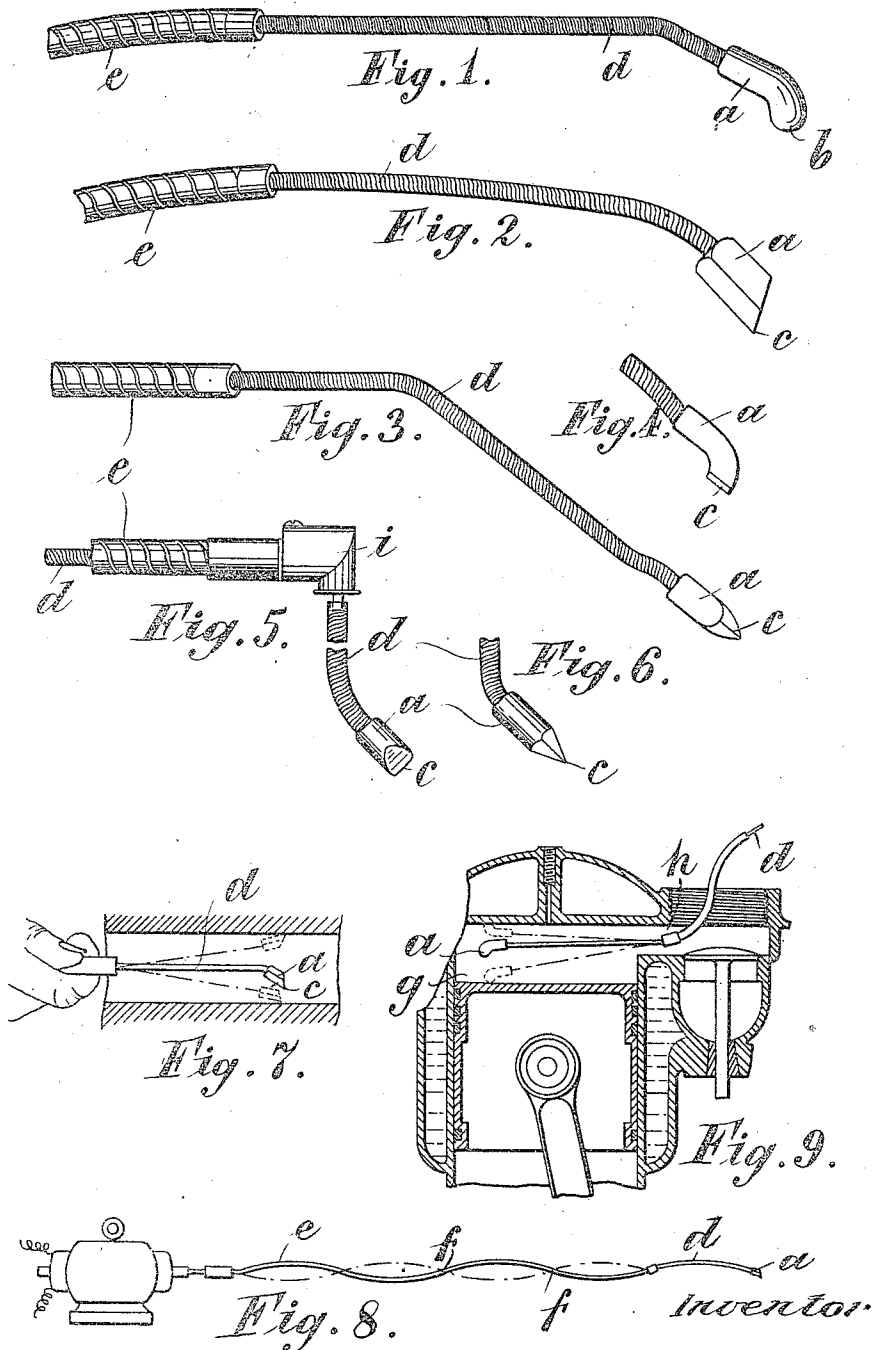


G. CALVERT.
 COMBUSTION ENGINE CLEANER.
 APPLICATION FILED MAR. 7, 1911.

1,053,007.

Patented Feb. 11, 1913.



Witnesses:
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UNITED STATES PATENT OFFICE.

GEORGE CALVERT, OF STOKE NEWINGTON, LONDON, ENGLAND, ASSIGNOR TO MECHANICAL DECARBONISING SYNDICATE LIMITED, OF LONDON, ENGLAND.

COMBUSTION-ENGINE CLEANER.

1,053,007.

Specification of Letters Patent.

Patented Feb. 11, 1913.

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To all whom it may concern:

Be it known that I, GEORGE CALVERT, a subject of the King of England, residing at 100 Evering road, Stoke Newington, in the county of London, England, have invented certain new and useful Improvements in Combustion-Engine Cleaners; and I do hereby 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, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to an apparatus for scarifying or burnishing surfaces which are not easily accessible with tools of the ordinary kind, the invention being especially applicable for instance, to the decarbonizing of piston heads, or combustion chambers, of internal combustion engines without necessitating dismounting of the cylinders.

According to the present invention an unbalanced tool, which may be provided or not with a cutting edge, is mounted on the free end of a flexible shaft, so that when the shaft is rotated at a suitable speed a vibratory action is set up, and when the tool is brought into contact with the surface to be treated the said surface is subjected to a very rapid succession of blows, or a hammering action. Provision may also be made for adjusting the point of support of the shaft in relation to the tool or free end of the shaft, so that the nature of the vibrations may be varied.

In the accompanying drawings Figure 1 is a view of one form of tool according to the invention. Fig. 2 is a similar view of one form of scarifying tool having a cutting edge. Figs. 3 and 4 are two views of another form of scarifying tool. Fig. 5 is a view illustrating an alternative mode of driving a scarifying tool, Fig. 6 being a view of an alternative form of tool for use with the arrangement shown in Fig. 5. Figs. 7 and 8 are diagrams illustrating vibrations which are set up when the tool is in use. Fig. 9 illustrates one application of the invention to the decarbonizing of a piston and combustion chamber of an internal combustion engine.

In carrying out the invention according to one mode a tool *a*, which may have a

rounded nose *b*, Fig. 1, for burnishing, or may be provided with a cutting edge *c*, Fig. 2, is mounted on the free end of a flexible shaft *d*, which is provided with the usual non-rotating casing *e*.

The casing *e*, does not extend to the tool *a*, but is stopped short so as to leave a part of the shaft *d*, unrestrained and free to oscillate. The tool *a*, is also so arranged that it is unbalanced in relation to the axis of the shaft *d*, so that when the shaft is rapidly rotated the tool *a*, will not only rotate, but an intense vibratory action will be set up. It is sometimes found in practice that this vibration is not confined to the uncovered portion of the shaft *d*, but is transmitted to the remainder of the shaft in the form of transverse or harmonic vibrations as indicated in Fig. 8. When such occurs the casing *e*, may be held by the operator without inconvenience, at any one of the nodes *f*, the tool *a*, taking up a position approximating to a node and steadily vibrating with short regular vibrations. When, however, the tool is brought into contact with a hard surface it violently rebounds and rapidly strikes the surface with hammerlike blows, the frequency and intensity of which depend upon the speed of rotation of the shaft.

If the tool is inserted between two surfaces as indicated diagrammatically in Fig. 7, it rapidly rebounds from one to the other. This action is utilized according to the invention for the purpose of removing the carbon from interior surfaces which are not easily accessible by ordinary tools, for example, it may be used with advantage in the decarbonizing of the piston and combustion chamber of an internal combustion engine as indicated in Fig. 9. The tool is inserted into the cylinder *g*, through the usual valve passage *h*. The flexible shaft *d*, is rapidly rotated, for instance by an electric motor, and is moved about by the operator, so that the tool *a*, strikes all the adjacent surfaces of the piston and combustion chamber, loosening the carbon deposits thereon.

The tool shown in Fig. 2 is intended for decarbonizing the greater part of the surface of a piston and combustion chamber, while the tools shown in Figs. 3 to 6 are intended for treating the angles or other positions not so easily accessible with the

- tool shown in Fig. 2. In Fig. 5 the free portion of flexible shaft *d*, carrying the tool *a*, is shown mounted upon a casing *i*, containing bevel gearing such as is commonly adopted in connection with dental drills. After the surfaces have been treated with tools such as shown in Figs. 2 to 6 they may be finished or burnished with a round nosed tool such as shown in Fig. 1.
- 10 If desired the casing *e*, may be held or supported at its end adjacent to the uncovered end of the shaft *d*, and in order that the vibratory action may be varied, this end of the casing *e*, may be fitted with a sliding sleeve or be otherwise rendered adjustable in order that its position in relation to the tool *a*, or the length of the uncovered portion of the shaft *d*, may be varied to alter the vibratory action of the tool.
- 20 It will be understood that the invention is applicable for other surfaces than those above mentioned, for instance, it may be applied to the cleaning of tubes, the form of the tool on the free end of the unre-

strained portion of the shaft being varied to suit the nature of surface to be treated.

Claims—

1. A device of the character described comprising a flexible shaft, a handle on said shaft, a hammer directly and rigidly secured to the free end of said shaft, said hammer having an unbalanced portion to one side of the center of the shaft, and means to rapidly rotate said shaft to produce a series of successive blows on the surface being operated on.

2. In a device of the character described comprising a flexible shaft, an unbalanced hammer directly and rigidly secured to the free end of the shaft, and a handle on the flexible shaft.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GEORGE CALVERT.

Witnesses:

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