May 29, 1945. C. A. STINE 2,376,945

PISTON CLEANING APPARATUS

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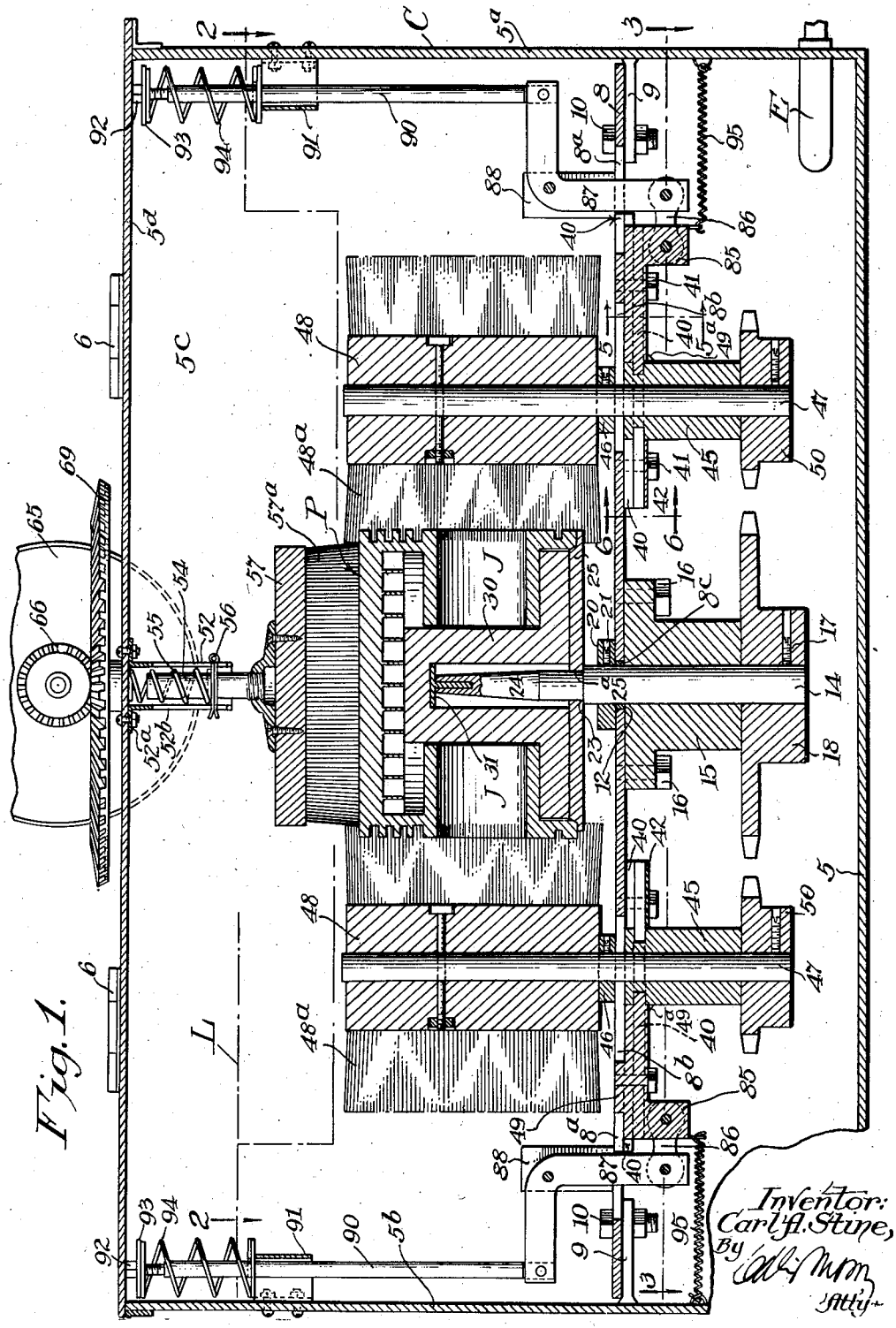


Fig. 1.

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Fig. 2.

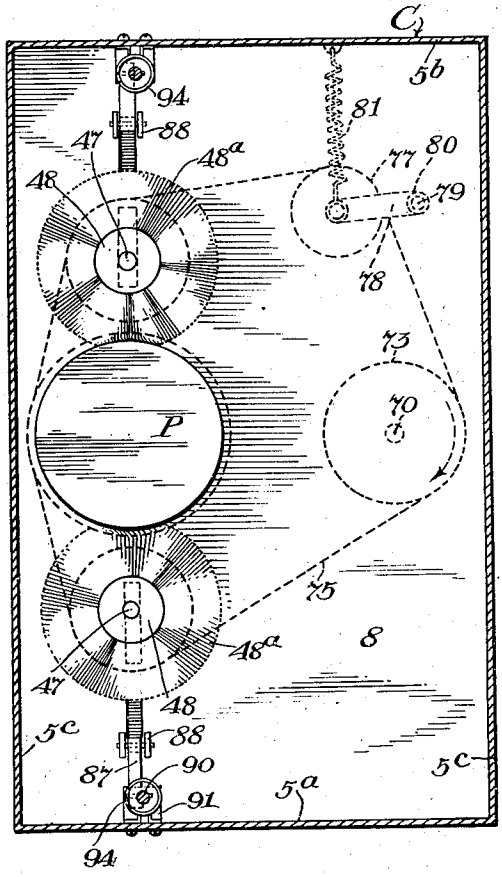


Fig. 3.

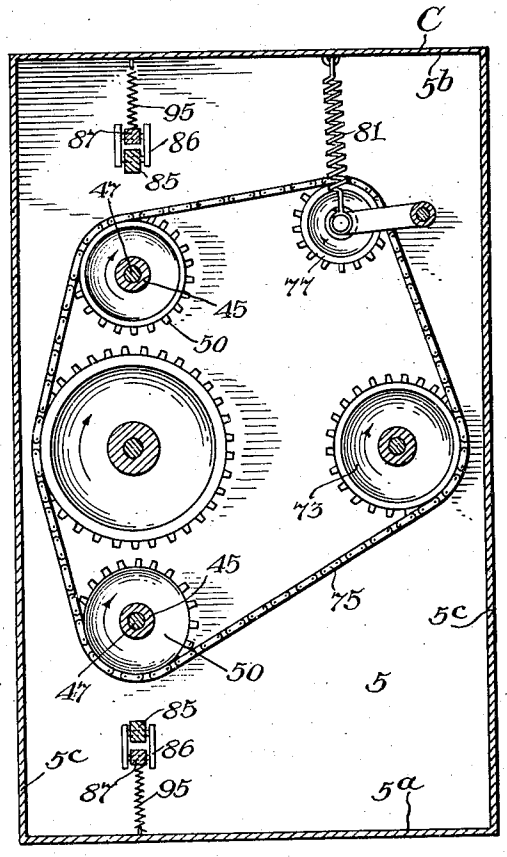
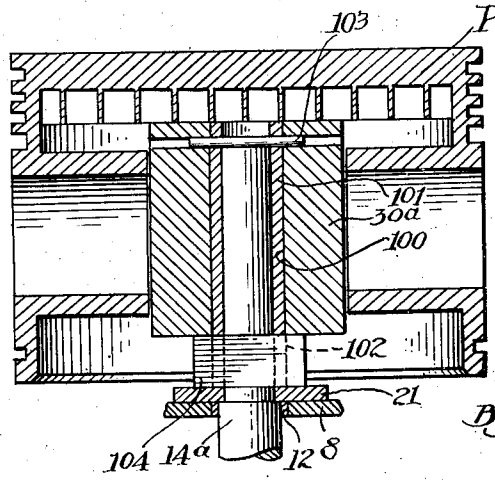


Fig. 8.



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Fig. 4.

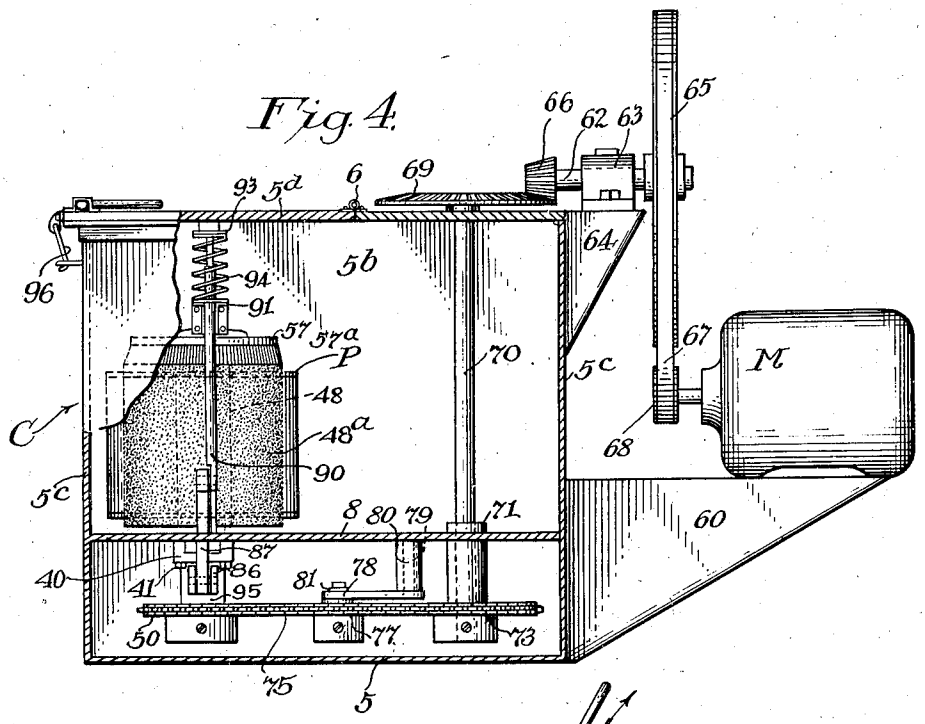


Fig. 6.

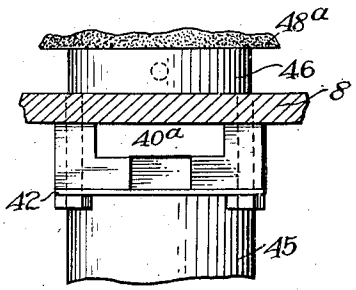


Fig. 7.

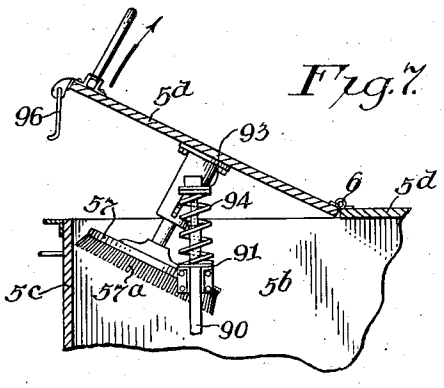
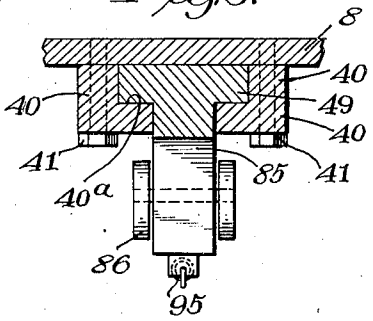


Fig. 5.



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Patented May 29, 1945

2,376,945

UNITED STATES PATENT OFFICE

2,376,945

PISTON CLEANING APPARATUS

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Application February 1, 1943, Serial No. 474,312

3 Claims. (Cl. 15—21)

My invention has to do with cleaning methods and apparatus and in its more particular aspects it relates to cleaning internal combustion engine pistons and the like.

The pistons of internal combustion engines become coated with carbonaceous deposits which require removal. Heretofore this has been done either by means of scraping or by immersing the piston in a chemical solution which dissolves the deposit. One of the shortcomings of such methods, however, has been the unduly long time element required for the operation. This is particularly objectionable when the pistons are being cleaned in the field, as in the case of cleaning the pistons of airplane motors, when it is necessary to return the craft to use as soon as possible.

I have found that the cleaning operation can be considerably speeded up and improved by applying rotary brushes to the pistons while immersed in the cleaning solution and, in its broader aspects, my invention contemplates such a method and novel means for carrying it out.

Another object of the invention is the provision of a simple apparatus for relatively moving the brushing elements and the object being cleaned.

Another object is the provision, in such an apparatus, of brush elements which are adjustable and movable radially towards and away from the work being cleaned.

Another object is the provision of means for automatically moving the brushes into and out of engagement with the object being cleaned by virtue of raising and lowering of the cover lid of the tank or cabinet in which the assembly is housed.

While I have enumerated some of the major features of my invention, there are still further and subordinate advantages inherent in the invention, and how those as well as the features enumerated are achieved will be best understood from a detailed explanation of a presently preferred embodiment, for which purpose I shall refer to the accompanying drawings, in which:

Fig. 1 is a vertical section;

Fig. 2 is a reduced plan section taken on line 2—2 of Fig. 1;

Fig. 3 is a reduced plan section taken on line 3—3 of Fig. 1;

Fig. 4 is a reduced vertical section;

Fig. 5 is a fragmentary section taken on line 5—5 of Fig. 1;

Fig. 6 is a fragmentary section taken on line 6—6 of Fig. 1;

Fig. 7 is a reduced fragmentary section similar to Fig. 4 but showing the tank lid raised; and

Fig. 8 is a fragmentary enlarged sectional view showing a variational form of work holding means.

Referring now to the drawings, I show a tank or cabinet C capable of containing a cleaning solution suitable for the cleaning operation to be performed, many such solutions being well known in the art. Tank C has a bottom wall 5, and walls 5a, 5b, opposite side walls 5c and a cover 5d hinged at 6. A horizontal partition wall 8 is secured in the tank by means of brackets 9 and bolts and nuts 10. Wall 8 has openings 8a, 8b, 8c for the purpose to be described.

Within wall opening 8c I mount a bushing 12 for a shaft 14 which passes downwardly through a bearing 15 secured to the partition by cap screws 16. Shaft 14 has secured to its lower end, as by a set screw 17, a sprocket 18. The shaft is held against longitudinal movement by means of the bearing 15 and a collar 20, the collar being secured to the shaft by a set screw 21. The upper end of the shaft is of reduced diameter to present an annular shoulder 23 and an outer bifurcated top end 24. A base plate 25 has a central opening 25a through which the shaft 14 passes so that the plate rests against shoulder 23. A work supporting block or table 30 is secured on the upper end of the shaft by means of a T plate 31. This block 30 is here shown as being particularly adaptable to hold a conventional piston against rotation relative to the block, the block being rectangular in cross-section and fitting between opposite journal portions J of the supported piston P.

Secured to partition 8 under each opening 8b, by cap screws 41, I provide a pair of oppositely disposed angle iron tracks 40 between which there is a T-shaped space 40a along which a bearing member 45 is slidable. A stop plate 42 is secured to the under face of tracks 40 at one end to stop further movement of the bearing 45 at the proper point relative to the work. A shaft 47 is journalled in each of the respective bearing members 45, said shafts being held against longitudinal movement by virtue of said bearing members and the collars 46 secured to the respective shafts by set screws. On the upper end of each shaft 47 I secure a rotary brush 48 each having a bristle portion 48a.

Secured to the lower end of each of the respective shafts 47 by a set screw there is a sprocket 50.

A slotted cylinder 52 is secured to the under face of lid 5d by means of the attaching flange 52a, and a plunger 54 is reciprocally mounted in the cylinder, being resiliently urged outwardly by

a coil spring 55 and being held against rotation by a cotter pin 56, which pin is slidable in the slot 52b in the cylinder. A brush member 57 is secured to the lower end of the piston, the brush having a bristle portion adapted to wipingly engage against the top surface of the piston P being cleaned.

Secured to the rear side wall 5c exteriorly of the tank there is a motor mount 60 upon which a conventional electric motor M is mounted. A shaft 62 is journalled in a bearing 63 carried by a housing 64 secured to wall 5c, a sheave 65 being secured to the outer end of shaft 62 and a bevel gear 66 being secured to the opposite end of said shaft, and a drive belt 67 operating the shaft from a drive pulley 68 secured to the motor drive shaft. A second bevel gear 69 meshing with gear 66 is secured outside the cabinet C to the upper end of a drive shaft 70, which shaft is journalled in the stationary part of the cover lid 5d and in a bearing 71 carried by the partition wall 8, a drive sprocket 73 being secured to the lower end of the drive shaft. By mounting the shaft 70 through the lid 5d of the solution containing cabinet C, I avoid the necessity of packing.

A chain belt 75 drives the sprockets 18, 50 from the drive sprocket 73 as best shown in plan in Fig. 3, there being an idler sprocket 77 journalled in an arm 78, which arm is pivotally mounted on the partition wall 8 by means of cap screw 79 and post 80. A coil spring 81 secured at one end to the arm 78 and at its other end to an end wall of the cabinet yieldably holds the belt 75 taut.

To slide bearing members 45 and their carried shafts and brush elements towards and away from the work holder 30, to facilitate applying and removing the work, I weld one end of a slide bar 49 to each bearing 45, as shown at 49a, and each slide bar is longitudinally slidably mounted in the space 40a between angle track members 40.

A depending retractor arm 85 is carried by each of the slide bars 49 and each of these arms is pivotally connected, by means of a link 86, to the lower end of a bell crank 87 pivotally carried by a post 88 mounted on the partition wall 8. Pivotally secured to the other end of the crank 87 I provide a squared rod 90 which is slidably supported by a bracket 91 secured to the end wall. Each rod 90 is tapped from its top to receive a cap screw 92 to hold a retainer washer 93, between which washer and bracket 91 I dispose a compression spring 94 which normally urges the rod 90 upwardly. A tension spring 95, secured at one end to the retractor arm 85 and at its other end to the end wall 5a, normally urges the slide plate 40 away from the work P. The compression of springs 94 may be adjusted by the cap screws 92.

While I have described only one retracting mechanism, it will be understood that there is one of such mechanisms for each brush 50 and they are the same, so that both brushes 48 are simultaneously moved towards or away from the work. Each of the rods 90 is long enough that when the lid 5d is raised the springs 94, 95 cause the upper end of each rod to project above the plane of the top of the cabinet walls and thus retract the brushes 48 from engagement with the work P. Lifting of the lid also lifts brush 57 from engagement with the top of the piston P. This frees the work to be removed from the holder 30. Conversely, when the lid 5d is closed down, it engages the outer ends of the rods 90 and forces them downwardly, moving the brush elements into radial engagement with the piston P. A lock 96 is provided to hold the lid down on the cabinet against pressure of the springs 94, 95. In operation, a sufficient supply of cleaning chemical is introduced into the cabinet C to cover the work and brushes, as shown by the liquid level L, and the lid is closed down to force the brushes into engagement with the work. I show a heating element E for use in cases where it is desired to heat the cleaning solution in the cabinet. Upon starting the motor, the belt 75 drives the brushes 48 and the work carrying shaft 14 in the same direction so that the brushes disposed on each side of the piston engage the piston being cleaned. I find it desirable to have the ratio of the work rotating sprocket 18 to the brush driving sprockets 50 of the order of 2 to 1 so so that the brushes rotate at a substantially greater speed than the work.

In operation, the bristles of the brushes 48, 57 bearing against the piston immediately remove any carbonaceous deposit which the cleaning chemical has attacked and loosened, leaving the surface freely exposed at all times to the cleaning chemical. As a result of this combined action of the brushes and chemicals, the cleaning operation is completed in much less time than would be required for either a chemical cleaning operation or a scraping operation alone. I find that the agitation of the solution in cabinet C by the brushes 48 causes the solution to act more efficiently.

While I have described an apparatus of a capacity for cleaning one piston at a time, it will be understood that a multiplicity of such units may be utilized in a single tank and driven by a common drive element.

In Fig. 8 I show a variational work holding structure. Here the piston P being cleaned is detachably mounted over a wood block 30a which has a central bore 100. A metal sleeve 101, longitudinally slotted at 102, is mounted in the bore, being held therein by a cross pin 103. A transverse drive key 104 extends through slot 102 and a transverse slot in the rotatable shaft 14a to cause rotation of the sleeve and the carried block as the shaft is rotated. For different sized pistons P blocks 30a of corresponding sizes would be used.

While I have resorted to considerable detail for the purpose of making my invention understood, I wish it understood that within the broader scope of my invention, as defined by the appended claims, various modifications and adaptations may be made without departing from the spirit of the invention.

I claim:

1. Cleaning apparatus comprising, in combination, a tank adapted to hold a cleaning solution, a cover lid swingably mounted on the tank, a work holder rotatably mounted in the tank, a journal member mounted in the tank for lateral sliding movement relative to the work holder, a brush shaft journalled in the journal member for rotation about an axis parallel to the axis of rotation of the work holder, a brush mounted axially on the shaft, means responsive to swinging movement of the cover lid to slide the journal member, and means for rotating the work holder and shaft.

2. Cleaning apparatus comprisng a tank, a cover on the tank, a work holder rotatably mounted in the tank, a journal member mounted in the tank for lateral sliding movement rela-

tive to the axis of the work holder, a brush shaft journalled in the journal member, a brush mounted axially on said shaft, a drive shaft mounted for rotation in the tank about an axis parallel to the axes of the work holder and brush shaft, the top end of the shaft extending through the cover, drive means operatively connected with the top end of the drive shaft, a wheel secured on the work holder, wheels secured respectively on said shafts, a belt operatively connecting said wheels, and an idler roller resiliently engaging the belt.

3. Cleaning apparatus comprising a tank adapted to contain a cleaning solution, a hinged cover lid on the tank, a pair of juxtaposed shafts journalled for rotation in the tank, a rotary brush secured on one of the shafts, a work support secured on the other shaft whereby to hold work in position to be radially engaged by the brush, means for simultaneously rotating the shafts, means for moving one of the shafts laterally with respect to the other whereby to free the brush from engagement with the work carried on the work support, the last-mentioned means including a bar slidably mounted in the tank and operatively engaging the brush carrying shaft, a bell crank operatively connected to the bar and means movable by virtue of movement of the cover lid to move the bell crank.

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