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2,504,301

METHOD OF WASHING AND CLEANING ENGINE CYLINDERS

Original Filed Dec. 10, 1945

3 Sheets-Sheet 1

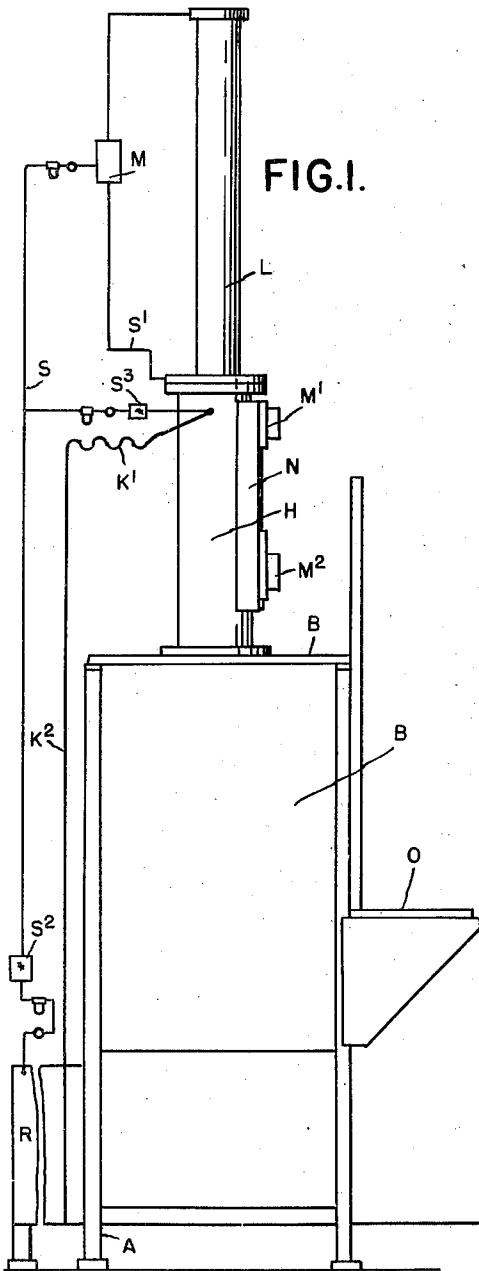


FIG. 1.

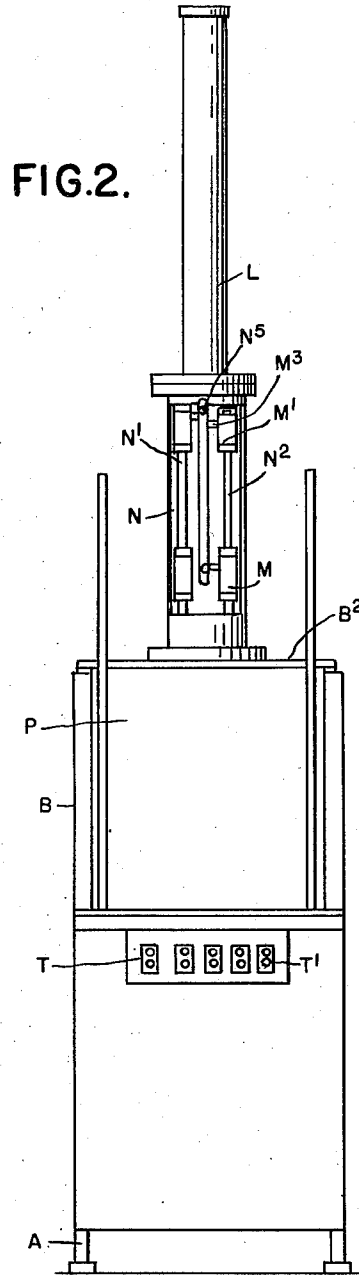


FIG. 2.

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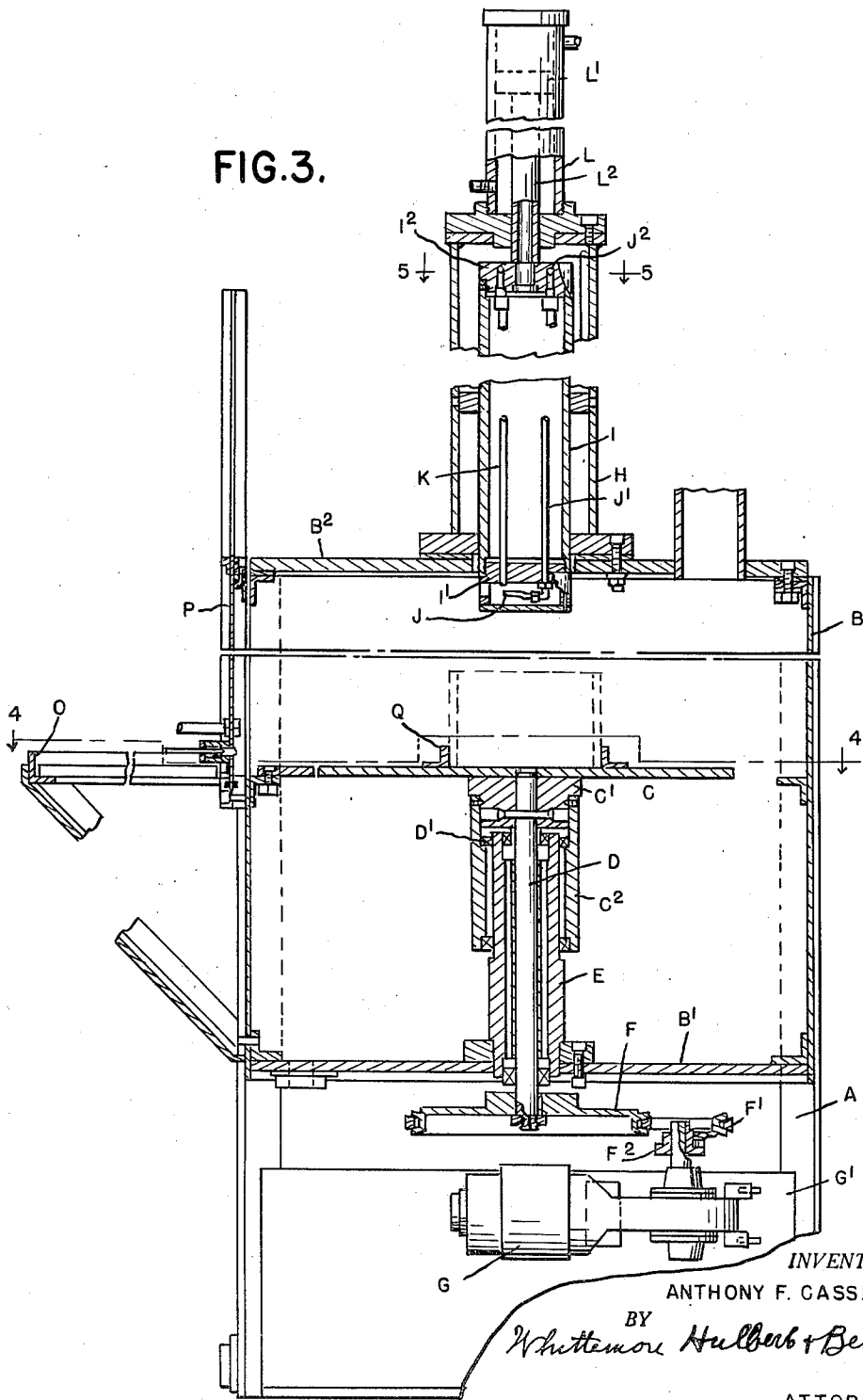
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FIG. 3.



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3 Sheets-Sheet 3

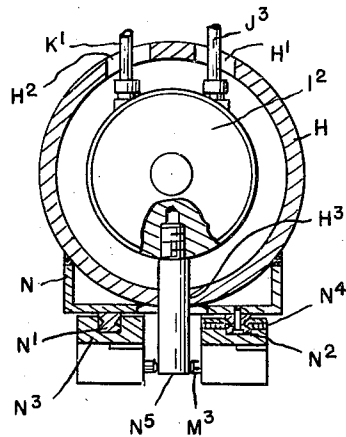
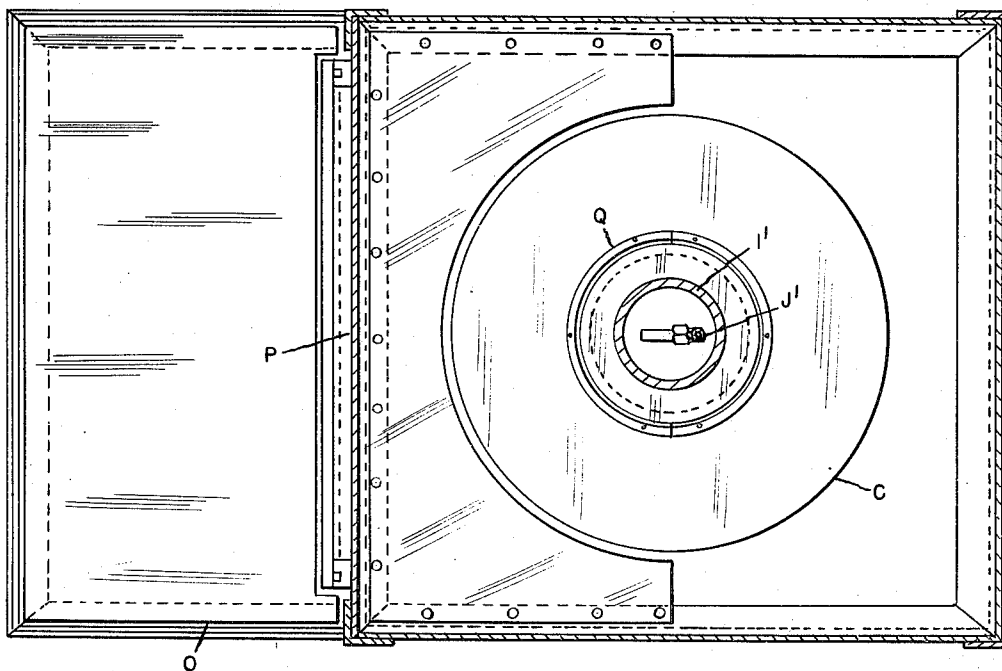


FIG. 5.

FIG. 4.



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## UNITED STATES PATENT OFFICE

2,504,301

METHOD OF WASHING AND CLEANING  
ENGINE CYLINDERS

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Original application December 10, 1945, Serial No.  
633,924, now Patent No. 2,420,463, dated May  
13, 1947. Divided and this application October  
14, 1946, Serial No. 703,242

## 1 Claim. (Cl. 51—282)

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The invention relates to the cleaning of engine cylinders to remove therefrom all dirt and grit which would be detrimental to the operation of the engine. The instant application is a division of application Serial No. 633,924, filed December 10, 1945, which issued May 13, 1947, as Patent No. 2,420,463.

In the present state of the art, engine cylinders have been provided with a chromium plated inner surface both for the purpose of affording a hard wearing surface and also to recondition the cylinders which are too large in bore. It has been found, however, that a continuous chromium surface is not desirable as it lacks lubricant retaining properties. It has, therefore, been the practice to remove a portion of the chromium by exposing it as an anode in an electrolytic bath. This results in pitting or interrupting the continuity of the surface forming therein microscopic channels or so-called "spider web" extending over the area. The subsequent honing operation and finishing the inner surface of the cylinder causes the deposits of small abrasive particles in these channels, which if not removed would produce rapid wear when the engine is in operation. Another effect of the de-plating or of the honing is to form jagged feather edges along the channels which tend to retain any abrasive particles lodged therein.

It is the object of the invention to completely remove all of the abrasive deposits in all portions of the area of the cylinder surface, and to this end the invention consists first, in a method of blasting successively all portions of the cylinder surface; second, in the dislodging of deposits in the interstices of the surface by abrasives carried by the blast; and further in the method as hereinafter set forth.

In the drawings:

Fig. 1 is a side elevation of the machine;  
Fig. 2 is a front elevation thereof;  
Fig. 3 is a vertical central section;  
Fig. 4 is a horizontal section on line 4—4, Fig. 3; and

Fig. 5 is an enlarged horizontal section on line 5—5, Fig. 3.

Broadly described my improved method consists in blasting every portion of the inner surface of the cylinder and in carrying by the blast a small amount of fine abrasive particles which assist in dislodging previous deposits in the channels or interstices. Thus, the jagged feather edges will to some extent be cut away so that the deposits in the channels are not retained thereby.

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To insure that all portions of the inner surface will be subjected to the blast, the blast nozzle extends centrally within the cylinder and relative axial reciprocatory and simultaneous relative rotary movements are imparted to said nozzle and cylinder. This is preferably accomplished by apparatus of the following construction.

A is a frame. B is a casing within said frame forming a wash chamber and C is a revoluble table within the chamber B for supporting the work. The table C is mounted on a vertical shaft D passing downward through a hollow post E rising from the bottom of the casing. A hub C' connects the table to the shaft and a cylindrical skirt C<sup>2</sup> depending from the hub surrounds the upper portion of the post and is revolubly supported thereon by antifriction bearings D'. Beneath the bottom B' of the casing a pulley F is secured to the shaft D which is connected by a belt F' with a small diameter pulley F<sup>2</sup> on the shaft of a motor G. The latter is mounted on a panel G' at one side of the frame A. Centrally mounted on the top B<sup>2</sup> of the casing B is a tubular extension H which forms a housing enclosing a hollow cylindrical plunger I. The latter passes through an aperture in the top B<sup>2</sup> and carries at its lower end a blast head I'. This is chambered to receive a radially directed air nozzle J which is connected to an air conduit J' extending to the upper end of the hollow plunger I and connected with a laterally-extending port J<sup>2</sup> in the upper head I<sup>2</sup> thereof. A liquid conduit K also extends from the head I<sup>2</sup> downward through the hollow plunger I and blast head I' to direct a liquid stream in front of the air nozzle J. Air and liquid are supplied to the conduits J' and K through flexible conduits J<sup>3</sup> and K' which pass through vertical slots H', H<sup>2</sup> in the housing H so as to permit of vertical movement of the plunger I therein. Above the housing H is an air cylinder L containing a piston L' connected by a piston rod L<sup>2</sup> with a head I<sup>2</sup> of the plunger I. Thus, by supplying air alternately to the upper and lower ends of the cylinder L, the piston therein will be reciprocated communicating a corresponding movement to the plunger I and the blast head I' at the lower end thereof. Consequently, a cylinder placed on the revoluble table C will have its inner surface subjected to the radially directed blast and the revolution of the cylinder together with the vertical reciprocation of the plunger will move the blast over all portions of said surface.

To adapt the device for washing cylinders of

various sizes, the dimensions of the casing B and the maximum stroke of the plunger I are suitable for the largest cylinder. It is, however, desirable to limit the stroke of the plunger to correspond to the actual length of the cylinder being washed, which is accomplished by an air valve and controlling means therefor. As diagrammatically shown in Fig. 1, the air valve M is operated by electric switches M' and M<sup>2</sup> vertically adjustably mounted on the housing H. Preferably the housing H has a pair of angle bars N welded or otherwise secured to one side thereof and rails N' and N<sup>2</sup> are mounted on these angle bars to extend parallel to each other in a vertical direction. Heads N<sup>3</sup> are adjustably mounted on the rails N' and N<sup>2</sup> and are held in different positions of adjustment by set screws N<sup>4</sup>. These heads N<sup>3</sup> support the switches M' and M<sup>2</sup> which are arranged in pairs on corresponding pairs of heads. A pin or finger N<sup>5</sup> secured to the plunger I extends radially outward through a vertical slot H<sup>3</sup> in the housing H which is between the angle bars N. This pin during the movement of the plunger I will contact the operating members M<sup>3</sup> of the switches M' and M<sup>2</sup> and through suitable electrical connections (not shown) will operate the valve M. The arrangement is such that when the upper switch members M' are operated by the pin or finger N<sup>5</sup>, the valve M will be shifted to supply air to the upper end of the cylinder L, while the lower end of said cylinder is connected to the exhaust. On the other hand, when the finger N<sup>5</sup> operates the lower switches M<sup>2</sup>, the valve will be reversed to supply air to the lower end of the cylinder L and to connect the upper end of said cylinder to the exhaust. It is, therefore, apparent that by shifting the heads N<sup>3</sup> on the rails N' and N<sup>2</sup>, the switches M' and M<sup>2</sup> may be positioned to give any desired length of stroke to the piston L' within the cylinder L. For convenience in introducing the work into the casing B and onto the revoluble table C and also for removing the work therefrom, a shelf O is mounted outside of the casing at the level of the table. The casing is also provided with a sliding door P on the side adjacent to the shelf O so that by raising this door a cylinder placed on the shelf may be transferred therefrom to the table C. Exchangeable adapters Q are secured to the table each forming centering device for a cylinder of given size thereby holding said cylinder with its axis coincident with that of the table.

The liquid ingredient of the blast is placed in a tank or container R preferably arranged in rear of the casing B. For this ingredient various materials may be used such, for instance, as an alkaline water solution, but a certain amount of fine abrasive material is carried by this solution into the blast. The liquid is raised from the tank and delivered to the jet by the ejector action of the air jet nozzle J blowing across the lower end of the conduit K. A conduit K<sup>2</sup> extends upward from the lower portion of the tank R and connects with the flexible conduit or hose K' which latter connects with the upper end of conduit K. Air is

supplied to the valve M and also to the flexible conduit or hose J<sup>3</sup> from any suitable source and through conduits S and S' controlled by electromagnetic valves S<sup>2</sup> and S<sup>3</sup>. The latter are operated by control switches T and these and other control switches as, for instance, one for the operation of the motor G, are mounted on a panel T' at the front of the casing and below the shelf O.

#### Operation

The cylinder to be washed is first placed on the shelf O after which the sliding door P is raised and the cylinder transfers from the shelf to the adapter Q on the table C. During this operation the plunger I is in its raised position so as to clear the cylinder. The door P is then closed and the machine is set in operation. This imparts rotary movement to the table C from the motor G through the pulleys F<sup>2</sup>, F, belt F' and shaft D. Also, air is supplied through the conduits S and S' to the valve M and conduit J. Assuming that the switches M', M<sup>2</sup> have been adjusted to control the length of stroke of the plunger the blast nozzle will be moved first downward and then upward during the continuous rotation of the cylinder. This operation is continued for a sufficient period of time to insure the removal of all material lodged in the crevices or interstices and such removal is expedited by the action of the abrasive in the blast which cuts away the jagged feather edges. The operating machine may then be stopped, the door opened, and the clean cylinder removed from the table to the shelf O.

What I claim as my invention is:

In a method of cleansing honed engine cylinders having chromium plated and partially deplated inner surfaces which have fine interstices due to the deplating and containing deposits due to honing held by feather edges also due to honing; the steps of successively blasting all portions of said inner surfaces with a blast of air cleansing liquid and a small quantity of fine abrasive particles in suspension therein, the quantity of abrasive particles and the time of surface exposure to the blast being limited to that required to cut said feather edges and to remove all deposits from said interstices without detrimental abrasion of said inner surface.

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