C. R. SHORT AND A. L. CASH.

METHOD AND APPARATUS FOR MAKING VALVES FOR INTERNAL COMBUSTION ENGINES.

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1,335,862. **Patented Apr. 6, 1920.**

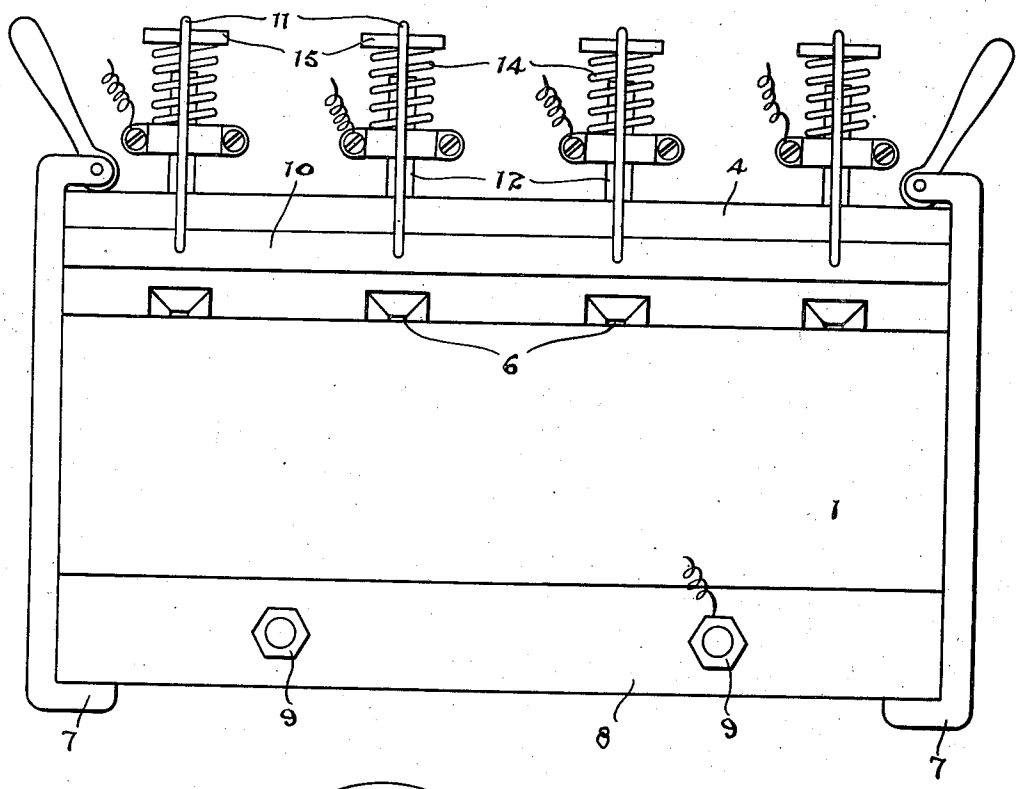


Fig. 1.

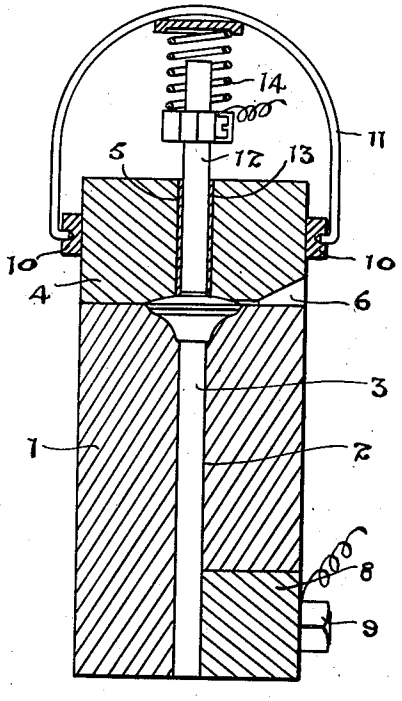


Fig. 2.

Inventors.

Charles R. Short.
Arthur L. Cash.
by H. J. S. Dennison Atty.

UNITED STATES PATENT OFFICE.

CHARLES REUBEN SHORT AND ARTHUR LAWTON CASH, OF DETROIT, MICHIGAN.

METHOD AND APPARATUS FOR MAKING VALVES FOR INTERNAL-COMBUSTION ENGINES.

1,335,862. Specification of Letters Patent. Patented Apr. 6, 1920.

Application filed September 12, 1919. Serial No. 323,386.

To all whom it may concern:

Be it known that we, CHARLES R. SHORT and ARTHUR L. CASH, both citizens of the United States of America, and residents of the city of Detroit, county of Wayne, State of Michigan, in the United States of America, have invented certain new and useful Improvements in Methods and Apparatus for Making Valves for Internal-Combustion Engines, as described in the following specification and illustrated in the accompanying drawings, that form part of the same.

The principal objects of the invention are, to overcome the difficulties met with in the manufacture of valves which will resist the destructive influences to which such valves are constantly subjected, and to devise a method and means whereby a valve may be produced at the minimum cost with the minimum waste and a minimum amount of labor and material which will be light, strong and durable, of uniform density, capable of resisting wear and will not pit, corrode, warp or go out of round.

A further object is to enable such valves being produced at a cost which will enable their use in moderate priced motors.

The principal feature of the invention consists in heating the valve stem within the mold to a predetermined degree and then pouring the molten metal to form the head into the mold and effecting a perfect weld between the stem and the head.

A further important feature consists in so molding the head as to chill the seat of the valve while maintaining the other portions soft so that they may be readily machined.

In the accompanying drawings, Figure 1 is an elevational view of a mold constructed in accordance with the present invention.

Fig. 2 is a vertical cross sectional view through the mold.

It is known to those conversant with the art that valves made of special alloys of greater density and high tempering point will resist the usual disintegrating conditions which cause the destruction of valves, but the method of making such valves is very expensive and there is an extremely high percentage of loss and the metal is extremely difficult to work, consequently the cost is prohibitive for any but high priced motors. Further these valves even when most carefully made do not always prove effective because of the loosening or separation of the head from the stem.

The present invention accomplishes the desired result in a very simple manner by heating the head end of the valve stem electrically to a point approaching fluidity while inclosed in the mold for molding the head. The molten metallic compound is then poured around the stem and effects a perfect fusion with the metal of the stem.

The mold may be formed in sections in such a manner that the face portion of the valve will be molded in its finished form and given a hardened face by the mold being in the form of a chill and the upper side may be softer so that it may be more readily machined.

In the form of the mold herein shown the lower portion 1 is preferably formed of cast iron with holes 2 bored vertically therethrough to receive the valve stem 3.

At the top of the holes 2 are concentric recesses formed to the finished shape of the lower portion of the valve head which includes the seating face.

The upper portion 4 of the mold is preferably formed of compressed carbon having holes 5 extending vertically therethrough in axial alinement with the holes 2 in the block 1. These holes are of larger diameter than the holes 2.

The block 4 is formed with gate openings 6 into which the metal of the valve head is poured.

The upper and lower portions of the mold are held together in any suitable manner; clamps 7 are here shown.

The valve stems are clamped securely in the lower member of the mold by the blocks 8 secured by suitable clamping members 9.

The upper end of the valve stem extends a short distance into the holes 5 in the upper mold member.

Bars 10 are secured to the upper mold block 4 and pivotal bails 11 are secured in these bars and extend over the top of the block.

After the valve stems have been placed in position copper electrodes 12 are inserted into the upper block 4. These are insulated from the block by the mica tubes 13 arranged in the holes 5. The electrodes engage the top ends of the valve stems, being held in contact by the coil springs 14 which are arranged under the bails 11, being elec-

trically insulated by the insulating fiber caps 15.

The electric terminals are connected to the binding posts on the electrodes and the electric current heats the valve stems.

When the desired heat has been attained the metal of which the valve heads are formed is poured into the gates. The metal striking the metal block 1 is chilled and forms a hardened face on the valve.

The metal of the upper side of the valve head contacting with the carbon retains a soft texture and will be comparatively easy to machine. The heating of the valve stem in this manner insures the fusion of the metal of the valve head with the stem for the entire depth of the head, consequently the head cannot be separated from the stem.

It will be understood from this description that the numerous machining operations and many handlings of the valve necessary with methods previously employed will be obviated.

The apparatus herein shown is merely diagrammatic and may be altered materially so far as structure is concerned without departing from the spirit of the invention which is to pre-heat the valve stem within a mold and then pour the molten metal to form the valve head around the stem.

What we claim as our invention is:—

1. A method of making valves, consisting in electrically heating a valve stem within a mold, then molding the valve head metal around the stem to fuse therewith.

2. A method of making valves, consisting in confining the valve stem within a mold having a recess the shape of the valve head, the stem being in contact with a heating electrode, then heating the stem to a predetermined degree, and then pouring molten metal into the recess to form the valve head around the heated stem.

3. A method of making valves, consisting in forming a mold in two sections, one of which is of metal and the other of carbon, the metal section having a recess the shape of the under part of the valve and the carbon section having a recess the shape of the top part, the carbon section having a gate opening for pouring of the metal, then placing a valve stem in the lower mold section to extend into the mold recess, then connecting a heating electrode to engage the valve stem and heating same, then pouring metal into the mold to form the head around the stem.

4. An apparatus for forming valves, comprising, a metal block having a recess in one face the shape of one side of the valve head and a concentric hole to receive the valve-stem, means for holding the stem, a block closing the mold recess and having a gate opening leading therefrom and a hole concentric with the mold recess, an insulating lining in said hole in the latter block, an electrode inserted in said hole, and means for holding the electrode in contact with the valve stem.

CHARLES REUBEN SHORT.
ARTHUR LAWTON CASH.