J. F. KNOWLTON.

EXHAUST VALVE FOR INTERNAL COMBUSTION ENGINES.

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Patented Mar. 11, 1913.

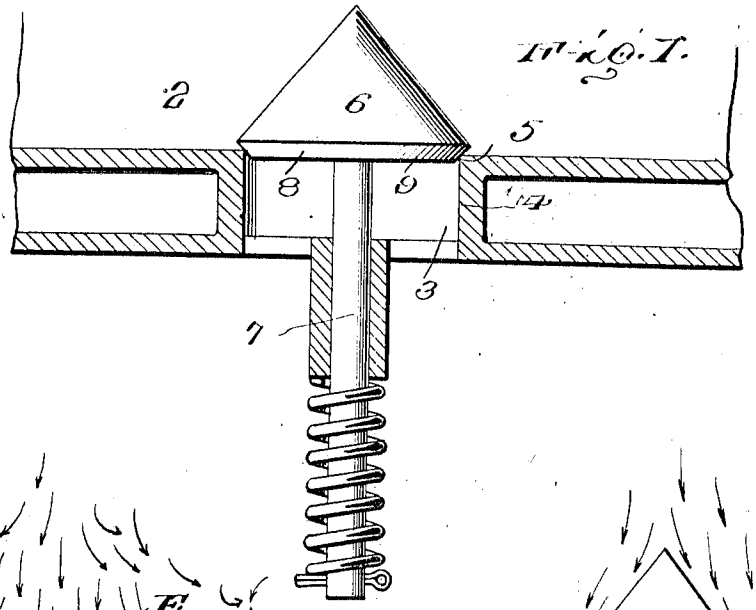

Fig. 1.

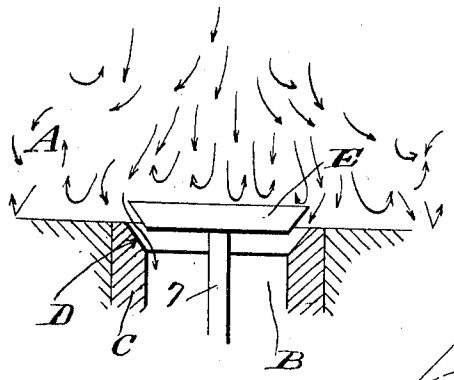

Fig. 3.

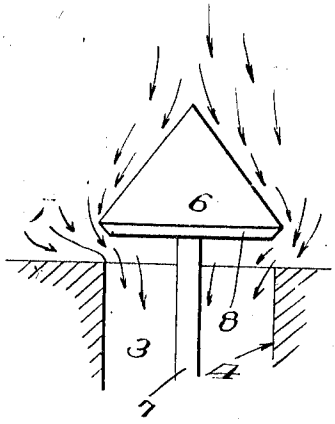

Fig. 4.

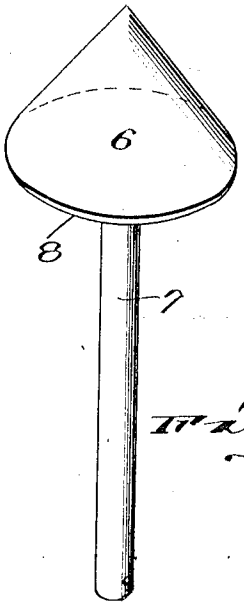

Fig. 2.

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EXHAUST-VALVE FOR INTERNAL-COMBUSTION ENGINES.

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To all whom it may concern:

Be it known that I, JEFFERSON F. KNOWLTON, a citizen of the United States, residing at Canton, in the county of Lincoln and State of South Dakota, have invented certain new and useful Improvements in Exhaust-Valves for Internal-Combustion Engines, of which the following is a specification.

My invention relates to valves for internal combustion engines, and while the invention is not limited to exhaust valves thereof, it is particularly adapted therefor, or to use in connection with any valve controlling an escape opening.

The ordinary exhaust valve or valve controlling an escape opening is a frustum of a cone having a flat top, the valve being formed with flat opposite sides and seating upon a relatively deep conical seat, the surface of which extends parallel to the inclined marginal edge of the valve. This form of valve acts when opened as an obstruction to the easy outward passage of the burned gases or other fluid designed to escape through the valve opening. Part of the charge endeavoring to pass out of the exhaust opening rebounds from the face of the valve and part is deflected laterally from the face of the valve. A relatively small part only can pass around the margin of the valve and through the space between the marginal face of the valve and the seat. As a consequence, innumerable cross currents, swirls and counter-currents are set up within the exhausted gases. The charge does not pass easily through the valve opening between the lifted valve and its seat and the valve opening chokes. A further objection to this form of valve as applied to the exhaust opening of an internal combustion engine is that it is very noisy. A considerable part of the noise of an exhausting charge issuing from an internal combustion engine is due to the choking of the exhaust passage. Furthermore, in this form of valve, the relatively deep tapering seat is liable to detain small particles of carbon causing the plugging of the valve and preventing the valve from seating truly. Again, in the ordinary form of valve above referred to, the valve is relatively thin in proportion to its diameter. There is relatively little rigidity to the valve, and hence the valve is very liable to warp, thus preventing it seating truly.

One of the main objects of my invention is to provide a valve of such form that it will offer the minimum of obstruction to the outward passage of the exhaust gases, or gases escaping through an escape opening, the valve being so formed as to reduce to a minimum any chance of the escaping gases rebounding from the face of the valve or becoming deflected except in the direction of the valve opening.

A further object is to provide a valve seat and valve so formed that a maximum of exhaust opening will be provided when the valve is forced from its seat.

A further object is to provide a valve and valve seat so formed that the valve seat will not offer a lodgment for particles of carbon but will instead clear itself, and a further object is to provide a valve having such thickness and shape as will prevent the valve from warping.

Other objects will appear in the course of the following description.

My invention is illustrated in the accompanying drawings wherein:

Figure 1 is a fragmentary sectional view of an explosion chamber with my improved valve therein. Fig. 2 is a perspective view of the valve detached. Fig. 3 is a sectional diagrammatic view like Fig. 1 but showing an old form of valve. Fig. 4 is a like view to Fig. 3, but showing the action of my improved valve.

Corresponding and like parts are referred to in the following description and indicated in all the views of the accompanying drawings by the same reference characters.

Referring to Fig. 3, A designates an explosion chamber of any suitable character and B the escape opening for the exhaust. This escape opening is surrounded by a seat member C having an outwardly flared seat D. The valve E consists of a disk forming the frustum of a cone. The edge face of the disk is ground and converges toward the spindle of the valve so as to fit accurately against the face of the seat D. This is the usual and ordinary form of escape valve and is only used to illustrate the action of the valve upon the exhaust gases. It will be seen from the arrows in Fig. 3 that when the valve is open and the exhaust gases endeavor to pass out through the annular passage between the valve and the seat, that some portion of the exhaust will strike against the flat inner face of the valve E

and will rebound therefrom. Other portions of the exhaust gases will be deflected laterally by the rebound of the gases striking the flat inner face of the valve, and a part of this deflected gas will strike the end wall of the explosion chamber and be deflected upward, while a part will pass around the edge of the valve and out through the valve opening. These counter currents so set up within the explosion chamber prevent the easy outward passage of the gas and tend to choke the valve opening. It is to be noted here that in this form of valve the seat D presents a surface particularly adapted for the lodgment of particles of carbon and particles of carbon lodging upon the seat will prevent the proper closing of the valve and tend to plug the valve. Furthermore, it will be seen that the valve is flat and relatively thin and therefore particularly liable to warp.

In Fig. 1, 2 designates the exhaust end of an internal combustion engine of any suitable construction and having the exhaust opening 3. The wall 4 of this exhaust opening is perpendicular to the inner face of the explosion chamber and parallel to the axis of movement of the valve so that at the junction of the wall 4 with the inner face of the chamber, a seat 5 is provided which is right angular in cross section. The valve 6 is supported on a spindle 7 in any usual or desired manner and is operated by any suitable mechanism. The valve itself is solid and comprises a substantially conical body, the apex of the cone not being cut off so that the inner face of the valve forms a perfect cone. The side margin of the conical body is cut away to provide a valve face 8 which inclines centrally and toward the exterior of the explosion chamber. The outer face 9 of the valve is of a diameter very slightly less than the diameter of the opening 3 so that the seating face 8 of the valve will contact with the seat 5 formed at the junction of the wall 4 of opening 3 and the inner face of the end of the explosion chamber. It will of course be seen that the greatest diameter of the valve 6 is greater than the diameter of the opening 3 and the smallest diameter of the valve slightly smaller than the diameter of the opening 3.

By reference to the arrows in Fig. 4, it will be seen that an exploded charge will be directed by the conical valve downward toward the valve seat, and that the valve will offer a minimum of obstruction to the outward passage of the burned gases. The exploded charge will not rebound against the face of the valve and therefore the cross currents and swirls set up by the construction shown in Fig. 3 will be to a very great extent eliminated, and that therefore the choking action will be very greatly reduced with a consequent reduction in the noise created by the outgoing charge. The conical shape of the valve aids and directs the burned gases to the valve opening, and furthermore by making the inner face of the valve cone-shaped, the pressure will be equalized over all sides of the cone. The valve will thus seat absolutely straight and true. The relatively sharp corner forming the valve seat 5 will not retain small particles of carbon, and as a consequence the valve will not become plugged. Again the conical shape of the valve gives a relatively thick body to the valve and acts to reduce any tendency of the valve to warp or otherwise get out of shape.

It will of course be understood that while I have described my valve as an exhaust valve, and while the construction is particularly applicable to the exhaust valves of combustion engines, I wish it distinctly understood that it might be equally well applied to other forms of valve and is not necessarily limited in its use to internal combustion engines.

What I claim is:

A valve for internal combustion engines consisting of a conical member arranged to extend within the exhaust port of the engine cylinder, the wall of said port extending at right angles to the inner wall of the cylinder, said conical member being beveled adjacent its base, the taper of the conical member and the bevel of the base portion combining to form a substantially sharp edge, the valve being disposed to open inwardly of the cylinder, its beveled base portion seating against the edge of the port when the valve is closed.

In testimony whereof, I affix my signature in presence of two witnesses.

JEFFERSON F. KNOWLTON. [L. S.]

Witnesses
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