June 17, 1969 E. E. LINER 3,449,835

APPARATUS FOR USE IN THE REBUILDING OF VALVES FOR INTERNAL COMBUSTION ENGINES

Filed Feb. 27, 1967

FIG. 1

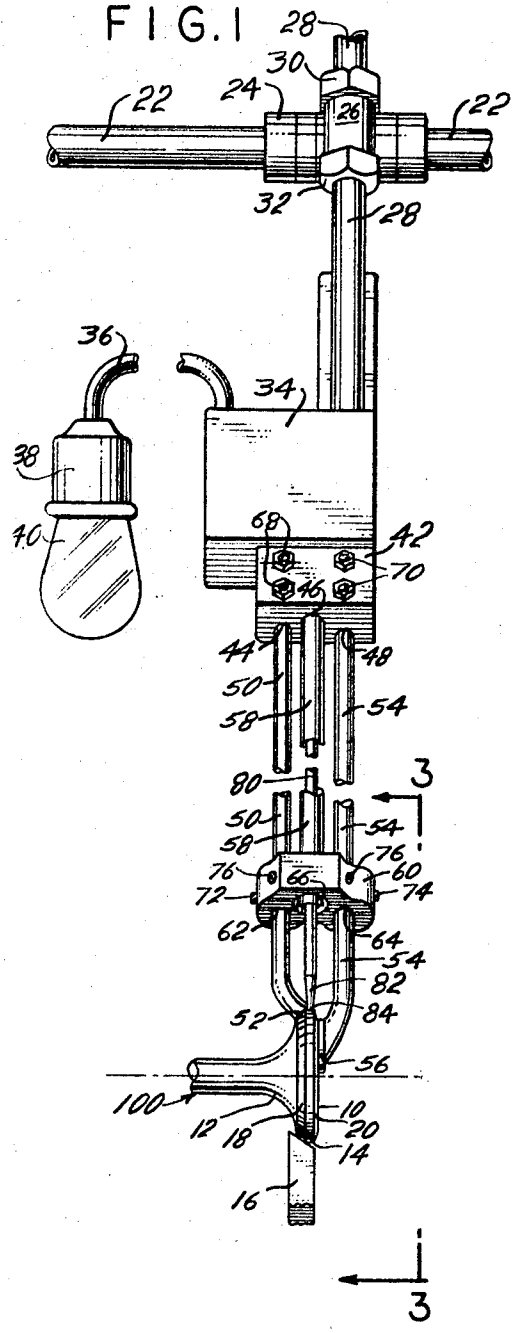


FIG. 2

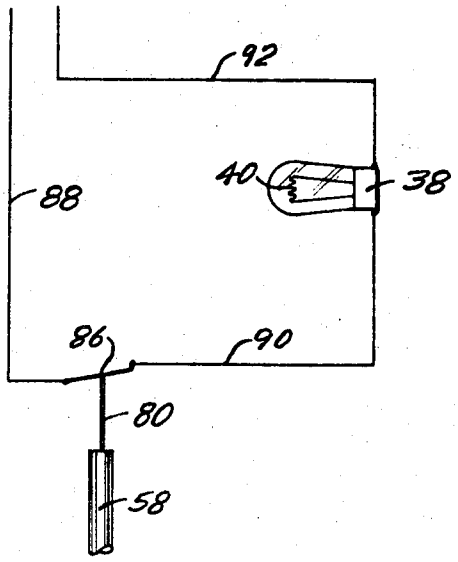
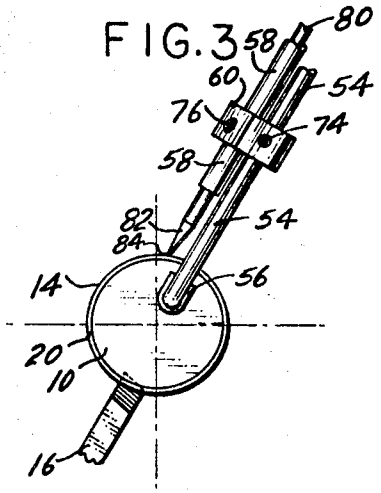


FIG. 3



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APPARATUS FOR USE IN THE REBUILDING OF VALVES FOR INTERNAL COMBUSTION ENGINES

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ABSTRACT OF THE DISCLOSURE

An indicating device for use in the finishing of a built-up valve in which the face of the valve will be cut to proper size and shape. The device includes feelers which engage surfaces of the valve so as to give an indication of the changes in size of the valve.

This invention is for apparatus for the rebuilding of valves for internal combustion engines.

The exhaust valves on diesel engines are subject to high temperature and the degrading effects of high temperature. These exhaust valves are damaged in operation. Some of the damage is due to metal burning away, the collection of carbon and impurities on the valves and, even, the chipping of the valves. I have worked with the rebuilding of valves and have developed this method and accompanying apparatus for said rebuilding. In fact, from discussions and comments from users of these rebuilt valves, in certain instances, it appears that the rebuilt valve has a longer life and gives more satisfactory service than some of the new available valves.

Accordingly, an object of this invention is the provision of a rebuilt valve having a long life; a rebuilt valve which is a high-quality valve; a low-cost valve; and a method for the rebuilding of valves which makes it possible to provide a rebuilt valve having properties equivalent to and, in some instances, greater than a new valve.

These and other important objects and advantages of the invention will be more particularly brought forth upon reference to the accompanying drawings, the detailed disclosure in the specification and the appended claims.

In the drawings:

FIGURE 1 is a view illustrating the apparatus used for cutting the valve face on the valve head and indicates when the valve face has been properly cut;

FIGURE 2 is a schematic wiring diagram illustrating the electric light indicator for indicating when the valve face has been properly cut on the valve head; and

FIGURE 3, taken on line 3—3 of FIGURE 1, is a fragmentary view looking at the outside surface of the head of the valve and illustrates the apparatus employed for indicating when the valve face has been properly cut on the valve head.

In the rebuilding of valves, I normally receive the valve in a used condition whereby there is carbon and other impurities on the valve. It is necessary to remove the carbon and other impurities. There are many ways of removing the impurities. Some of these are: to brush off the carbon, to sandblast the valve head or to turn the valve head on a lathe to get down to bare metal.

After the valve has been cleaned, it is inspected for

defects such as cracks or fissures or flaws. If there be numerous cracks or flaws in the valve head, or if there be a large crack or flaw in the valve head, the valve head is then discarded as it is not profitable to rebuild the valve. One of the ways to determine if a valve is suitable for rebuilding is to immerse it in a penetrating oil and, then, to allow the excess penetrating oil to drain. The valve is then washed in soap and water and dried. The valve is then placed in an oven and heated to approximately 150°–200° F. to drive the penetrating oil entrapped in a crack or flaw onto the surface of the valve. It is possible to see the oil on the surface of the valve to determine if a crack or flaw is too great for rebuilding the valve. Another way is to immerse the valve in a penetrating oil and, then, to allow the excess penerating oil to drain from the valve. The valve is washed with soap and water and dried. A developing powder such as chalk is placed over the valve and removed. The valve is then examined under an ultraviolet light. A crank or fissure in the valve is readily apparent when viewed under the ultraviolet light.

Then, the underside of the head of the valve and the valve section are enlarged or built-up. For example, I place the valve, head down and stem up, on a metal cooling block. The metal cooling block has cold water circulating through it. Naturally, this cools the head of the valve. Then, I weld onto the underside of the head of the valve and the throat an alloy comprising cobalt, chromium and tungsten. This alloy is known as "Stellite No. 6" and contains essentially about sixty-five (65%) percent cobalt, thirty (30%) percent chromium and five (5%) percent tungsten. By having the head of the valve on a cold cooling block, there is substantially no intermingling of the alloy, "Stellite No. 6," and the metal in the body of the valve. Or, in other words, the "Stellite No. 6" remains substantially free of valve body alloys. In this manner, the valve is filled up so that it can be shaped for further use.

Then, the head of the valve is modified. For example, the outer surface or the top surface of the valve, surface **10** as illustrated in FIGURES 1 and 3, is made flat by turning on a lathe cutting away excess metal. In most instances, it is not necessary to cut away excess metal to make surface **10** flat as the used valve has a sufficiently flat surface **10**. Further, the excess metal on the under side of the valve is cut away and the valve portion **12** of the valve to conform to proper configuration. The valve is cut away at **14** or the circular portion **14** is made to a predetermined diameter. Then, cutterhead **16** cuts away the underside of the valve to form a valve face **18**. The valve face **18** may have one of many angles such as: 23°, 30°, 45° and 51° to name a few.

In certain instances, it is desirable to shape the valve by removing a small portion at the periphery of the flat or outer surface **10** to form a slight bevel **20**.

At this stage there is a rebuilt usable exhaust valve for use in a diesel engine.

In FIGURES 1, 2 and 3, there is illustrated apparatus for finishing the valve and for cutting the valve face **18** on the valve head. This apparatus comprises a support rod **22** near the lathe. On the support rod **22** is a rotatable collar **24**. This rotatable collar **24** fits loosely on the support rod **22** and may be rotated around the support rod **22**. There is attached or welded to the rotatable collar **24** a positioning collar **26**. The positioning collar **26** is

positioned at right angles to the rotatable collar **24**, viz., longitudinal axis of the rotatable collar **24** is at right angles to the longitudinal axis of the positioning collar **26**. There is positioned in the positioning collar **24** a depending rod **28**. The depending rod **28** is positioned in the positioning collar **26** by means of upper adapter **30** and a lower adapter **32**. The ends of the positioning collar **26** are externally threaded. The adapters **30** and **32** are internally tapped and have openings in them for fitting with the depending rod **28**.

The depending rod **28** connects with a lock **34**. The depending rod **28** may be welded to the lock **34**. The lock **34**, by means of a cord **36**, connects with an electric light base **38** having light **40**.

An adjustment block **42** is attached to the lower end of the lock **34**. In the hole **48** there is positioned a support rod **54** for the fixed valve head feeler **56**. It is seen that the lower end of the rod **54** bends to the left to form the fixed valve head feeler **56**.

In the hole or opening **56**, there is positioned a protective tube **58** for the movable feeler.

Near the lower ends of the support rod **50** and the support rod **54**, there is positioned a guide block **60**. This guide block **60** has three passageways or openings **62**, **64** and **66**. The support rod **50** passes through the passageway **62**. The protective tube **58** is in the passageway **66**. The support rod **54** is in the passageway **64**.

With respect to the adjustment block **42**, there are two setscrews **68** for definitely positioning the support rod **50** in the passageway **44**. Also, there are two setscrews **70** for defienitely positioning the support rods **54** in the passageway **48**. The protective tube **58** is positioned in the passageway **46** by press fit or by being soldered or welded in place. With respect to the guide block **60**, there is a setscrew **72** for positioning the guide block **60** with respect to the support rod **50** in the passageway **62**. Also, there is a setscrew **74** for definitely positioning the guide block **60** with respect to the support rod **54** in the passageway **64**. Further, there are two setscrews **76** for definitely positioning the guide block **60** with respect to the protective tube **58**.

In the protective tube **58**, there is a movable feeler **80**. The lower end of the movable feeler **80** tapers at **82** to form a flat bearing surface **84**.

The upper end of the movable feeler **80** contacts the switchblade **86**. One side of the switchblade **86** contacts a lead **88** and the other side of the switchblade **86** contacts a lead **90**. The lead **90** contacts light fixture **38**. Also, a lead **92** contacts light fixture **38** and leads back to a source of electromotive force. Further, as is well understood, the lead **88** leads back to a source of electromotive force. In the adapter **38** is the incandescent light bulb **40**.

The valve **100** is placed in a lathe. This valve **100** has had the bell portion **12** shaped to the desired configuration. Also, the flat outer surface **10** of the valve **100** has been shaped to the desired configuration as well as the slight bevel or taper **20** on this flat outer surface **10**. Further, the diameter of the valve head as evidenced by the diametrical surface **14** has been reduced to the desired size. Therefore, at this point of the rebuilding of the valve, it is necessary to cut the valve face **18**. The apparatus, as illustrated in FIGURES 1, 2, and 3, is of assistance in the cutting of the valve face.

The apparatus is lowered or rotated so that the fixed valve head feeler **56** contacts the outer surface **10** and the fixed valve face feeler **52** contacts the shoulder or that portion of the valve which will become the shoulder and the flat surface **84** of the movable feeler **80** contacts the diametrical surface **14**. At this time, the valve face **18** has not been formed or cut. Therefore, the fixed valve face feeler **52** rides relatively high on the valve head. This means that the movable feeler **80** rides relatively low and the switchblade **86** is in an open position with respect to the leads **88** and **90**. The cutterhead **16** cuts away the inner undersurface of the valve head to form the valve face **18**. When the fixed valve face feeler **52** is far enough down on the valve face **18**, then the movable feeler **18** is elevated so as to close the switchblade **86** between the leads **88** and **90** so that the incandescent light **40** illuminates. At this time the operator of the lathe knows that the valve face **18** has been cut properly and the valve has been finished. Again, it is to be pointed out that the angle of the valve face **18** may be one of many angles dependent upon what the customer has ordered. For example, the valve face **18** may be of an angle of 20°, 30°, 45° and 51° to name a few.

From the foregoing it is seen that I have provided a method for rebuilding a valve and which method makes it possible to rebuild the valve which is satisfactory for use in diesel engines and which valve gives satisfactory service. Also, I have provided an apparatus which makes it possible to quickly show when the valve face has been properly cut on the valve head.

Although the rebuilding of the valve has been described and termed the rebuilding of an exhaust valve for a diesel engine, it is to be realized that an intake valve for a diesel engine can be rebuilt as well as an intake or an exhaust valve for gasoline engines and kerosene engines. Usually, the intake valve does not suffer the wear that an exhaust valve suffers. Therefore, an intake valve is usually not rebuilt. Further, the exhaust valve in a gasoline engine or a kerosene engine is usually not rebuilt. It is usually more economical to buy new exhaust valves for gasoline or kerosene engines than it is to rebuild an exhaust valve. However, with a diesel engine, it is usually more economical, or less expensive, to rebuild an exhaust valve than to buy a new exhaust valve. This is especially so when the rebuilt exhaust valve gives equal or better service than a new exhaust valve gives.

As is well known, the valve stem in the valve portions of an exhaust valve are often made from an austenitic steel alloy. With proper heat treatment, the stem portions extend into ferritic head portions. The composition of such an alloy has, in addition to iron, chromium. Chromium, nickel, molybdenum and, maybe, some nitrogen. For example, there may be about 18% chromium, 4% nickel, about 3% molybdenum and about 0.15% nitrogen.

Having presented my invention, what I claim is:

1. An indicator for indicating the dimensions of a valve head, said indicator comprising:

(a) a fixed valve face feeler for contacting the shoulder of the valve head;

(b) a movable feeler for contacting the diametrical surface of the valve head;

(c) said valve face feeler and said movable feeler being at an angle to each other to account for the angle of the shoulder of the valve head with respect to the diametrical surface of the valve head;

(d) means to support the fixed valve face feeler and the movable feeler; and

(e) an indicator for indicating when the fixed valve face feeler and the movable feeler are in a predetermined desired position with respect to valve head.

2. An indicator according to claim **1** and comprising:

(a) said fixed valve face feeler contacting the valve face of the valve head;

(b) said movable feeler contacting the diametrical side of the valve head; and

(c) said means being a guide block for positioning the fixed valve face feeler, the movable feeler and the fixed valve head feeler with respect to each other.

3. An indicator according to claim **2** and comprising:

(a) a support rod;

(b) a rotatable collar on said support rod;

(c) a rod depending from said rotatable collar;

(d) said rod connecting with said means to support the fixed valve face feeler and the movable feeler;

(e) a guide for the movable feeler;

(f) said indicator comprising an electric light, a switch and an electric circuit for actuating the light; and

(g) a switch juxtapositioned to the movable feeler to close the circuit to actuate the electric light when the fixed valve face feeler, the movable feeler and the fixed valve head feeler are in a predetermined position with respect to each other.

References Cited

UNITED STATES PATENTS

3,042,909	7/1962	Pistoles	33—147 X
3,386,178	6/1968	Arnold et al.	33—147 X

FOREIGN PATENTS

Ad. 10,617	6/1908	Great Britain.
1,112,948	11/1955	France.

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U.S. Cl. X.R.

33—181; 51—103, 165, 236