

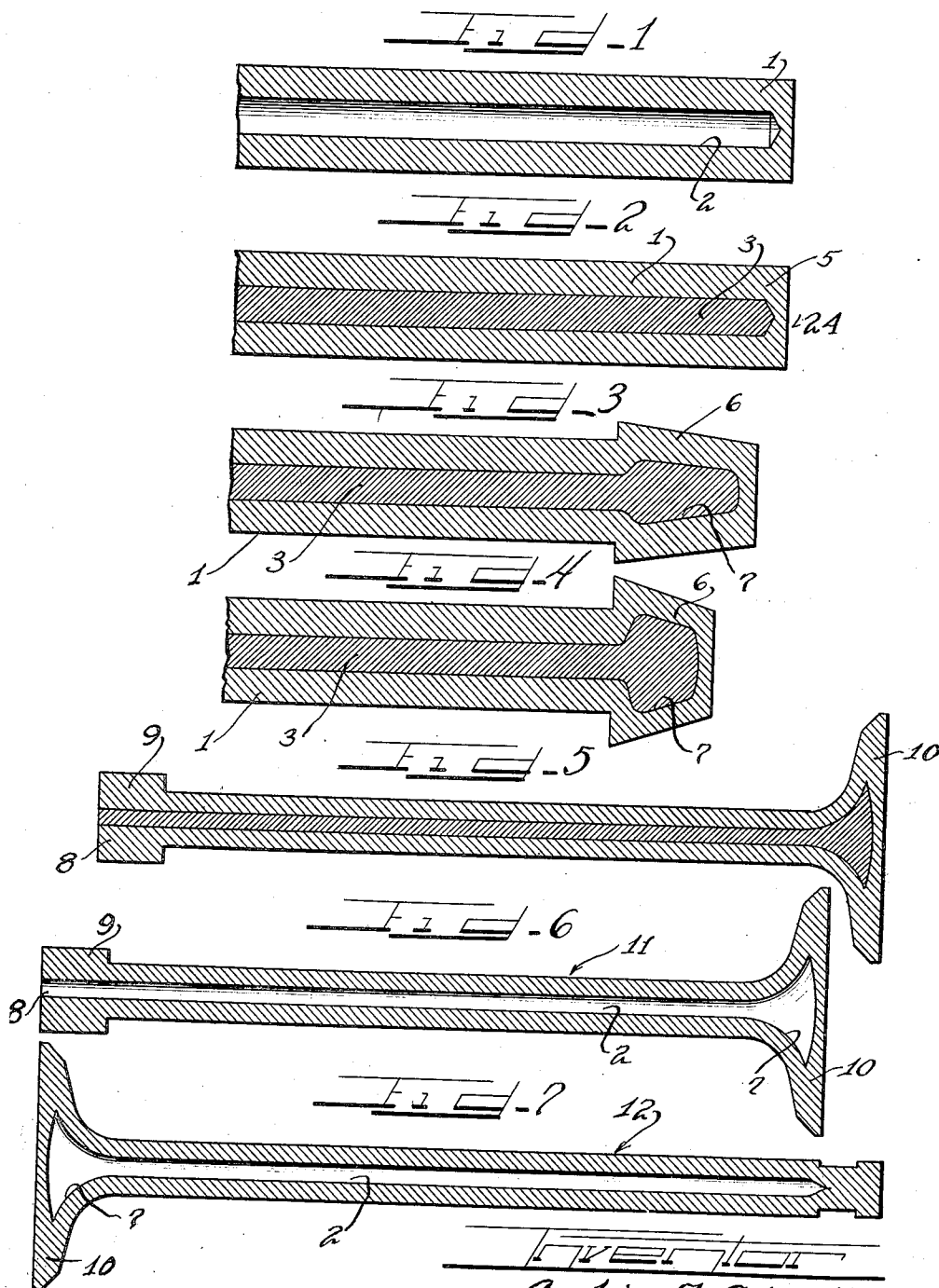
Sept. 21, 1937.

A. T. COLWELL

2,093,775

METHOD OF MAKING VALVES

Filed Oct. 29, 1931



Archie J. Colwell.

Charles J. Colwell

bu

ALL

UNITED STATES PATENT OFFICE

2,093,775

METHOD OF MAKING VALVES

Archie T. Colwell, Cleveland, Ohio, assignor to
Thompson Products Incorporated, Cleveland,
Ohio, a corporation of Ohio

Application October 29, 1931, Serial No. 571,730

4 Claims. (Cl. 29—156.7)

This invention relates to a method of making valves and particularly to a method of making hollow valves for internal combustion engines.

Hollow valves have found application in high compression internal combustion engines. The cost of making such valves, heretofore, has been very high and consequently the use of this type of valve has been limited to expensive installations where extreme operating conditions require the best regardless of cost.

It is the purpose of this invention to provide an economical method of making hollow valves.

It is an object of this invention to provide a method of making hollow valves in which it is unnecessary to ream the valve head.

It is a particular object of this invention to provide a method of making hollow valves from stem size stock wherein the recess is formed during the forging of the valve.

These and other objects of this invention will be apparent from the following description and appended claims.

This invention (in a preferred form) is illustrated in the accompanying drawing and hereinafter more fully described.

As shown on the drawing:

Figure 1 is an enlarged fragmentary sectional view of a rod having a recess therein, which is used for forming a valve according to my invention.

Figure 2 is an enlarged fragmentary sectional view similar to Figure 1 and showing a metallic insert in the recess of the rod.

Figures 3 and 4 are enlarged fragmentary sectional views illustrating steps in the formation of a valve.

Figures 5 and 6 are sectional views showing further steps in the formation of a valve according to my invention.

Figure 7 is a sectional view of a completed valve.

As shown on the drawing:

In carrying out this invention, a rod 1 of suitable valve material such as tungsten steel or chromium steel is provided. The rod 1 is preferably cut to size from rod stock. The rod 1 is drilled to provide a recess 2 extending substantially throughout its entire length and through one end thereof. The recess 2 is preferably cylindrical and concentric with the rod 1.

The rod 1 is heated to a forging temperature, and an unheated insert 3 is fitted into the recess 2. The metal of the insert 3 should have a relatively low melting point compared to the melting point of the metal of rod 1 so that the

initially cold insert will be heated and softened by contact with the heated rod 1. Such metals as copper and aluminum and their alloys may be satisfactorily used for the insert.

The composite metallic rod 4 thus formed is gripped adjacent its closed end 5 in a suitable die and the closed end 5 thereof, which has been heated to a forging temperature, is upset to form an enlargement 6. This operation also causes the portion of the recess 2 adjacent the end 5 of the rod 1 to become enlarged as at 7. The metal 3 which is rendered soft by the heat necessary to bring rod 1 to a forging temperature fills up this enlarged recess 7, thereby acting as a filler to prevent the metal of the enlargement 6 from collapsing. The rod at this stage of the process is illustrated in Figure 3.

One or more subsequent upsetting and forging operations are performed on this end of the rod, as illustrated by Figures 4 and 5. In each case, the soft metal 3 maintains an enlarged recess in the finished head 10.

The forging steps are carried out in quick succession immediately after the insert metal 3 has been fitted in the recess 2 to prevent the insert metal from flowing too freely.

During one stage of the upsetting of the end 5 of the rod, the open end 8 is upset to form an enlargement 9.

When a head 10 is completely formed from the enlargement 6, the insert metal 3 is removed by drilling it out from the stem end and heating the head to allow the portion in the head recess to be poured out. However, it will readily be seen that the whole article may be heated above the melting point of the metal 3 and the metal from both the head recess 7 and the stem recess 2 poured out.

The hollow valve article thus formed is illustrated at 11 in Figure 6. The enlarged portion 9 is then swedged to seal the stem recess 2 of the valve. The article is then machined to form the completed valve illustrated at 12 in Figure 7.

This invention provides an economical and expedient method of making a valve. The valve is made from rod stock having originally substantially the same diameter as that desired for the finished valve stem. This provision eliminates the necessity of using expensive dies which are necessary in extrusion processes. The action of the insert metal in forming the head recess makes it unnecessary to perform a reaming operation.

Many changes may be made in the steps of the process and arrangement thereof, and I do not

wish to be limited otherwise than is necessary by the prior art and the scope of the appended claims. It will be understood that the valve may be made from tube stock instead of rod stock and the completed valve may be filled with sodium or other cooling medium, or the copper insert may be left in the valve to form a copper cooled valve.

I claim as my invention:

10 1. The method of making a hollow valve which comprises drilling a recess in a metallic rod, heating the rod to forging temperature, placing an unheated insert of a metal of low melting point in said recess, upsetting the end thereof to form a head thereon, thereby enlarging the insert metal to form an enlarged recess in the upset portion and removing the insert metal therefrom.

15 2. The method of making a valve of the class described comprising drilling a hole in a steel bar almost but not quite to the end of the bar, filling the hole with copper and increasing the diameter of the closed end of the filled bar so as to increase the diameter of both the steel and the copper at that point and provide a mushroom shaped copper filling encased in steel at the head

end of the valve, and extending down the valve stem.

3. The method of making a copper cooled valve which comprises providing a steel bar having a recess extending from one end thereof into spaced relation from the other end thereof, placing an insert of copper in the recess and upsetting the closed end of the blank to form a valve head and to spread out the copper therein and provide a mushroom-shaped copper filling encased in steel in the head end of the valve and extending down the stem.

4. The method of making a valve which comprises providing a steel bar having a recess therein extending from one end thereof into spaced relation from the other end thereof, filling the recess with copper, increasing the diameter of the closed end of the filled bar so as to increase the diameter of both the steel and copper at that point and provide a mushroom-shaped copper filling in the steel blank and removing said copper filling to provide a continuous cavity enlarged in the head of the valve and extending down the stem of the valve.

ARCHIE T. COLWELL. 25