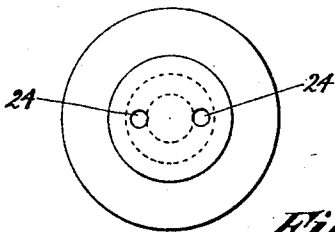
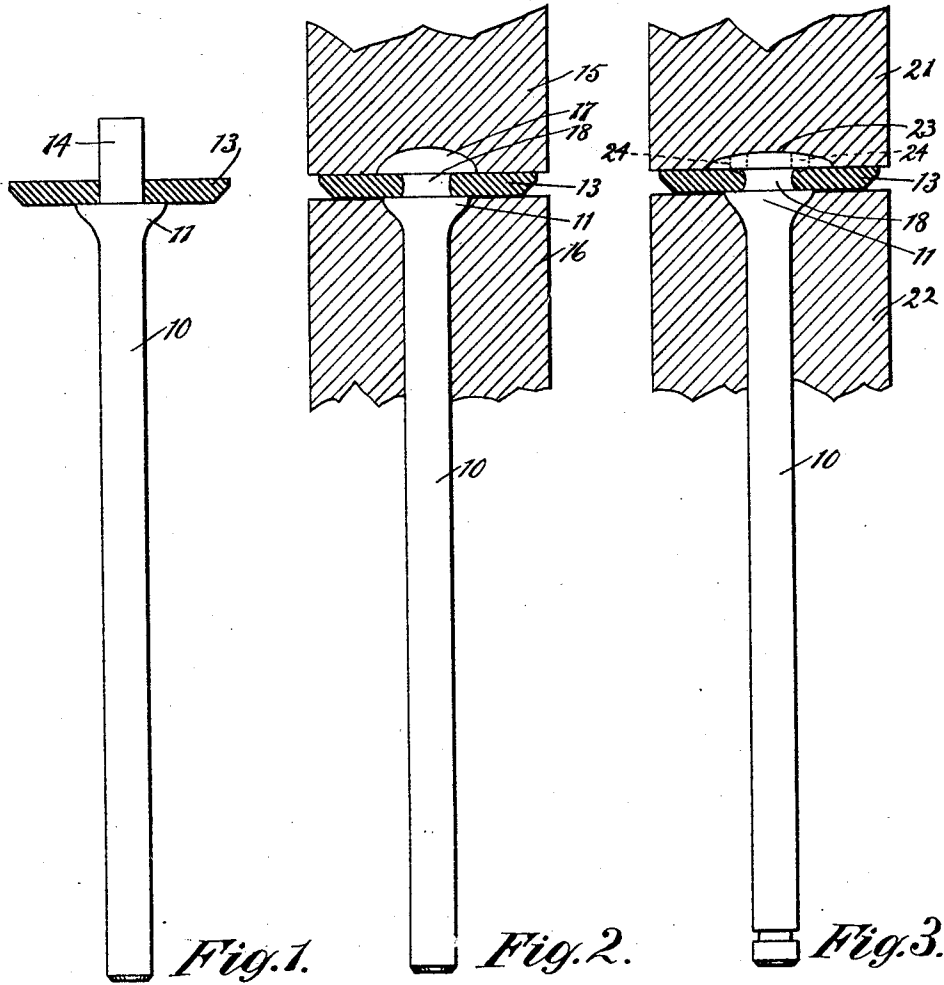


Oct. 23, 1928.

1,688,423

R. JARDINE  
METHOD OF MAKING VALVES  
Filed Dec. 20, 1924



Inventor:  
Robert Jardine.

By *Gilson, Mann & Cox*  
Attys

# UNITED STATES PATENT OFFICE.

ROBERT JARDINE, OF DETROIT, MICHIGAN, ASSIGNOR TO RICH TOOL COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

## METHOD OF MAKING VALVES.

Application filed December 20, 1924. Serial No 757,233.

This invention relates to valves for combustion engines, and the method of making the same.

One of the objects of the invention is the provision of a new and improved method of manufacturing valves whereby valve heads may be secured to their stems in an efficient, cheap and permanent manner.

Another object of the invention is the provision of a new and improved composite valve that is cheap to manufacture, easily assembled, one that will retain the rigid relation between the parts in all conditions of service, and that is not likely to become broken or defective while in use.

Other and further objects and advantages of the invention will appear from the following description taken in connection with the accompanying drawings, in which

Fig. 1 is an elevation of the valve and head in assembled relation, before the head is secured in permanent position on the stem, with parts in section;

Fig. 2 is a side elevation of the valve and dies in the position of clamping the head on the stem;

Fig. 3 is a similar view, showing the final step in the process of securing the head on the stem, with parts in section; and

Fig. 4 is a plan view of the finished valve.

On the drawings, the reference character 10 designates a valve stem provided in the usual manner with a shoulder 11. The valve head 13 may be composed of any suitable material. Preferably it is made of a suitable non-oxidizing material, and may be thin enough to be stamped from sheet metal. The head may comprise one or more rigid or slightly resilient disks. In the form of the device selected to illustrate one embodiment of the invention the head is composed of a comparatively rigid disk of non-oxidizing material.

In the process of manufacturing the valve the stem with the shoulder 11 is heated, the disk or head 13 placed thereon, as shown in Fig. 1, and the outer end 14 of the valve is headed over by suitable means, as by the dies 15 and 16 to form the cap or head 17 as clearly shown in Fig. 2.

While I have shown the shoulder 11 as being formed prior to the formation of the cap 17 it is understood that it is immaterial so far as the invention is concerned whether the shoulder be formed before, after or simul-

taneously with the cap or head 17, so long as the valve head 13 is clamped between two distorted portions of the stem, as clearly shown in Fig. 2. Preferably this operation is performed while the head is relatively cold and the stem heated in the usual manner.

It is common practice to secure a stem to a valve head by heating the stem and distorting its outer end to clamp the cold valve head in position against a shoulder on the stem. The contraction of the heated stem on cooling will clamp the disk or valve head 13 between the cap or head 17 and the shoulder 11 with a tremendous force. The usual method of heading over the end of the valve stem will swage the neck or portion 18 of the stem between the shoulder 11 and cap or head 17 and cause an intimate contact of the contiguous particles, but the cooling of the stem at this point disrupts this intimate contact and consequently at high temperatures the head is likely to work loose on the stem. In order to avoid this difficulty the head and stem after being assembled as shown in Fig. 2 in the manner just described, are heated and placed in dies 21 and 22 and subjected to a great pressure which further upsets the neck portion 18, forcing the adjacent surfaces of the neck and valve head into extremely intimate contact. This operation may further distort the head 17 or shoulder 11 or both, depending on the shape or form of the dies.

Since the stem and valve head will expand and contract together, the intimate contact of the particles of the neck 18 and disk or valve head will be maintained at all temperatures, and hence there will be no tendency of the two to pull apart and the valve head become loose on the stem.

If desired, the headed portion 23 of the finished valve may be provided with recesses 24 for the engagement of a tool for rotating or grinding the same as is usual in such constructions.

The valve head 13 is preferably, though not necessarily, stamped from sheet metal, and consequently the valves may be cheaply and rapidly manufactured in either small or large quantities.

I claim as my invention:

1. A method of securing valve heads to valve stems which consists in heating said stem, securing a head thereon while in an unheated condition by clamping the same between a shoulder and head formed on said

stem while the same is hot, heating said stem and head and pressing said head and shoulder toward each other.

5 2. A method of securing a valve head on a stem which consists in clamping the valve head while in an unheated condition between a shoulder and a head on the stem, heating the stem and head, and then subjecting the head of the stem to pressure in the direction  
10 of said head.

3. A method of securing a valve head to a stem which consists in heating said stem, fastening a valve head while in an unheated  
15 at each side of said valve head while said

stem is hot, heating the valve head and stem together, and further distorting the stem while said head and stem are in heated condition.

4. A method of making valves which con- 20  
sists in securing a valve head while comparatively cold to the end of a stem between two distorted portions thereof while said stem is in heated condition, and then heating said valve head and stem, and forcing the outer 25  
distorted portion of said stem inwardly against said head by pressure.

In testimony whereof I affix my signature.

ROBERT JARDINE.