub shafts or followers 47 and 48, respectively, upon which are freely and rotatably mounted contact rollers 45 and 46, respectively, for engaging the missile 6 at opposite points thereof, as illustrated in Figure 3. The contact rollers 45 and 46 are identically formed; they may be solid or of sheet metal and may be rimmed by non-metallic traction material, such as rubber composition material or similar substance.

The stub shafts 48, carried by the lower

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pusher arms 42, are extended to ride, as cam followers, in cam grooves 49 symmetrically formed in a base plate 50 rigidly attached to the cylindrical casing 16 by bands 51 and 52 which are provided with curved portions 53 forming guiding elements for the upper leg 29 of the piston rod 23. Although each follower 48 is shown as being an extended stub shaft, it is obvious that such follower portions may be formed separate from the stub shafts and depend from the arms 42 at suitable locations thereon.

Each of the cam grooves 49 consists of an outwardly-turned portion 54 merging into a straight-portion 55 which is terminated by an inwardly-directed portion 56.

The plate 50, in addition to the cam slots 49, has a central slot 57 to provide the necessary clearance for the rod 30, and at each side is provided with portions 58 supporting channel-shaped guideways 59 and 60, the guideway 60 having a serrated base 61 for engaging similar serrations 14 on the missile 6 when in the guideways 59 and 60. The upper portions of the guideways 59 and 60 are cut away, as at 62, whereby the missile 6 may be loaded on the projector by being placed on the bottoms of the guideways.

The cylinder 16 is provided with an exhaust port 16' which is uncovered by the piston 22 at the end of its travel to allow the driving fluid in the cylinder 21 to be exhausted to the atmosphere. Extending from the port 16' is a passageway 25' leading to a slot 27' in the buffer plate 25 for maintaining the forward end of the cylinder 21 always in communication with the atmosphere to prevent the formation in front of the piston 22, of either an air pocket or a vacuum, the presence of which would, as is obvious to those skilled in the art, impede the forward as well as the rearward movements of the piston 22.

When the projector is not loaded or if for some reason not in its fully loaded position, the safety lever 32 will be free to be rotated by the spring 37 to place the lug 34 behind the projection 35, locking the rod 30, and thereby the piston rod 23 and piston, against forward movement.

An auxiliary port 63 at the rear of the cylinder 21 permits the escape therefrom to the atmosphere of any driving fluid that may be present in the cylinder when the piston 22 is locked by the safety lever 32 as already explained. The auxiliary port 63 has a slide 64 provided with a reduced portion 64' which when aligned with the port 63 opens the same to the atmosphere. The slide 64 is urged to a closing position by a spring 65 but is prevented from being so positioned, when the piston 22 is locked, by a lug 66 on the slide 64 and which abuts the rear of the piston 22.

To project the missile at a desired target, the missile is placed on the guideways 59 and 60. The weight of the missile will depress the lug 36, rotating the lever 32 against the action of the spring 37 to raise lug 34 away from the projection 35 thereby releasing the piston rod 23 for a slight forward movement occasioned by the spring 44 biasing the pusher arms 41 and 42 towards each other to move the followers 48 out of the curved portions 54 of the cam grooves and into the straight portions 55 of the same, which in turn moves the contact rollers 45 and 46 into engagement with the missile and also allows the spring 65 to move the slide 64, and thereby its reduced portion out of register with the port 63, thus closing the safety port 63.

A blank cartridge, which may be of the type used for discharging a rifle grenade, is fired in

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the rifle 15 and the gases generated within the rifle barrel impinge upon the piston 22 forcing it and also the post 30 and the pusher arms 41 and 42 carried thereby, forwardly to push the missile 6 along the guideways 59 and 60. Due to the serrations 14 on the missile and 61 in the guideway 60, the missile 6 is given a spinning movement while being moved along the projector.

As the arms 41 and 42 are being moved forwardly by the post 30, the followers 48 ride in the straight portions of the cam grooves. Just prior to the missile 6 leaving the projector, the followers 48 enter the inwardly-curved portions 56 of the cam grooves 49, whereupon the pusher arms are quickly and suddenly drawn towards each other to give added impetus to the already moving missile to forcibly eject it from the projector towards its target.

To prepare for the next missile, the rod 30 is manually withdrawn to the rear until the lever 32 snaps over the projection 35.

In the event the rifle 15 should be accidentally fired or fired under pressure introduced into the cylinder 21 while the projector is unloaded or while being loaded, or for any reason the missile is not firmly seated preparatory to its being ejected, the piston 22 is held against forward movement by the interengagement between the lever lug 34 and the projection 35. As a result, the port 63 is held open and the driving gases will be expelled through this port without actuating the piston 22.

However, when the missile is properly loaded in the projector, it will then rotate the safety lever 32 causing disengagement between the depending lug 34 and the projection 35, releasing the piston 22 for forward movement sufficiently to permit the escape port 63 to be closed by the slide 64, and when the rifle is fired, the pressure of the gases will be fully applied against the piston 22 for driving the same forwardly.

Although the gases generated by the explosion of the blank cartridge are employed to drive the piston 22 forwardly, it is obvious that as a substitute for the blank cartridge, compressed air or other suitably applied fluid may be employed as the driving force, in which case the projector may be used as shown or utilized as a catapult separate and apart from the rifle.

Although no specific aiming attachment for this apparatus has been illustrated, it is obvious to those skilled in the art that the rifle with this projector device may be directed at the target in the usual manner for sighting and aiming a rifle grenade. Thus, the rifleman can aim the projector at a target by aligning the rear sight leaf of the rifle with some part of the projector, such as the rod 30. In lieu of the above, a sighting device may be formed on or from the rod 30, or it may be mounted on either guideway or may be bridged across the forward ends of both guideways 59 and 60.

I claim:

1. A projectile propelling mechanism for hurling a missile, comprising, a casing adapted for attachment to the muzzle end of a rifle and having a cylinder adapted to be placed in communication with the barrel bore of the rifle, a piston slidable in said cylinder, cylinder head means closing one end of said cylinder, a piston rod attached to said piston and slidable through said head, a supporting rod secured to the end of said piston rod externally of said cylinder, a pair of upper pusher arms pivoted on said supporting rod, a pair of lower pusher arms spaced

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from said upper arms and pivoted on said supporting rod, means connecting corresponding upper and lower pusher arms for pivotal movement as a unit, spring means biasing the arms of each pair toward one another, a launching base mounted adjacent and in fixed relation with said casing, there being spaced parallel guideways on said base at opposite sides thereof, a pair of symmetrically-arranged cam grooves on said base, each groove having a straight portion parallel with said guideways, the outer terminals of said grooves being curved toward each other, wheel members rotatably mounted on the ends of said pusher arms and adapted to engage a missile for moving the same between and along said guideways, and followers attached to each lower pusher arm, each follower riding in a respective one of said cam grooves, said wheel members being adapted to engage and propel the missile in response to propulsion of said piston in said cylinder.

2. A projectile propelling mechanism for hurling a missile, comprising a casing having a cylinder, a piston slidable in said cylinder in one direction, pusher arms, means pivotally mounting said arms, means rigidly connecting said pivotal mounting means with said piston, spring means biasing the free ends of said arms toward each other, a launching base in fixed relation with said casing, parallel guideways on said base adapted to engage and guide said missile in translation therealong, there being cam grooves on said base, members mounted on the ends of said pusher arms and adapted to engage the missile for moving the same along said guideways, and followers attached to said arms and engaging said cam grooves, said cam grooves and followers coacting to accelerate said missile just prior to launching from said base.

3. In a missile-projecting device, a plate having spaced parallel guideways to engage and guide a missile therealong in translation, there being a pair of spaced cam grooves in said plate having straight portions parallel with said guideways, said grooves being curved toward each other at their forward ends, a pivot rod, a pair of arms pivoted on said rod, means mounting said rod for translation along said plate between said guideways, with the free ends of said arms in propelling engagement with a missile positioned between said guideways, means operable to propel said rod along said plate, and means carried by each said arm and engaging a respective cam groove.

4. In a device for projecting a missile, a launching base, spaced parallel guideways at opposite sides of said base to receive and guide a missile for translation therebetween, propelling means movable between said guideways for applying a propelling force to the missile for moving the same between and along said guideways, and means associated with said propelling means and including a pair of cam grooves in said base for applying an additional accelerating force to the missile just prior to launching from between said guideways.

5. In a mechanism for projecting a missile, a launching base, parallel channel-shaped guideways at opposite sides of said base and adapted to receive the missile between them for guided translation therealong, first means including pivoted arms for engaging and rapidly forcing said missile longitudinally along said guideways, and means carried by said base for pivoting said arms toward each other during movement of

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said missile along and between said guideways for additionally accelerating the missile just prior to launching from between said guideways.

6. A projectile propelling mechanism for hurling a missile, comprising, a cylindrical casing adapted for attachment to the muzzle end of a rifle and having a cylinder adapted to be placed in communication with the barrel bore of the rifle, a piston slidable in said cylinder, shock absorbing means for said piston closing one end of said cylinder, a piston rod attached to said piston, a supporting rod secured to the free end of said piston rod, a pair of upper pusher arms pivoted on said supporting rod, a pair of lower pusher arms spaced from said upper arms and pivoted on said supporting rod, means connecting corresponding upper and lower ones of said pusher arms together, spring means biasing said corresponding arms toward each other, a launching base attached to said casing, spaced guideways on opposite edges of said base, a pair of symmetrically-arranged cam grooves on said base, each groove having a straight central portion, a forward terminal inwardly-curved portion and a rearward terminal outwardly-curved portion, wheel members rotatably mounted on the ends of said pusher arms and adapted to engage a missile on said base for moving the same along and between said guideways, and followers attached to said lower pusher arms, each follower riding in and along a respective one of said cam grooves whereby said wheel members are caused to move toward each other to accelerate the missile just prior to launching of the missile from said base.

7. In combination, a missile having a serrated periphery, a launching base, guideways at opposite sides thereof adapted to receive said missile, serrations along one of said guideways engaging the serrated periphery on the missile for spinning the same as it moves along and between said guideways, propelling means reciprocable lengthwise of said base for rapidly forcing the missile along said guideways preparatory to projecting the missile, whereby the same is simultaneously translated and rotated, and means including cam grooves in said base and coacting with said propelling means to accelerate said missile as it moves along and between said guideways just prior to its emergence therefrom.

8. In a mechanism for projecting a missile

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having a serrated periphery, a launching base, channel-shaped parallel guideways on said base and extending longitudinally thereof, there being serrations in one of said guideways adapted to engage the serrations on the missile for causing the missile to spin about its own axis as it is translated longitudinally along and between said guideways, first means including relatively transversely movable missile-engaging elements adapted to engage and propel a missile along said guideways, and second means including cam grooves in said base and a follower on each element engaging a respective cam groove, said followers and grooves cooperating to move said elements toward each other just prior to launching from said base, to accelerate said missile.

9. The combination with a round missile having a serrated periphery, of a launching base, straight parallel guideways on said base to receive and guide a missile in translation therealong, means on one said guideway to engage the serrations on said missile for spinning the same during its passage along said guideways, propelling means reciprocable along said base parallel to said guideways, a pair of arms each pivoted at one end on said propelling means, the other ends of said arms being engageable with the missile to propel the same along said guideways, a stub shaft on each arm remote from the pivot thereof, there being a pair of slots in said base, each shaft riding in a respective slot, said slots being generally parallel with said guideways but curved inwardly toward each other at their forward termini whereby to pivot said arms inwardly and accelerate said missile as the same leaves said base.

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