H. S. SHAFER.

CARBON REMOVING MEANS FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED MAR. 11, 1918.

1,306,637. Patented June 10, 1919.

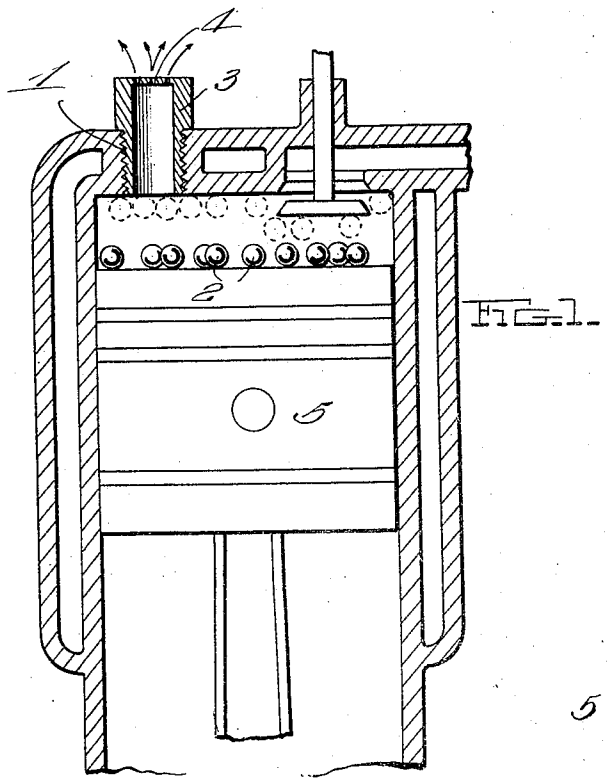



FIG. 1.

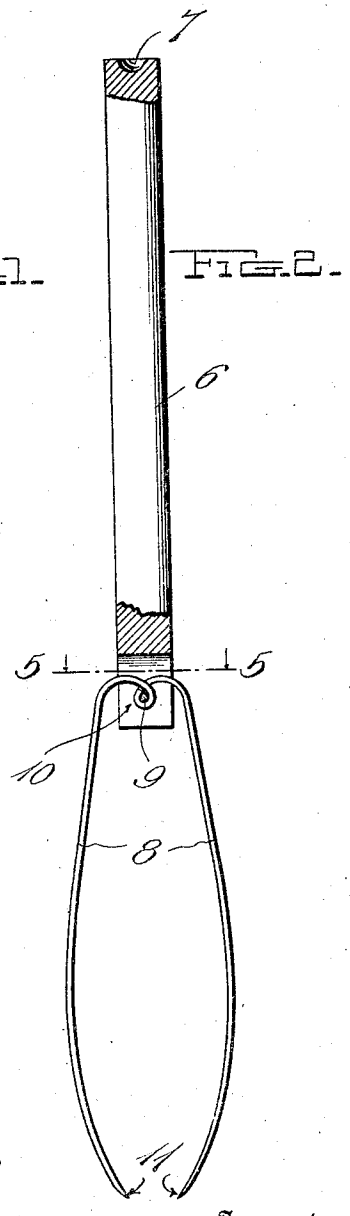



FIG. 2.

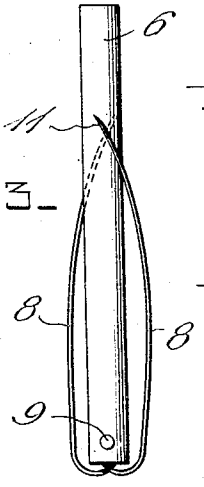



FIG. 3.

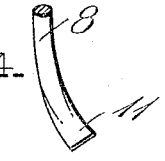



FIG. 4.

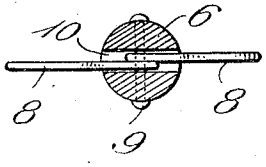



FIG. 5.

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# UNITED STATES PATENT OFFICE.

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## CARBON-REMOVING MEANS FOR INTERNAL-COMBUSTION ENGINES.

1,306,637. Specification of Letters Patent. Patented June 10, 1919.

Application filed March 11, 1918. Serial No. 221,871.

*To all whom it may concern:*

Be it known that I, HOWARD S. SHAFER, a citizen of the United States, residing at Nazareth, in the county of Northampton and State of Pennsylvania, have invented certain new and useful Improvements in Carbon-Removing Means for Internal-Combustion Engines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has for its object to provide extremely simple and inexpensive, yet highly efficient means for removing carbon from the cylinders of internal combustion engines without the necessity of removing any parts except the spark plugs and without filling the cylinders with injurious liquids or compounds, scraping said cylinders or burning the carbon therefrom.

With the foregoing object in view, the invention resides in the novel features of construction and unique combinations of parts to be hereinafter fully described and claimed, the descriptive matter being supplemented by the accompanying drawing which forms a part of this specification and in which:

Figure 1 is a vertical section of an internal combustion engine showing the carbon loosening balls in the cylinder and the carbon discharge plug threaded in the usual spark plug opening;

Fig. 2 is a side elevation partly in section showing the tool which is employed for removing the balls from the cylinder;

Fig. 3 is a side elevation of the tool in folded position;

Fig. 4 is a detail perspective view showing the terminal of one of the fingers with which the tool is provided; and

Fig. 5 is a transverse section of the tool on the plane of the line 5—5 of Fig. 2.

In order to loosen the carbon from the cylinder and piston, I remove the spark plug from the usual opening 1 and drop a plurality of steel balls or other suitable bodies of metal 2 into the cylinder through the opening, said opening being then closed by a plug 3 which is perforated as shown at 4 to permit the loosened carbon to be blown from the cylinder upon the compression strokes of the piston 5, the exhaust strokes of said piston discharging some of the carbon through the open exhaust valve and some through said plug. After placing the balls 2 in the cylinder and applying the plug 3, the engine is either run for several minutes under its own power or is otherwise operated, so that said balls are forcibly thrown against the cylinder and piston heads to effectively loosen the carbon therefrom, this carbon being discharged from the cylinder as above set forth. For the purpose of removing the balls 2 from the cylinder, a bar magnet 6 is provided, one end of said magnet having a socket 7 to receive the balls while one or more wire fingers 8 are connected to the other end of said magnet, two of said fingers being preferably employed. These fingers are bent inwardly and pivoted at 9, for movement independently of each other in a kerf 10 of the magnet 6 and when not in use may be folded oppositely against the sides of said magnet as shown in Fig. 3. When the fingers are extended to the proper extent however they may be inserted through the spark plug opening 1 to move the balls 2 toward said opening, so that when the other end of the magnet 6 is inserted, the balls will be within the magnetic field thereof. The free ends of the fingers 8 are by preference flattened as seen at 11 to prevent these fingers from slipping under the balls without moving the latter in the required direction.

From the foregoing, taken in connection with the accompanying drawing, it will be obvious that I have provided an extremely simple and inexpensive arrangement of parts for removing carbon from the engine cylinders, yet that the device will be highly efficient, it being of course understood that the opening of the engine valves will dictate the size of the balls 2, it being essential that these balls be of such size as to prevent interference with the proper operation of the valves. Since probably the best results are obtained from the several details shown and described, these details are preferably employed, but within the scope of the invention as claimed, numerous minor changes may well be made.

I claim:

1. A tool for removing small bodies of metal from engine cylinders comprising a magnet insertible into the cylinder, and a finger carried by said magnet for moving said bodies of metal into the active field thereof.

2. A tool for removing small bodies of

metal from engine cylinders comprising a bar magnet insertible in the cylinder and having in one end a kerf, and a wire finger pivoted at one end in said kerf for moving said bodies of metal into the active field of said magnet.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

HOWARD S. SHAFER.

Witnesses:
MATTIE M. WOODRING,
WILSON E. BECK.

**Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."**