Aug. 23, 1938. C. W. MILLER 2,127,929

METHOD OF MAKING VALVES

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Fig. 1.

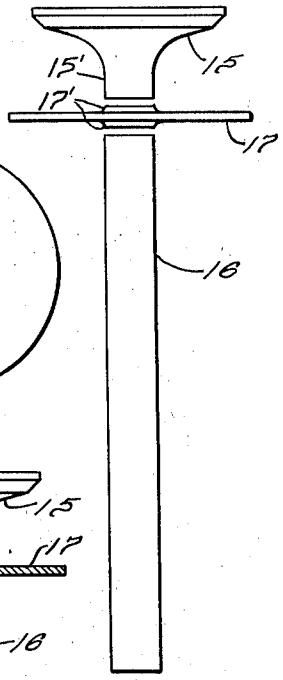


Fig. 2.

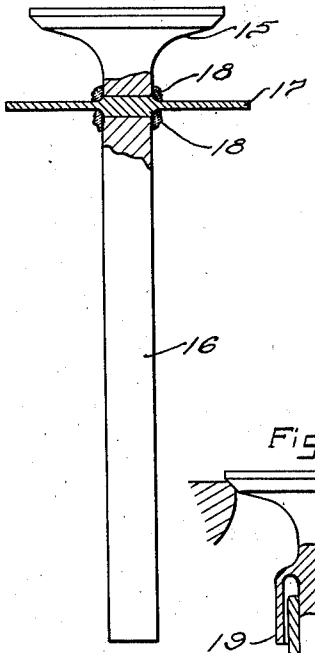


Fig. 5.

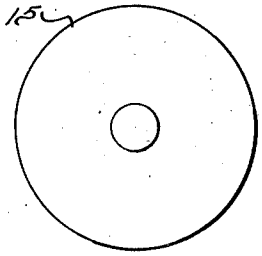


Fig. 3.

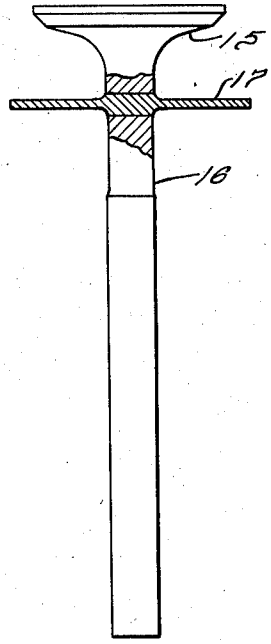


Fig. 4.

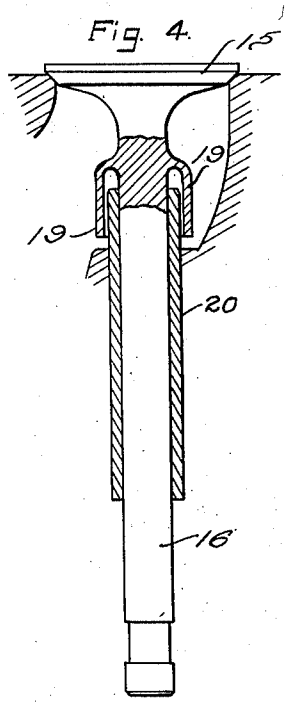


Fig. 6.

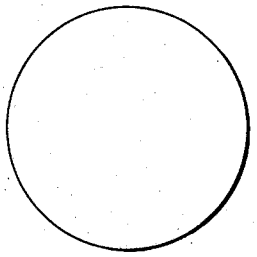
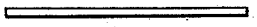


Fig. 7.



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Fig. 8.

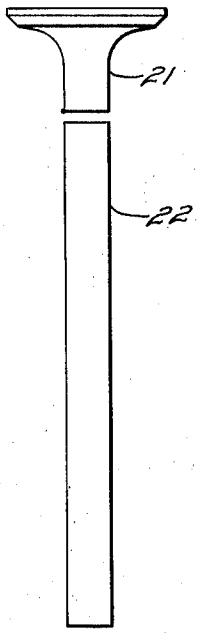


Fig. 9.

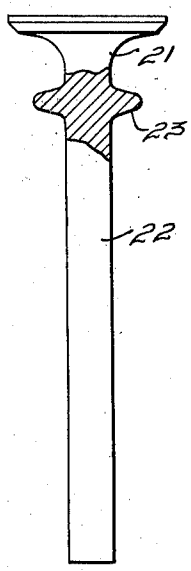


Fig. 10.

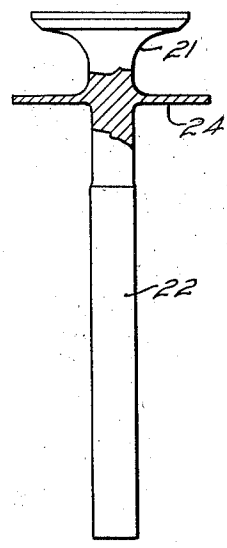


Fig. 11.

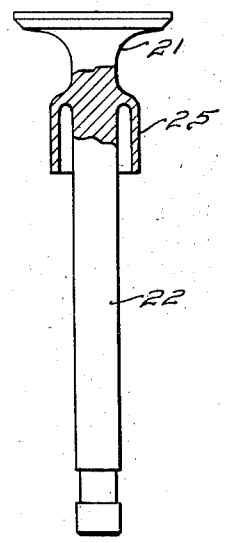


Fig. 12.

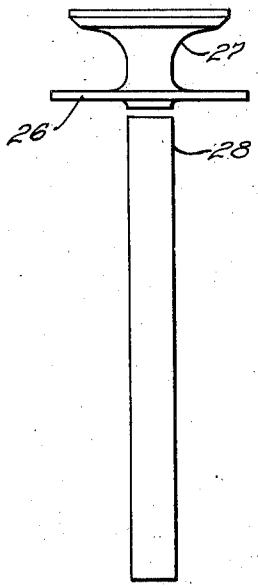


Fig. 13.

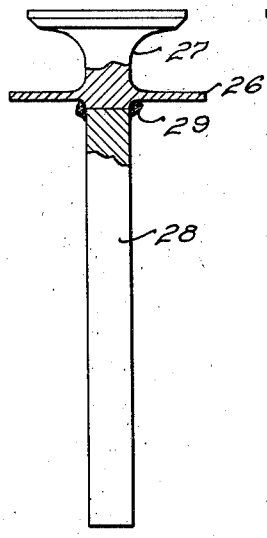
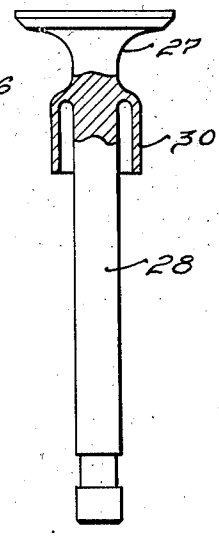


Fig. 14.



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UNITED STATES PATENT OFFICE

2,127,929

METHOD OF MAKING VALVES

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Application July 1, 1935, Serial No. 29,248

8 Claims. (Cl. 29—156.7)

This invention relates to a process of manufacturing valves and the valve produced thereby, and more particularly to valves of the so-called "poppet" type commonly used in internal combustion engines.

In modern engineering practices it has been found to be increasingly necessary to provide valves which will resist the terrific heat to which they are exposed in modern high compression internal combustion engines. This is particularly true in the case of valves controlling the exhaust ports where the valve heads and stems are exposed to relatively high temperatures, frequently causing scaling, pitting and sticking of the valve stem in the valve guide. Several different types of alloys have been developed to produce the necessary heat resisting characteristics. Among such alloys are steel, chromium, vanadium, nickel, molybdenum, and others. It has been found, however, that in using the alloys above described the cost of such valves is very materially increased, and while valves made of such alloys are frequently found to produce the required heat resisting properties, the valve stems of such valves and the heads of the valves frequently become coated with deposits from the exhaust, resulting in the sticking and pitting of the valves in the valve guides. When this condition occurs, it is usually necessary to take out the valves and reseat them, and frequently it is found necessary to replace the worn valves with new ones.

An object of my invention, therefore, is to provide means for protecting the stem of a valve from the heat generated in the combustion chamber, and to protect it from the products of combustion which frequently form on the valve stem and cause it to stick and become pitted.

Another object is to provide a valve by a new and novel process, which permits the use of ordinary iron or steel in the stem of the valve and provides a valve head composed of an alloy of various metals which are highly resistant to heat.

Another object is to provide a valve containing the features above enumerated which can be manufactured at a cost substantially the same as that of ordinary valves.

Another object is to provide an integral skirt for a valve stem which will not become loosened by the rapid reciprocation of the valve in operation, or loosened by the frequent heating and cooling of the valve under normal operating conditions.

Still other objects are to provide a strong, durable, efficient valve, which will operate with great precision and accuracy, and will be highly resistant to those elements causing wear on the valve under normal operating conditions.

These and other objects will be apparent during the course of the following description.

In the drawings forming a part of this application:

Figure 1 is a side elevational view showing the separate parts of my valve before they are united as by welding or otherwise;

Figure 2 is a view corresponding to Fig. 1 showing the first step in the process of manufacturing the valve;

Figure 3 is a view corresponding to Figure 2 showing the welding flash removed and part of the stem reduced to finished size;

Figure 4 is an elevational view, partly in section, showing the completed valve mounted on a valve seat;

Figure 5 is a plan view of the valve disc member shown in Figure 1;

Figure 6 is a plan view of another type of valve disc;

Figure 7 is a side view of the disc shown in Figure 6;

Figure 8 is a side elevational view of a modified form of my invention showing the separate parts before being united;

Figure 9 shows the first step in producing this type of valve by welding;

Figure 10 illustrates the next step in the manufacture of the valve showing the valve disc formed from the weld;

Figure 11 shows the completed valve;

Figure 12 illustrates a second modified form of my invention, and shows the parts before assembly, with the valve disc formed integrally with the valve head;

Figure 13 illustrates the first step in the manufacture showing the head welded to the valve stem; while

Figure 14 shows the completed valve.

The preferred form of my invention as disclosed in the Figures 1 through 7 discloses a valve head **15**, a valve stem **16** and a separate valve disc **17**. As shown in Figure 1, the valve head, stem and valve disc may be manufactured as separate parts, the valve head **15** preferably being formed of an alloy of steel and such highly heat resistant metals as chromium, tungsten, manganese, nickel and the like. Likewise, the valve disc **17** may be made of such alloys although for certain uses it may be found desirable to use ordinary iron or steel in the disc. The valve stem **16**, however, due to the fact that it is not

subject to the intense heat applied to the valve head, may be made of ordinary iron or steel.

It will be noted that the head **15** is formed with a short stem portion **15'** integral therewith, this being necessary, or at least desirable, as this portion of the valve will be unprotected by the skirt from the exhaust gases, so as to allow the proper flow of gases under the valve, and consequently it is desirable that it be formed of a heat resisting alloy as in the case of the head proper. It will also be noted that it is preferable to form the disc **17** with control bosses **17'** on the opposite sides thereof, each having an exposed end area substantially the same as the end areas of the head portion **15'** and stem **16**, so as to facilitate the subsequent welding of these parts together in assembled relationship. However, these bosses may be omitted, as shown in Figures 6 and 7, if desired.

The valve parts shown in Figure 1 are suitably welded together to form the construction shown in Figure 2 in which the numeral **18** indicates the welding material.

The next step in the manufacture of the valve is indicated in Figure 3, which shows the welding flash **18** removed and a portion of the valve stem **16** reduced to finished size. While I have shown only a portion of the valve stem **16** reduced to finished size before forming a skirt on the stem, it may be desirable in some instances to finish the stem **16** along its entire length before forming the skirt, or it may be desirable to reduce a portion of the stem **16** to a diameter slightly smaller than the finished size as the stem may be slightly distorted when the skirt is turned to its final shape. Thus a reduced stem diameter at the top of the guide will insure clearance and permit free action thereof, even though the valve stem is slightly distorted.

The next step in the manufacture of the valve is shown in Figure 4 in which the valve disc **17** is turned down around the top end of the valve stem **16** by any suitable means as by die shaping, forming a skirt **19**, adapted to telescopically receive the projecting end of the coacting valve guide **20** and thereby protect the valve stem **16** from the intense heat developed in the combustion chamber, and to prevent the formation of deposits of the products of combustion thereon. The skirt **19** may be trued up by machining after it has been formed if thought desirable, and may be machined sufficiently to reduce its thickness where valve weight is important.

In producing the modified form of valve illustrated in Figures 8 through 11, a valve head **21** may be formed of an alloy of the type used in the preferred form and a separate valve stem **22** formed of ordinary iron or steel may be used. It will be noticed that in this form of my invention no separately formed valve disc is used. The first step in the manufacture of this type of valve is illustrated in Figure 9, which shows the valve head **21** and valve stem **22** united by welding and having a sufficient amount of material gathered or upset as at **23** during the welding operation to provide material to be later forged or otherwise formed to provide the desired skirt.

Figure 10 illustrates the next step in the manufacture in which the material **23** is drawn out, forged or otherwise acted upon to form a disc **24** extending radially of the stem **22** such as forging. The next step in the process consists in acting upon the disc **24**, by any suitable means, to form the skirt **25** shown in Figure 11.

In the second modified form of my invention, illustrated in Figures 12, 13 and 14, a disc **26** is shown formed integrally with the valve head **27**. Figure 12 illustrates the parts before they are united and Figure 13 shows the valve head united to the valve stem **28** by welding **29**. The last step in the manufacture of this valve corresponds to that illustrated in the preceding forms and consists in turning the valve disc downwardly to form the skirt **30**.

The skirt, formed by any of the means herein illustrated, protects the end of the stem from the intense heat and the products produced in the combustion chamber. This construction, by the welding of the skirt to the valve body, provides an exceptionally strong and durable valve having a skirt, which will not work loose on account of the varying conditions of temperature and wear to which it is subjected. While my valve was developed for use in connection with exhaust valves of internal combustion engines, it is not intended to limit my invention to exhaust valves alone, as it may be conveniently used on inlet valves and at various places where valves are subjected to high temperatures.

It will be apparent to those skilled in the art, that my invention may be variously changed, used or modified, without departing from the spirit of the invention or sacrificing the advantages thereof, and that the embodiment of my invention disclosed herein is illustrative only, and that my invention is not limited thereto.

What is claimed is:

1. The process of manufacturing poppet valves and the like comprising, providing a disc on the stem coaxial therewith and in spaced relation to the head of the valve, and then forming said disc into a skirt arranged in generally spaced relation about said stem.

2. The process of manufacturing poppet valves and the like comprising, forming the valve head and valve stem separately, placing a disc between the mating ends of the head and the valve stem and uniting the head, stem and disc into an integral valve body by welding, and then bending the disc over the end of the valve stem to form a protecting skirt.

3. The process of manufacturing poppet valves and the like comprising, forming the valve head and valve stem separately, placing a disc between the mating ends of the head and the valve stem, uniting the head, stem and disc into an integral valve body by welding, reducing at least a part of the valve stem to its final shape, and turning the outside edge portions of the disc down around the end of the valve stem to form a skirt to protect the valve stem from the intense heat and products of the combustion chamber.

4. The process of manufacturing poppet valves and the like, comprising forming a separate valve head and valve stem, uniting the mating ends of the valve head and stem by welding to form an integral valve body, upsetting said stem adjacent the area of weld to form a projecting body of material, and then forming said body of material into a skirt surrounding the stem.

5. The process of manufacturing poppet valves and the like, comprising forming a separate valve head and valve stem and uniting the mating ends thereof to form an integral valve body by a welding operation, and gathering up enough material during the welding operation to form a body on the side of the valve near the point of the weld, and then forming said body into a protecting skirt depending over the end of the valve stem.

6. The process of manufacturing poppet valves

and the like, comprising forming a separate valve head and valve stem and uniting the mating ends thereof to form an integral valve body by a welding operation and gathering up enough material during the welding operation to form a body on the side of the valve near the point of the weld, forming said body into a circular disc centered on the valve stem and at right angles to the plane thereof, and then bending the disc over the end of the valve stem to form a protecting skirt therefor.

7. The process of manufacturing poppet valves and the like, comprising forming a separate valve stem and valve head provided with an integral disc at the stem end thereof, uniting the mating ends of the head and stem by a welding operation to form an integral valve body, and then bending the disc over the end of the valve stem to form a protecting skirt therefor.

8. The process of manufacturing poppet valves and the like comprising providing an integral valve member comprising a head portion and a stem portion of different materials and a disc, at the juncture of said portions, and forming said disc into a depending skirt arranged in generally spaced relation about said stem portion.

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