April 21, 1925. 1,534,815

G. P. SETTER

ENGINE CYLINDER REPAIR METHOD AND APPARATUS

Filed Dec. 15, 1922

FIG. 1

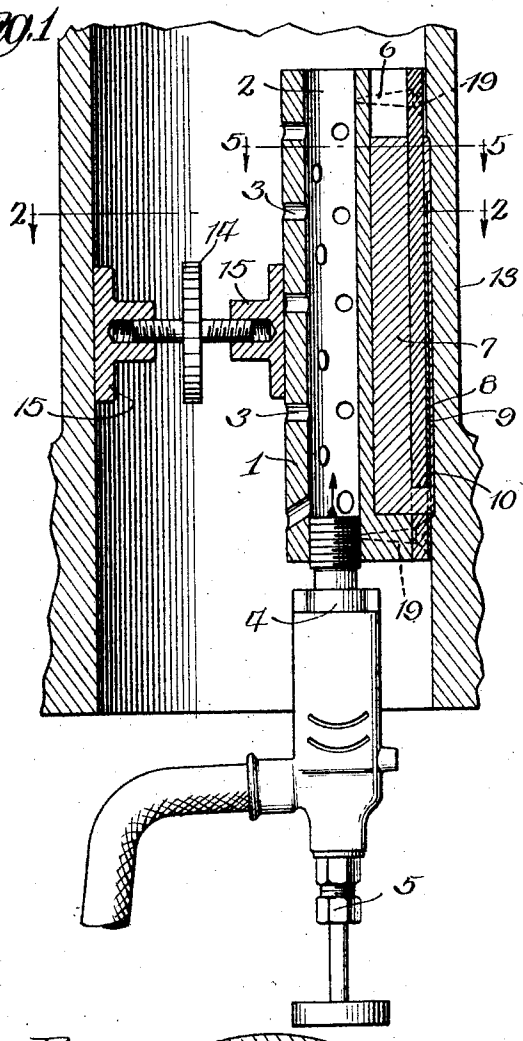


FIG. 3

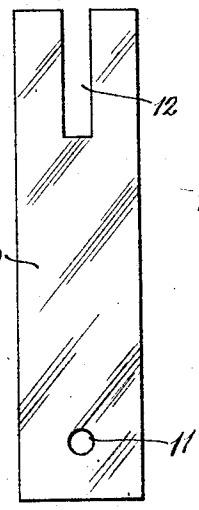


FIG. 4

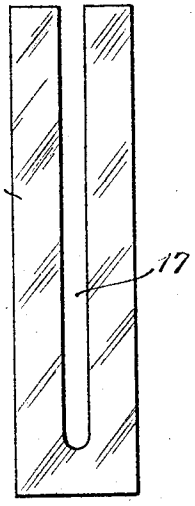


FIG. 5

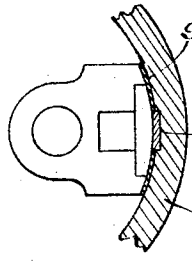
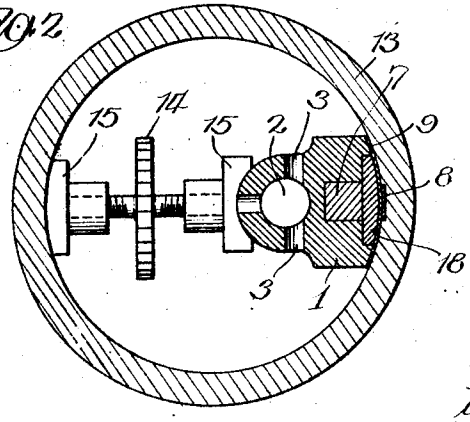


FIG. 6



FIG. 2



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UNITED STATES PATENT OFFICE.

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ENGINE CYLINDER REPAIR METHOD AND APPARATUS.

Application filed December 15, 1922. Serial No. 607,087.

To all whom it may concern:

Be it known that I, GEORGE P. SETTER, a citizen of the United States, and resident of Chicago, Cook County, Illinois, have invented a certain new and useful Improvement in Engine Cylinder Repair Methods and Apparatus, of which the following is a specification.

This invention relates to the repairing of internal combustion engine cylinders, such as those employed on automobiles, and particularly to the filling of grooves cut in the inner surface of the cylinder. Heretofore, this work has been done in various ways, necessitating taking out the cylinder and laying it on its side, so that metal could be melted and run into the groove to be filled. This, of course, is more or less expensive, inasmuch as the taking out of the engine and the replacement thereof is in itself a matter of some time and trouble. Furthermore, melting the metal and running it into the groove and inner surface of the cylinder, while the latter is cold, does not always result in securely anchoring the filling in the groove, and fillings applied in this way have very often dropped out or have been pulled out while being trimmed off before replacing the engine in the automobile, or in the motor boat or other place from which it was taken.

Generally stated, the object of the invention is to provide an improved method and apparatus for filling grooves or cavities in the inner surface of internal combustion engine cylinders, such as the grooves cut some times by the wrist pin, or in other ways, whereby it will not be necessary to remove the engine cylinders from their position in the automobile, or whether the engine is mounted, and whereby the fillings applied to the grooves or cavities will be anchored firmly therein, thus not only reducing the cost of doing this kind of work, but also ensuring better results than were obtained with methods heretofore employed for this purpose.

It is also an object to provide certain details and features of construction tending to increase the general efficiency and the desirability of an apparatus of this particular character.

To these and other useful ends the invention consists in matters hereinafter set forth and claimed and shown in the accompanying drawings in which—

Figure 1 is a vertical section of an internal combustion engine cylinder, showing certain portions thereof broken away for convenience of illustration, and showing a vertical section of the apparatus involving the principles of the invention, in operative position within the cylinder.

Figure 2 is a transverse or horizontal section on line 2—2 in Figure 1.

Figure 3 is a face view of a front plate of said apparatus.

Figure 4 is a face view of an intermediate plate or shim which may be used if the groove in the cylinder is of considerable depth, so as to allow for shrinkage of the filling.

Figure 5 is a horizontal section on line 5—5 in Figure 1.

Figure 6 is a similar view, but showing the filling apparatus removed, and showing the filling trimmed down smooth and flush with the inner surface of the cylinder.

As thus illustrated, the invention comprises a heating apparatus in the form of a torch body 1 having a vertical combustion chamber 2 and lateral openings 3 to admit air thereto. The burner 4, of any suitable character, is secured to the lower end of said torch body to supply the fluid fuel, such as gas or vapor, to produce heat. A valve 5 is provided to control the supply of fluid fuel, in a manner that will be readily understood. Said torch body also has a vertical chamber 6 which serves as a crucible or melting pot for the metal 7 which is to be used in filling the groove or cavity in the inner surface of the cylinder. In Figure 1, this groove is shown at 8, and it will be seen that the aluminum plate 9 is interposed between the curved outer side of the body 1 and the curved inner surface of the cylinder. Said torch body has an opening 10 through which the melted metal flows to the lower end of the groove in the cylinder, and the plate 9 has an opening 11 which registers with the opening 10 for this purpose. The upper portion of the plate 9 preferably has a slot 12 into which the overflow of the metal, when it rises in the groove 8, may flow and thus be observed by the operator or person doing the work, it being understood that the cylinder 13 is open at the

top for this purpose. Any of the well known metals known for this purpose can be used, and when melted such metal does not stick to the aluminum plate 9, but will adhere to the metal of the cylinder.

Now it will be seen that before the metal 7 is melted, the heat of the torch will heat the entire structure, including the cylinder, so that the metal will be permitted to run into a groove in a cylinder wall which is highly heated, and which has been heated as a matter of fact, to a temperature equal to or above the melting point of the metal to be used for the filling. Thus the filling tends to adhere tightly to the cylinder, in the groove or cavity in which the metal is caused to flow upwardly, for as soon as the metal is melted and assumes a liquid condition it will rise in the groove 8 until it reaches the level lof the other metal in the chamber 6 of the torch body. The person doing the work can then turn the valve 5 and stop the heat and thus stop the operation and permit the metal to cool.

Any suitable means can be employed for holding the apparatus in place. For example, as shown in Figure 1, a screw 14 can be threaded in the blocks 15 and the latter can bear respectively against the torch and the other side of the cylinder, and the screw when tightened to push the blocks away from each other will firmly hold the apparatus in position against the scored or grooved side of the cylinder.

Sometimes, of course, the scoring or groove or cavity is so deep that it requires a considerable amount of metal to fill it, and in such case the filling may shrink when it cools to such an extent that the outer surface of the filling will not be flush with the surface of the cylinder. In such cases, the auxiliary aluminum plate 16 can be employed, having the vertical slot 17 opposite the groove to be filled. This plate 16 may be inserted as a shim between the plate 9 and the surface of the cylinder, so that the filling will not only fill the groove in the cylinder, but will also fill the slot 17 and thus protrude slightly beyond the surface of the cylinder. However, when the filling cools, the shrinkage will then be about equal to the thickness of the plate 16, and the outer surface of the filling will be found to be practically flush with the surface of the cylinder. The thickness of the plate 16 will depend, of course, upon the depth of the groove to be filled, and the character of the metal employed for the filling, as some metals have more shrinkage than others. For ordinary purposes, however, the thickness of the plate 16 may be the same as the thickness of the plate 9, in case the groove or scoring of the cylinder is of such depth that a little allowance must be made for shrinkage of the filling.

Now the method and apparatus shown can be used, it will be seen, without taking the engine out, as the operation is performed while the engine remains in vertical position. In other words, it is not necessary to take the engine cylinders out and lay them down horizontally in order to flow the metal into the grooves or cavities in the cylinder. To the contrary, the engine cylinder remains in position; the engine cylinder is heated while the metal is being melted within the cylinder; the metal is supplied to the lower end of the groove in the cylinder and forced upward therein; and thus a filling is made in the form of a casting in the mold formed on one side by the groove in the cylinder and on the other side by the smooth surface of the apparatus. It will be understood, of course, that a plunger (not shown) may be inserted in the upper end of the chamber 6, if necessary, to positively force the metal down therein and thus force the molten metal upward in the groove in the cylinder. Ordinarily, it will be understood, the weight of the metal in chamber 6 is sufficient to force it through the openings 10 and 11 into the lower end of the groove 8, and then upward in the latter. Positive pressure, however, can be supplied, if necessary, in any suitable manner. The molten metal enters one end of the groove and flows along the groove to the other end thereof, and this may be done vertically as shown in order to obviate the necessity of taking the engine out of the automobile, or away from the other place where it is being used, so that considerable expense is thus avoided by using the method shown and described.

The torch body can be constructed in any desired or suitable manner, but it is preferably provided with a removable front wall 18 which contains the opening 10 previously mentioned. The main body of the torch can be made of cast iron or of any suitable metal, but the front wall 18 is preferably of copper or brass, and this plate may be held in place by screws 19, shown in dotted lines in Figure 1, or by any suitable means, whereby it can be removed when necessary or desirable.

What I claim as my invention is—

1. The method of filling grooves or cavities in the inner surface of an internal combustion engine cylinder, comprising the maintaining of the cylinder in vertically disposed position, the melting of the metal and the flowing thereof to the lower end of the groove in the cylinder, causing the molten metal to rise in said groove, under confinement therein, and allowing the metal to cool to form a permanent filling for said groove.

2. A method as specified in claim 1, comprising also, in combination with said other steps, the heating of the cylinder wall by

the operation of melting the metal to be used for the filling, so that the metal in rising in said groove has contact only with the confining surfaces which have been preheated to the temperature of the molten metal itself.

3. A method as specified in claim 1, comprising also, in combination with said other steps, the preheating of the cylinder wall to a temperature substantially the same as the temperature necessary for melting the metal to form the filling, so that the groove in the cylinder wall is preheated to facilitate the filling thereof by easy flow of the molten metal therein, and to cause the molten metal to more firmly adhere to the engine cylinder.

4. The method of filling grooves in the inner surface of internal combustion engine cylinders, comprising the closing of the outer side of the groove, to form a cavity, and the flowing of molten metal from one end of said cavity to the other, under confinement, to produce a filling in the form of a casting in said groove.

5. A method as specified in claim 4, comprising also, in combination therewith, the preheating of said groove to facilitate the flow of metal therein, and to ensure adhesion of the filling to the metal of the cylinder.

6. A method as specified in claim 4, comprising also, in combination therewith, the use of the heat for melting the metal to preheat the cylinder wall to substantially the same temperature, so that the metal for the filling is flowed freely in contact with surfaces having substantially the same temperature, the metal for the filling being melted close to the groove for this purpose.

7. The method of filling grooves in the inner surface of internal combustion engine cylinders, comprising the mounting of the cylinder in vertically disposed position, and the flowing of the molten metal in the groove while the engine cylinder remains in said position, by confining the molten metal in said groove until it cools therein.

8. Apparatus for filling grooves in the inner surfaces of motor vehicle internal combustion engine cylinders, comprising means to provide a smooth surface to confine the molten metal in the groove, means for melting the metal for the filling, having an opening to supply said molten metal to the one end of said groove, so that the metal will flow between the groove and said confining surface, and means to removably hold the apparatus in position in the engine cylinder, while the cylinder is in position, thereby to obviate the necessity of removing the engine from the vehicle.

9. Apparatus as specified in claim 8, said smooth surface being formed by an aluminum plate.

10. Apparatus as specified in claim 8, in combination with a thin plate interposed between the engine cylinder and said confining surface to allow for shrinkage of the filling when the depth of the groove is such as to require such allowance for shrinkage, said interposed plate having a slot into which the filling protrudes, before the filling cools, so that the thickness of this plate determines the allowance made for shrinkage.

11. Apparatus as specified in claim 8, said melting means comprising a burner and a torch-like body having a melting cavity or chamber therein, with said feed opening leading from the bottom of said chamber to the lower end of the groove in the cylinder.

12. The improved apparatus for filling grooves in the inner surfaces of internal combustion engine cylinders, operative while the cylinder is in vertically disposed position, substantially as shown and described.

13. The method of filling grooves or cavities in the inner surface of an internal combustion engine cylinder, comprising the closing of the outer side of the groove, to form a cavity, flowing molten metal in said groove, under confinement therein, allowing the metal to cool and adhere to the cylinder, and removing the confining means, so that the filling for the groove will have a smooth outer surface.

GEORGE P. SETTER.