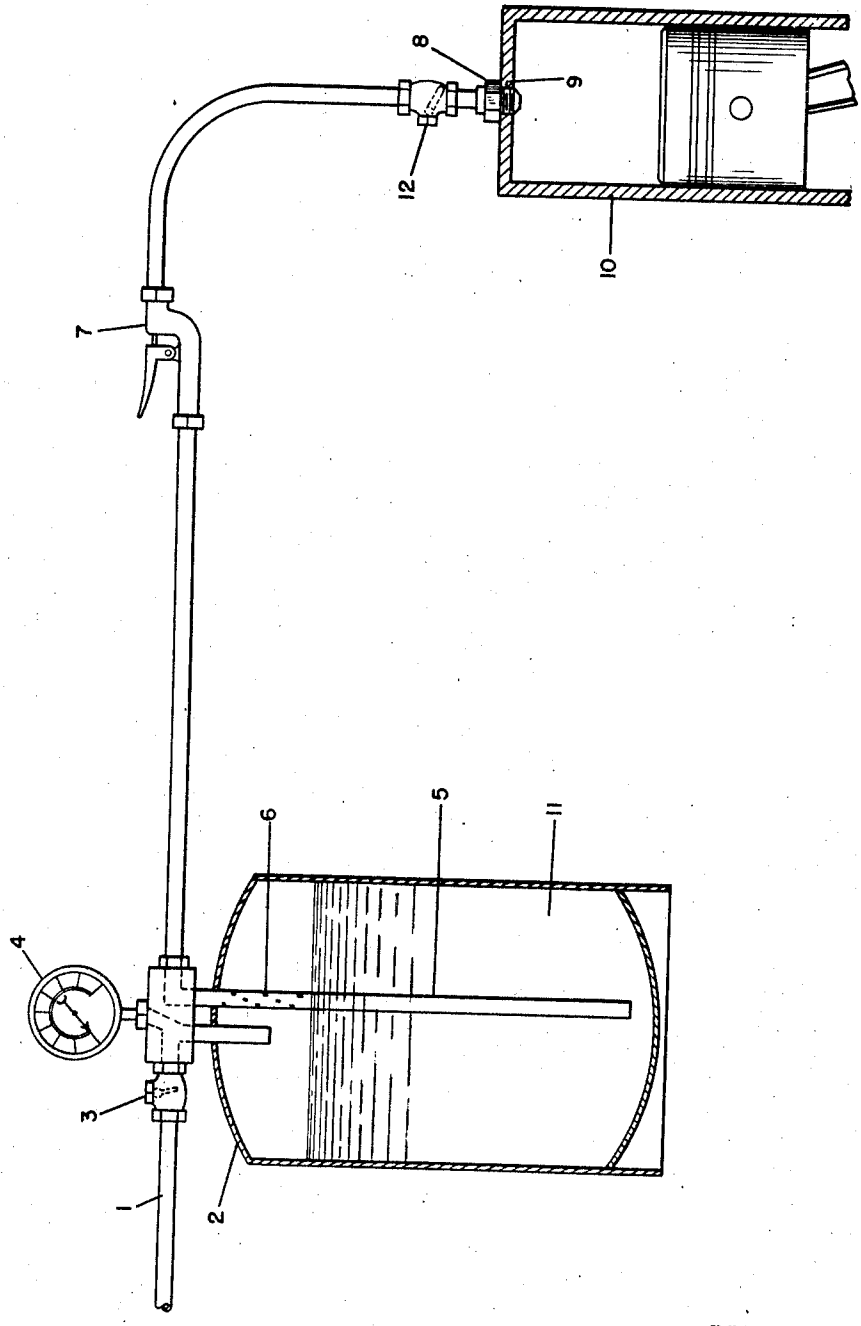
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GUM AND CARBON REMOVAL

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GUM AND CARBON REMOVAL

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1 Claim. (Cl. 123—198)

This invention relates, as indicated, to a new method of de-gumming and de-carbonizing internal combustion engines and the like and more particularly to a method whereby a greatly improved result is obtained in a period of treatment much shorter than that generally employed.

One of the chief causes of inefficiency in the operation of internal combustion engines of the automotive type is the formation of gum and "carbon" deposits on the cylinder walls, pistons, and valves. Such deposits may cause pre-ignition and "knocking," sticking of piston rings, shorting of spark plugs and burned and poorly seated valves. Stuck piston rings, poorly seated valves and delayed action of the valves due to sticky valve stems are common causes of loss of compression. So-called "carbon" deposits are composed of carbon and other solids bound together by gummy binders and may be either hard and brittle or soft and porous.

Other types of deleterious deposits common in internal combustion engines are "lead" deposits on valve stems comprising lead salts and gum from the breakdown products of unconsumed leaded gasoline, mixtures of gum and certain dyes used to color fuels which form particularly tough deposits, and varnish-like deposits caused by the leakage of certain anti-freeze solutions into the cylinders.

It is the present practice to remove the "carbon" by disassembling the parts and either burning the deposits or mechanically removing the same, or by running the engine until warm, turning off the ignition, and introducing a gum solvent through the spark plug openings. The solvent may also be introduced through the manifold. All such methods have been tedious, time-consuming, and only partially effective.

It is, therefore, a principal object of our invention to provide a new and improved method of treating internal combustion engines to remove gum and carbon deposits, which method will be both expeditious in operation and unusually effective in obtaining the result desired.

A further object is to provide a method which may be employed while the engine is running and yet permit introduction of a carbon gum solvent directly to the cylinder being treated.

It is also an object to provide a method of solvent treatment wherein the solvent is introduced in such a manner that it is distributed where needed and forced to penetrate the deposits.

Other objects of this invention will appear as the description proceeds.

To the accomplishment of the foregoing and related ends this invention, then, consists of the steps hereinafter fully described and particularly pointed out in the claim.

The annexed drawing and the following description set forth in detail one approved mode of carrying out the invention, such disclosed mode, however, constituting but one of the various ways in which the principle of the invention may be used.

Broadly stated, our invention comprises a new and improved method of de-gumming and de-carbonizing internal combustion engines comprising introducing into a cylinder of the engine being treated a mixture of a gas and a carbon gum solvent under pressure for a sufficient period to ensure penetration of the solvent throughout the gum and carbon deposits, and operating the engine during said period of introduction.

Our new method is also applicable to other devices or mechanisms comprising a piston-cylinder assembly such as air compressors and air-brakes in which gums generally, due to breakdown, oxidation and polymerization of the lubricating oil are often formed. The solvent is introduced in finely divided form under pressure and the pressure is then increased by operation of the device to force the solvent into the deposits wherever located.

More particularly, one embodiment of our new method comprises the introduction of the solvent to the cylinder of an internal combustion engine through the spark plug opening in atomized form in a stream of compressed air and operating the engine on the other cylinders so that on the up-stroke of the piston in the cylinder being treated an unusually high pressure is produced, a check-valve closing the compressed air line.

Said annexed drawing illustrates in diagrammatic fashion one type of apparatus which may be employed in carrying out the method of our invention. A line 1 leads from a gas pressure source (not shown) to the upper end of a pressure tank 2 shown in cross-section after passing through a check-valve 3 which serves to prevent any flow back along said line should the tank fall on its side, for example. A gauge 4 indicates the pressure in said tank 2.

Another line 5 which extends to near the bottom of the tank and passes out through the top thereof is perforated in its upper portion and above the level of the liquid with minute perforations 6. It then continues to a trigger valve 7 and after passing another check valve 12, shortly thereafter terminates in a fitting 8 adapted

to be screwed tightly in the spark plug opening 9 of the engine cylinder 10.

To carry out our method employing the above described apparatus the engine is operated until thoroughly warmed and the spark plug removed from one cylinder (or sometimes from two cylinders if V-8 or 12 cylinder engines are being treated). The fitting 8 is then screwed tightly in such opening, using two hoses if two cylinders are being treated simultaneously, and the trigger valve 7 opened. The engine is kept running on the remaining cylinders although it will generally be stopped when transferring to another cylinder to facilitate the removal and replacement of spark plugs. The gas from the pressure source, such as compressed air, enters the tank 2 where the pressure on the surface of the solvent 11 contained therein forces the solvent up the pipe 5 and into the engine cylinder. The compressed air is also forced through the perforations 6 in the pipe 5 where it mingles with the solvent to form a fog or mist and it is in this condition that the solvent enters the cylinder. It will be noted that there may thus be a very considerable pressure in such cylinder, depending on the pressure source, when the piston is at the bottom of its down-stroke. On the up-stroke there will, therefore, be created a much greater pressure since the check-valve 12 prevents any back flow past its situation. This very high pressure together with the manner in which the solvent is introduced assures of the thorough saturation and impregnation of the deposits with the solvent wherever they may be. Since the spark plug is absent there is no igniting spark and no portion of the solvent is consumed in the cylinder being treated although a certain amount may be consumed in the hot manifold, causing no deleterious effect.

The quantity of mixture flowing depends largely on the gas pressure in the line 1, the size and number of the perforations 6, and the size of the orifice in the fitting 8. The pressure in the line 1 may vary over a considerable range and may under certain conditions advantageously exceed the normal compression pressure of the cylinder. The size of the perforations will influence the degree of atomization of the carbon gum solvent as well as the quantity of mixture flowing.

The gas employed is generally compressed air since it is inexpensive and easy to handle. It may, however, be any of the various other gases under pressure such as steam which aids in blowing out carbon or oxygen which assists by burning it out.

By the employment of our new method the solvent is introduced to the cylinder in atomized form securing an even distribution to all parts of the combustion chamber including the port and exhaust valves. Since the engine is operating on the other cylinders a high degree of compression is obtained in the cylinder being treated which multiplies the effectiveness of the solvent. Furthermore, as the carbon is loosened and detached it is scavenged from the cylinder, any loose carbon remaining in the cylinder being blown out by running the engine after replacement of the spark plug.

The pressures obtained by the above described method are, of course, in excess of the compression pressure of the cylinder (not ignition compression) and even on the down-stroke the pressure is sufficient to force a certain amount of the solvent through the intake valves with a resultant beneficial effect upon the valve stems and guides as well as the intake manifold which is often partially blocked by deposits. This latter condition is most often noted in engines subjected to intermittent operation, such as pumping or air-compression engines, where the deposits may have the effect of preventing equal distribution of the fuel to the cylinders.

It is to be understood, of course, that by "operation" of the engine, as used herein, it is intended to include any method of reciprocating the pistons, as by turning the flywheel by hand, although it is contemplated that generally the engine will be running under its own power during injection of the solvent.

After treatment, an improvement of as much as 20% may be noted in cylinder compression, especially when valves and piston rings were previously sticky and not functioning properly. The tendency to knock, due to carbon, is reduced and the engine runs more quietly and evenly. The treatment may be applied in a very short time and with much less trouble than the various methods employed in the past.

Other modes of applying the principle of our invention may be employed instead of the one explained, change being made as regards the process herein disclosed, provided the step or steps stated by the following claim or the equivalent of such stated step or steps be employed.

We, therefore, particularly point out and distinctly claim as our invention:

The method of de-gumming internal combustion engines which comprises introducing a mixture of a gas and a liquid gum solvent atomized therein through the spark-plug opening of a cylinder, such gas being under pressure sufficient to ensure penetration of the solvent throughout the gum deposits, and mechanically reciprocating the piston in the cylinder being treated to compress the gas therein, while preventing the return flow of said mixture through said spark plug opening.

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