

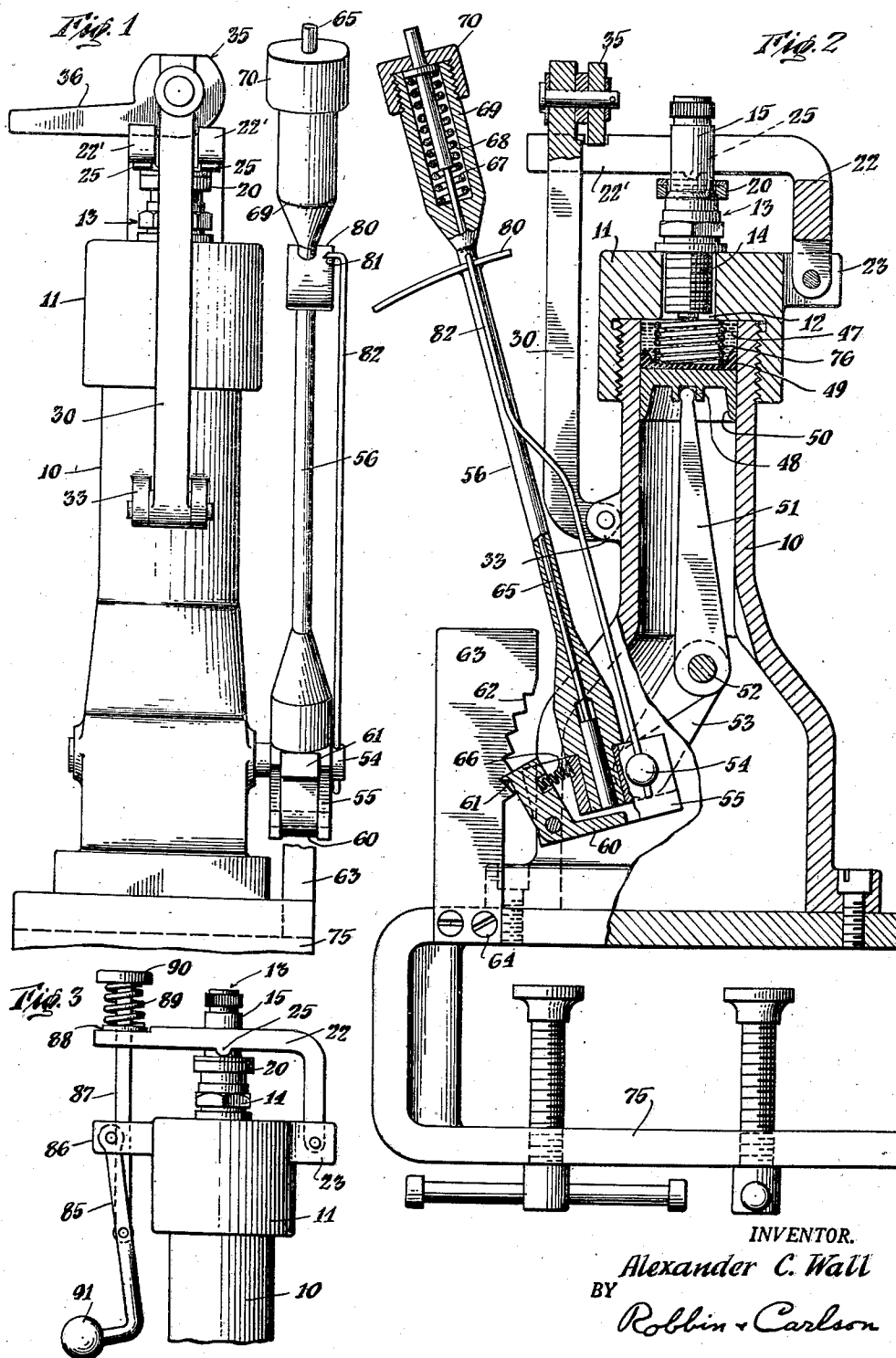
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SPARK PLUG TEST BOMB

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SPARK PLUG TEST BOMB

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1

This invention relates to spark plug testing devices and has for an object to provide a device of the above type having novel and improved details of construction and features of operation.

Another object is to provide a device of the type above indicated having novel and improved means for securing the plugs for testing.

Another object is to provide simple and dependable means to control the testing pressure.

Another object is to provide a device of the above type which is suited to use for testing in the field and is rapid in operation.

Various other objects and advantages will be apparent as the nature of the invention is more fully described.

As a feature of the present invention the testing device is made in the form of a cylinder having a head in which the spark plug is inserted for testing. A quick acting linkage is provided to secure the plug in place in an unthreaded hole in the cylinder head, so that the time and labor required for screwing and unscrewing the plug is eliminated.

The cylinder is provided with a manually operated piston for building up the required testing pressure and with a scale cooperating with the operating lever to indicate the pressure. The lever is latched in position to hold the pressure while the plug is being tested, but may be readily released when the test is completed.

There are available a number of commercial spark plug testing devices which involve either motor-driven pressure pumps or hand-operated pressure pumps, requiring a multiplicity of hand operations to secure the necessary high pressure to extinguish the spark at the gap of the spark plug. That is due, fundamentally, to the fact that since a pressure of approximately 25 to 30 atmospheres is required, either a multiple stage pump of normal construction or a pump having an extremely large ratio of displacement to clearance volume is required. Mechanical multi-stage pumps require large amounts of power and are not portable. Normally, the use of a long stroke pump involves valves and a mechanical hand mechanism such as a rack and pinion, which is laborious to operate.

This invention provides a pump which, by means of a single stroke of the hand through an arc of approximately 120° is capable of producing on the nose of the spark plug a pressure increase of from 25 to 30 atmospheres. This is accomplished by means of a liquid which covers the piston, and which reduces to zero the clearance up to the very electrodes of the spark plug. Since

2

the oil is, in effect, a piston of adjustable shape and diameter, it is possible to accommodate plugs of different reach, as well as plugs of the same reach, without any change in the mechanism.

It is also to be noted that the mechanism is simple, in that no valves of any type are employed. The device is made particularly for field application where no source of power may be available.

Although the novel features which are believed to be characteristic of this invention are pointed out more particularly in the claims appended hereto, the invention may be better understood by referring to the following description, taken in connection with the accompanying drawing in which specific embodiments thereof have been set forth for purposes of illustration.

In the drawing,

Fig. 1 is a side elevation of a testing device embodying the present invention;

Fig. 2 is a front elevation with parts in section to show the constructional details; and

Fig. 3 is a detail view illustrating another embodiment of the invention.

Specific terms are used herein for convenience in referring to various details of the invention. It is to be understood, however, that these terms are to be given an interpretation commensurate with the state of the art.

Referring to the drawing more in detail, the testing device is shown in Figs. 1 and 2 as comprising a cylinder 10 having a head 11 provided with an unthreaded hole 12 suited to receive a spark plug 13 for testing. The spark plug comprises the usual base 14 and sleeve 15.

For holding the plug 13 in place in the unthreaded hole 12, a lever 22 is provided which is pivoted to an ear 23 on the cylinder head 11. The lever 22 is bifurcated, having parts 22' which span the sleeve 15 of the plug. Each part 22' is provided with a boss 25, engaging a collar 20 which is placed over the base 14 of the plug.

For latching the lever 22 in position, a latching arm 30 is provided which is pivoted to an ear 33 on the cylinder 10 and extends upwardly between the parts 22' of the lever 22. A rotating cam 35 is pivoted at the top of the arm 30 and bears against the parts 22' for holding down the lever 22. The cam 35 is attached to an operating handle 36 by means of which it may be actuated to secure the lever 22 or to release the same.

The cylinder 10 is provided with a piston 50, having a sealing washer 49, which is slidable axially thereof for building up pressure therein. Said piston 50 is actuated by a piston rod 51

3

which seats in a socket 48 formed on the piston. The piston rod 51 is attached by a pin 52 to a crank 53. The crank 53 is carried on a shaft 54 which extends outwardly through the cylinder wall and carries a bracket 55 to which an operating lever 56 is attached. The bracket 55 carries a latch 60 having a pawl 61 which is held by a spring 66 in engagement with a rack 62 formed in a bracket 63 attached to the cylinder by suitable means shown as screws 64. The latch 60 is releasable by a rod 65 which extends axially through the lever 56 and is normally held in an upward position by a spring 67 seated in a recess 68 formed in a boss 69 at the top of said lever 56. The recess 68 is shown as closed by a cap 70, the rod 65 extending therethrough to be accessible for actuation. A U-clamp 75 is provided for securing the cylinder to a suitable support. A spring 76 is provided to force the piston 50 and sealing washer 49 to the down position.

A layer of liquid 47, such as oil, is provided above the sealing washer 49 to form a liquid piston head which may reduce the clearance to any desired minimum value as the oil can accommodate itself to the contour of the cylinder head and spring. Hence an extremely large ratio of displacement to clearance volume may be obtained.

The lever 56 is of a type suited to flex or bend under the load required for exerting the necessary pressure on the piston 50. The amount of deflection of the lever 56 is thus a measure of the pressure within the cylinder 10. In order to measure this deflection a scale 80 is provided which is mounted on the lever 56 and registers with a pointer 81 on a rod 82 which is mounted in the bracket 55. Scale 80 may, of course, be graduated directly in terms of pressure within the cylinder 10.

In the operation of this device the plug 13 to be tested is positioned within the hole 12, the collar 20 placed thereon, and the lever 22 brought into holding engagement therewith. The arm 30 is then brought upwardly between the parts 22' of the lever 22 and the handle 36 is actuated to cause the cam 35 to apply the desired holding pressure to the lever 22. This pressure is sufficient to cause the plug to seat on the head 11 and to effect a pressure-tight seal suited to withstand the testing pressure. The lever 56 is then actuated with sufficient force to build up the desired testing pressure in the cylinder as indicated by the pointer 81 on the scale 80. The pawl 61 engages the rack 62 for holding the lever 56 in this position until released. The testing voltage may then be applied to the plug 13 in the usual manner.

After the plug has thus been tested the pressure is first released by actuation of the rod 65 which releases the pawl 61 from the rack 62 and permits the piston 50 to be retracted. The handle 36 is then actuated to rotate the cam 35 sufficiently to remove pressure from the lever 22, whereupon the arm 30 may be withdrawn from registration with the lever 22 to permit the latter to be pivotally rotated so as to release the plug 13. These operations may then be repeated for testing the next plug.

It is to be noted that in the above described embodiment the entire testing may be carried out rapidly and efficiently. Only two motions are required for affixing and seating the plug, namely, the actuation of the lever 22 and of the arm 30. This may, of course, be effected in a much shorter time than that normally required for screwing and unscrewing a plug in a cylinder head. The

4

testing pressure may be simply and effectively built up by manual actuation of the lever 56. This pressure may be readily determined and controlled by observing the scale 80 as above described.

In the embodiment shown in Fig. 3 a toggle connection is provided for securing the lever 22 in place. This toggle comprises an arm 85 pivoted to a boss 86 formed on the cylinder head 11. A link 87 is pivoted to the arm 85 and carries at its upper end a collar 88 which is held by a spring 89 against the lever 22. A fixed collar 90 is provided to form an operating handle for the link 87 and to hold the spring 89 under compression. The arm 85 is provided with a handle 91. The links 85 and 87 are so arranged that they are on or past center as shown when in operating position, so that they are automatically locked against release. Holding pressure is applied by the spring 89 to the lever 22 for securing the plug 13 in the cylinder head 11. The wall of the cylinder 10 forms a stop to limit the movement of the arm 85 to holding position.

When it is desired to release the lever 22 the toggle is opened by pulling the arm 85 outwardly past its center position. The spring 89 compresses slightly if necessary to permit this movement. Pressure on the collar 88 is thus removed and the link 87 may be swung out of engagement with the lever 22. The piston 50 and the actuating mechanism therefor are similar to those above described in connection with Figs. 1 and 2.

Although certain specific embodiments of the invention have been shown for purposes of illustration, it is to be understood that the invention is capable of various adaptations as will be readily apparent to a person skilled in the art. The invention is only to be limited in accordance with the scope of the following claims.

What is claimed is:

1. A spark plug testing device comprising, a cylinder having a head, there being an opening in said head to receive a spark plug for testing, a piston in said cylinder, a crank for actuating said piston and a lever connected to actuate said crank to build up a predetermined pressure in said cylinder, said lever being bendable under said pressure, and a scale associated with said lever to indicate the amount of deflection thereof as a measure of the pressure in said cylinder.

2. A spark plug testing device comprising, a cylinder having a head, there being an opening in said head to receive a spark plug for testing, a piston in said cylinder movable for building up air pressure therein for testing, a crank for actuating said piston and a lever connected to actuate said crank to build up a predetermined pressure in said cylinder, and means for latching said lever in actuated position.

3. A spark plug testing device comprising, a cylinder having a head, there being an opening in said head to receive a spark plug for testing, a piston in said cylinder movable for building up air pressure therein for testing, a crank for actuating said piston, a lever connected to actuate said crank to build up a predetermined pressure in said cylinder, a ratchet mounted on said cylinder and a releasable pawl on said lever cooperating therewith to latch said lever in actuated position.

4. A spark plug testing device comprising, a cylinder having a head, there being an opening in said head to receive a spark plug for testing, a piston in said cylinder, a crank for actuating said piston, a lever connected to actuate said

5

crank to build up a predetermined pressure in said cylinder, said lever being bendable under said pressure, and a scale associated with said lever to indicate the amount of deflection thereof as a measure of the pressure in said cylinder and means for latching said lever to actuated position.

5. A spark plug testing device comprising, a cylinder having a head, there being an opening in said head to receive a spark plug for testing, a piston in said cylinder, a crank for actuating said piston, a lever connected to actuate said crank to build up a predetermined pressure in said cylinder, said lever being bendable under said pressure, and a scale associated with said lever to indicate the amount of deflection thereof as a measure of the pressure in said cylinder, a ratchet mounted on said cylinder and a releasable pawl on said lever cooperating therewith to latch said lever in actuated position.

6. A spark plug testing device comprising a cylinder having a head, there being an unthreaded opening in said head to receive a spark plug for testing and means seating said plug in said head to effect a pressure seal for said cylinder, including a pivoted lever having holding means engaging said plug, releasable mechanical means for holding said lever in pressure engagement with said plug, a piston in said cylinder movable for building up air pressure therein for testing, a crank for actuating said piston and a lever connected to actuate said crank to build up a predetermined pressure in said cylinder.

7. A spark plug testing device comprising, a cylinder mounted in a substantially vertical direction having a head, there being an opening in said head adapted to receive and to hold a spark plug for testing, a piston displaceable in said cylinder, a body of non-compressible fluid

6

on said piston constituting a fluid piston head therefor, a body of compressible gas above said fluid piston head, and means for displacing said piston and the fluid piston head thereon toward said plug to compress said gas to a predetermined pressure in said cylinder, said body of non-compressible fluid being adapted to conform to the lower region of the plug and to the upper surface of the piston to reduce clearance to a minimum and to increase the ratio of piston displacement to clearance volume to an extremely high value whereby a high testing pressure may be built up by a single piston displacement.

8. A spark plug testing device comprising, a substantially vertical cylinder having a head, there being an unthreaded opening in said head adapted to receive a spark plug for testing, means for seating said plug in said head to effect a pressure seal for said cylinder including a pivoted lever having holding means engaging said plug and releasable mechanical means for holding said lever in pressure engagement with said plug, a piston displaceable in said cylinder, a body of non-compressible fluid on said piston constituting a fluid piston head therefor, a body of compressible gas above said fluid piston head, and means for displacing said piston and the fluid piston head thereon toward said plug to compress said gas to a predetermined pressure in said cylinder, said body of non-compressible fluid being adapted to conform to the lower region of the plug and to the upper surface of the piston to reduce clearance to a minimum and to increase the ratio of piston displacement to clearance volume to an extremely high value whereby a high testing pressure may be built up by a single piston displacement.

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