Feb. 9, 1937. H. WESLAKE 2,070,102

ENGINE POPPET VALVE

Filed Dec. 4, 1935

Fig. 1.

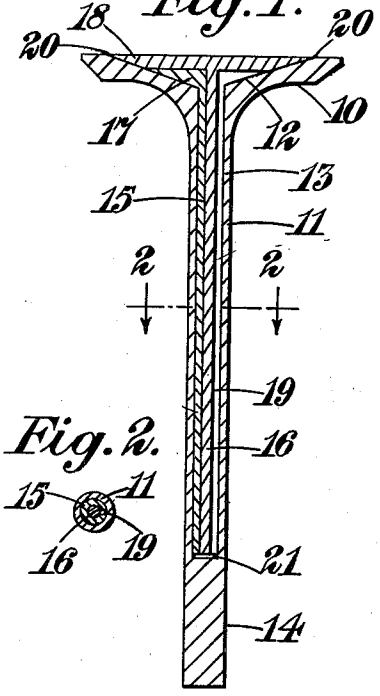


Fig. 2.

Fig. 3.

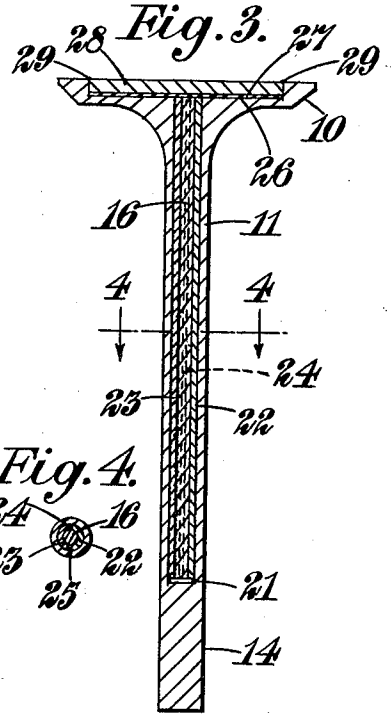


Fig. 4.

Fig. 5.

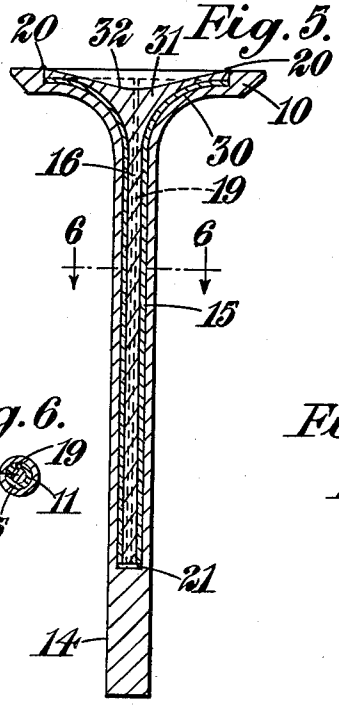


Fig. 6.

Fig. 7.

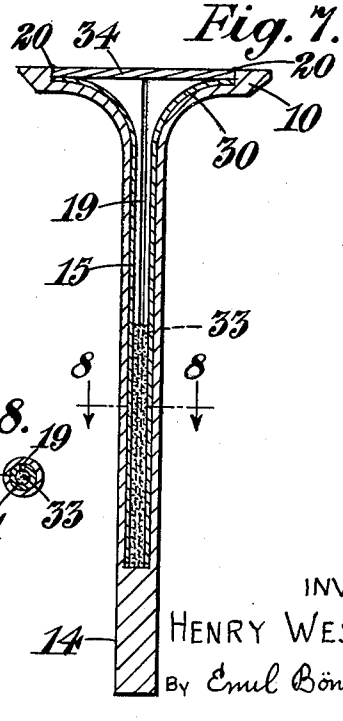
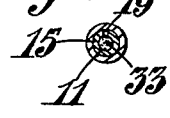


Fig. 8.



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2,070,102

ENGINE POPPET VALVE

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In Great Britain December 8, 1934

11 Claims. (Cl. 123—188)

This invention is for improvements in or relating to poppet valves, particularly for internal combustion engines, of the kind having a hollow valve stem containing a sleeve or core of a metal having a better thermal conductivity than the metal of which the valve is composed.

It has been found with this arrangement that heat can be readily drained away from the valve head, particularly of exhaust valves, whereby higher compression ratios can be used in the cylinders than with ordinary valves and the efficiency of the engine may be therefore considerably increased. Metals having good thermal conductivity have usually high coefficients of expansion and therefore it has been found necessary to allow a larger clearance between the valve stem and its guide than for an ordinary valve owing to the tendency of the core to spread the valve stem when it becomes heated. An object of the present invention is to eliminate or minimize the spreading effect of the core.

According to this invention, a poppet-valve comprises a head and a hollow stem formed from steel and a resilient collapsable core disposed in said hollow stem and formed from a metal having a better thermal conductivity than steel.

It will be appreciated that with this arrangement there will be no danger of the valve becoming unduly distorted by the expansion of the core under heat since the core will collapse rather than distort the stem and yet, owing to the resilience of the core, it will be maintained in good thermal contact with the stem when the valve becomes cooler.

In one constructional form of the invention, the core is provided with at least one slot extending along the length thereof, which slot is arranged to render the core radially collapsable.

A further feature of the invention consists in that said core is formed in a number of parts which are capable of relative movement to provide for the collapse of the core as a whole.

A still further feature of the invention consists in that the core is hollow and in that a non-resilient metal spindle is inserted within said hollow core and is of such a size as to ensure engagement of the core with the surrounding walls of the valve stem. A novel feature of the invention consists in that a bore is arranged to extend through said head into said stem, in which bore said core is located.

Yet a further feature of the invention consists in that said core is secured in position by a metal plate which is fixed to the valve head and engages the end of the core.

Yet another feature of the invention consists in that the core is hollow and a liquid, or a salt becoming liquid at the working temperature of the engine, is inserted within the core. The liquid operates within the stem of the valve and conducts away the heat from the head thereof in known manner.

The following is a description of a number of embodiments of the invention, reference being made to the accompanying drawing, in which:—

Figure 1 is a longitudinal section through a valve having a core and central spindle both provided with heads,

Figure 2 is a section on the line 2—2 of Figure 1,

Figure 3 is a similar view to Figure 1 but in which neither the core nor the spindle is provided with a head, which core is formed in two parts,

Figure 4 is a section on the line 4—4 of Figure 3,

Figure 5 is also a similar view to Figure 1 showing a construction in which the core is tubular and is splayed out into an enlarged bore in the valve head,

Figure 6 is a section on the line 6—6 of Figure 5,

Figure 7 is a similar view to Figure 5 and differs in that the central spindle is replaced by a salt, and

Figure 8 is a section on the line 8—8 of Figure 7.

Referring to the construction in Figure 1, the valve head 10 and stem 11 are formed integrally from steel. The head of the valve is formed with a conical recess 12 from which extends a bore 13 into the stem of the valve. The end 14 of the stem is left solid. A cylindrical copper core 15 is arranged to be a press-fit within the bore in the stem and is provided with an axial passage in which is located an iron spindle 16. Both the cylindrical core and the spindle are provided with countersunk heads 17 and 18 which are arranged to fit into the conical recess in the head of the valve. The wall of the cylindrical copper core is provided with a longitudinal slot 19 which also extends through the countersunk head 17. The core is arranged to be a press-fit into the stem while the spindle, which may be formed of steel or other material having a smaller coefficient of expansion than copper, is of such a size as to be a snug fit in the core. The head of the spindle is secured to the head of the valve at 20 by welding. When the valve becomes heated, the core tends to expand to a greater extent than the valve stem. The slot 19, however, per-

mits the metal of the core to flow circumferentially rather than to exert radial pressure in the stem. In order to permit the core and the spindle to expand longitudinally, they are made of such a length as to leave a small gap 21 between their ends and the bottom of the bore in the valve spindle.

In the construction shown in Figure 3, the core is formed in two parts 22 and 23, which are so dimensioned that, when in position in the valve stem, they are separated by gaps 24 and 25. Unlike the previous construction, neither the core nor the spindle 16 is provided with a head but they are arranged to lie flush at their outer ends with the bottom of a straight-sided recess 26 formed in the head of the valve. A copper plate 27 is arranged within the recess so as to contact with the flat inner wall thereof and with the ends of the spindle and core. Above this space is located an iron plate 28 which is welded at 29 to the valve head.

In the construction shown in Figure 5, the core 15 is formed from copper tubing which has a slot 19 down one side thereof. The bore, which extends through the head of the valve and along the stem, is outwardly flared at the head of the valve and the tubing is likewise outwardly flared at 30. The spindle 16 is provided with a head 31 which is shaped to fit the flared portion 30 and is also slightly cup-shaped, as indicated at 32.

The construction shown in Figure 7 is somewhat similar to that last-described with the exception that the spindle is omitted and part of the space within the hollow core is filled with a salt 33 or a material which becomes liquid when heated, such as sodium nitrate or metallic sodium. The outer end of the hollow core is closed by an iron disc 34 which is arranged in a recess in the valve head and secured therein by welding 20. In this construction, the core 15 has a longitudinal slot 19 as in Fig. 5.

I claim:—

1. A poppet valve comprising a head and a hollow stem of steel, a tubular resilient metal core disposed within said stem in contact therewith and having a slot extending along the length of the core.

2. A poppet valve comprising a head and a hollow stem of steel, a copper tubular core disposed within said stem in contact therewith and having a slot extending along the length of the core.

3. A poppet-valve comprising a head and a hollow stem of steel, and a resilient collapsable core of a metal having a better thermal conductivity than steel disposed in said hollow stem and having such a size relative to the stem that it will always be retained by reason of its resilience in close contact with said stem.

4. A poppet-valve comprising a head and a hollow stem of steel, and a resilient collapsible copper core disposed in said hollow stem and having such a size relative to the stem that it will always be retained by reason of its resilience in close contact with said stem.

5. A poppet-valve comprising a head and a hollow stem of steel, a core disposed in said hollow stem and having at least one slot extending along the length thereof to render it resiliently collapsable, said core having such a size relative to the stem that it will always be retained by reason of its resilience in close contact with said stem.

6. A poppet-valve comprising a head and a hollow stem of steel, a resilient collapsable core of a metal having a better conductivity than steel disposed in said hollow stem, and a metal retaining member disposed over the core in a recess formed in the head of the valve and secured to the valve head.

7. A poppet-valve comprising a head and a hollow stem of steel and having a bore extending through the head into said stem and having an enlarged part in said head, a resilient collapsable core of a metal having a better thermal conductivity than steel arranged in good thermal contact with the walls of said bore and having an enlarged head which engages with the enlarged part of said bore in the valve head.

8. A poppet-valve comprising a head and a hollow stem of steel, and a resilient collapsible core of a metal having a better thermal conductivity than that of said stem shaped to fit said hollow stem and positioned in the latter, a central spindle adapted to fit said hollow core and positioned in said core, and a head on said core fixed to the valve head to secure the core in position.

9. A poppet-valve comprising a head and a hollow stem of steel, a hollow resilient collapsable core of a metal having a better thermal conductivity than that of said stem shaped to fit said hollow stem and positioned in the latter, a central spindle adapted to fit said hollow core and positioned in said core, and a head on said core welded to the head of the valve.

10. A poppet-valve comprising a head and a hollow stem of steel, and having a bore extending through said head into said stem, said bore having an enlarged part within said head, a tubular resilient collapsable core of a metal having a better thermal conductivity than steel shaped to fit said bore and positioned therein, a central iron spindle adapted to fit within and positioned in said tubular member, and a head on said spindle engaging the enlarged part of the bore within the head of the valve and welded to the valve head.

11. A poppet-valve comprising a head and a hollow stem of steel, a hollow resilient collapsable core of a metal having a better thermal conductivity than steel disposed in said hollow stem in good thermal contact therewith, and a material partly filling said hollow core, which material becomes liquid upon the application of heat.

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