G. R. RICH.

PUPPET VALVE.

APPLICATION FILED JUNE 12, 1912.

1,051,845. Patented Jan. 28, 1913.

Fig. 1.

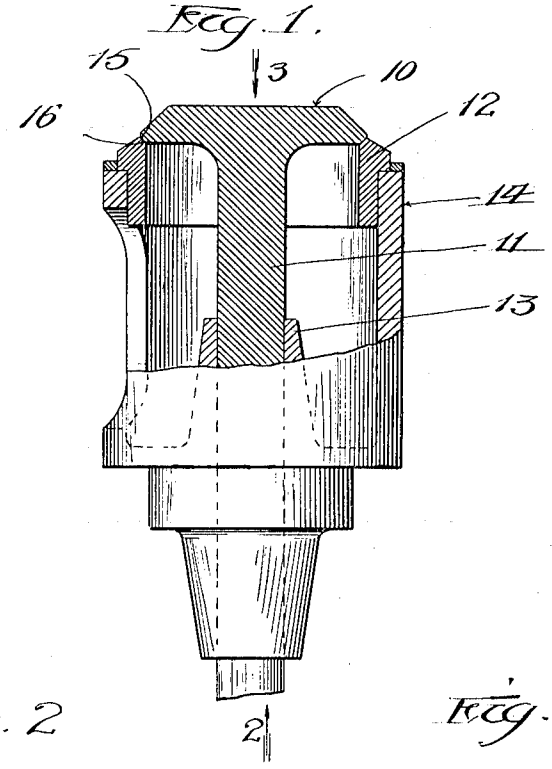


Fig. 2

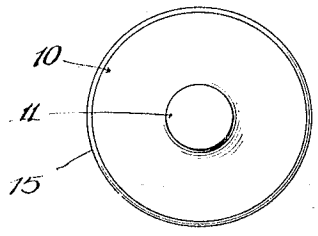
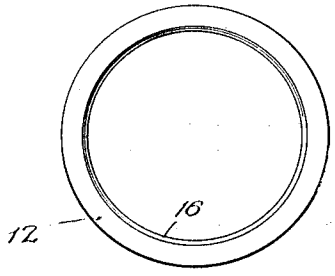


Fig. 3.



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UNITED STATES PATENT OFFICE.

GEORGE R. RICH, OF OAK PARK, ILLINOIS, ASSIGNOR TO RICH TOOL COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

PUPPET-VALVE.

1,051,845. Specification of Letters Patent. Patented Jan. 28, 1913.

Application filed June 12, 1912. Serial No. 703,202.

To all whom it may concern:

Be it known that I, GEORGE R. RICH, a citizen of the United States, residing at Oak Park, in the county of Cook and State of Illinois, have invented new and useful Improvements in Puppet-Valves, of which the following is a specification.

This invention relates to valves for internal combustion engines, and more particularly to that class of valves known as puppet valves.

It is well known to those skilled in the art that much difficulty is encountered with the ordinary cast metal puppet valves, such as those formed of iron or nickel, because of the tendency of carbon to accumulate thereon from their continued use in internal combustion engines, and further because of their tendency to warp and lose their shape, it being frequently necessary to rid them of the carbon deposit and sometimes necessary to grind them to make a true fit on the valve seat.

The object of the present invention is to construct the valve and its seat in a novel manner, whereby the possibility of carbon depositing thereon as well as the danger of warping is reduced to a minimum.

To such ends, this invention consists in a puppet valve and its seat, made of "high speed steel" or other dense and highly tempered high grade steel, whose grain is exceedingly fine and which is capable of holding its temper when subjected to very high temperatures.

The invention is clearly illustrated in the accompanying drawing in which—

Figure 1 is a central longitudinal section through a puppet valve and its seat embodying the present invention, Fig. 2 is an end view of the valve and its stem looking in the direction of the arrow 2 in Fig. 1, and Fig. 3 is an end view of the valve seat, looking in the direction of the arrow 3 in Fig. 1.

Referring to said drawing, 10 designates a puppet valve provided with the valve stem 11, and arranged to seat upon the valve seat 12. In accordance with the common practice, the stem is guided in a bearing 13, and the valve seat is secured in a suitable support 14.

In the present invention the puppet valve 10, is formed with a tapered annular bearing face 15, preferably very narrow in extent, and adapted to seat against and upon an annular bearing face 16, of the valve seat 12, which, as shown, is tapered to fit the valve perfectly and like the bearing face 15, of the puppet valve, is very narrow in width.

One or both members of the complete valve, but preferably both members, are constructed of a high grade of tempered steel, such as "high speed steel" or "tungsten" steel, or other high grade steel containing in its composition, a percentage of tungsten. Steel of this kind has very little if any grain, is very dense and retains its temper, even when subjected to high temperatures reaching approximately 1700 degrees Fahrenheit. As a result the bearing surfaces of a puppet valve and its seat, formed of such steel, may be made exceedingly narrow in extent, almost to a knife edge, whereby the possibility of carbon depositing thereon to an appreciable extent, is wholly eliminated. Furthermore, the high temperature to which valves of this class are subjected, in internal combustion engines, does not draw the temper of the steel, consequently the puppet valve and its seat retain their hardness and therefore do not warp or easily wear out of shape.

While it is well known that metal-cutting tools, made of "tungsten" steel, retain their cutting power when making thick cuts, and are thereby heated to a temperature as high as 750 degrees Fahrenheit, I have discovered that a puppet valve and its stem, made of metal, containing at least six per cent. tungsten, retains its extreme hardness, does not warp, or pit or collect carbon on its bearing surface, when subjected to the high temperatures of gases developed in internal combustion engines, which gases usually reach a temperature as high as 1200 degrees Fahrenheit,—sometimes higher. My experiments show that puppet valves, made in accordance with my invention, remain in perfect working condition, free from any appreciable carbon deposit, after having been subjected to this high temperature of gases in an internal combustion engine of an automobile during a run of 4,000 miles. The advantage of such a valve is readily apparent to any one familiar with the art in which this invention belongs. This result cannot be obtained with puppet

valves made of ordinary "tool steel", because when such valves are subjected to the high temperature present in internal combustion engines the temper of the steel is apt to be drawn, and the valves soon warp and need regrinding. Valves made in accordance with my present invention will last practically as long as the internal combustion engine in which they are used, and do not require frequent regrinding.

In the manufacture of the present puppet valve I employ a round rod of "tungsten" steel of approximately one half the diameter of the valve, and when heated to a temperature of more than 1700 degrees Fahrenheit draw down the greater portion of said rod to form the valve stem, by subjecting the sides thereof to comparatively light hammer strokes, after which the large end of the rod is hammered down endwise, to form the valve proper. The rough piece is then annealed, finished and rehardened. Thus I provide a valve and its stem of one piece of "tungsten" steel in which the metal throughout its structure is condensed materially over and above what it would be if the valve and its stem were cut from a piece of "tungsten" steel of the diameter of the valve proper. A valve, made by cutting it out of a large piece of "tungsten" steel, would not produce the same result as a valve made in accordance with the present method of making a valve.

I claim as new and desire to secure by Letters Patent.

1. As a new article of manufacture, a puppet valve constructed of "high speed steel".

2. As a new article of manufacture, a puppet valve constructed of steel containing in its composition a percentage of tungsten.

3. As a new article of manufacture, a puppet valve having a very narrow annular bearing face, and constructed of "high speed steel".

4. As a new article of manufacture, a puppet valve and its stem constructed of steel containing in its composition a percentage of tungsten.

5. As a new article of manufacture, a puppet valve and its stem constructed of a single piece of steel, containing in its composition a percentage of tungsten.

6. As a new article of manufacture, a puppet valve having a very narrow annular bearing face, said valve having a valve stem formed integral therewith, and constructed of "tungsten" steel.

In witness whereof, I have hereunto signed my name, at Chicago, Cook county, Illinois, this 11th day of June 1912.

GEORGE R. RICH.

Witnesses:
FRANK THOMPSON,
OTTO M. CARRY.