Feb. 11, 1947. L. P. NOVAK 2,415,606

METHOD OF MAKING SHROUDED POPPET VALVES

Filed Dec. 31, 1943 2 Sheets-Sheet 1

Fig-1

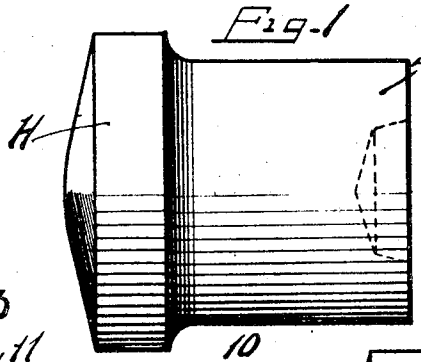


Fig-2

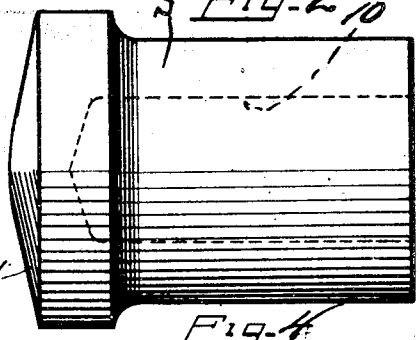


Fig-3

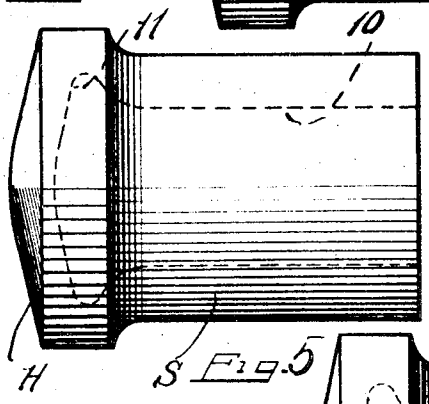


Fig-4

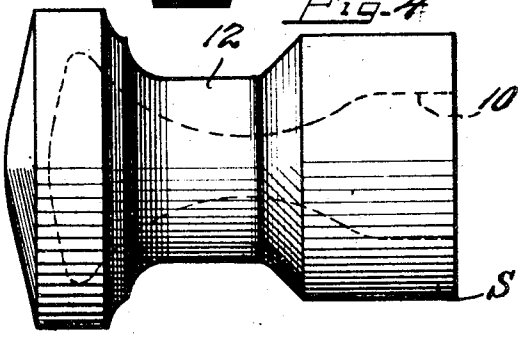


Fig-5

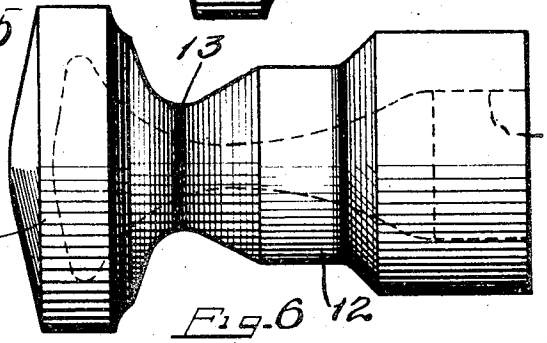


Fig-6

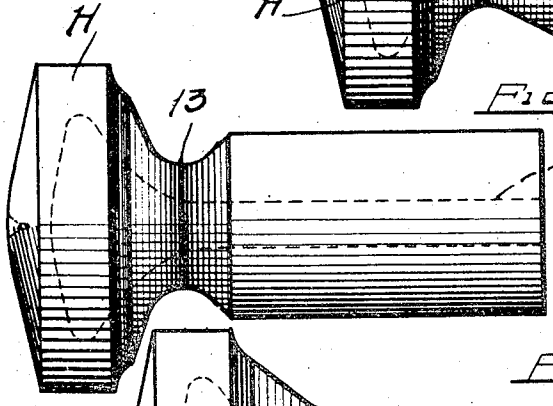
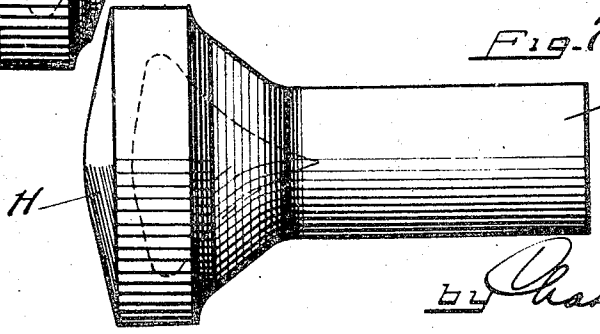


Fig-7



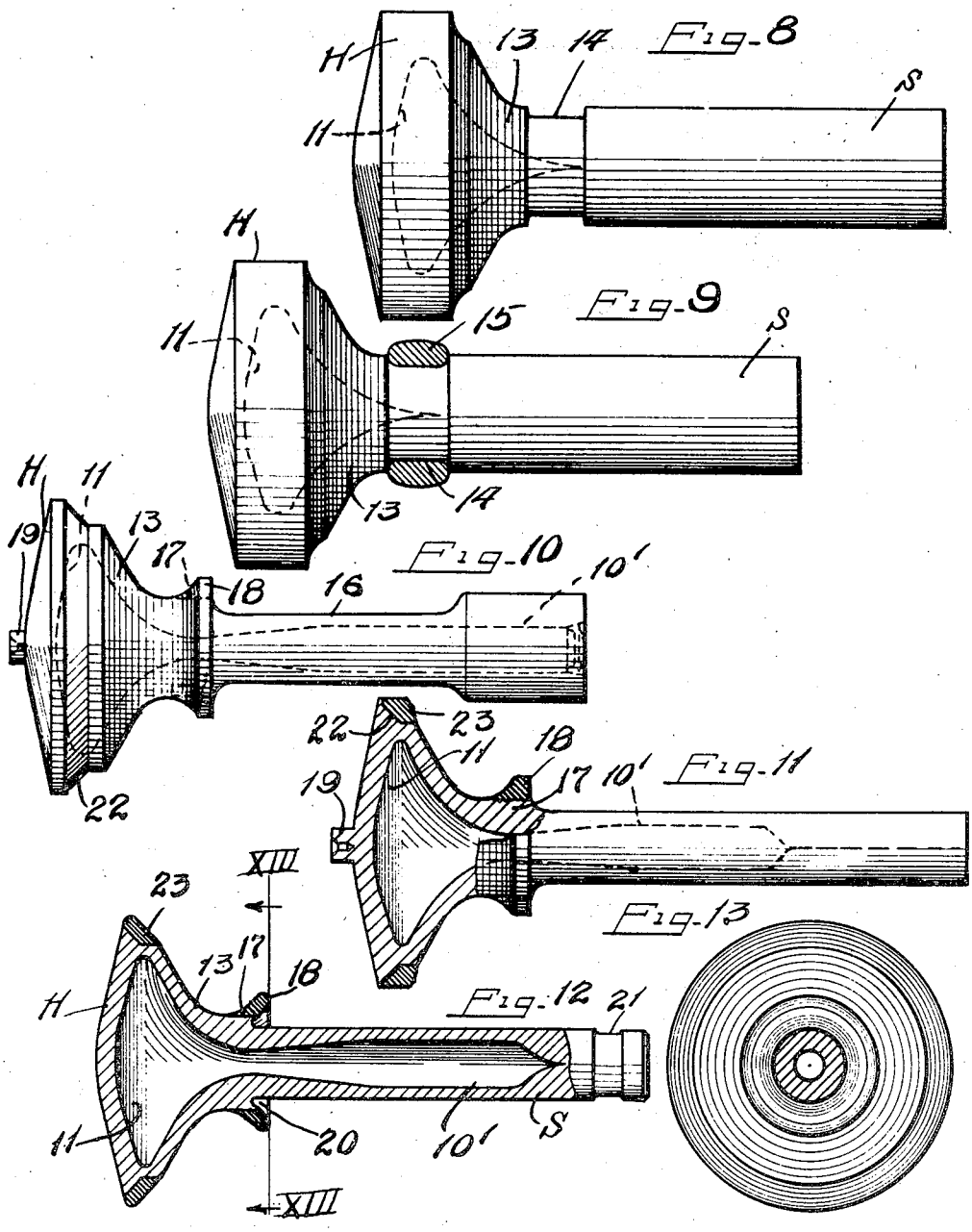
Inventor
Louis Philip Novak

by Charles A. Williams

Feb. 11, 1947. L. P. NOVAK 2,415,606

METHOD OF MAKING SHROUDED POPPET VALVES

Filed Dec. 31, 1943 2 Sheets-Sheet 2



Inventor
Louis Philip Novak.
by Charles O. Fields Attys.

Patented Feb. 11, 1947

2,415,606

UNITED STATES PATENT OFFICE

2,415,606

METHOD OF MAKING SHROUDED POPPET VALVES

Louis Philip Novak, Cleveland, Ohio, assignor to Thompson Products, Inc., Cleveland, Ohio a corporation of Ohio

Application December 31, 1943, Serial No. 516,345

3 Claims. (Cl. 29—156.7)

1

My invention relates to a method of making a shrouded poppet valve for internal combustion engines.

In general, the object of my invention is to provide a new method for making shrouded valves, which will save time and material and will allow for the use of more corrosion-resistant material for the shroud.

In making the ordinary shrouded valve, it has been customary to extrude the valve to the shroud diameter so that when the stem part is machined, there will be sufficient material left under the head to machine out the shroud. This means that there must be a much larger diameter provided for in the stem when it is extruded in order to allow for the shroud, and the greater portion of this stem material must then be machined away to form the shroud.

In accordance with my improved process, the valve is extruded to nubbin size, that is, the same size as a valve without a shroud, and then a corrosion-resistant alloy is puddled or welded intimately to the stem at the shroud zone, and thereafter the valve stem is machined in the usual way, but with considerable saving of material and time, to form the shroud whose tip is composed in greater part of the corrosion-resistant material.

My invention is of particular utility in connection with hollow poppet steel valves, such as the type of valve disclosed in McBride et al. Patent No. 1,984,751, dated December 18, 1934. A valve of this type to which my invention would be applied, could be successively formed substantially in accordance with the process disclosed in this patent, but, before the drilling operation of the valve stem, a circumferential groove is formed in the stem adjacent to the valve head into which groove the corrosion-resistant material for the shroud is applied. Thereafter, the stem is drilled to form the stem cavity to meet the head cavity and the stem is machined to form the embryo shroud, whereafter the stem is extruded for lengthening thereof and closure of the stem cavity, and then by a final machining operation the finished valve is produced with the noncorrosive material forming an integral part of the shroud.

On the drawings, the various figures show the various formation steps of a valve from a billet of suitable metal.

Figure 1 shows the embryo valve after the first forging operation;

Figure 2 is the form after piercing for the embryo stem cavity;

2

Figure 3 shows the form after machining and reaming to enlarge the stem cavity and produce the head cavity;

Figures 4 and 5 show the form after subjection of the form of Figure 3 to hammer dies for constriction of the stem;

Figure 6 shows the form after the first extrusion operation;

Figure 7 shows the form after the second extrusion operation;

Figure 8 shows the form after further extrusion and lengthening of the stem, and after a groove has been cut in the stem adjacent the neck of the blank;

Figure 9 shows the form after corrosion-resistant material has been applied in the groove;

Figure 10 shows the form after drilling of the stem and machining to form the embryo shroud;

Figure 11 shows the form after extrusion of the enlarged nubbin on the end of the stem to close the stem cavity;

Figure 12 shows the finished valve; and

Figure 13 is a section on plane XIII—XIII of Figure 12.

On the drawings, Figure 1 shows the embryo stem S and head H resulting from the forging of a billet of suitable metal such as austenitic steel, while Figure 2 shows the form after further forging and extrusion to lengthen the stem, and piercing to provide the stem cavity 10.

Figure 3 shows the form resulting from machining or reaming to enlarge the stem cavity and to form the head cavity 11, this cavity 11 being substantially the same size as in the finished valve.

Figures 4 and 5 result from successive hammer-die treatment to produce the restriction 12 and the neck 13. Figure 6 shows the form resulting from extrusion and contraction of the outer end of the stem to the diameter of the restriction 12, and the resulting contraction in diameter of the stem cavity 10. After a second extrusion operation, the stem is contracted to entirely close the stem bore to form substantially a solid stem as shown in Figure 7. Further extrusion results in lengthening of the stem and reduction of the stem diameter to the form shown in Figure 8.

In the form shown on Figure 8, the stem is of nubbin size, that is, substantially the size it would be for the production of an unshrouded valve. In accordance with my invention, this stem is now machined to provide the circumferential groove 14 adjacent to the neck part 13 at the base of the head H. Corrosion-resistant metal is then intimately puddled or welded into

the groove 14 to become integral with the stem and build up a band or ring 15 of larger diameter than the nubbin diameter of the stem S. Any suitable corrosion-resistant material may be used, examples of which are nickel, chromium and iron alloys; nickel, molybdenum and iron alloys; non-ferrous nickel-chromium alloys; and chromium-tungsten alloys. Figure 9 shows the band or ring 15 located in the zone where the shroud is to be formed.

After application of the corrosion-resistant material the stem is drilled to provide the cavity 10' which merges in the head cavity 11, and then the valve is machined in a lathe or otherwise to reduce the intermediate part 16 to substantially finished valve stem diameter while leaving a nubbin end of the same diameter as the stem of Figure 9. The machining of the stem along the zone of the corrosion-resistant material 15 will leave the base portion 17 of the shroud from which the corrosion-resistant material extends for forming the shroud end 18. During this machining operation, the head H and the neck part 13 are trimmed down closer to finished dimensions and the boss 19 may be left on the head for centering of the valve for further machining operation to its finished form.

After the machining operation resulting in the form shown on Figure 10, the valve can be filled with coolant such as sodium (not shown) and is subjected to die operation to draw out and contract the large nubbin end of the stem shown on Figure 10 to finished stem diameter, this operation closing the end of the stem cavity 10', the resulting form being shown by Figure 11. This form is now placed in a lathe for machining to the finished form shown on Figure 12. During this final machining operation, the shroud part formed by the base 17 and the end 18 of corrosion-resistant material is under-cut as indicated at 20 and trimmed down to form the completed shroud. During this final machining operation, the groove 21 is formed near the tip end of the stem for receiving retainer lock structure (not shown) when the valve is put into service. During the final finishing operation the head and its neck part are also turned down to final dimensions and the centering boss 19 is cut away.

When machining the embryo valve to the form shown on Figure 10, a circumferential groove or channel 22 may be cut in the head to receive a ring of hard corrosion-resistant material 23. This material may be puddled or welded intimately in the groove 22, as shown in Figure 11, and then, when the valve is turned down to its final form during the final machining operation, this material will form a heat and corrosion-resistant seating face for the valve, as shown on Figure 12.

It will be apparent from the above description that shrouded valves can be produced with considerable saving of material and time and with a resulting shroud or skirt at the neck of the valve composed in greater part of the corrosion-resistant material. This corrosion resistant shroud is desirable in exhaust valves to deflect the exhaust gases away from the valve stem and is effective to increase the life of the valve.

I claim as follows:

1. The method of making a shrouded poppet valve which comprises forming a valve head with an embryo shank thereon whose diameter at the shroud zone is less than shroud diameter, then providing a circumferential groove in the shank at the shroud zone and applying corrosion-resistant material in said groove to an outer diameter greater than that of the embryo shank, then machining the shank end to form the valve stem, machining the corrosion-resistant metal to a shroud shape, and undercutting the base of the shroud to form a skirted shroud with said corrosion-resistant metal forming the skirted end of the shroud.

2. The method of making a shrouded poppet valve which comprises first forming an embryo valve with a shank of a diameter less than the outer diameter of the shroud which is to be formed thereon, then at the zone where the shroud is to be formed, puddling corrosion-resistant metal onto the shank of the embryo valve adjacent the head to locally build up the shank diameter to greater than shroud diameter, machining the end of the shank to finished valve stem diameter, machining the outside of the corrosion-resistant metal to shroud shape, and undercutting the base of the shroud to form a skirted shroud with said corrosion-resistant metal forming the skirted end of the shroud.

3. The method of providing a shroud on a poppet valve of the type in which a cavity in the stem communicates with a cavity in the head, which comprises forming the valve by extrusion and contraction up to the embryo form in which the shank cavity is closed to form a solid shank of a diameter less than the diameter which would be necessary if the shank were to be machined to form an integral shroud, then forming a circumferential groove in the shank, then puddling corrosion-resistant material onto the shank in said groove to locally build up a ring to an outer diameter slightly greater than shroud diameter, reducing the end of the shank to substantially finished valve stem diameter, machining the corrosion-resistant metal to a shroud shape, and undercutting the base of the shroud to form a skirted shroud with said corrosion-resistant material forming the skirted end of the shroud.

LOUIS PHILIP NOVAK.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,127,929	Miller	Aug. 23, 1938
1,136,408	Cobb	Apr. 20, 1915
1,235,344	Lindemann	July 31, 1917
933,698	Crook	Sept. 7, 1909
1,106,064	Thompson	Aug. 4, 1914
2,135,966	Daisley	Nov. 8, 1938
1,984,751	McBride	Dec. 18, 1934
2,057,858	Sullins	Oct. 20, 1936
1,106,054	Thompson	Aug. 4, 1914
1,583,432	Wilcox	May 4, 1926
1,727,621	Taub	Sept. 10, 1929
1,789,374	Sullivan	Jan. 20, 1931
2,032,162	Zahodiakin	Feb. 25, 1936
2,165,871	Rector	July 11, 1939
2,277,356	Sargent	Mar. 24, 1942

FOREIGN PATENTS

Number	Country	Date
470,934	British	Aug. 4, 1936