

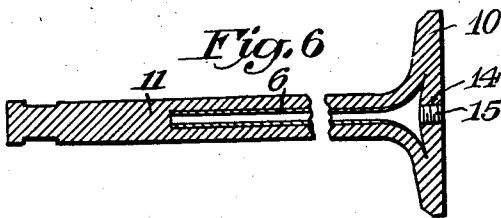
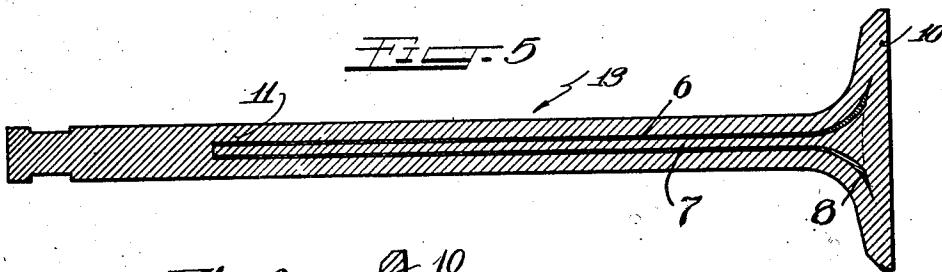
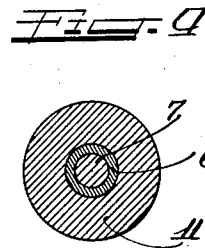
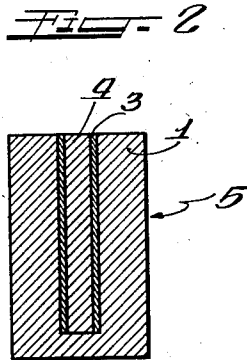
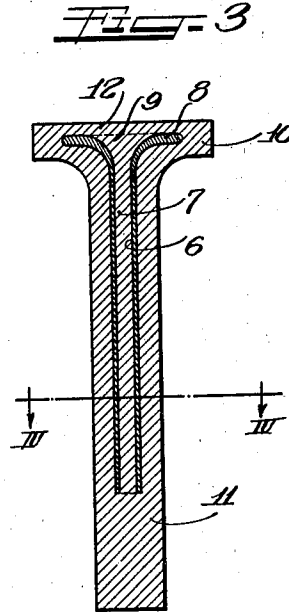
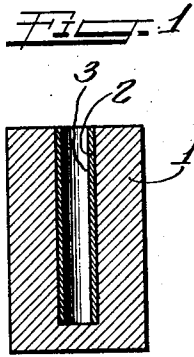
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METHOD OF MAKING INLAID METAL VALVES

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METHOD OF MAKING INLAID METAL VALVES

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This invention relates to composite metallic articles and the method of making them, and in particular to a method of making metal cooled poppet valves for internal combustion engines.

5 The gases which pass the exhaust valves of internal combustion engines maintain the exhaust passageway at approximately 1600° F. for ordinary engine speeds. These gases have a very destructive effect on the valves, causing corrosion
10 and warping, and producing a destructive change in the metal of the valve. These gases are directed against a portion of the valve which includes the upper portion of its stem and the lower portion of its head.

15 Many types of valves have been provided, which have some means of drawing the heat away from the portion thereof against which the stream of hot gases is ordinarily directed. The present invention pertains to this class of valves.

20 It is an object of the present invention to provide a metallic cooled valve in which the cooling element is in the form of a tube embedded in the metal of the valve.

It is a particular object of this invention to provide a valve having a copper sleeve embedded therein.

It is a further object of this invention to provide a novel and expedient method for embedding a metallic sleeve within the body of a valve.

30 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.

On the drawing:

Figure 1 is a sectional view of a recessed metal blank with a metal tube inserted therein.

40 Figure 2 is a sectional view of the blank of Figure 1 with a metallic insert or plug within the metal tube.

Figure 3 is a sectional view showing a partially completed valve formed from the blank of Figure 2.

45 Figure 4 is an enlarged sectional view taken on the line IV—IV of Figure 3.

Figure 5 is a sectional view of a complete valve.

Figure 6 is a broken sectional view of a valve with the insert removed therefrom.

50 As shown on the drawing:

In carrying out this invention, a blank 1 is formed by casting or by cutting a slug from a bar of rolled stock. A suitable recess 2 is drilled in the blank 1 longitudinally thereof. The recess
55 is preferably cylindrical and concentric with the

blank 1, extending through one end of the blank and for a considerable distance within the blank.

The recessed blank is heated to a forging temperature and a metallic tube 3 is forced into the expanded recess or bore 2. After this, a metallic insert or plug 4 is forced into the bore of the tube 3.

The blank 1 is formed of any suitable valve material, such as tungsten steel or nickel-chromium steel. The tube 3 is made of any suitable metal or alloy which has a relatively high rate of heat conductivity and which will readily form a bond with the metal of the valve. Copper is preferably used to form the tube 3. The insert 4 may be of any metal or alloy, of different characteristics from those of the metal of the tube 3, and may be, and preferably is, of the same material as the blank 1.

The composite metallic blank 5, thus formed, is extruded through a suitable die, while the metal of blank 1 is still at forging temperature. In the preferred way, the metal blank 5 is extruded so as to form a head portion 10 and a stem portion 11 thereon, such as shown in Figure 3. The inserts 3 and 4 are drawn out in the stem of the valve as shown at 6 and 7, respectively, and are spread out in the head to form the portions 8 and 9, respectively.

As the metal of the blank 1 was heated to a forging temperature before the relatively cold inserts 3 and 4 were forced into the recess, the metal 1 will, upon cooling, shrink on the sleeve 6 and form a firmly bonded joint between the sleeve 6 and the body of the valve.

In the extruding operation, a suitable tool is used to force the metal of the blank 1 to completely cover the inserts 3 and 4 as shown at 12 of Figure 3.

The valve blank thus formed is forged and machined to form the completed valve 13. The valve 13 comprises a stem 11 and head 10, a sleeve 6 firmly embedded in and bonded to the stem 11 and extending into the head as shown at 8. The insert 4 is worked into the core 7 which is integral with the stem 11 and head 10 of the valve.

If a hollow stemmed valve is desired, the core 7 can be melted out of the sleeve 6 after extrusion and before the portion 12 of the head 10 is formed. In this case, the insert 4 is preferably formed of low melting metal so as not to interfere with the bond between the sleeve 6 and the body of the valve.

The valve thus formed is illustrated in Figure 6. If desired, a recess 13 may be drilled in the

portion 12 of the valve so that the metal 4 may be melted and removed from the valve. The recess 13 may then be filled by a plug 14 which is preferably threaded in place.

5 It will be seen that this invention provides a simple and economical method of making a valve having a heat conducting sleeve therein having a perfect union between the metals of the valve.

10 While I have described my invention in relation to the formation of a valve, it is understood that many other composite metallic articles of the same general nature, such as tappets, may be made in accordance with the invention.

15 Many changes may be made in the design and proportion of the parts, as well as the arrangement of the steps of the process, and I do not wish to be limited otherwise than is necessary by the prior art and the scope of the appended

20 claims.

I claim as my invention:

1. The method of making a cooled valve, which comprises extruding a metallic blank containing a tube formed of a metal having a relatively high rate of heat conductivity and an insert of another metal within said tube to form a head and stem on the blank with the tube and insert disposed in the stem and spread out in the head.

2. The method of making a cooled valve, which comprises placing a tube formed of a metal having a relatively high rate of heat conductivity in the recess of a recessed blank, inserting a metal plug in said tube and extruding the composite blank to form a head and stem therefrom.

3. The method of making a copper cooled valve, which comprises forcing a copper tube into the recess of a recessed blank, forcing a metal insert into said tube, extruding the composite blank at forging temperature to form a head and stem and allowing the composite headed member to cool to shrink the metal of the blank about said tube.

4. The method of making a copper cooled valve, which comprises drilling a longitudinal recess of considerable depth in a metal blank, inserting a copper tube in said recess, placing a metal insert in said tube, extruding the composite blank

to form a head thereon and working the metal of the head over the top thereof to completely enclose said copper tube.

5. The method of making a valve which comprises drilling a recess in a suitable metal blank, heating the blank to forging temperature, inserting a tube of a different metal into the recess in said blank, placing a metal insert in said tube, working said blank to form a head and stem thereon and removing said metal insert.

6. The method of making a metal cooled valve, which comprises inserting a tube of desired characteristics within a recessed metal blank, placing a metallic insert within said tube and forming a head and stem on the blank by extruding the blank to thereby cause the material of the tube to spread out in the head.

7. The method of making a cooled valve which comprises forcing a metal sleeve having the desired characteristics within a heated metal blank and shaping the blank to form a head and stem thereon.

8. The method of making a cooled valve which comprises shaping a metal blank having a copper tube therein to form a head and stem thereon.

9. The method of making a cooled valve which comprises shaping a metal blank having a metal tube of desired characteristics therein to form a head and stem thereon with the metal of the tube unexposed.

10. The method of making a cooled valve which comprises inserting a metal tube of desired characteristics within a blank, supporting said tube by an insert of a different metal, shaping a portion of said blank to form a valve head with the metal of the tube spread out therein and drawing out the opposite portion of the blank to form a valve stem.

11. The method of making a cooled valve which comprises inserting a copper tube within a metal blank, placing a slug of metal within said blank to completely fill said tube, shaping a portion of said blank including a part of said tube to form the valve head and drawing down the rest of said blank to form the valve stem.

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