H. R. RICARDO & H. A. HETHERINGTON.

VALVE OF INTERNAL COMBUSTION ENGINES.

APPLICATION FILED FEB. 1, 1913.

1,095,355.

Patented May 5, 1914.

2 SHEETS—SHEET 1.

FIG. 1.

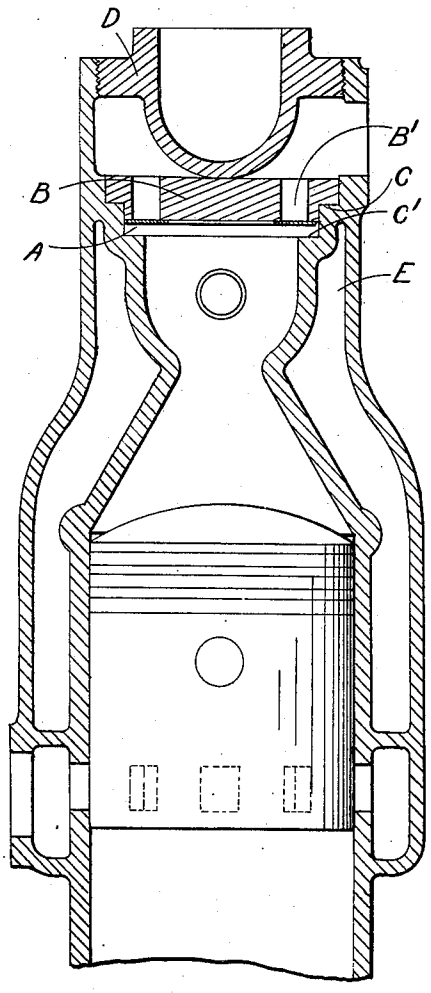


FIG. 2.

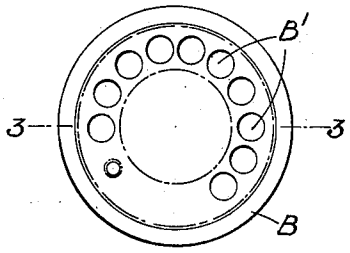


FIG. 3.

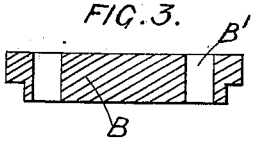


FIG. 4.

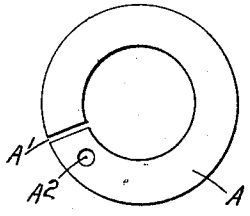
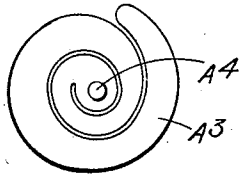


FIG. 5.



WITNESSES

John W. Hoving

Cornelius Hoping

INVENTORS

H. R. RICARDO AND H. A. HETHERINGTON

BY Thos. Dedenmeel

ATTORNEY

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2 SHEETS—SHEET 2.

FIG. 6.

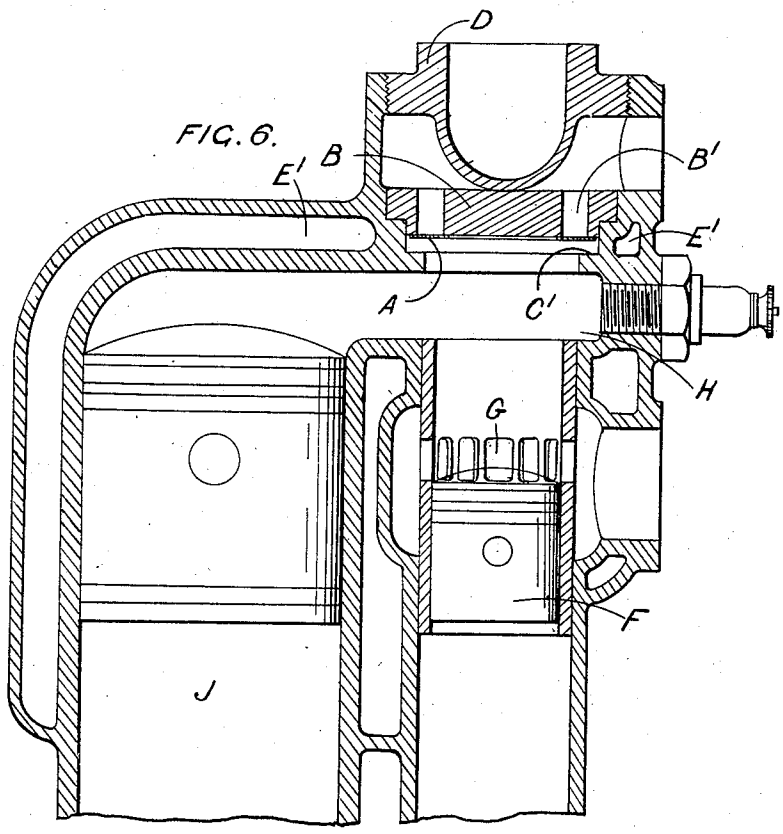
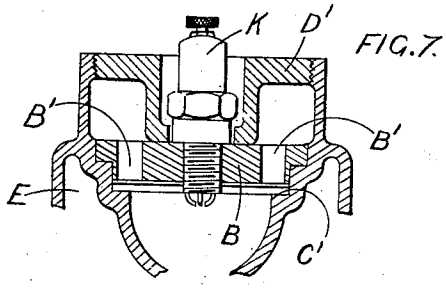


FIG. 7.



WITNESSES

John H. Young

Cornelius Young

INVENTORS

H. R. RICARDO AND H. A. HETHERINGTON

BY Hvam Oldenweel

ATTORNEY

UNITED STATES PATENT OFFICE.

HARRY RALPH RICARDO, OF LONDON, AND HENRY ANSTRUTHER HETHERINGTON, OF BYFLEET, ENGLAND.

VALVE OF INTERNAL-COMBUSTION ENGINES.

1,095,355. Specification of Letters Patent. Patented May 5, 1914.

Application filed February 1, 1913. Serial No. 745,693.

To all whom it may concern:

Be it known that we, HARRY RALPH RICARDO and HENRY ANSTRUTHER HETHERINGTON, citizens of the United Kingdom of Great Britain and Ireland, and residents of 13 Bedford Square, London, England, and Sandilands, Byfleet, Surrey, England, respectively, have invented certain new and useful Improvements in or Relating to the Valves of Internal-Combustion Engines, of which the following is a specification, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to the valve of internal combustion engines and has particular reference to valves of the leaf type which are sometimes employed. Hitherto when a leaf valve has been used as the inlet valve in an internal combustion engine it has been so placed that it was not in direct contact with the gases during combustion, that is to say, it has been in some situation where it could not become very hot. According to the present invention the leaf valve is positioned where it is directly exposed to the gases at the time of combustion and it is mounted upon a seating which is cooled as by a water jacket so that even in this position the valve cannot become too hot. Preferably the seating itself is placed in close proximity to some water-cooled portion of the cylinder head and the inlet ports in the seating are distributed in such a manner as to keep the seating as cool as possible. Further means may be provided whereby the heat is conducted away rapidly from the seating, a convenient construction being to keep the seating in its place in the cylinder head by means of a hollow plug or head made of copper or some other material which is a good conductor of heat.

The valves are preferably made of steel, phosphor bronze or other highly elastic metal. They may be of various shapes but a flat circular or spiral form is preferred.

In the accompanying drawings:—Figure 1 is a longitudinal vertical section showing a leaf valve mounted according to this invention in the cylinder head of an internal combustion engine intended to work on a two-stroke cycle. Fig. 2 is a bottom plan of the valve-seating with the valve omitted, the position of the valves being indicated in broken lines. Fig. 3 is a section on the line 3—3 of Fig. 2. Fig. 4 is a plan of the leaf valve separately. Fig. 5 is a plan of another form of leaf-valve which may be mounted according to this invention in a manner similar to that described with reference to the valve shown in Figs. 1, 2, 3 and 4. Fig. 6 is a longitudinal vertical section showing the valve illustrated in Figs. 2, 3 and 4, mounted in the cylinder head of an engine intended to work on a four-stroke cycle, and Fig. 7 is a vertical section through a portion of a cylinder head fitted with another form of the valve according to this invention.

Like letters indicate like parts throughout the drawings.

With reference first to Figs. 1, 2, 3 and 4 the valve A which is shown separately in Fig. 4 is a flat ring of thin sheet metal divided at A′ and secured by a rivet or screw which passes through a hole A^2, to a seating B. This seating is in the form of a shouldered disk fitting into a recess made to receive it in the walls C of the cylinder. This disk is provided with a series of holes B′ which form the inlet ports which are controlled by the valve A and it will be seen that these ports are distributed over a considerable area of the seating which is thus kept much cooler than would be the case if, for example, there were only one large opening. The bottom face of the disk or seating B is machined or otherwise worked and the valve is so mounted upon it that when the valve is closed the two surfaces lie in close contact. Thus the temperature of the thin metal valve will practically be that of the disk B any difference in the two temperatures being due merely to the rate of conduction of heat through the thickness of the valve itself. As the valve is of thin sheet metal this difference is very slight.

In order that the temperature of the seating shall be kept as low as possible a plug or head D is provided which screws into the

upper part of the cylinder casting and is formed of copper or other material which is a good conductor of heat. The lower part of this plug is pressed into contact with the central portion of the seating B leaving an annular space through which the mixture or air can circulate on its way to the ports B′.

In the example shown the plug D is hollowed or recessed to give a comparatively large outer surface and to assist in keeping the seating cool. Any other means may be adopted to attain that end, for example, the plug or head may be fitted with channels through which cooling water is circulated but the arrangement shown is found to be sufficient in practice.

It will be seen that the water jacket E of the cylinder is carried right up into the head so that the metal adjacent to the seating B is cooled. This detail of construction is a further means for preventing the valve from becoming too hot.

The bottom C′ of the recess forms an annular stop or guard for the valve A and as this guard is itself kept cooled by its proximity to the water-jacket E, it also acts to keep down the temperature of the valve. Further there is no danger of preignition as there might be if another form of guard were employed having portions not adjacent to the water cooled surfaces.

Any well known form of flat leaf valve may be used provided that it admits of being mounted so as to make close contact with the surface of the seating. Fig. 5 shows an alternative form of valve by way of example. As will be seen this consists of a flat spiral A^3 which can be mounted on the seating by means of a screw or rivet through a central hole A^4.

Fig. 1 shows the invention applied to the cylinder head of an internal combustion engine intended to work on a two-stroke cycle but it may also be employed in an engine working on a four-stroke cycle and such an application is illustrated in Fig. 6. In that figure it will be seen that the seating B is disposed at the top of the casting forming the head of the cylinder and is in close proximity to a water-jacket E′. The inlet ports B′ in this construction are opposite to a piston-valve F which controls the exhaust ports G. The space H above the piston-valve F and immediately beneath the seating B is in direct communication with the main cylinder J and forms part of the compression space. As in the construction shown in Fig. 1 an annular stop or guard C′ is provided in close proximity to the water-jacket E′.

Fig. 7 illustrates another convenient construction in which the valve seating B is formed with a central opening through which the sparking plug K is screwed from the top. In this form the seating is kept in place by a screwed head or plug D′ recessed and provided with a central opening to receive the sparking plug. If desired this head D′ may be made of copper or some other material which is a good conductor of heat. Mounting the sparking plug in this manner is advantageous as it obviates the necessity of forming a cast boss for it on the cylinder head and allows the employment of a light spun metal water-jacket. The annular space between the recessed head D′ and the seat B forms an inlet passage leading to the ports B′ as in the construction shown in Fig. 1 and Fig. 6.

There are many advantages in the employment of a thin leaf spring valve in an internal combustion engine. The whole of the valve is composed of effective springing material and as the rapidity of action of any puppet valve must depend upon the ratio which the power stored in the spring bears to the inertia of the valve the rapidity of action in a valve of this type where the entire mass of the valve is composed of active springing material must of necessity be much greater than that of even the best designed ordinary puppet valve. Again owing to the extreme lightness of the valve and the comparatively large area of its working face the valve is practically silent in its action.

What we claim and desire to secure by Letters Patent is:—

1. A valve for internal combustion engines comprising a seating, a leaf valve mounted on said seating where it is directly exposed to the gases at the time of combustion, and a plug or head made of heat-conducting material adapted to hold said seating in position and assist in cooling same.

2. A valve for internal combustion engines comprising a seating, a leaf valve mounted on said seating where it is directly exposed to the gases at the time of combustion, a plug or head made of heat-conducting material adapted to hold said seating in position and assist in cooling same, and a sparking plug mounted in said plug or head and arranged to pass through both the seating and the leaf valve.

3. A valve for internal combustion engines, comprising a seating, a leaf valve thereon and a sparking plug so mounted as to pass through both valve and seating.

4. A valve for internal combustion engines comprising a seating having an annular series of ports, a leaf valve on said seating and covering said ports, a plug or head forming an annular inlet passage leading to said ports, and a sparking plug passing through a central aperture in said seating.

5. A valve for internal combustion engines comprising a water-cooled cylinder

head, a recess in same, a shouldered disk forming a seating and arranged in said recess, a leaf valve on said seating and directly exposed to the gases at the time of combustion, and a valve-containing recess formed in the cylinder head beneath the shouldered disk to contain the leaf valve and limit its movement.

In witness whereof we have hereunto set our hands in presence of two witnesses.

HARRY RALPH RICARDO.
HENRY ANSTRUTHER HETHERINGTON.

Witnesses:
JOHN TOMTEL,
HENRY FAIRBROTHER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."