

UNITED STATES PATENT OFFICE

WHEELER G. LOVELL AND THOMAS A. BOYD, OF DETROIT, MICHIGAN, ASSIGNORS TO
GENERAL MOTORS RESEARCH CORPORATION, OF DETROIT, MICHIGAN, A CORPORATION OF DELAWARE

METHOD AND MEANS FOR REMOVING CARBON DEPOSITS

No Drawing.

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This application relates to the removing of carbon deposits from internal combustion engines, and its principal objects are to provide chemical compounds which will readily
5 loosen the deposits and a method which will quickly and efficiently clean the carbon coated surfaces.

We have found that aliphatic amines having a boiling point of at least 150° F. when
10 used alone or with other compounds employed to remove varnish are effective carbon removers. When desirable, compounds may be employed with these aliphatic amines to assist in penetrating the carbon deposits or in
15 starting the engine after the carbon remover has been injected into the cylinders.

These aliphatic amines include the primary amines of which isoamylamine, ethanolamine, benzylamine, ethylene, diamine monohydrate, and hydroxyethylamine are examples;
20 the secondary amines of which di-isomylamine and diethanolamine are examples, and the tertiary amines of which tri-isoamylamine and triethanol amine are examples.
25 We use those aliphatic amines which boil above 150° F. to keep the carbon remover in the liquid state in a hot engine because the heat accelerates the solvent action of the liquid. Optimum conditions in a water cooled
30 engine are to heat the parts to just below the boiling point of water and employ an aliphatic amine which remains liquid at that temperature.

By way of a specific example, we may run
35 an engine until it is hot, then introduce into each cylinder about a tablespoonful of hydroxyethyl amine and let the engine set, preferably for an hour or more. After the engine
40 is started the loosened carbon is blown out the exhaust. The metal surfaces can also be cleaned by wiping the deposit off.

The carbon remover dissolves in the binder of the carbon coating, or the two may be mutually soluble, causing the binder and the
45 deposit as a whole to swell. The heat developed when the engine is started drives the solvent and some of the binder away leaving a somewhat porous and disintegrated mass
50 which is lightly held together and the rush of

gases blows the loosened carbon away when the engine is operated.

If the compound makes the engine more difficult to start it may be mixed with a more readily ignitable substance. For the aliphatic amines, alcohol or benzol or a mixture of
55 the two is preferred to gasoline. The mixture of alcohol and benzol also has the advantage that it renders the compound more fluid and in other ways assists in penetration into the
60 binder of the carbon deposit.

Other compounds, such as aniline, furfural, etc., which have a solvent action on varnish, may be employed with the aliphatic amines.

We claim:

1. The process of cleaning carbon deposits from an internal combustion engine which
65 comprises heating the carbon coated parts, placing on the carbon deposit an aliphatic amine which boils above 150° F., and removing the deposit.

2. The process of cleaning a carbon deposit from an internal combustion engine which
70 comprises running the engine until the carbon coated parts are heated, dissolving into the binder of the deposit an aliphatic amine which boils above 150° F., and blowing the loosened carbon out of the engine exhaust.

3. The process of cleaning a carbon deposit from an internal combustion engine
80 which comprises running the engine until the carbon coated parts are heated, dissolving into the binder of the deposit a primary aliphatic amine which boils above 150° F., and blowing the loosened carbon out the engine
85 exhaust.

4. The process of cleaning a carbon deposit from an internal combustion engine which
90 comprises running the engine until the carbon coated parts are heated, dissolving into the binder of the deposit hydroxyethylamine, and blowing the loosened carbon out the engine exhaust.

5. The process of cleaning carbon deposits from an internal combustion engine which
95 comprises heating the carbon coated parts, placing on the carbon deposit a primary aliphatic amine which boils above 150° F., and removing the deposit.

6. The process of cleaning carbon deposits 100

from an internal combustion engine which comprises heating the carbon coated parts, placing on the carbon deposit hydroxyethylamine, and removing the deposit.

5 7. A carbon removing compound comprising an aliphatic amine which boils above 150° F., and a solvent for varnish.

8. A carbon removing compound comprising a primary aliphatic amine which boils above 150° F., and a solvent for varnish.

10 9. A carbon removing compound comprising hydroxyethylamine, and a solvent for varnish.

15 10. A carbon removing compound comprising an aliphatic amine which boils above 150° F., and alcohol.

11. A carbon removing compound comprising a primary aliphatic amine which boils above 150° F., and alcohol.

20 12. A carbon removing compound comprising a primary aliphatic amine which boils above 150° F., benzol and alcohol.

13. A carbon removing compound comprising an aliphatic amine which boils above 150° F. alcohol and benzol.

25 In testimony whereof we affix our signatures.

WHEELER G. LOVELL.
THOMAS A. BOYD.

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