UNITED STATES PATENT OFFICE.

WILLIAM E. AHERN, OF WESTFIELD, MASSACHUSETTS.

METHOD OF DECARBONIZING INTERNAL-COMBUSTION ENGINES.

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To all whom it may concern:

Be it known that I, WILLIAM E. AHERN, a citizen of the United States of America, residing at Westfield, in the county of Hampden and State of Massachusetts, have invented a new and useful Method of Decarbonizing Internal-Combustion Engines, of which the following is a specification.

My invention relates to improvements in methods of removing carbon deposits from the cylinders, combustion-chambers, piston heads, valve heads, piston-rings, etc., of internal-combustion engines, and consists in introducing into the engine combustion-chamber and cylinder, while the latter are hot, a refrigerating liquid, that is, a liquid which gives up its latent heat rapidly, when subjected to the agitation of vaporization, and so causing to be broken up and finely disintegrated the carbon deposits, by reason of the physical action of said liquid on the carbon, as hereinafter more fully set forth.

The refrigerating liquid shatters the hot carbon, when brought into contact therewith, just as most solids are shattered when in a heated state and suddenly subjected to extreme cold in the form of liquid, the action produced when cold water is poured on a hot plate of glass being somewhat analogous.

It is a well known fact that one of the principal difficulties encountered in the operation of the internal-combustion engine is due to the accumulations of carbon or carbonaceous deposits on the interior of the walls of the cylinder or cylinders and combustion-chamber or -chambers, on the head or heads of the pistons and valves, and on other parts, of the engine, such deposits being very hard and flintlike, and presenting an uneven or granular surface with some portions considerably elevated above surrounding portions. These deposits and especially the more elevated portions thereof become heated to such a degree that the incoming charges of explosive mixture are prematurely ignited and caused to explode, with the result that the engine is caused to give forth a sound commonly termed a "knock," and the even, constant, and efficient operation of the engine is materially affected in a deleterious manner, to say nothing of the consequent excessive wear and tear.

The primary object of my invention is to eliminate the hereinbefore mentioned difficulty by providing a method whereby all carbon deposits can be expeditiously, economically, conveniently, and thoroughly removed, and the engine parts affected can be kept free and clear.

A further object of the invention is to provide a decarbonizing method or treatment that can be discontinued at any time and resumed at any time, the engine being used between the two periods and immediately after discontinuing said treatment, if desired, since there is nothing about the treatment to prohibit or interfere with the immediate use of the engine upon the discontinuance of the treatment, that is, the discontinuance of the introduction of the liquid. The treatment as a whole may not and generally will not be at an end when the introduction of the liquid ceases, inasmuch as the disintegrating process continues as long as any carbon remains and while there is liquid to act thereon, but the treatment so far as the operator is concerned may be said to end upon the discontinuance of the introduction of said liquid. The ability to discontinue the treatment at any time and then to use the engine is an advantage of great importance when engines are involved which are liable to be needed at any moment, as those used for fire apparatus for example.

Another object is to provide a decarborizing method in the carrying out of which no changes of adjustments of accessory parts of the engine are necessary, and no parts need be removed.

Still another object is to provide a decarbonizing method that is absolutely harmless, being incapable of injuring either the operator or the engine.

The treatment is usually applied while the engine is in operation so that all foul parts can be reached by the liquid and the latter will be driven into or against such parts, the whole of the disintegrated mass will be forced out with the waste gases, by the exhausting devices of the engine, and the vaporization and consequent cooling of the liquid will be promoted. When the engine is permitted to run, every particle of the disintegrated matter is removed therefrom. The carbon deposits are reduced by this treatment to such a state or condition of fineness that the removal of the same by the exhaust of the engine causes no injury to the valves and valve-seats.

Heretofore various methods have been resorted to for getting rid of the carbon in

engines, such as burning it out by means of a jet of oxygen and a lighted match, applying a so-called carbon solvent solution (there really being no solvent for carbon) to the carbon for a predetermined period, or disassembling and scraping the parts, but neither in these methods nor any other prior method is the physical law involved in my method made use of, nor is it possible to attain the same results.

The method in detail consists in introducing, through the air-intake of the carbureter, or through any convenient opening in the tube leading from the carbureter to the engine-cylinder or cylinders, into said cylinder or cylinders and combustion-chamber or combustion chambers, while such members are hot and the engine is in operation, a refrigerating liquid which is immediately vaporized and cooled and shatters the carbon deposits as soon as said liquid contacts with said deposits, and in exhausting the disintegrated matter. Stated in other words, the method consists in suddenly contracting and so shattering the carbon deposits, by applying thereto while they are in a heated state a liquid the temperature of which is low, and in removing by exhaustion the shattered particles. Since the refrigerating liquid is introduced into the compression space in the engine, it is possible that all of the carbon may not have left such space by the time the operator ceases to pour in said liquid, but if the engine be left in operation for a few minutes the residue will very quickly disappear.

Ammonia becomes very cold when agitated, wherefore it is a good liquid to employ in connection with my method, but should be mixed with water in the proportions of about eighty per cent. (80%) water and twenty per cent. (20%) ammonia. Ammonia is also a valuable agent in this method for the reason that it is noncombustible as well as being a rapidly cooling liquid when subjected to the agitation of vaporization. A combustible or inflammable liquid would not be practical, as will readily be understood.

I do not desire or intend to be restricted or confined to the use of ammonia and water, but reserve the right to employ any other suitable agent or medium, also to modify the treatment or method in some matters of detail, without, of course, exceeding the scope of my claims.

The amount of liquid necessary, and the time required in any given case wherein the method is applied, depends upon the nature of such case. Roughly estimated, from a quart to a gallon of the liquid is sufficient, and from ten to thirty minutes is the time required. After an engine has been thoroughly cleared of carbon by my method, it may be kept so by repeating the treatment at more or less frequent intervals, a little of the liquid being introduced from time to time to bring about the desired result.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A method of decarbonizing internal-combustion engines, consisting in subjecting the carbon deposits, while in a heated state, to the physical action of a non-combustible refrigerating liquid, and in removing the resultant.

2. A method, of decarbonizing internal-combustion engines, consisting in subjecting the carbon deposits, while in a heated state, to the physical action of a non-combustible refrigerating liquid, and in exhausting the resultant.

3. A method, of decarbonizing internal combustion engines, consisting in contracting and shattering the carbon deposits, by subjecting such deposits, when hot, to the action of a non-combustible cold liquid.

4. A method, of decarbonizing internal-combustion engines, consisting in contracting and disintegrating the carbon deposits, by applying to such deposits, while hot, a non-combustible liquid which becomes cold when subjected to the agitation of vaporization.

5. A method, of decarbonizing internal-combustion engines, consisting in contracting and disintegrating the carbon deposits, by subjecting such deposits, while hot, to the action of a non-combustible cold liquid, and in exhausting the disintegrated matter.

6. A method, of decarbonizing internal-combustion engines, consisting in introducing into the chambered parts of an engine, wherein and whereon carbon deposits are present, while said engine is in operation and said parts are in a non-combustible heated state, a refrigerating liquid, and in utilizing the exhaust of said engine in freeing said parts from the matter disintegrated by the action of said liquid on said deposits.

WILLIAM E. AHERN.

Witnesses:
F. A. CUTTER,
ROSCOE R. MOODY.