

April 6, 1926.

1,579,916

C. W. CUSHING

EXPLOSION TELLTALE FOR INTERNAL COMBUSTION ENGINES

Filed May 24, 1924

Fig. 1.

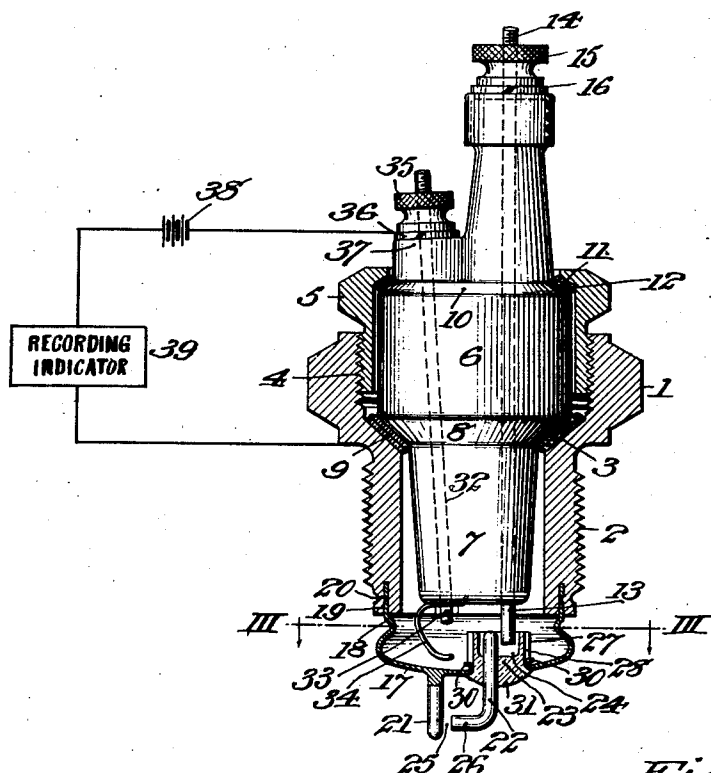


Fig. 2.

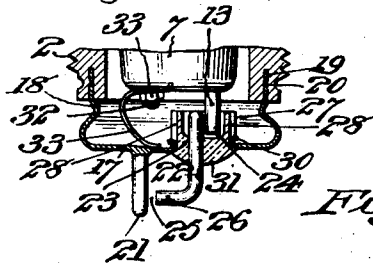


Fig. 3.

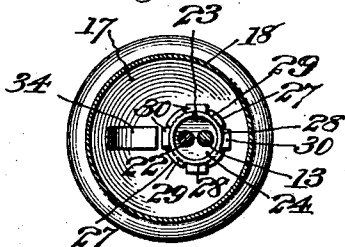
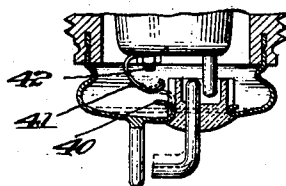


Fig. 4.



Inventor

Warren W. Cushing

By his Attorneys

Thompson

UNITED STATES PATENT OFFICE.

CLARENCE W. CUSHING, OF BROOKLYN, NEW YORK.

EXPLOSION TELLTALE FOR INTERNAL-COMBUSTION ENGINES.

Application filed May 24, 1924. Serial No. 715,591.

To all whom it may concern:

Be it known that I, CLARENCE W. CUSHING, a citizen of the United States, and resident of the borough of Brooklyn, in the city and State of New York, have invented a new and useful Improvement in Explosion Telltales for Internal-Combustion Engines, of which the following is a specification.

My invention relates to explosion telltales for internal combustion engines, and has for its object a device which is actuated by the explosion of combusted gases in the cylinder, to indicate that a spark has been produced and the charge fired or exploded.

Another object is to provide a device having an electrode and a diaphragm coacting therewith, which diaphragm is actuated by the expansion of the combustion gases in the cylinder.

Another object is to provide a device having a yielding contact arranged to coact with the movable diaphragm.

Another object is to provide a device which may be incorporated in a spark plug of the internal combustion engine.

Another object is to provide certain improvements, in the form, construction and arrangement of the parts whereby the above named and other objects may be effectively attained.

A practical embodiment of my invention is represented in the accompanying drawing, in which

Fig. 1 represents a vertical central section of a spark plug having my improved device incorporated therein.

Fig. 2 represents a similar view of the lower end of the spark plug with the parts in another position.

Fig. 3 represents a horizontal section taken in the plane of the line III—III of Fig. 1, looking in the direction of the arrows, and

Fig. 4 represents a detail vertical section similar to Fig. 2, of a modified form of contact carried by the diaphragm.

The hollow base of the spark plug is denoted by 1, and is provided in the usual manner with exterior screw threads 2 on its inner end. This hollow base 1 is also provided with the usual seat 3. The outer end of the base is interiorly screw threaded at 4 for the engagement of a threaded hollow cap 5.

An insulating block of porcelain or other suitable material is provided with an enlarged portion 6 and a reduced inner portion 7. The inner end of the portion 6 is inclined at 8 and arranged to rest with a gasket 9 upon the seat 3 of the base 1. The outer end of the enlarged portion 6 is oppositely inclined at 10 and arranged to be engaged by an inwardly disposed shoulder 11 of the hollow cap 5. A gasket 12 is disposed between the shoulder 11 and the inclined portion 10, which gasket 12 together with the gasket 9 cushion the enlarged portion 6 between the seat 3 and the shoulder 11, and prevent any leakage between the base and plug. The high voltage electrode 13 is disposed longitudinally in the block with the inner end extending below the reduced portion 7. The outer end of the electrode is screw threaded at 14 for the engagement of the usual thumb nut 15 and washer 16.

A diaphragm 17 having a peripheral wall 18 is arranged to rest in an annular recess 19 in the base 1. The walls 18 are secured in the recess by crowding the metal of the base 1 toward the walls at intervals as shown at 20. A grounded electrode 21 extends inwardly from the diaphragm 17 into position to coact with a floating electrode 22 mounted in an insulating member 23 fixed to move with the diaphragm 17. This member 23 is recessed at 24 to receive an inner end of the electrode 13 and also house the outer end of the floating electrode 22, which is located at all times in close proximity to the fixed electrode 13, so that any electrical current energizing the electrode 13 will be passed to the floating electrode 22 and form a spark at the gap 25 between the bent end 26 of the floating electrode 22 and the grounded electrode 21.

The member 23 is secured to the diaphragm 17 as follows:—

Longitudinal ribs 27 and grooves 28 are formed in the member 23 which grooves are connected by horizontally arranged recesses 29 in the ribs 27. The diaphragm 17 has an irregular shaped hole to conform with the contour of the ribs and grooves of the member and certain portions of the metal cut from the diaphragm at the hole are turned upwardly to form retaining prongs 30. These prongs are bent away from the hole so as to permit the ribs 27 to pass upwardly

until the recesses 29 register with the diaphragm. At this point the member 23 is rotated about 45 degrees so that the diaphragm is housed in the recesses beneath the ribs. The prongs 30 are now bent downwardly into position to engage the grooves 28 between the ribs, thereby locking the member 23 against rotation on the diaphragm. The member 23 also has an enlarged head 31 which overlaps the hole in the diaphragm and prevents outward movement of the member in the diaphragm.

Thus it will be seen that the member 23 is locked against longitudinal movement by reason of the diaphragm being held in the recesses 29 between the ribs 27 and head 31, while the prongs 30 and the grooves 28 prevent rotary movement of the member.

A low voltage electrode 32 is also disposed longitudinally in the block with the inner end extending below the reduced portion 7 and screw threaded to receive a nut 33, between which nut and the end of the reduced portion 7 there is secured a spring actuated finger 34 which forms a yielding contact for the diaphragm in its upward movement. The outer end of the electrode 32 is also screw threaded to receive a thumb nut 35 and washer 36, which washer is arranged to seat upon an off-set portion 37 of the insulating block.

In order to more clearly understand the use of this invention, I have illustrated diagrammatically in Fig. 1 an electrical circuit, one end of which connects with the base of the plug 1 which is grounded to the motor in the usual manner, while the other end is attached to the low voltage electrode 32 between the thumb nut 35 and washer 36. In this circuit there is inserted a battery 38 for energizing the circuit, and a recording indicator 39 of any well known or approved type for registering each explosion of the charge of combustible gases in the cylinder.

In the form shown in Fig. 4, the diaphragm is provided with a curved yielding prong 40 which is arranged to contact with the yielding contact finger 41 carried by the low voltage electrode 42.

In operation, the high voltage current for the spark plug is, of course, supplied through the usual source (not shown) to the fixed electrode 13, from which it jumps across the space between the fixed electrode 13 and the floating electrode 22, thence to the gap 25 between the grounded electrode 21 and the floating electrode 22 where the spark is formed. As each explosion of the charge of combustible gases in the cylinder occurs the diaphragm will be moved to the position shown in Fig. 2, in which position the diaphragm contacts with the spring actuated finger 34 and closes the circuit. When the circuit is closed, the electrical energy of the battery 38 will actuate the indicator 39,

which records the explosion of the charge of combustible gases in the cylinder. After the explosion, the diaphragm will assume its normal position, as shown in Figs. 1, 3 and 4 and move away from the spring actuated finger 34, thereby breaking or opening the circuit.

In the form shown in Fig. 4, the movement of the diaphragm will cause the yielding prong 40 to engage the yielding contact finger 41 and close the circuit.

While I have shown and described this device used in connection with a spark plug, I wish it understood that this invention may be used in conjunction with other sparking devices to record the explosion of the combustible gases in the cylinder. In this connection it will be seen that a movable diaphragm grounded in the circuit and arranged to contact with a yielding insulated finger also connected in the circuit, includes a low voltage battery and recording indicator.

It is evident that various changes may be resorted to in the form, construction and arrangement of the various parts without departing from the spirit and scope of my invention; hence, I do not intend to be limited to the specific details herein shown and described, except as they may be included in the claims.

What I claim is:—

1. An explosion telltale for internal combustion engines comprising, a base, an insulator arranged in said base, an electrode in said insulator, and means on the base actuated by the expansion of the combusted gases in the cylinder, said means being arranged to contact with said electrode.
2. An explosion telltale for internal combustion engines comprising, a base, an insulator arranged in said base, an electrode in said insulator, and a yielding means actuated by the expansion of the combusted gases in the cylinder, said means being arranged to contact with said electrode.
3. An explosion telltale for internal combustion engines comprising, a base, an insulator arranged in said base, an electrode in said insulator, and a yielding means on the base actuated by the expansion of the combusted gases in the cylinder to form a contact with said electrode.
4. An explosion telltale for internal combustion engines comprising, a base, an insulator arranged within said base, an electrode in said insulator having a contact finger, and means on the base actuated by the expansion of the combusted gases in the cylinder to form a contact with said finger.
5. An explosion telltale for internal combustion engines comprising, a base, an insulator arranged within said base, an electrode in said insulator having a contact finger, and a yielding means on the base actuated

by the expansion of the combusted gases in the cylinder to form a contact with said finger.

6. An explosion telltale for internal combustion engines comprising, a base, an insulator arranged within said base, an electrode in said insulator having a resilient contact finger, and a yielding means on the base actuated by the expansion of the combusted gases in the cylinder to form a contact with said finger.

7. An explosion telltale for internal combustion engines comprising, a base, an insulator arranged within said base, an electrode in said insulator, and a diaphragm actuated by the expansion of the combusted gases in the cylinder to form a contact with said electrode.

8. An explosion telltale for internal combustion engines comprising, a base, an insulator arranged within said base, an electrode in said insulator, and a diaphragm on the base actuated by the expansion of the combusted gases in the cylinder to form a contact with said electrode.

9. An explosion telltale for internal combustion engines comprising, a base, an insulator arranged within said base, an electrode in said insulator, and a yielding diaphragm actuated by the expansion of the combusted gases in the cylinder to form a contact with said electrode.

10. An explosion telltale for internal combustion engines comprising, a base, an insulator arranged within said base, an electrode in said insulator, and a yielding diaphragm on the base actuated by the expansion of the

combusted gases in the cylinder to form a contact with said electrode.

11. An explosion telltale for internal combustion engines comprising, a base, an insulator arranged within said base, an electrode in said insulator having a contact finger, and a yielding diaphragm on the base actuated by the expansion of the combusted gases in the cylinder to form a contact with said finger.

12. An explosion telltale for internal combustion engines comprising, a base, an insulator arranged within said base, an electrode in said insulator having a resilient contact finger, and a yielding diaphragm on the base actuated by the expansion of the combusted gases in the cylinder to form a contact with said finger.

13. In a spark plug, a base, an insulator therein, a sparking electrode in said insulator, a telltale electrode also in said insulator, and a diaphragm on said base coacting with said sparking electrode and movable to contact with said telltale electrode.

14. In a spark plug, a base, an insulator therein, a sparking electrode in said insulator, a telltale electrode also in said insulator, a diaphragm on said base, a grounded electrode and a floating electrode both carried by the diaphragm and coacting therewith and with the sparking electrode, said diaphragm being movable to contact with said telltale electrode.

In testimony, that I claim the foregoing as my invention, I have signed my name this 22nd day of May 1924.

CLARENCE W. CUSHING.