UNITED STATES PATENT OFFICE.

ABRAHAM LOUIS METZ AND GILBERT O. BERGERON, OF NEW ORLEANS, LOUISIANA.

CARBON-REMOVER.

1,307,562. Specification of Letters Patent. Patented June 24, 1919.

No Drawing. Application filed January 18, 1918. Serial No. 212,492.

To all whom it may concern:

Be it known that we, ABRAHAM L. METZ, and GILBERT O. BERGERON, citizens of the United States, residing at New Orleans, in the parish of Orleans and State of Louisiana, have invented certain new and useful Improvements in Carbon-Removers, of which the following is a specification.

It is well known that in the operation of internal combustion engines it is necessary periodically to remove the layer or film of carbon which is deposited on the cylinder walls, piston, valves, and spark plug, in order to keep the engine in good running condition. Heretofore this has usually been done by removing the cylinder head and scraping off the crust of carbon with a sharp instrument. It has been proposed to remove this carbon deposit by introducing into the cylinder a liquid compound which would dislodge the carbon. The compounds thus far proposed, however, have been impractical for the purpose, some because they were ineffective in dislodging the entire crust of carbon, others because they were too slow to be preferable over the old scraping method, and others because they tended toward a corrosive or other injurious effect upon the metals of the parts with which they came into contact.

It is the object of our invention to produce a novel carbon-removing compound which will attack the film of carbon and dislodge it in a very short space of time, more quickly than any compound now known; which will be efficient and thorough in its action and will leave the coated surface clean and bright; which will not have any corrosive or injurious effect upon the metals; and which requires no experience or skill to use it properly and effectively.

A further aim of the invention is to produce a carbon remover which is so compounded as to raise the flash-point so as to minimize the danger from imflammability in handling or storage of the compound.

The deposit of carbon in an engine is due partially to incomplete combustion and partially to the cracking or splitting of the oil (either fuel or lubricating oil or both) which cracking results in the forming of a film of oil about the fine carbon particles and causing them to adhere together and to the exposed surfaces in the combustion chamber. The continuing action forms a coating of gradually increasing thickness which is hardened and compacted by the high temperature and pressure in the combustion chamber.

A compound embodying our invention is a neutral volatile solvent of oils and has a high vapor tension and pressure which becomes greater as the engine is heated. It is highly penetrating and enters the interstices of the carbon layer and permeates the latter and dissolves the molecular film of oil that causes the carbon particles to cohere and to adhere to the exposed surfaces in the combustion chamber. As a result of the action of our compound upon the oil film, the carbon crust is reduced to a finely comminuted condition and, assisted by the heat in the combustion chamber, is changed into a dry powder of soot-like fineness, which powder is readily blown out through the exhaust passages when the engine is operated.

Our improved compound comprises a major ingredient of benzolic character, that is, derived from fractional distillation of coal tar, for example, benzol, or petroleum ether which is a distillate from petroleum. Either is a solvent of oils. About half or a little over half of the entire volume of the compound may be made up of this ingredient. The major portion of the remaining half in volume is preferably an alcoholic ingredient, the lower alcohols of the paraffin series, such for example, as wood alcohol or denatured ethyl alcohol. A relatively small amount of acetone or its equivalent is included and also a small quantity of carbon-tetra-chlorid or the poly-chloro derivatives of ethylene and ethane, such as tetra-chloro-ethylene or tetra-chloro-ethane is employed. Carbon-tetra-chlorid is a highly penetrating oil solvent, and it has the further characteristic of raising the flash-point of the com-

pound, the ingredients of major quantity, that is, the benzolic and alcoholic ingredients referred to, being of very low flash-point. By raising the flash-point, the effectiveness of the compound is not impaired but on the other hand is improved, and at the same time the danger from inflammability in the handling of the compound and the storage of the same on dealer's shelves is reduced. To the foregoing ingredients, we preferably add a very small quantity (for example about one-tenth of one per cent. of the total volume) of naphthyl-methyl-ether or naphthyl-ethyl-ether, and also a similar quantity of or at least a trace of malachite green, or naphthol green, which gives color to the compound.

An illustrative compound embodying our invention may be prepared by combining:

Benzol	55	parts.
Wood alcohol	40	"
Acetone	4	"
Carbon-tetra-chlorid	1	"
Naphthyl-methyl-ether or naphthyl ethyl-ether	0.1	"
Malachite green	A trace.	

Another illustrative compound may comprise:

Petroleum ether	55	parts.
Methyl alcohol	35	"
Acetone	5	"
Carbon-tetra-chlorid	2	"
Naphthyl-methyl-ether or naphthyl-ethyl-ether	0.1	"
Malachite green	A trace.	

Another illustrative compound may comprise:

Benzol or petroleum ether	55	parts.
Denatured ethyl alcohol	40	"
Acetone	4	"
Carbon-tetra-chlorid	1	"
Malachite green or naphthol green	A trace.	

Another illustrative compound may comprise:

Benzol or petroleum ether	50	parts.
Denatured ethyl alcohol or wood alcohol	40	"
Acetone	5	"
Tetra-chloro-ethylene or tetra chloro-ethane	4	"
Naphthyl-methyl-ether or naphthyl-ethyl-ether	0.1	"
Malachite green	A trace.	

We have found by experiments that the proportions of the several ingredients may be varied somewhat and still give the desired results. The specific formula which we have found preferable and most efficient, however, is the following:

Benzol	55	parts.
Wood alcohol	40	"
Acetone	4	"
Carbon-tetra-chlorid	1	"
Naphthyl-methyl-ether	0.1	"
Malachite green	A trace.	

In use, a quantity of the compound is introduced into the cylinders of the engine in any suitable manner as through the pet cock or through the spark plug hole after removing the spark plug, and while this may be done when the engine is cold the action of the compound is expedited if it is introduced when the engine is hot or warm. In a short time the carbon crust will be disintegrated by the liquid and the vapor therefrom, and the engine may then be started up in the usual way. The dislodged carbon will be discharged through the exhaust passage in the form of fine powder or soot, leaving the surfaces in the combustion chamber clean and free from incrustation. If it is merely desired to clean the spark plugs, they may be removed from the cylinders and immersed in a quantity of the liquid compound in a receptacle for a short time.

We claim as our invention:

1. A carbon removing compound comprising a benzolic oil solvent forming about half in volume of the compound, an alcoholic oil solvent forming the major portion of the remaining half in volume of the compound, a relatively small quantity of acetone, a relatively small quantity of carbon-tetra-chlorid, an extremely small quantity of naphthyl-methyl-ether, and an extremely small quantity of malachite green.

2. A carbon removing compound comprising an benzolic oil solvent forming about half in volume of the compound, an alcoholic oil solvent forming the major portion of the remaining half in volume of the compound, a relatively small quantity of acetone, and a relatively small quantity of carbon-tetra-chlorid.

3. A carbon removing compound comprising

Benzol, about	55	parts.
Wood alcohol, about	40	"
Acetone, about	4	"
Carbon-tetra-chlorid, about	1	"
Naphthyl-methyl-ether, about	0.1	"
Malachite green	A trace.	

In testimony whereof we have hereunto set our hands.

ABRAHAM LOUIS METZ.
GILBERT O. BERGERON.

Correction in Letters Patent No. 1,307,562.

It is hereby certified that in Letters Patent No. 1,307,562, granted June 24, 1919, upon the application of Abraham Louis Metz and Gilbert O. Bergeron, of New Orleans, Louisiana, for an improvement in "Carbon-Removers," an error appears in the printed specification requiring correction as follows: Page 2, third formula, after line 43, insert the words and figures, *Naphthyl-methyl-ether or naphthyl-ethyl-ether—0.1 part;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 15th day of July, A. D., 1919.

[SEAL.]

R. F. WHITEHEAD,

Acting Commissioner of Patents.

Cl. 87—5.