

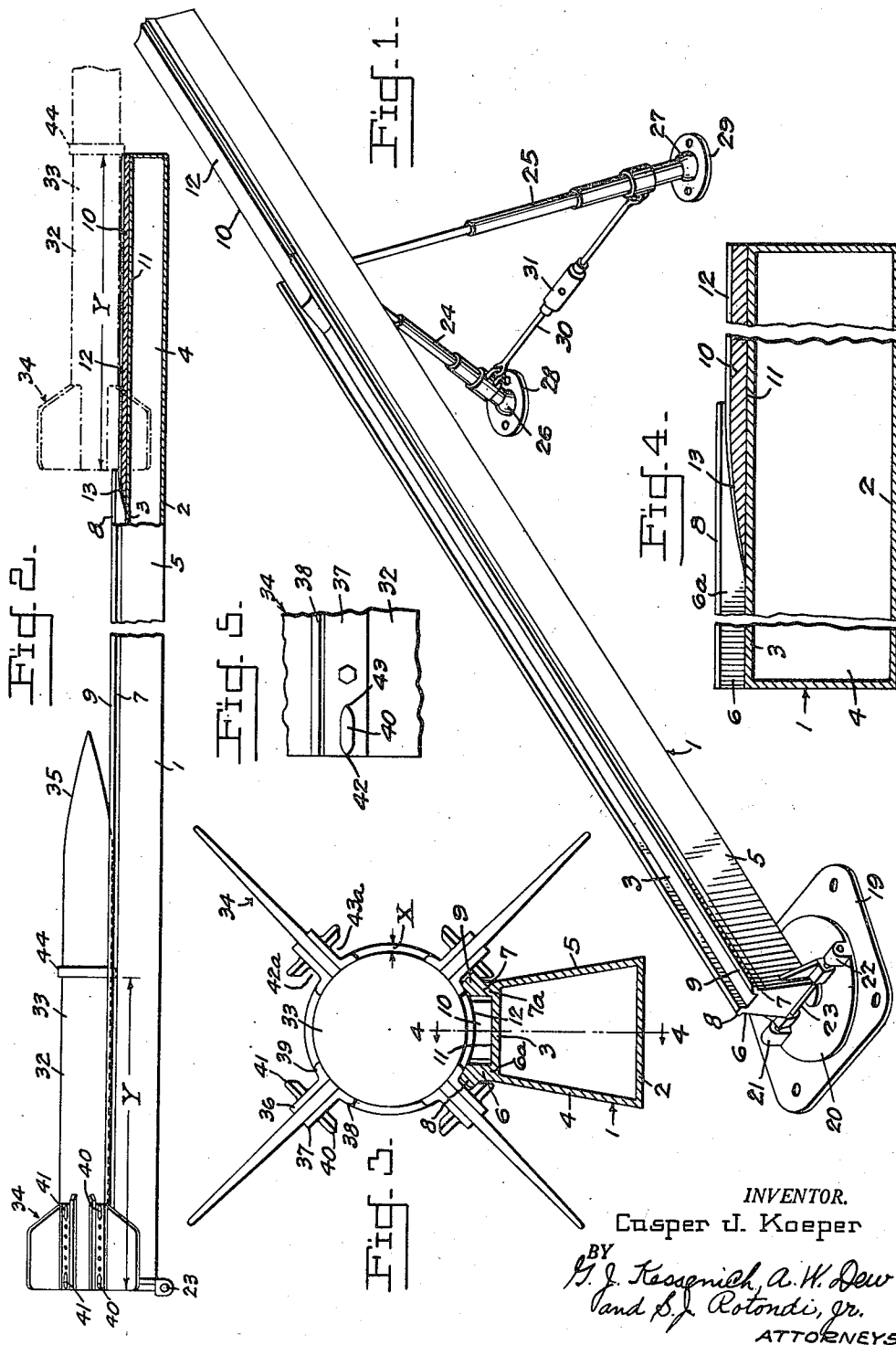
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NON-TIP OFF LAUNCHER

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1

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NON-TIP OFF LAUNCHER

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

The present invention relates to launchers for rockets and more particularly to a rocket launcher in which the launching rail is constructed and arranged to simultaneously release front and rear bourrelets supporting the rocket on the launcher, upon commencement of the flight of the rocket.

One of the contributing causes of dispersion of a rocket is the deflection imparted to the rocket during burning by the tipping off of the rocket as it commences its free flight. In prior art rocket launchers in the time interval during which the rocket is not quite clear of the launcher, the rear end of the rocket is still supported by the launcher when the center of gravity has passed the end of the launcher, and is no longer supported. The center of gravity starts to fall under the influence of gravitational forces causing a deflection in the rocket, and also giving to the rocket a transverse angular momentum, which results in additional deflection, until the forces of stabilization stop this yawing action.

It is accordingly an object of this invention to provide a rocket launcher which will eliminate this objectionable tip off phenomenon.

It is also a further object of this invention to provide the combination of a rocket having front and rear bourrelets with a rail type launcher which is designed so that the front bourrelet leaves a first section of the launcher, which comprises two parallel rails, and is picked up by a second single rail extension of the first rail portion, for the remainder of its travel on the launcher.

With these and other objects in view which will become apparent as the following specification develops, reference is made to the following drawing, which forms a part of the specification and wherein:

Figure 1 is an isometric view of the launcher including the supports therefor.

Figure 2 is a longitudinal section through the launcher showing a rocket in its initial position, and in a position (dotted figure) unsupported, as the front and rear bourrelets leave their respective launcher surfaces.

Figure 3 is a transverse section through the launcher and rocket showing the rocket in position with respect to the front and rear bourrelets.

Figure 4 is a longitudinal section taken on line 4—4 of Figure 3.

Figure 5 is a fragmentary detail of the rear bourrelet portion secured to the fin assembly of the launcher.

Referring to the drawing, wherein the same reference characters have been used to indicate the same parts in the several figures, 1 designates a rail type launcher, the main portion of which is trapezoidal in cross section and is made of built up steel plate comprising a lower flat plate 2, upper flat plate 3 and upwardly inclined side plates 4 and 5, all welded together in the well known manner. Secured to the top plate 3, or made integral therewith, and

2

disposed in parallel spaced relation are longitudinal rails 6, 7 comprising substantially thick vertically upstanding parallel web portions 6a and 7a and upwardly and outwardly directed flanged portions 8 and 9, each of which engages portions of the rear bourrelet of the rocket in a manner to be described.

Double rails 6 and 7 end a substantial distance short of the forward end of the launcher, and are replaced by a single rail 10 for the remaining extent of the launcher. Single rail 10 is a solid upstanding boss portion, having a transverse width slightly smaller than the horizontal distance between the inner edges of parallel webs 6a and 7a, a lower flat surfaces 11 welded to top plate 3, and an upper curved surface 12 for contacting the outer periphery of the front bourrelet of the rocket. The upper curved surface of the single rail is located below the uppermost surface of the upwardly and outwardly directed portions 8 and 9 of the parallel double rail, and the arrangement of these surfaces bears a specific relationship to each other and to the engaged surfaces of the front and rear bourrelets of the rocket. The specific relationship will be described in greater detail in connection with the description of the rocket.

The single rail extends rearwardly a short distance between the webs 6a and 7a of the double rails and is rearwardly and downwardly curved as at 13 (see Fig. 4) from the maximum height of surface 12 to zero as it merges with the flat surface of plate 3 so that the front bourrelet of the rocket will gradually ease into and engage the forward rail as the rocket proceeds up the launcher.

Any convenient type of support may be provided for the launcher, and in the exemplification shown (see Fig. 1) the support comprises a flat base plate 19 which may be secured on the flat surface of a vehicle or which may rest upon a level portion of the ground. Base plate 19 has a central circular portion 20 which is centrally pivotally connected with plate 19 and which is provided with diametrically opposed upstanding bosses 21 and 22 to form bearings for a rod 23 journaled therein and secured to the underside of plate 2 of the launcher. This support enables an operator to rotate the launcher to aim it in any direction, and to elevate the front end of the launcher in order to get the required launching angle for a rocket to be fired. The launcher is also provided with supporting legs 24 and 25 including ball and socket connections (not shown) secured to the lower flat plate of the launcher approximately directly below the point where the single and double rails meet. Legs 24 and 25 are made up of intussuscepted tubular pipe sections telescopically arranged so that the launcher inclination may be changed at will, and the lower ends of each leg have ball and socket connections 26 and 27 with circular disc like foot pads 28 and 29 which may rest upon the ground or be secured to the flat surface of a vehicle as desired. When the legs are swung to their supporting positions, they extend in diverging relation with respect to the connection to the launcher, and a tension rod 30 having a turnbuckle arrangement 31 is provided on the rod so that the legs may be fixed at any desired angle. Suitable gunner's quadrants or other similar sighting bubbles (not shown) are also provided to aim the launcher.

The special purpose rocket 32 which is fired from the launcher of this invention comprises a typical elongated shell 33 having a stabilizing fin assembly 34 secured about the tail end, and a forwardly tapering front end 35. The rear bourrelet is formed as part of the fin assembly and comprises segments 36 and 37 bolted on opposed sides of each fin, on the inner radial end thereof. Each of the segments has outwardly directed legs or flanges 38 and 39 peripherally engaging the rocket shell and secured thereto as by welding, and radially outwardly spaced from the legs are outwardly directed

fingers or bosses, 40 and 41, extending in a substantially normal direction to the flat face of each fin. Two of these fingers are provided for each segment, one at the rear and one at the forward end thereof, and each finger is elongated with forwardly and rearwardly tapering points 42 and 43 (see Fig. 5). The flanges 38 and 39 form with fingers 40 and 41, notches or slots 42a and 43a into which are received the upwardly and outwardly directed flanges 8 and 9 of the double rail, to guide the rocket in its forward motion up the launcher.

The rocket is also provided with a forward bourrelet 44 which is a cylindrical enlargement, encircling the shell of the rocket immediately rearwardly of the forward taper of the shell, and having a radial thickness, which, for convenience, may be designated as X inches, and which is adapted to be contacted by the curved surface 12 of the single rail when the front bourrelet of the rocket has left the double rail. The flanges 38 and 39 of segments 36 and 37 also have a radial thickness of X inches to present a smooth surface for contact with the double rail, so that the rocket is cradled and supported in place on the double rail by the forward and rear bourrelets as clearly seen in Figures 2 and 3.

The launching rail structure is designed so that the distance Y between the rear end of the fin assembly, and the rear edge of the forward bourrelet is substantially the same as that length of the single rail extending from the forward end of the double rail to the forwardmost end of the launcher. As the forward bourrelet leaves the double rail at Y distance rearwardly from the muzzle end of the launcher, it is picked up by the single rail for the last Y feet of the rocket's travel. The rear bourrelet segments are so spaced that they will rest on the double rail but will clear the single rail as the rocket travels up the launcher. At the moment the front and rear bourrelets simultaneously leave their respective rails, a clearance of X inches exists between the rocket body and the front rail, and it is only necessary to design the rocket so that the gravity drop is less than the clearance provided, in order to insure that the rocket is unsupported and in free flight at the moment the rails are cleared.

For example a particular rocket was experimented with in which the front bourrelet left the parallel rails approximately 10 feet from the muzzle end of the launcher. This last 10 feet of travel resulted in a gravity drop of approximately 0.6 inch. A thickness of 0.75 inch was provided for the front bourrelet thereby giving a clearance of 0.15 inch between the rocket body and forward rail at the time the rocket cleared the launcher.

The non-tip off feature could also be incorporated in a launcher that would guide the rocket by longitudinal slots in the launching rail. Studs attached to the rocket would ride in the launching rail slots, and the slot for the last Y feet of travel would be wider so that a rear stud would clear the widened portion of the slot. At the time the forward stud would clear the muzzle end of the launcher, a smaller rear stud would simultaneously clear the widened launching slot, and the rocket would be unsupported and in free flight.

Other modifications and alterations of the structure which has been disclosed herein for purposes of illustration will be apparent to one skilled in the art, and it is obvious that the same may be made without departing from the spirit and scope of the invention as defined in the following claims.

I claim:

1. A non-tip off rocket launcher comprising an elongated built up steel section having parallel upper and lower plates, a pair of elongated parallel upstanding web members secured to said upper plate, each said web member having an upwardly and outwardly directed flange forming a double rail, said double rail adapted to be received in notches provided in the fin section

of a rocket supported on said launcher, said double rail guiding the initial flight of said rocket, a single rail extension of said double rail secured to said top plate, said single rail having an upper curved surface disposed a short distance below the upper surface of said double rail, and having a transverse width slightly less than the distance between the web members of said double rail, said single rail adapted to be engaged only by a cylindrical bourrelet encircling a rocket adjacent its forward end after said bourrelet has traveled beyond the forward extremity of said double rail.

2. The combination in claim 1 wherein the horizontal distance between the forward bourrelet and the rear extremity of a rocket to be launched is approximately equal to the length of said single rail.

3. In combination with a fin stabilized projectile having a cylindrical ring encircling said projectile adjacent the forward end thereof to form a bourrelet, and a fin assembly secured to the tail of said projectile having means thereon forming a rear bourrelet; a non-tip off projectile launcher, means for supporting said launcher on an incline, said launcher comprising an elongated main body portion of built up steel plates having upper and lower parallel plates, a pair of elongated parallel upstanding web members secured to said upper plate, each said web member having an outwardly and upwardly directed flange forming a double rail adapted to be received in notches formed in said rear bourrelet to guide the initial flight of said projectile, a single rail extension of said double rail having a transverse width less than the distance between said parallel web members and an upper surface disposed a slight distance below the upper surface of said double rail, said single rail adapted to be engaged by said forward bourrelet only after said bourrelet has traveled beyond the forward extremity of said double rail.

4. In a launcher for a rocket having a ring forming a bourrelet a predetermined distance forwardly of the rear end of the rocket and spaced guide supports adjacent the rear end thereof, a double rail comprising a pair of laterally spaced guide rails forming the rear portion of said rocket launcher adapted to engage said spaced guide supports and said bourrelet, and a single rail extension of said double rail, said single rail having a length equal to said predetermined distance and a width less than the distance between said spaced guide supports, said single rail being constructed and arranged to be engaged only by said forward bourrelet after said forward bourrelet has traveled beyond the forward extremity of said double rail.

5. In combination with a fin stabilized projectile having a cylindrical ring encircling said projectile adjacent the forward end thereof to form a bourrelet, and a fin assembly secured to the tail of said projectile having means thereon forming a rear bourrelet; a non-tip-off projectile launcher, means for supporting said launcher on an incline, said launcher comprising an elongated main body portion of built up plates having upper and lower parallel plates, a pair of elongated parallel upstanding web members secured to said upper plate, each said web member having an outwardly and upwardly directed flange forming a double rail adapted to be received in notches formed in said rear bourrelet to guide the initial flight of said projectile, a single rail extension of said double rail having a transverse width less than the distance between said parallel web members and an upper surface disposed a slight distance below the upper surface of said double rail, and adapted to be engaged by said forward bourrelet only after said bourrelet has been traveled beyond the forward extremity of said double rail, the horizontal distance between the rear extremity of said projectile and said forward bourrelet being approximately equal to the length of said single rail extending beyond said double rail.

6. In a non-tip off launcher, an elongated body portion

5

including upper and lower flat parallel plates, a pair of longitudinal rails integral with and disposed in parallel relation along the upper edges of said upper plate, and having substantially thick, vertically upstanding web portions, said web portion defining upwardly and outwardly directed flanges adapted to engage portions of the rear bourrelet of a rocket, said rails terminating a substantial distance short of the forward extremity of said launcher, and a single rail comprising a solid upstanding boss secured on the forward portion of the upper plate of said launcher and having a transverse width slightly smaller than the horizontal distance between the inner edges of said web portions of said rails, and a curved upper surface disposed below the uppermost surface of said upwardly and outwardly directed portions of said rails, said single rail extending rearwardly a short distance between said web portions of said rails and being rearwardly and downwardly curved at its rearward portion to merge with said flat surface of said upper plate, the length of said single rail extending beyond the forward extremity of said parallel rails being equal to the rear extremity of a rocket and its forward bourrelet.

7. In combination with a fin-stabilized projectile having a ring encircling said projectile adjacent the forward end, to form a bourrelet, and segmental members secured to opposed sides of said fins having formed therein, longitudinal slots; a projectile launcher comprising a main double rail portion for guiding said projectile in its initial flight, said double rail having upwardly and outwardly directed flanges adapted to be received in said slots, and a single rail extending beyond the forward extremity of said double rail adapted to be engaged only by said forward bourrelet after said forward bourrelet has traveled beyond the forward extremity of said double rail, the horizontal distance between the rear extremity of said pro-

6

jectile and said forward bourrelet being equal to the length of said single rail extending beyond the forward extremity of said double rail.

8. In combination with a rocket having front and rear bourrelets, a non-tip-off launcher having rear guide rail means and front guide rail means, means rigidly connecting said front and rear guide rail means in sequential aligned relation, said rear guide rail means being constructed and arranged to engage said rear and front bourrelets to support said rocket at the front and rear portions thereof, said front rail guide means being constructed and arranged to engage said front bourrelet to support the rocket at its front portion only thereof after said front bourrelet has traveled beyond the forward extremity of said rear guide rails and having an effective length substantially equal to the distance between said front and rear bourrelets, said front and rear bourrelets being axially spaced to simultaneously disengage the front and rear guide rails respectively as said rocket commences free flight.

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