July 11, 1939. E. RECTOR 2,165,871

PROTECTIVE DEVICE FOR POPPET VALVES

Filed Jan. 12, 1938

Fig. 1

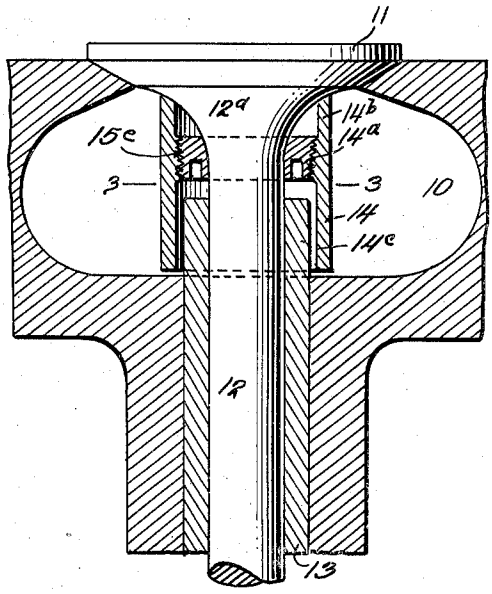


Fig. 2

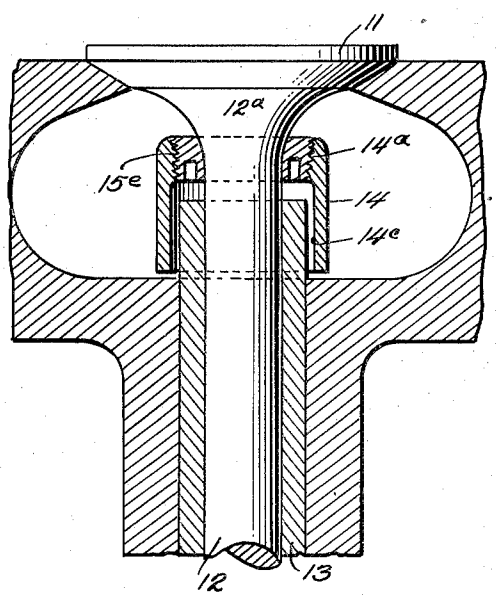


Fig. 3

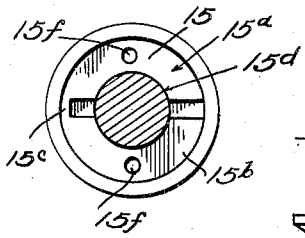


Fig. 5

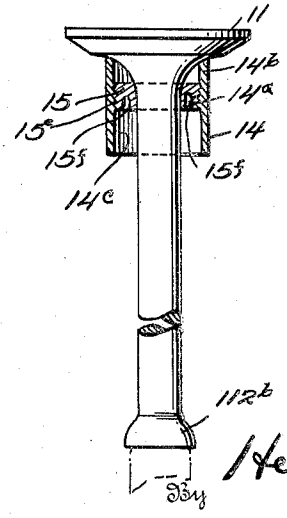
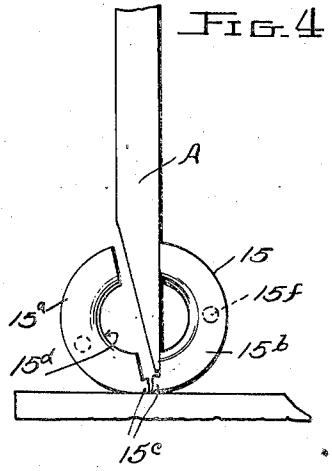


Fig. 4



Inventor

Enoch Rector

Henry G. Bartok

Attorney

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PROTECTIVE DEVICE FOR POPPET VALVES

Enoch Rector, New York, N. Y.

Application January 12, 1938, Serial No. 184,660

9 Claims. (Cl. 123—188)

My invention relates to improvements in protective devices for poppet valves, and has to do, more particularly, with the provision of an attachment for the protection of the stem and guide of poppet valves conventionally employed in internal combustion engines.

In the automotive industry particularly, the trend of internal combustion engine design has been directed toward increase of power and reduction of fuel consumption through operation at increased engine speeds. While, by the development and use of strong, light weight metals, it has been possible to provide internal combustion engines which can withstand, successfully, the vibration and strains incident to operation at sustained high speeds, the intense heat developed during such operation presents a valve problem which metallurgy has, as yet, not been able to eliminate. Even the finest valves of heat-treated silicon, tungsten and chrome steel alloys are subject to warpage and sticking in their guides when operated under the extreme temperatures characterizing the exhaust gases discharged from the cylinders of present day high speed internal combustion engines.

A number of engineers have sought to eliminate this trouble by the provision and use of a protective element which is intended to shield the portion of the valve stem disposed in the conventional exhaust port. While such protective devices are of recognized value for the purpose, the problem of securement of such to the valve has not yet been satisfactorily solved. It is to the solution of this problem that the present invention is directed.

More particularly, it is a primary object of my invention to provide a stem and guide shield for conventional internal combustion engine poppet valves which is easily securely attachable thereto.

It is an object of my invention to provide such an attachable shield which is inherently adjustable to permit attachment to valve stems which are slightly oversize or undersize with respect to standard dimensions.

It is an object of my invention to provide such a valve shield, which, though manufactured only in several sizes, may be installed upon substantially any of the large number of types and sizes of valves in use.

It is an object of my invention to provide a valve-stem shield which may be installed upon poppet valves of the type provided with an enlarged or "mushroom" tappet portion.

Other objects of my invention are to provide a valve-stem shield which may be inexpensively manufactured from standard stock shapes by automatic machinery; which requires no special skill or expensive tools for installation; which is light in weight; which has less tendency to transmit its absorbed heat to the portion of the valve upon which it is carried; and which is sufficiently rugged to withstand all the stresses and strains incident to its use for the normal life of the valve upon which it is installed.

Further objects, and objects relating to details and economies of manufacture, installation and use will definitely appear to those skilled in the art upon familiarization with the following description. My invention is clearly defined by the appended claims. Preferred embodiments of my invention are illustrated in the accompanying drawing forming a part of this specification, in which:

Figure 1 is a vertical sectional view of one valve port and guide of an L type internal combustion engine provided with a conventional poppet valve upon which has been assembled a valve-stem shield constituting a preferred embodiment of my invention;

Fig. 2 is a vertical sectional view of a portion of a similar engine provided with a valve-stem shield constituting another embodiment of my invention;

Fig. 3 is a detail sectional view of a portion of the valve stem and shield illustrated in Fig. 1, said view being taken on the line 3—3 of that figure;

Fig. 4 is a plan view of the valve-stem-engaging part of my improved shield, said part being fractured by a wedge element to permit its assembly with a poppet valve of the type provided with an enlarged foot or tappet portion; and

Fig. 5 is a detail sectional view, on a reduced scale, of such a large-footed valve provided with a valve shield which embodies the phase of my invention illustrated in Fig. 4.

The same reference numerals refer to the same parts throughout the several views.

In a broad sense, my invention finds embodiment in a protective shield for the stem and associated guide of conventional poppet valves, which shield is provided with a radially-inwardly movable circular clamp portion adapted to be constricted upon the valve stem at any desired location thereon by a simple manual operation. More particularly, the design of the device is preferably such as to permit the separation of its parts to an extent sufficient to permit the insertion of the tappet end of the valve stem there-

through, even though, as in the case of mushroom-tappeted valves, said tappet end be considerably larger than the guide portion proper of the valve stem.

More specifically, and with reference to the accompanying drawing, I have disclosed in Figs. 1 and 3 a preferred form of valve shield for use in a conventional internal combustion engine provided with an exhaust port 10 closed by the head 11 of a conventional poppet valve provided with a stem portion 12 slidably received in a conventional guide 13 for actuation by cam means (not shown). The head 11 and stem 12 of the valve are, as is common, joined by an accurately flared or conoidal portion 12*a* which is often, though not necessarily, commercially ground, at its lower extremity, to a diameter minutely less than that of the stem proper. Where the valve is ground to such a form, my construction avails itself of the fact, as will later appear.

The valve stem and guide protective shield illustrated in Figs. 1 and 3 consists of a tubular sleeve element 14 formed of heat-resistant steel or equivalent material. The sleeve 14 is internally taper-threaded at 14*a*, defining upper and lower unthreaded skirt portions 14*b* and 14*c*, respectively. The upper shirt portion 14*b* is counterbored at an angle of approximately 30 degrees and lies close to, or against the valve portion 12*a*, well inward of the seating face of the valve head 11. The lower portion 14*c* of the skirt element has an internal diameter slightly greater than the outside diameter of the valve guide 13 and is of a length such as to substantially envelop the otherwise exposed upper end of the guide 13, without, however, interfering with the seating of the valve head 11 even after repeated valve grinding operations.

Novel means are provided for rigidly attaching the sleeve 14 to the valve. These means preferably consist of a pair of segmental jaw members 15*a*, 15*b*, joined by a slightly flexible web 15*c* and jointly defining a shallow plug 15 provided with a central bore 15*d* of a diameter corresponding to that of the valve stem and external screw-threads 15*e* of tapered form complementary to, and engageable with, those 14*a* of the sleeve or skirt element 14. The segments 15*a*, 15*b* of the plug 15 are each further provided with a socket 15*f* into which may be placed the pins of a spanner wrench (not shown). The relative dimensions of valve stem 12, plug 15 and sleeve 14 are such that rigid assembly of these elements is manually possible. Preferably, the bore 15*d* of the plug 15 is of a shape complementary to the upper portion of the valve stem 12 and the adjacent portion of the conoidal valve portion 12*a*. As has been explained, the diameter of the valve at this point is frequently slightly less than the diameter of the valve stem proper. Where such is the case, clamping of the plug 15 at this location insures secure, rigid, assembly. Even though such a difference in size is not inherent in a given instance, such a slight relief may be provided by holding the valve against an abrasive wheel. However, experience with my device has indicated that, under the heat of operation, a tight seizing of the plug 15 on the valve stem normally occurs.

It will be self-evident that, through the use of a small pipe wrench or pliers on the sleeve 14 and a spanner wrench engaged with the sockets 15*f* of the plug 15, the latter may be drawn down tightly into threaded engagement with the threads 14*a* of the sleeve 14 and the web 15*c* of the plug will yield sufficiently to permit clamping of the jaws 15*a*, 15*b* upon the valve. The skirt portion 14*c* of the sleeve is of such size as to clear the valve guide 13, and this skirt portion, together with the upper skirt portion 14*b*, effectively shields and turns away the hot exhaust gases which otherwise would impinge upon the valve stem intermediate the valve head 11 and guide 13. Obviously, the sleeve 14 may take various external forms, and further, need not extend into contact with the valve portion 12*a*. It will be noted that the plug 15 is relatively shallow as compared to the extent of the sleeve member 14. Accordingly, heat transfer from sleeve to valve stem is materially impeded to an extent such that warpage and/or seizing thereof in its guide 13 is precluded. Moreover, the valve stem is protected against erosion and/or carbon accumulation—the other recognized cause of impaired valve action.

In Fig. 5 of the drawing, I have illustrated an increasingly popular type of valve provided with an enlarged tappet foot 12*b*. My valve shield may be readily installed upon such a valve, notwithstanding the presence of said enlargement, simply by fracturing the web 15*c* which connects the segments 15*a*, 15*b* of the plug. Such fracture may be easily accomplished by a simple wedge element A and a light hammer blow. The fracturing operation is depicted in Fig. 4 of the drawing.

Under some circumstances, as where the valve stem is quite sub-standard in diameter, it may be desirable to fracture the web 15*c* and file down the broken edges to reduce the effective diameter of the bore 15*d*. Where the segments 15*a* and 15*b* are separate, either by fracture or by initial manufacture, the proper alinement of their threads is insured by the spacing of the sockets 15*f* induced by the spanner wrench (not shown) employed for assembly of these segments with the sleeve member 14.

In Fig. 2, I have illustrated a slightly modified form of my invention in which the upper skirt portion 14*b* of the sleeve member illustrated in Fig. 1 has been omitted. The balance of the structure is identical and need not be specifically described.

I am aware that my invention is susceptible of embodiment in various structural forms. The shape of the sleeve member 14 may be appropriately flared to correspond to the shape of the valve port with which it is associated. Similarly, the plug 15 may be composed of more than the two segmental portions illustrated.

By fabrication of the members 14 and 15 in several sizes, but with a standard thread size, numerous combinations may be obtained, satisfying the various requirements of the trade. These and other changes will readily appear to those skilled in the art upon familiarization with the concepts of my invention herein set forth. I, accordingly, claim my invention broadly, as indicated by the appended claims.

What I claim is:

1. A protective shield for a poppet valve, comprising: a tubular skirt element adapted for disposition about the stem of the valve in coaxially spaced relation thereto, said skirt element being provided with a coaxially threaded upper portion, and a complementarily threaded detachable clamping block engageable with the threads of said skirt element and effective, by threaded

engagement therewith, to clamp said skirt element to the coaxially associated valve.

2. A protective shield for a poppet valve, comprising: a tubular skirt element adapted for disposition about the stem of the valve in coaxially spaced relation thereto, said skirt element being provided, adjacent its upper end, with coaxial internal threads of slight taper, and a constrictible valve-stem-engaging member provided with complementary external threads effective, when screw-assembled within said skirt element, to rigidly secure said skirt element to said valve stem.

3. A protective shield for a poppet valve, comprising: a tubular skirt element adapted for disposition about the stem of the valve in coaxially spaced relation thereto, said skirt element being provided, adjacent its upper end, with coaxial internal threads of slight taper, and means for rigidly securing said skirt element to the stem of the valve, said means comprising a pair of segmental jaw elements mutually engageable about said valve stem and provided with external threads which, when screwed into association with the threads of said skirt element, are effective to clamp the valve, skirt and jaw elements together in rigidly unitary assembly.

4. A protective shield for a poppet valve, comprising: a tubular skirt element adapted for disposition about the stem of the valve in coaxially spaced relation thereto, said skirt element being provided, adjacent its upper end, with coaxial internal threads of slight taper, and means for rigidly securing said skirt element to the stem of the valve, said means comprising a pair of segmental jaw elements joined by a flexible web, provided with internal valve-stem-engageable faces and with external threads which latter, when screwed into association with the threads of said skirt element, are effective to clamp the valve, skirt and jaw elements together in rigidly unitary assembly.

5. A protective shield for a poppet valve of the type having a disc-like head and a conoidal portion joining said head to the valve stem proper, comprising: a tubular skirt element adapted for coaxial disposition about the stem and substantially flush abutment with the conoidal surface of said valve, and means for rigidly thus securing said skirt element to the valve, said means comprising an annular internal shoulder in said sleeve element intermediate its ends, said shoulder being provided with internal tapered screw threads, and a shallow externally-threaded plug receivable within said threaded shoulder and provided with a constrictible bore the walls of which are adapted to clamp tightly around said valve stem when said plug is threadedly associated with said tubular sleeve element.

6. A protective shield for a poppet valve of the type having an enlarged tappet foot, comprising: a tubular skirt element adapted for disposition about the upper portion of the valve stem in concentric spaced relation thereto, said skirt element being provided with concentric internal screw threads, and detachable segmented, annulus-constituting means provided with threads complementary to those of said skirt element interposable between said threaded skirt portion and said valve stem and effective, when threadedly assembled, to clamp said skirt element in rigid coaxial assembly with said valve stem.

7. A protective shield for a poppet valve of the type having an enlarged tappet foot, comprising: a tubular skirt element adapted for disposition about the upper portion of the valve stem in concentric spaced relation thereto, said skirt element being provided with concentric internal screw threads, and segmental, annulus-constituting means joined by a frangible web and provided with external threads complementary to those of said skirt element and effective, when threadedly assembled therewith, to clamp said skirt element in rigid coaxial assembly with said valve stem.

8. A protective shield for a poppet valve, comprising: a tubular protective skirt member adapted for disposition beneath the poppet valve head in contact therewith and in spaced coaxial relation with the valve stem, said tubular member having an annular portion thereof axially tapered internally in the direction of the valve head, and means for rigidly securing said protective member in said above-stated relationship, said last-mentioned means consisting of a tapered, axially-bored, radially-constrictible plug the peripheral surface of which is complementary to the tapered portion of said tubular protective member and tightly wedgeable therein in the direction of the valve head and the bore surface of which is complementary to said valve stem and clampable thereon upon radial constriction of said plug incident to said wedged engagement of the latter with said valve-head-engaged tubular member.

9. A separable protective shield for a poppet valve, comprising: a detachable, radially-constrictible annular plug the surface of the axial bore of which is tightly engageable upon the stem of the valve, a tubular protective skirt member adapted for disposition about said annular plug and its encircled valve stem, and means for detachably securing said stem, plug and skirt elements in rigid operative assembly, said means comprising coactive cam surfaces upon the contiguous portions of said plug and said skirt member effective, by forced axial telescopic association, to constrict said plug into clamped engagement with said valve stem and into tightly wedged securement within said protective skirt member.

ENOCH RECTOR.