Sept. 20, 1960 M. P. BROWN 2,953,065

HIGH VELOCITY ACCELERATOR

Filed March 14, 1958 3 Sheets-Sheet 1

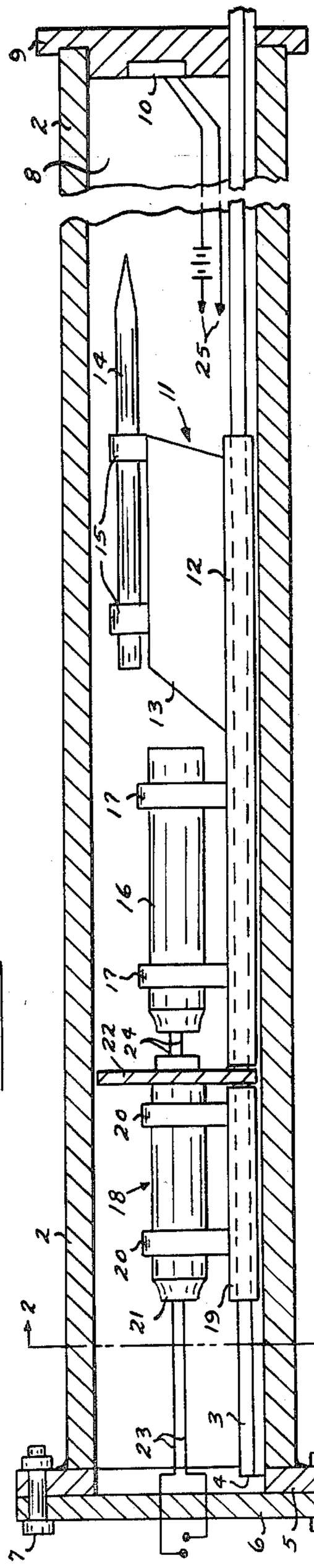

Fig-1

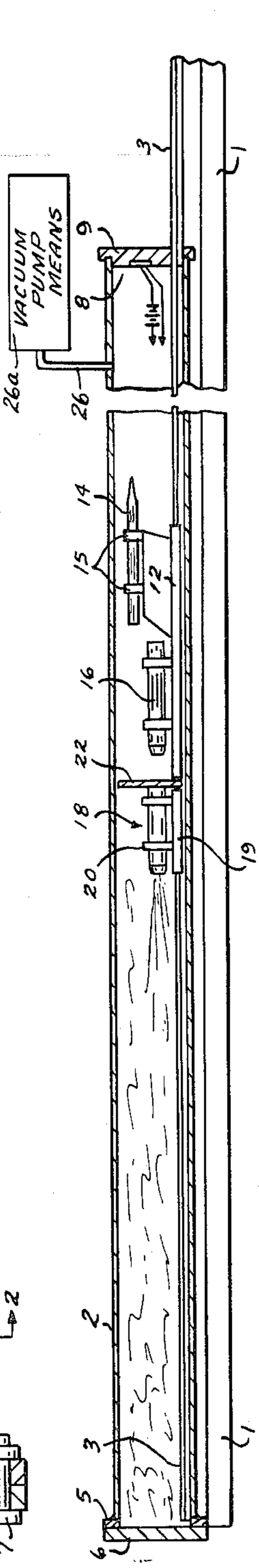

Fig-3

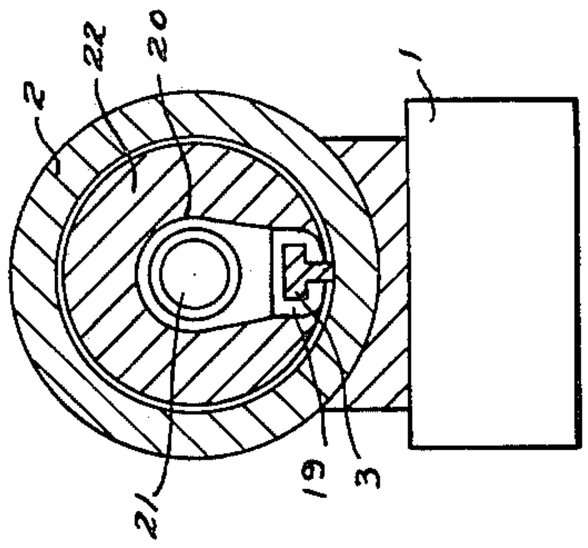

Fig-2

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HIGH VELOCITY ACCELERATOR

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Fig-4

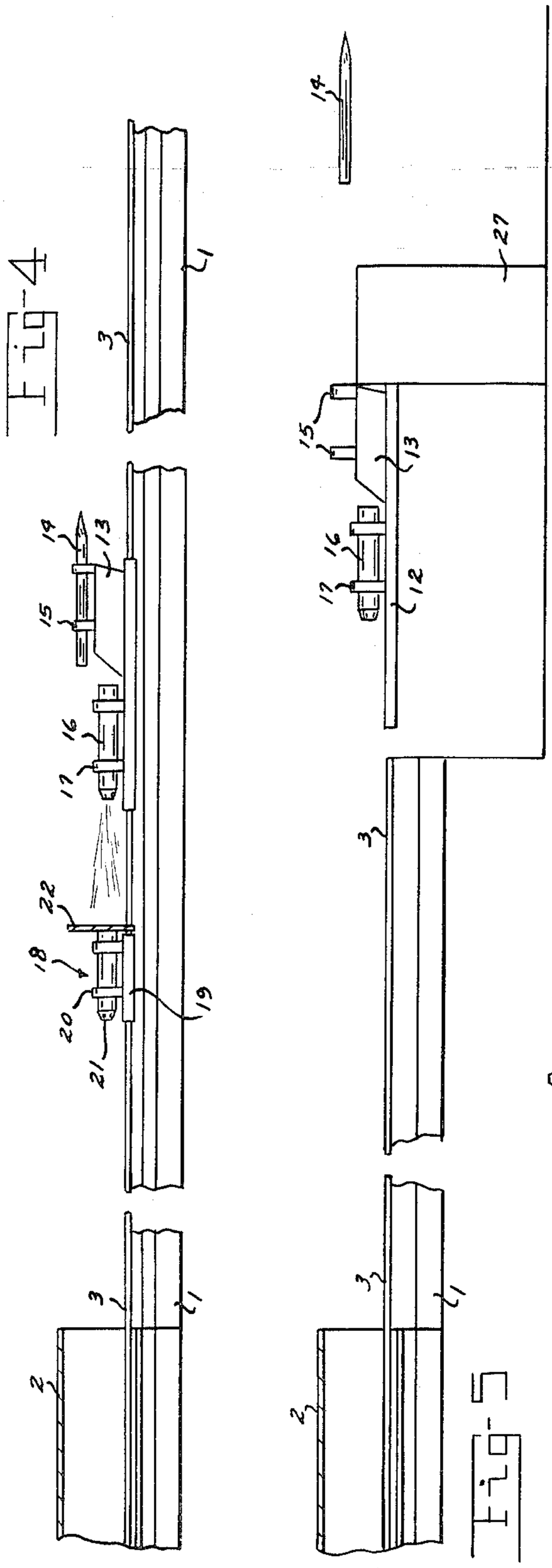

Fig-5

Fig-6

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HIGH VELOCITY ACCELERATOR

Filed March 14, 1958 3 Sheets-Sheet 3

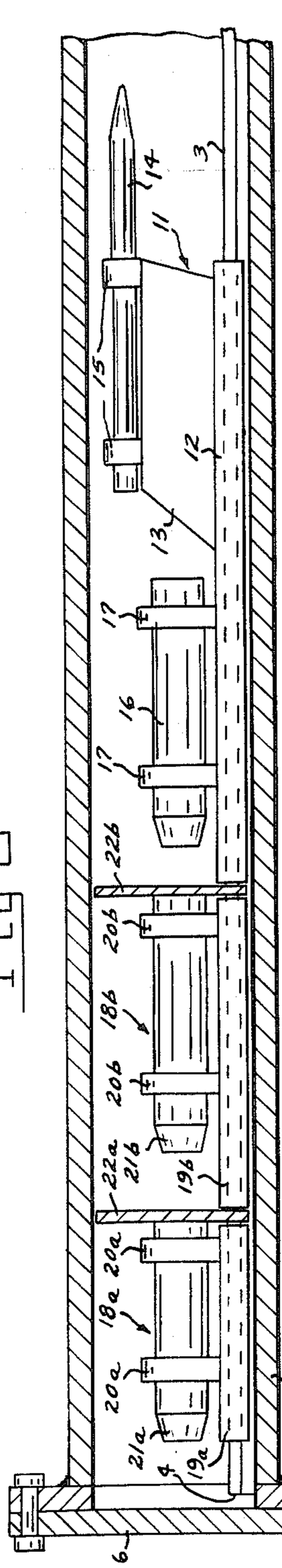

Fig-6

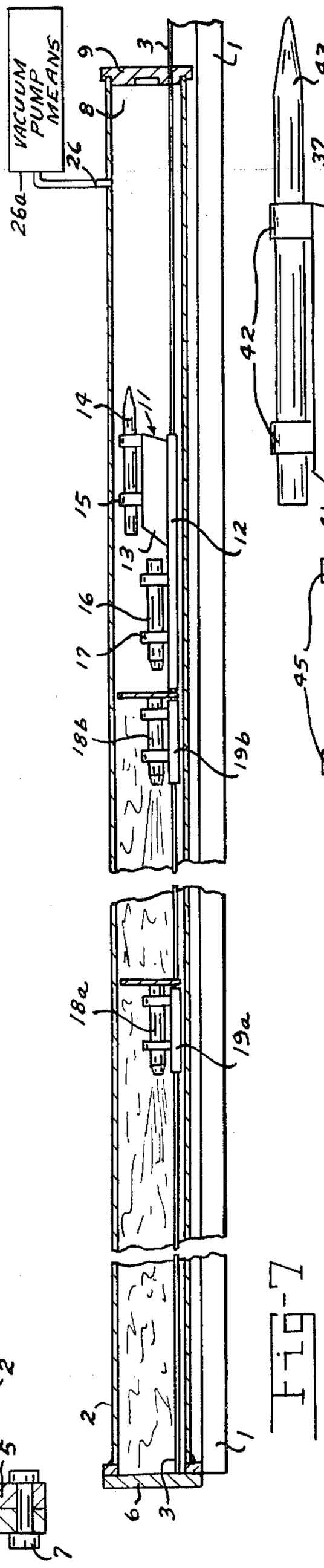

Fig-7

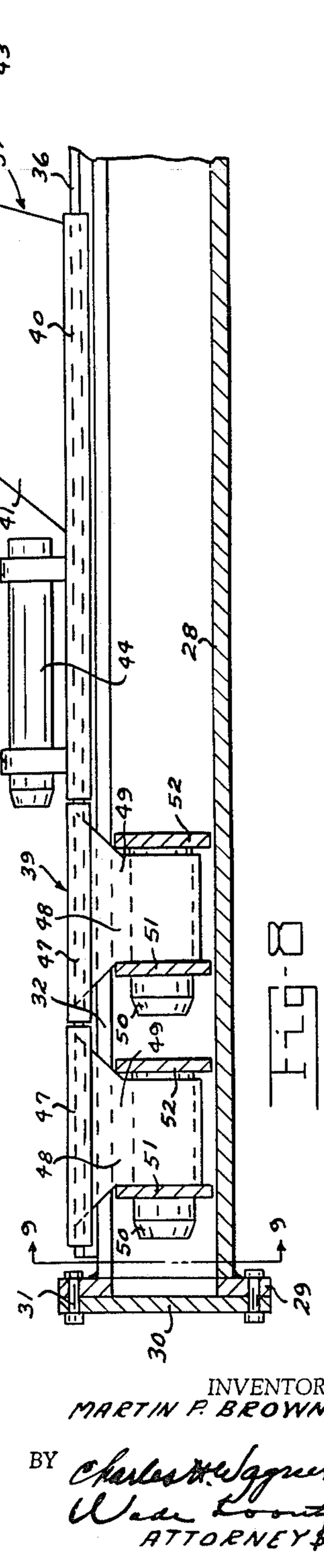

Fig-8

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United States Patent Office

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2,953,065

HIGH VELOCITY ACCELERATOR

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Filed Mar. 14, 1958, Ser. No. 721,618

9 Claims. (Cl. 89—1.7)

(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herewith may be manufactured and used by or for the United States Government for governmental purposes without payment to me of any royalty thereon.

This invention relates to means for increasing the speed of land craft and more particularly to test apparatus for obtaining higher velocities of test vehicle on test tracks without an increase in the length of the track and has for an object a high speed catapult launching device for projectiles, rockets, and other air vehicles.

At the present time it appears that the maximum velocity which has been obtained by a test item launching vehicle on a test track is about 3300 feet per second. Increase in the velocities obtainable on test tracks using present techniques is limited by the specific impulse of available rocket propellants and in some cases by track length. An object of this invention is to materially increase these velocities with such available propellants and without increasing materially the length of the track.

Current practice in propelling test sled mounted test items is to employ single or two stage boosters which are mounted on the test item sled, or a pusher sled which disengages when the booster is expended. The use of additional booster stages and increase of the track length leads to a point of diminishing returns and for present propellants appear to be in the vicinity of 3300 ft. per second.

Velocities of launching aircraft plus velocities of projectiles or rockets totalling 7,000 ft. per second in the future are likely, and therefore the testing of ordnance at these velocities is desired, which is an object of the present invention.

A further object of the present invention is to employ a closed breech launcher or tubular container into which the test vehicle track extends and mounting the test vehicle on the track in the rear end of the container with propelling means such as rockets and boosters facing rearwardly, the container being closed by a frangible closure at its forward end, adapted to be displaced by the forward movement of the test sled.

A still further object includes explosive means to remove the forward closure when the test item approaches near the forward end of the closed breech container.

Another object is the evacuation of the closed breech container to reduce air resistance in front of the test vehicle and test item or projectile as it is projected forwardly through the container toward the frangible forward closure.

A further object includes a plurality of pusher type acceleration vehicles disposed on the track behind the test vehicle for initial acceleration of the test vehicle and which disengages the vehicle when they are expended.

A further object is the provision of means for progressively firing the rocket means on the proceeding booster vehicles as rear booster propelling rockets are expended.

A further object includes means for mounting a test

projectile, such as a test rocket, on the test item supporting vehicle so that it will be projected forwardly in space upon abrupt deceleration of the test item supporting vehicle or sled.

A further object includes the possibility of venting the closed breech or launcher tube to keep the accelerations within the container within limits that will not exceed the stress that can be tolerated by the test item or sled assembly.

A further object is the provision of a gas sealing abutment means between the inner wall of the breech container and the auxiliary booster device disposed immediately in the rear of the main rocket booster on the test vehicle to receive the blast therefrom when the first or rear booster device is expended.

A further object includes a mono-rail supporting system extending into the breech container and forwardly thereof for the test vehicle and booster devices to travel upon and a rear closure through which the test item, sleds and boosters can be inserted onto the mono-rail.

A further object includes a dual rail supporting system for the test vehicle and booster devices in which the tracks or rails are disposed outside of the breech loading container, and the container is slotted longitudinally at its top, with means supporting a test vehicle on the rails outside and means extending through the slots connecting the test vehicle and booster device for travel on the rails.

Other objects and advantages will become apparent from the following description and accompanying drawings in which like reference characters refer to like parts in the several figures of the drawing.

Figure 1 is a somewhat diagrammatic vertical longitudinal sectional view through a test vehicle launcher, parts being broken away to foreshorten the view.

Figure 2 is a transverse vertical section taken about on line 2—2 of Figure 1.

Figure 3 is a diagrammatic vertical longitudinal sectional view, on a smaller scale showing the test vehicle within the closed breech receptacle being projected forwardly by the first booster device, but before reaching the forward frangible seal, and showing the means for exhausting air from the interior of the closed breech container.

Figure 4 is a fragmentary diagrammatic sectional view of the device illustrating how the second or main booster "takes over" when the first booster becomes expended.

Figure 5 is a further diagrammatic view illustrating the test vehicle at the end of its travel, where it leaves the end of the track or rail and strikes the deflector, with the test item, or projectile projected forwardly at maximum velocity.

Figure 6 is a slightly modified longitudinal vertical sectional view similar to Figure 1 in which more than one booster device is employed within the closed breech container.

Figure 7 is a view similar to Figure 3, but showing how the second booster can be fired while the rear or first booster is still in operation to further increase the velocity of the launching sled while it is within the closed breech launching tube.

Figure 8 is a further modification of the invention in which the launching device is supported on dual parallel guide rails located above and at opposite side of the launching tube, and in which the tube is slit longitudinally with means extending through the slit for connecting the booster devices to their slippers on the rails. In this form two booster rockets are disposed to function within the tube and the main booster rocket on the test vehicle is disposed to operate outside of the launching tube.

Figure 9 is a transverse vertical section taken about line 9—9 of Figure 8.

Referring first to Figures 1 to 5 the reference numeral 1 denotes a prepared rigid support or base, such as the ground or a cement foundation on which my device is mounted.

A closed breech container or launching tube 2 preferably of cylindrical form is firmly supported on the base 1 and a mono-rail 3, preferably of T shape is suitably secured at the bottom of the tube 2 to its inner periphery. The track or rail 3 terminates at its rear end at 4 adjacent the breech end of the launching tube 2, this end of the tube being flanged at 5 with a removable breech closure or plate 6 secured over the loading end of the tube by suitable securing means, such as bolts 7. If desired any suitable quick, removable breech sealing closure can be employed.

The rail 3 extends forward materially beyond the mouth 8 of the launching tube 2 and is rigidly supported by suitable supports or brackets from the base 1 to maintain the track in a precise straight line.

In practice the closed breech launching tube or cylinder 2 may inclose a considerable portion of the track. In a 3000 foot track the launching tube may inclose 1000 or more feet of track, if desired.

A frangible closure or cap 9 is provided to seal the mouth 8 of the container or tube 2. If desired an explosive 10 may be associated with the frangible cap 9 for the purpose of disintegrating or removing the cap just prior to the test vehicle or sled 11 reaching the cap.

The test item supporting vehicle is indicated generally at 11 and comprises a guide shoe forming a slipper base 12 as shown in Figures 1 and 2 to fit and slide on the guide rail 3. The test vehicle is formed with a test item support 13 upstanding therefrom to receive and support a test item 14 such as a rocket, projectile shell or other aerodynamic item in spaced parallel relation to the guide rail 3. Suitable brackets 15 being provided on the support 13 for receiving and holding the test item 14, with release means for preventing rearward movement of the test item relative to the test item supporting vehicle 11 but permitting the test item 14 to continue forwardly at maximum velocity when the test vehicle is decelerated, such as shown in Figure 5, by a stop means or deflector 26 in the path of the test vehicle 11.

Firmly secured to the test vehicle 11 in rear of the support 13 is the main test vehicle accelerating device such as a booster rocket or rockets 16 which are supported from the slipper base 12 of the test vehicle 11 by spaced supports 17.

Mounted on the rail 3 in rear of the guide support or slipper base 12 of the test vehicle 11 is a primary or first booster vehicle 18 comprising a slipper base or first booster sled 19 designed to slidably fit the rail 3. The sled 19 has upstanding standards or brackets 20 firmly fixed thereto into which is firmly fixed a primary or first booser device such as a booster rocket 21.

Mounted at the forward end of the primary booster rocket 21 is an abutment disk in the form of a gas seal 22, the periphery of which is shaped to conform to the inner shape of the breech launching container or cylinder 2, but in fairly closely spaced relation to the interior of the container tube 2 so as to travel therein, preferably without touching.

Suitable firing mechanism such as electric conductors 23 may be connected to the igniter of the booster rocket 21 from the exterior of the container 2. Also suitable firing means may be provided such as conductors 24 for firing the main or primary booster rocket 16 when the first booster rocket 21 is wholly or partly expended when separation of the first booster device ignites the main booster rocket 21. Also suitable contacts and conductors 25 may be provided for energization by the test item sled 12 as the same approaches the frangible closure

cap or seal 9 to fire the explosive 10 to remove or disintegrate the closure cap 9 slightly before the test item sled 12 reaches the cap 9.

It is also contemplated that the cap 9 may be made of highly frangible material so that the striking of the cap 9 by the test item 14 may disintegrate or remove the cap 9 to one side to permit the test item 14 and sled 12 to pass out of the tube 2 without material deceleration or damage.

In loading the device for a test the closure cover 6 is removed by removing the bolts 7, although other quick release securing means for this breech plate 6 may be provided.

The test item supporting sled 11 is now inserted through the breech of the container or cylinder 2 with the slipper base 12 slidably disposed on the rail 3 as shown. Suitable lubricants between the rail 3 and slipper 12 may be introduced if desired.

The firing conductors 24 are now connected to a suitable firing mechanism which preferably is carried on forward surface of the gas seal 22. The gas seal 22 and its associate booster sled 18 are now inserted through the breech with the slipper base or sled 19 slidably disposed on the rail 3. Lubricant between the rail 3 and first booster sled slipper 19 may also be provided, if desired.

The firing conductors 23 for the rocket 21 are now connected through the breech to any suitable firing circuit and the breech closure 6 is replaced and secured gas tight by the securing means, such as the bolts 7.

The breech loading test item accelerating container 2 is also provided with means in the form of a conduit 26 located in the forward or muzzle portion 8 of the tube 2 for evacuating the air from within the tube.

Before firing the rocket 21 the air within the tube 2 is preferably evacuated through the conduit 26 connected to suitable vacuum pump means 26a to provide a partial vacuum within the tube 2, this being maintained by the sealing closure 6 at the breech end and the frangible closure cap 9 at the forward or muzzle end 8.

With the booster sled 11 and auxiliary booster sled 18 in the position approximately as shown in Figure 1 the auxiliary or first booster rocket 21 is fired in any conventional way, such as energizing the conductors 23 to fire a squib in the rocket 21 to ignite the rocket proper.

The rocket 21 accelerates the auxiliary sled 19 forwardly, which in turn pushes the test vehicle sled 11 forwardly as shown in Figure 3. The gas seal or shield 22 prevent an appreciable amount of pressure generated by the rocket 21 behind the shield 22 from leaking forwardly while the low pressure area in the tube 2 ahead of the shield 22 assisted in increasing the acceleration and velocity of the test item sled 11 and the test item 14 carried thereby.

At some point during its forward travel, either within the container 2 or after it has passed out of the container 2 the primary or main rocket booster 16 is fired, preferably as the propellant force of the auxiliary booster 21 falls off or becomes expended.

The blast of the primary rocket booster 16 strikes the gas shield 22, decelerating the first booster 18 with a corresponding further increase in acceleration and velocity of the test vehicle sled 11.

When the test item supporting vehicle sled 11 approaches the frangible muzzle sealing cap 9 the contacts 25 are closed, preferably, by the test vehicle sled 11, to fire the explosive 10 to remove or disintegrate the cap 9 so that it will not damage or decelerate the test vehicle sled 11 or injure the test item 14.

Since the cap 9 is made of any suitable highly frangible material it is also contemplated that the test vehicle or test item 14 may strike, and disintegrate the cap 9 out of the way without any appreciable loss in acceleration of the test item sled 11 in the event that the explosive 10 is not employed. It is also contemplated that before the

time when the test vehicle **11** reaches cap **9** the vacuum in the tube **2** will be decreased to provide a positive pressure ahead of the seal **22**, which is sufficient to "pop" the closure cap **9** to one side out of the way of the test vehicle **11** and test item **14**.

The main booster, or boosters **16** on the sled **11** continue to increase the velocity of the test vehicle **11** and test item **14** until the sled **12** nears or reaches the far end of the rail **3** as shown in Figures 4 and 5 where the test vehicle and test item have reached the maximum velocity possible for the system, length of track and amount of booster power provided.

The primary booster rocket **16** on the sled **12** preferably becomes expended as it leaves the far end of the rail **3**, as shown in Figure 5 and the test vehicle is preferably quickly decelerated by a suitable deflector or yieldable abutment **27** but the test item **14** is projected freely forwardly as shown, at the maximum velocity of the test item sled **11**. It should be obvious that with the closed breech container or tube **2** and the removal of air from the interior of the tube **2** by suction through conduit **26** to reduce air resistance within the tube to a minimum, a very great increase in acceleration and velocity can be obtained without a material increase in the length of track required or in the propulsive force of the booster rockets that are employed.

The modification as shown in Figures 6 and 7 primarily involves the use of a plurality of secondary booster sleds each having a gas shield or seal similar to **22**. In this form the main test item and sled are assigned similar reference numbers to those used in the preferred embodiment, as they are of the same type as in Figures 1 to 5. A plurality of booster sleds are indicated at **18a** and **18b** each having slipper supports or bases **19a** and **19b** and gas seal shields or partitions **22a** and **22b** carried on the front ends of the booster rockets **21a** and **21b** which are supported on brackets **20a** and **20b**. Any suitable firing means, for instance a timer device may be provided to fire booster rockets **20a** and **20b** successively in their desired firing order and time, preferably the rear booster rocket **21a** is fired first and as it becomes expended any suitable mechanism fires the intermediate stage booster **21b**, causing separation between the two booster stages, as seen in Figure 7. As the intermediate stage booster rocket **21b** becomes expended the main booster rocket **16** on the test item support **11** is fired increasing the acceleration and velocity of the test item **14** to a greater degree than when a single auxiliary booster is employed. The operation and rocket firing means may otherwise be the same as described in connection with Figures 1 to 5.

Referring to modification shown in Figures 8 and 9 the closed breech container is indicated generally at **28**, flanged at its rear or breech end **29** to receive a breech closure plate or seal **30** which is removably secured thereon by any suitable quick removable securing means such as bolts **31**.

The tubular container or elongated cylinder **28** is slit longitudinally to provide a narrow guide slot **32**. The container or launcher tube **28** is also preferably held from spreading under internal pressure by retaining means **33** which in cross section almost surrounds the tube **28** leaving the slot **32** exposed.

The breech launching container **28** is, of course, rigidly supported on a suitably prepared base **34** which extends upwardly on opposite sides of the container **28** as indicated at **35** to support a pair of spaced rails **36** forming the track on which test items supporting vehicle **37** and the primary and intermediate booster devices **38** and **39** are slidably supported on slipper members or supports **40** which slidably engage and partly inclose the rails **36**.

In this form the test item vehicle **37** is supported from its slipper members **40** by a transverse support or base plate **41a** between the slippers on which the test item support **41** is rigidly carried. The support **41** carries

longitudinally spaced brackets **42**, similar to the members **15** in Figures 1 to 5, in which the test item **43** is detachably carried for forward projection as in the preferred form of the invention and is releasable for free forward flight when the support **41** is materially decelerated after forward acceleration.

Mounted on the transverse support **41a** immediately behind the test item support **41** is the main or No. 3 booster rocket **44** (or rockets if more than one is used and are placed side by side).

The booster rocket **44** is rigidly mounted on brackets **45** carried on the transverse supporting plate **41a** just referred to.

In order to provide for maximum acceleration of the test item supporting vehicle a plurality of auxiliary boosters **38** and **39** are provided. These boosters each have a transverse supporting plate **41a** and slipper channels **46—47**, preferably **C** shape in cross section to slidably fit the spaced **T** rails **36**. Projecting downwardly from the center of each of the plates **41a** is a comparatively thin longitudinally disposed fin or supporting plate **48**. The plate or fin **48** is disposed to guidingly fit the slot **32**. As seen in Figure 9 the lower end of the fins or plates **48** are each formed to provide a booster rocket holder or body **49** for rigidly supporting one of the first of intermediate booster rockets **50** in concentric relation to the central axis of the launcher tube **28**.

Gas seals in the form of circular abutment partitions **51** and **52** are fixed to the rocket holder or body **49** at the rear and front ends of the body **49** to closely conform to the interior of the test vehicle launcher tube **28**, in spaced relation to the inner periphery to provide a gas or pressure seal in a similer manner to the abutment partitions or disks **22** in the preferred forms shown in Figures 1 to 7.

The track or rails **36**, of course, extend forward materially beyond the mouth of the launcher tube or cylinder **28** and a closure cap (not shown) of a frangible nature similar to the cap **9** and cap disintegrating or removing means such as an explosive (**10** as seen in Figure 1) may be provided if desired, also any suitable displaceable seal may be provided to close the slot **32** before and after the fins **48** of the booster devices pass along the slot. This sealing means, not shown, may be in the form of a resilient sealing strip carried by one or both longitudinal edges of the tube **28** which define the slot **32**, movement of the fins **48** displacing the sealing means progressively from end to end as the boosters **38** are accelerated forwardly by the rockets **50**, the resilient means, or springs may be provided for, returning the sealing strips across the slot **32** in sealing relation as the fins **48** pass along the slit **22**.

The tracks are maintained in straight longitudinal alignment and parallel relation beyond the outer end of the breech loading test item launching tube **28**, and as in the preferred form shown in Figure 5 a yieldable abutment or deflector such as **27** is placed beyond the forward end of the track to arrest movement of the test item supporting sled **37**, as it leaves the end of the track so as to decelerate the sled and cause the test item **43** to be projected forwardly in space at the maximum velocity of the sled **37**.

With the construction shown in this modification it is also possible to "load" the device through the rear or breech **30** of the launching tube **28** as in the preferred embodiment since the rails **36—36** are displaced laterally out of alignment with the flange **29** and seal plate **30**. It is necessary however that the flange **29** be slotted to receive the fins **48**, also that the supporting base plates **41a**, of the boosters **38** and the base plate **41a** of the test vehicle **37** be elevated sufficiently at the center to clear the upper periphery of the flange **29**.

After the breech closure plate **30** is removed the runners or slippers **40** of the supporting sled **37** are first slipped onto the rails **36** and pushed forward as shown

in Figure 8, the test item 32, of cource, being positioned in the brackets 42, and the rocket booster 44 placed in position in the brackets 45.

The intermediate acceleration booster 49 is now slipped through the breech of the launching tube 28 with the slippers 47 slidably engaging the rails 36, and is moved forwardly into contact with the slippers 40 of the test item supporting vehicle 37. This disposes the sealing partitions 51—52 in closely spaced relation to the inner periphery of the launching tube 28, as shown, one gas seal at each end of the rocket booster holder or body 49, providing a double gas seal.

The first or initial auxiliary booster 38 is now inserted in the breech of the launching tube with its slippers 47 engaging the track 36 and the intermediate booster slippers 47 in a similar manner with the depending fins 48 in the guide slot 32.

It is to be understood that suitable means are provided for initially firing the first booster rocket 50, and subsequently firing the intermediate booster rocket 50 in the desired time sequence, preferably as the forward thrust of the first booster stage diminishes. Likewise, in a similar manner the main booster rocket 43 is fired. In this form of the invention it might be desirable to fire the main test item sled rocket 44 while the intermediate booster rocket is functioning. Also any suitable firing means may be used such as shown in the preferred form, where during final acceleration of the first booster, suitable contacts fire the intermediate booster rocket, which in turn subsequently fires the main booster on the test item sled. It should be noted that a preset timing device may be used and carried by the sled 37 to fire the two booster rockets 49 and main booster rocket 44 in the desired order and time sequence.

It will be obvious that various changes may be made by those skilled in the art in the details of the embodiments illustrated in the drawings and described in detail within the principle and scope of the invention as expressed in the appended claims.

I claim:

1. A closed breech test item launching device comprising an elongated launching tube having a closed breech end, a test item supporting vehicle, a track extending in parallel relation to said tube from a point adjacent the breech end of said tube to a point materially beyond the forward end of said tube, said vehicle having slippers disposed on said track for sliding engagement therewith from end to end, test item supporting means rigidly fixed on said vehicle above the level of said track to support a test item thereon, a booster rocket fixed on said test vehicle rearwardly of said test item supporting means for accelerating said vehicle forwardly along said track, an auxiliary booster device, slippers carried thereby slidably engaging said track rearwardly of said vehicle slippers for pushing engagement with said test vehicle, said auxiliary booster device having a body insertable into said launching tube through the breech end thereof, rocket booster means fixed on said body in parallel relation to the axis of said tube including a rocket fixed on said body facing said breech end, a gas sealing partition carried by said auxiliary booster device defining the interior of said launching tube in closely spaced relation, to retard the passage of pressure gases from said auxiliary booster rocket past said partition, removable closure means for the breech end of said tube, and means for firing said auxiliary booster rocket while the same is in said tube.

2. Apparatus as claimed in claim 1 including a frangible sealing closure for the forward end of said tube, and means for exhausting air from the interior of said tube.

3. Apparatus as set forth in claim 2 in which the air exhausting means is located adjacent the forward end of the tube.

4. A closed breech launching device comprising an elongated supporting base, a test vehicle acceleration track extending substantially the length of said base, an

elongated closed breech test vehicle launching tube having a central axis disposed in spaced parallel relation to said track throughout a material portion thereof, a test item supporting vehicle having elongated slipper means slidably engaging said track for acceleration thereon from end to end of the track, a test item support fixed on said slipper means above the level of said track, means for mounting a test item on said test item support in spaced parallel relation to said track for free flight forward upon abrupt deceleration of said vehicle, booster rocket means fixed on said slipper means rearwardly of said test item support for discharge rearwardly, a plurality of auxiliary booster rocket devices each having slipper means slidably engaging said track rearwardly of said test item supporting vehicle slipper means for pushing engagement therewith, said auxiliary booster means each having a body portion disposed to travel within said launching tube in spaced relation to the inner periphery of said tube, an auxiliary booster rocket fixed on said body portion having a discharge nozzle facing the breech closure means of said tube, a gas seal disk fixed on said auxiliary booster device in front of the forward end of said auxiliary booster rocket device, said disk defining the inner periphery of said tube in closely spaced relation thereto, a frangible closure for the front end of said tube for sealing the same against the entrance of outside air, and means for exhausting the air from within said tube adjacent the mouth thereof to provide a partial vacuum in said tube between said gas seal disk and said frangible closure when one of said auxiliary booster rockets is fired.

5. A closed breech test item acceleration and launching device comprising an elongated test item launching cylinder having a breech end for receiving said test item therethrough, removable closure means for closing and sealing said breech end, a highly frangible closure cap for closing and sealing the muzzle end of said cylinder, a test item vehicle supporting vehicle rail having a rear end disposed adjacent said closure means in forwardly spaced relation thereto, said rail disposed in fixed parallel relation to said cylinder and terminating in a forward end disposed materially forward of said muzzle constituting an acceleration track, a test item supporting vehicle comprising elongated slipper means slidably engaging said rail, means for releasably supporting an elongated test item on said slipper means above said rail, main booster rocket, means for fixing said booster rocket in said cylinder on said slipper means in rearwardly spaced relation to said test item and parallel to said rail with its discharge end facing rearwardly toward said closure means, an auxiliary rocket booster device comprising an elongated supporting slipper member slidably engaging said rail rearwardly of said test vehicle slipper means, an auxiliary booster rocket fixedly carried by said slipper member within said launching cylinder having a discharge end facing rearwardly toward said removable closure means, a gas sealing disk fixed on said auxiliary booster device in front of said auxiliary booster rocket, said disk having a periphery defining the interior of said launching cylinder in closely spaced relation thereto, and means for firing said auxiliary booster device while the same is in said cylinder.

6. A high acceleration test item propelling apparatus comprising an elongated cylinder, having a breech end and a muzzle end, a removable closure for sealing said breech end, a frangible closure cap for sealing said muzzle end, means connected to said cylinder for exhausting air from the interior of said cylinder, a straight elongated test vehicle supporting rail extending from a point adjacent said removable closure to a point materially beyond said muzzle end in spaced parallel relation to the axis of said cylinder for a test item supporting vehicle to travel thereon, a test item supporting vehicle carried on said rail, main booster rocket means fixed thereon within said cylinder with its discharge end facing in a direction toward said removable closure, an auxiliary booster device disposed on said rail rearwardly of said test item sup-

porting vehicle for accelerating said test item supporting vehicle forwardly on said rail, auxiliary booster rocket means fixed on said auxiliary booster device within said cylinder with its discharge end facing said closure means, and a gas sealing disk carried on said auxiliary booster device within said cylinder having a periphery closely defining the inner periphery of said cylinder in spaced relation thereto perpendicular to the axis of said cylinder, said disk having a front surface facing the discharge end of said main booster rocket means, and means for firing said auxiliary booster rocket means and said main booster rocket means successively.

7. Apparatus as set forth in claim 6 including means for removing said frangible closure cap out of the path of said auxiliary booster rocket means at a predetermined point during its travel toward said frangible closure cap.

8. A high acceleration device for test items comprising an elongated test item receiving cylinder having a breech end and a muzzle end, an elongated test vehicle supporting rail extending within said cylinder at the bottom thereof from a point adjacent said breech and to a point materially beyond the muzzle end for a test item supporting vehicle to travel thereon, a test item supporting vehicle disposed within said cylinder on said rail adjacent said breech end, a removable breech closure for inserting said vehicle through said breech end onto said rail, means on said vehicle for supporting a test item within said cylinder, rocket acceleration means carried by said test vehicle within said cylinder having its discharge end facing toward said breech closure, a frangible closure cap for sealing the muzzle end of said cylinder against the entrance of outside air into the cylinder, means connected to the cylinder adjacent the muzzle end thereof for exhausting the air from within said cylinder to provide a partial vacuum within the cylinder, means for firing said rocket accelerating means within said cylinder, and means for removing said closure cap from said muzzle end during the acceleration of said test vehicle by said rocket acceleration means toward said frangible closure cap, said closure cap removing means comprising an explosive for removing said closure cap, and means activated by said test item supporting vehicle for exploding said explosive prior to said test item supporting vehicle reaching said closure cap to remove said closure cap from said muzzle prior to said test item supporting vehicle or said test item reaching said closure cap during forward movement of said test item supporting vehicle in said cylinder, an acceleration booster device disposed within said cylinder on said rail between the test vehicle and said breech closure for pushing said test vehicle toward said frangible closure cap, said booster device having a rocket motor fixed thereon facing said breech closure, a gas sealing partition disk carried on said auxiliary booster device perpendicular to the axis of said cylinder with its periphery closely defining the inner periphery of said cylinder in closely spaced relation thereto, said gas sealing partition disk being positioned on said auxiliary booster device intermediate the auxiliary booster device rocket motor and the rocket acceleration means of the test item supporting vehicle with a front surface facing the discharge end of the rocket acceleration means for the test vehicle, and means for firing said auxiliary booster rocket motor within said cylinder while adjacent said breech end, and means for subsequently firing said rocket acceleration means on said test vehicle.

9. A high acceleration device for test items comprising an elongated test item receiving cylinder having a breech end and a muzzle end, an elongated test vehicle supporting rail extending within said cylinder at the bottom thereof from a point adjacent said breech end to a point materially beyond the muzzle end for a test item supporting vehicle to travel thereon, a test item supporting vehicle disposed within said cylinder on said rail adjacent said breech end, a removable breech closure for inserting said vehicle through said breech end onto said rail, means on said vehicle for supporting a test item within said cylinder having its discharge end facing toward said breech closure, a frangible closure cap sealing the muzzle end of said cylinder against the entrance of outside air into the cylinder, means connected to the cylinder adjacent the muzzle end thereof for exhausting the air from within said cylinder to provide a partial vacuum within the cylinder, means for firing said rocket accelerating means within said cylinder, and means for removing said closure cap from said muzzle end during the acceleration of said test vehicle by said rocket acceleration means toward said closure cap, in which said closure cap removing means comprises an explosive for removing said closure cap, and means activated by said test item supporting vehicle for exploding said explosive prior to said test item suporting vehicle reaching said closure cap, to remove said closure cap from said muzzle prior to said test item supporting vehicle or said test item reaching said closure cap during forward movement of said test item supporting vehicle in said cylinder.

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