July 21, 1936. F. W. PRESTON 2,048,027

HYDRAULIC TESTING MACHINE

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Fig. 1.

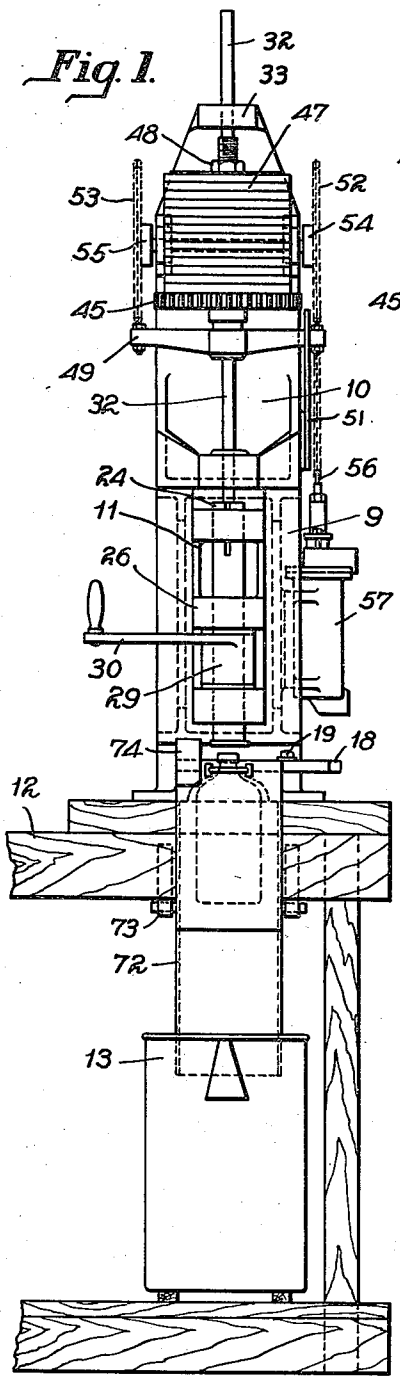
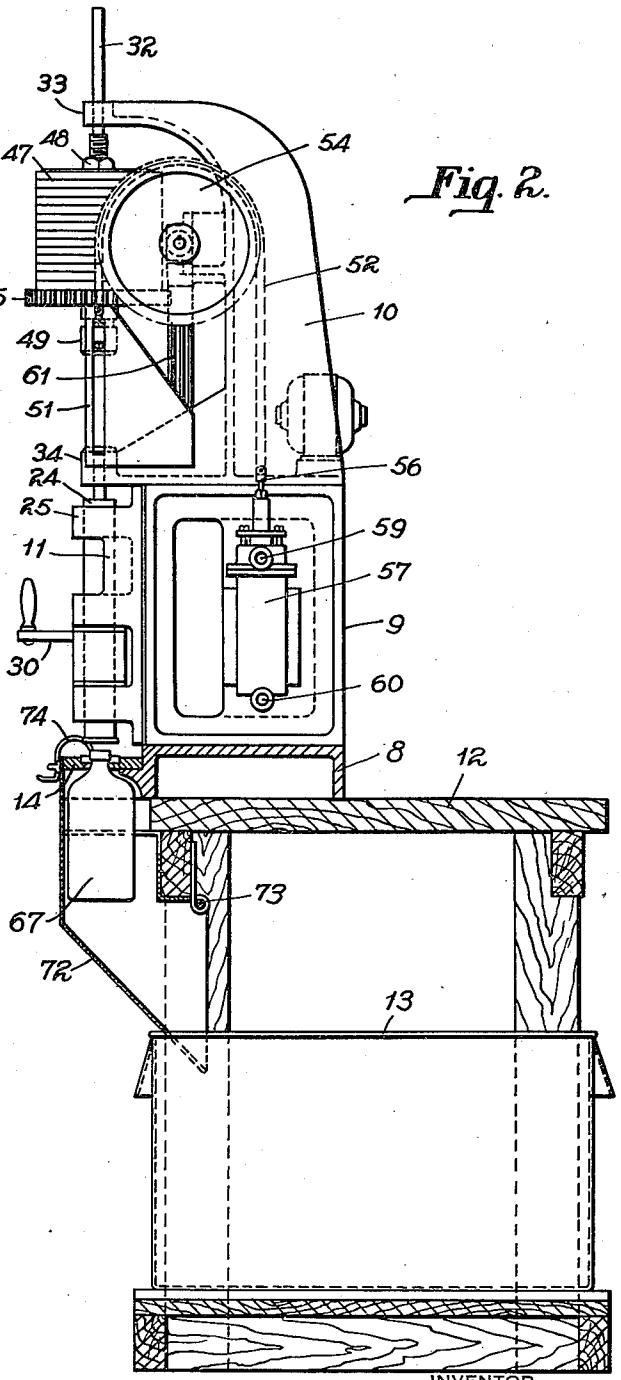


Fig. 2.



INVENTOR

Frank W. Preston,

By Archworth Martin,

Attorney.

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Fig. 3.

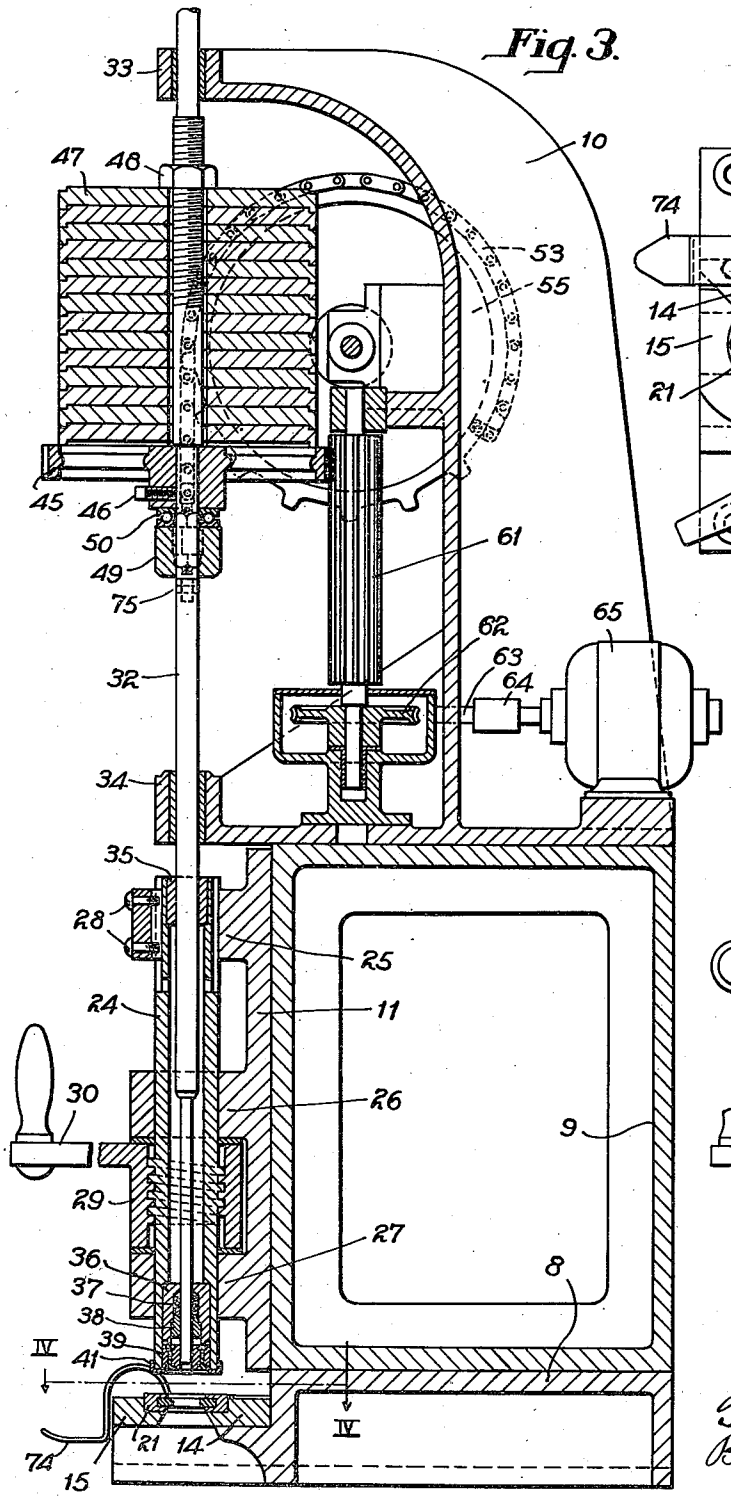
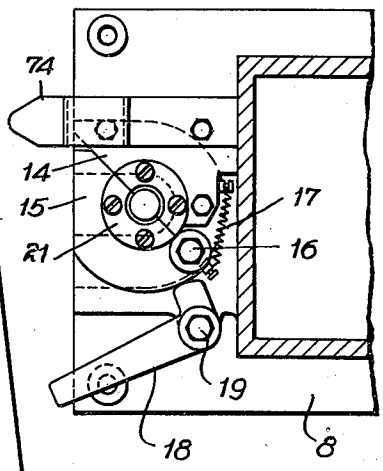


Fig. 4.



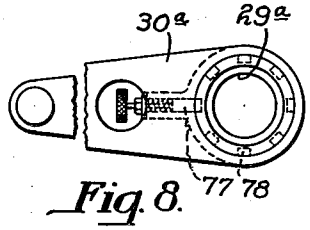


Fig. 8.

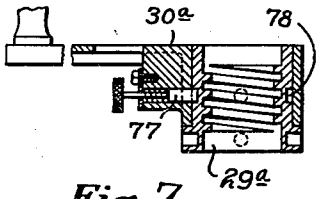


Fig. 7.

INVENTOR

Frank W. Preston,

By Archworth Martin,

Attorney.

July 21, 1936. F. W. PRESTON 2,048,027

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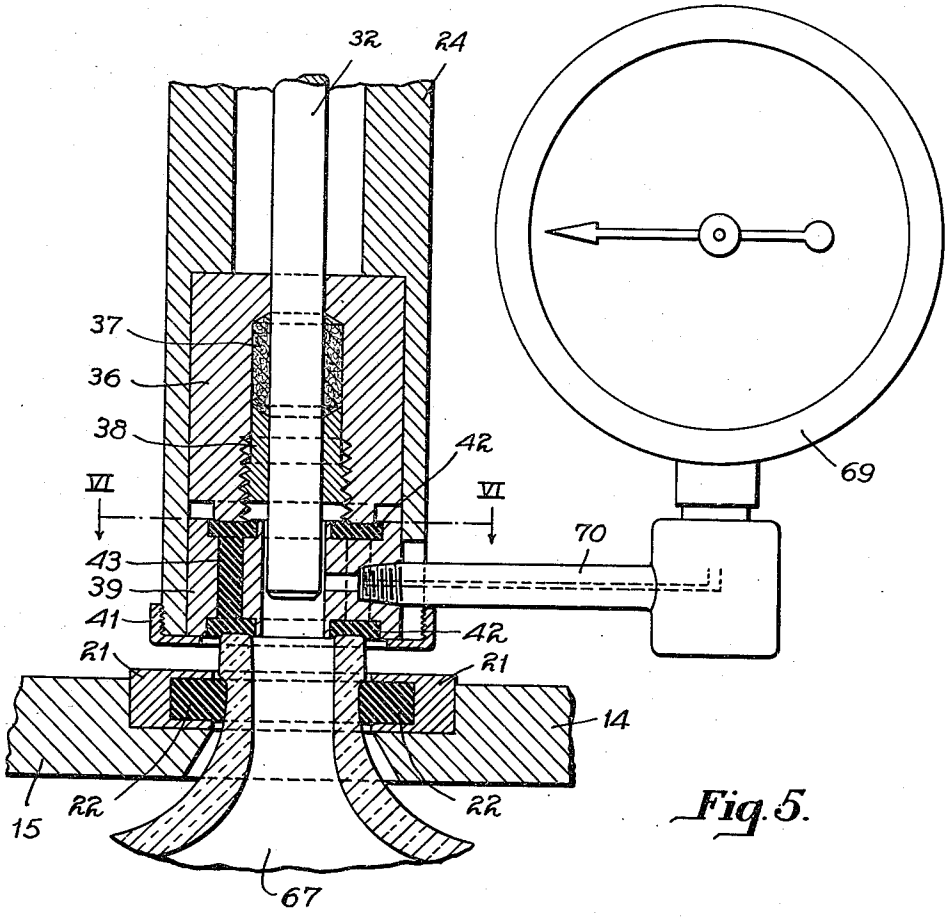

Fig. 5.

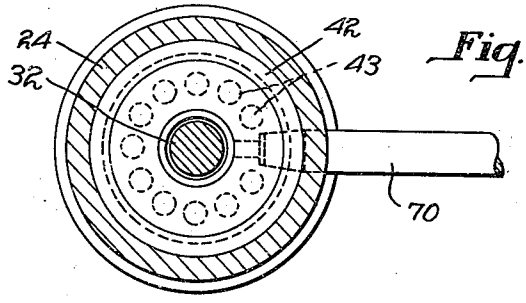

Fig. 6.

INVENTOR
Frank W. Preston,
By Archworth Martin,
Attorney.

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2,048,027

UNITED STATES PATENT OFFICE

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HYDRAULIC TESTING MACHINE

Frank W. Preston, Butler, Pa.

Application August 6, 1934, Serial No. 738,575

4 Claims. (Cl. 73—51)

My invention relates to hydraulic testing machines, and more particularly to apparatus for submitting bottles and other hollow articles to internally-applied liquid pressure for the purpose of determining the strength thereof.

One object of my invention is to provide means whereby hydraulic pressure may be created within an article without the necessity of employing any greater quantity of liquid than that which is directly contained within the bottle.

Another object of my invention is to provide means whereby a mechanically-operated plunger device is employed for the purpose of displacing liquid within an article to be tested, in combination with apparatus for insuring regularity or uniformity of thrusting pressures.

Still another object of my invention is to provide an improved form of sealing device for the mouth of the article to be tested.

A further object of my invention is to provide a testing machine of the character referred to which is of simple form and of great efficiency and accuracy in operation.

One form which my invention may take is shown in the accompanying drawings, wherein Figure 1 is a front elevational view of a machine; Fig. 2 is a side view thereof partly in section; Fig. 3 is a sectional view, on an enlarged scale, of a portion of the structure of Fig. 2; Fig. 4 is a view taken on the line IV—IV of Fig. 3; Fig. 5 is a vertical sectional view, on an enlarged scale, of certain of the packing and sealing devices; Fig. 6 is a view taken on the line VI—VI of Fig. 5; Fig. 7 is a sectional view showing a modification of the quill adjusting member of Fig. 3; and Fig. 8 is a plan view thereof.

As shown more clearly in Fig. 3 of the drawings, the structure includes a base 8 and intermediate frame member 9, an upper frame member 10 and a guide bracket 11. These members may be in the form of castings and are suitably bolted together. The apparatus is shown as mounted on a table 12 under which may be placed a receptacle 13 for broken glass and water.

A clamping jaw 14 (Fig. 4) is detachably secured to the base 8 and a jaw 15 is pivotally connected to the base by a pivot bolt 16. A spring 17 yieldably holds the jaw 15 in open position with respect to the jaw 14 and the jaw 15 is moved to closed position for gripping a bottle neck, by a cam lever 18 that is pivotally connected at 19 to the base. When the lever 18 is swung to released position, the spring 17 will, of course, move the jaw 15 to open position.

Each of the jaws 14 and 15 is provided with a semi-circular bushing 21 containing a removable liner or bushing 22 of yieldable material, so that the neck of a bottle will not be directly engaged by the metal members 21. The bushings 21 are removable so that other bushings of a curvature or radius to fit bottle necks of different sizes can be substituted. The packing elements 22 are also readily replaceable.

A quill 24 is slidably mounted in extensions 25, 26 and 27 of the bracket 11, and is held against rotation therein by screws 28 that extend into the bracket extension 25, and at their inner ends engage a vertical slot or keyway in the upper portion of the quill. A nut 29 is rotatably supported between the bracket extensions 26 and 27, and is provided with a handle 30. The nut has threaded engagement with square cut threads on the quill so that when the handle 30 is swung to and fro, the quill will be raised and lowered for short distances.

Owing to the short range of vertical movements possible with the nut 29, it may be necessary to effect vertical adjustments of the quill relative to the nut so that the lower end of the quill will have a proper field of movement to suit bottle necks of various lengths. In order to effect this adjustment, the screws 28 can be turned outwardly from engagement with the slot in the quill, whereupon the quill may be rotated a partial revolution to bring another slot into alignment with the screws 28, or can be given a complete turn, or more than a complete turn, whereupon the screws 28 are again moved into locking position.

A plunger 32 which is of thicker cross section in its upper portion, for strength, and at its lower portion is of reduced thickness so that such lower end may enter small-mouthed bottles, extends through the quill. The plunger is preferably of non-corrodible metal, and extends through guide bearings 33 and 34 on the frame member 10. Toward its lower end, the plunger extends through a guide bearing or bushing 35 that is mounted in the upper end of the quill, and through a stuffing box 36, the stuffing box being provided with hydraulic packing 37 that is held in place by a gland 38 to prevent water leaking upwardly past the stuffing box.

A sealing ring 39 is contained in the lower end of the quill and is held therein by a locking ring 41. The sealing ring, as shown more clearly in Fig. 5, is provided with annular washers or rings 42 on its upper and lower faces which may be of vulcanized rubber, portions 43 of which extend

through the metal ring **39**, to hold the annuli **42** in place.

A spur gear **45** is keyed to the plunger **32** by a set screw **46** and supports weights **47**, any desired number of which may be employed. The weights are held in place by a nut **48** that has screw-threaded engagement with the plunger **32**. A lifting member or yoke **49** is slidable along the plunger **32** and carries a ball bearing **50**, which, when the yoke is in raised position to support the plunger **32** and the weights carried thereby in elevated position, will reduce friction between the gear wheel and the yoke. One end of the yoke **49** extends through a slotted plate **51** which is secured to the frame **10**, so that the yoke is held against rotative movements.

Chains **52** and **53** are connected at their outer ends to the yoke or cross head **49** and pass over sprocket wheels **54** and **55**, respectively. The sprocket wheels are secured to a common shaft that is journalled in the upper framework **10** and the inner end of the chain **53** is secured to its sprocket wheel **55**. The inner end of the chain **52** is connected to a piston rod **56** which extends into a power cylinder **57**, so that when the piston within the cylinder **57** is operated, the sprocket wheels will be oscillated to lower and raise the cross head **49**. The weight of the plunger, together with the parts carried thereby, will effect downward movement of the cross head, while fluid pressure supplied through a port **59** in the upper end of the cylinder **57**, will effect lifting movement of the cross head **49** and the plunger **32**. The cylinder **57** is provided with a second port **60** so that when fluid is admitted through the port **59**, exhaust will take place through the port **60**, and when fluid is admitted through the port **60**, exhaust will be had through the port **59**.

The gear wheel **45** meshes with a wide-faced pinion **61** that is mounted on a shaft which carries a worm gear **62**, the worm gear being driven from a worm shaft **63** that is connected through a flexible coupling **64** with a motor **65**. The motor **65** may be constantly driven, so that the plunger **32** will be continuously rotated during its raising and lowering movements. It has been found that rotation of the plunger **32**, during its raising and lowering movements, results in less binding thereof in its bearings at **33**, **34**, **35**, and **36**, thereby reducing frictional resistance to raising and lowering movements of the plunger, and insuring that the plunger will always exert a given force on the liquid in the bottle, for a given weight of material carried by the plunger. The rotative movement has the further effect of increasing the life of the plunger bearings or guides.

In operation, a bottle **67**, nearly filled with water or other liquid, is placed between the jaws **14** and **15**, whereupon the cam lever **18** is swung to the position shown in Fig. 4, to close the ring **15** and effect gripping of the bottle neck between the jaw bushings **22**, as shown more clearly in Figs. 2 and 5. The handle **30** is then swung to move the quill **24** down until the sealing ring **39** engages the mouth of the bottle. Water, under some pressure, is then admitted to the lower end of the cylinder **57**, thus permitting the plunger **32** to move downwardly under the influence of the weights **47** and other moving parts carried by the plunger. As the lower end of the plunger **32** enters the bottle, it will displace the water therein and create an internal pressure within the bottle, to a degree dependent upon the weight of the plunger and the members carried thereby. The cross head, by reason of its weight, will continue to descend until it is clear of the gear wheel **45**, so that it will not at its lowest position support any of the weight carried by the plunger **32**. The parts may be permitted to remain in this position for one minute, or any other desired period of time.

Where pressure readings are required, I provide a gauge **69** that has connection through a conduit **70** with the interior of the sealing ring **39**. There is some slight clearance between the inner periphery of the sealing ring and the plunger **32**, so that pressure developed within the bottle may be registered by the gauge **69**.

In order to raise the plunger, fluid under pressure is admitted through port **59** to the upper end of the cylinder, thereby causing upward movement of the cross head which is again brought into engagement with the hub of the gear wheel **45** and its movement continued until the parts are restored to the positions shown in the drawings. The handle **30** may then be swung to raise the quill and the cam lever **18** moved to permit opening of the neck clamp.

In order to protect the operator, and to catch the broken glass, I provide a guide chute **72** that is pivotally supported at **73** from the table **12** and which discharges into the receptacle **13**. Ordinarily, the outer portion of the chute **72** will hang by its own weight in lowered position, so as to present no obstruction to the placing of a bottle. After a bottle is placed, the chute will be tilted to its upright position, and will be held there by a spring clip **74**. Upon lifting of the spring clip, the chute will swing about its pivot **73** to its lowered position.

The plunger **32** may suitably be made in sections which are joined together at **75** (Fig. 3). This arrangement facilitates separation of the plunger so that parts carried by the intermediate framework **9** can be readily replaced and repaired without disturbing the parts of the apparatus above the joint **75**.

It will be seen that since the only liquid required in connection with each testing operation is that contained within the bottle, there is no necessity for employing liquid supply lines and pumps therefor, nor is there any considerable loss of water when a bottle breaks under test, such as occurs where a liquid supply line is employed. Again, I avoid the disagreeable feature of having to contend with large volumes of water which would be discharged from a liquid pressure line in case of bottle breakage. Also, desired changes in testing pressures can be readily effected, and be made simply through the removal and placement of weights **47**.

Referring to Figs. 7 and 8, I show means for vertically adjusting the quill **24**, without the necessity of loosening the screws **28**. An interiorly threaded nut **29a** is provided with a handle **30a** having a hub which is rotatably mounted on the nut. The hub carries a spring pressed locking pin **77** which enters one of a plurality of circumferentially-spaced holes **78** provided in the nut, thereby detachably locking the nut and the handle together to allow for short adjustment of the quill. At its lower edge, the nut is drilled for the reception of a spanner wrench, whereby, upon pulling out of the pin **77**, the nut may be turned to raise or lower the quill through a desired distance, without moving the handle.

I claim as my invention:—

1. Hydraulic testing apparatus comprising means for supporting a liquid-containing receptacle with its mouth upwardly exposed, a verti-

cally movable quill for sealing the mouth of the receptacle, a plunger movable through said quill and into the receptacle, a weight device for moving the plunger down, means for raising the plunger, and means for effecting reverse movement of the raising means, independently of the plunger.

2. Hydraulic testing apparatus comprising means for supporting a liquid-containing receptacle with its mouth upwardly exposed, a vertically movable quill for sealing the mouth of the receptacle, a plunger movable through said quill and into the receptacle, a weight device for moving the plunger down, and means for raising the plunger, the weight device being rotatable with the plunger.

3. Hydraulic testing apparatus comprising means for supporting a liquid-containing receptacle with its mouth vertically exposed, a quill mounted above the said mouth, a sealing ring carried by the lower end of the quill in position to be moved against the mouth of the receptacle, means for raising and lowering the quill, a liquid displacement plunger movable through the quill and into the receptacle, and means for rotating the plunger relative to the quill during movement of the plunger.

4. Hydraulic testing apparatus comprising means for supporting a liquid-containing receptacle with its mouth upwardly exposed, a vertically-movable quill for sealing the mouth of the receptacle, a plunger movable through said quill and into the receptacle, a weight device for moving the plunger down, a lifting device for the plunger, and means for effecting reverse movement of the lifting device through a greater distance than the downward distance of plunger travel and out of supporting engagement with the plunger.

FRANK W. PRESTON.