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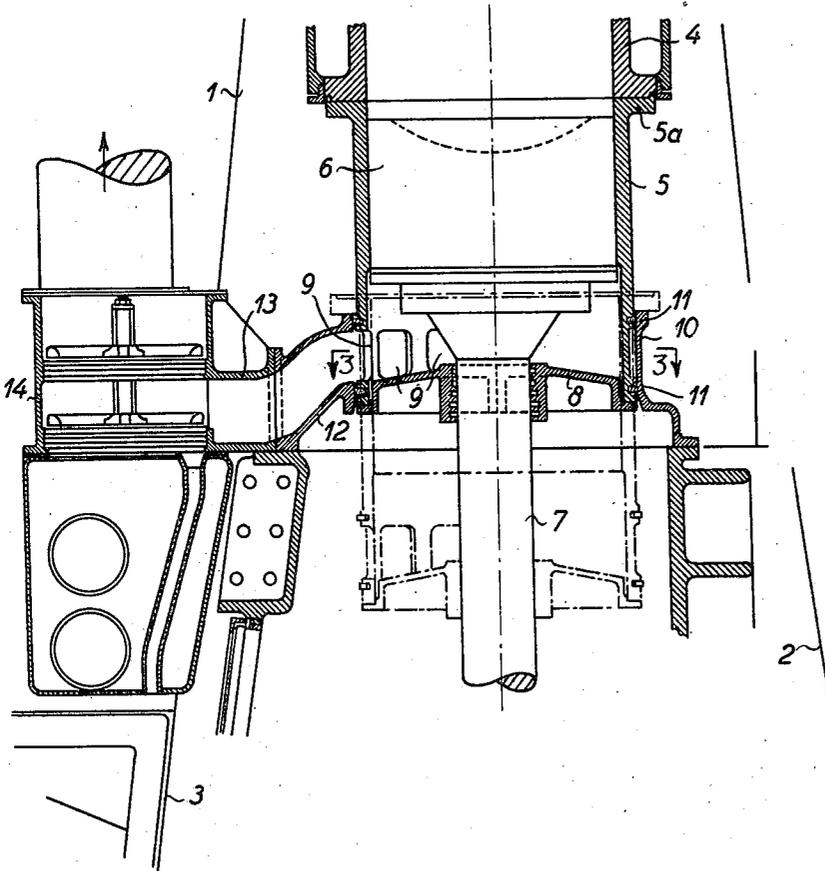
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CYLINDER CONSTRUCTION

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2 Sheets-Sheet 1

Fig. 1



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FIG. 2

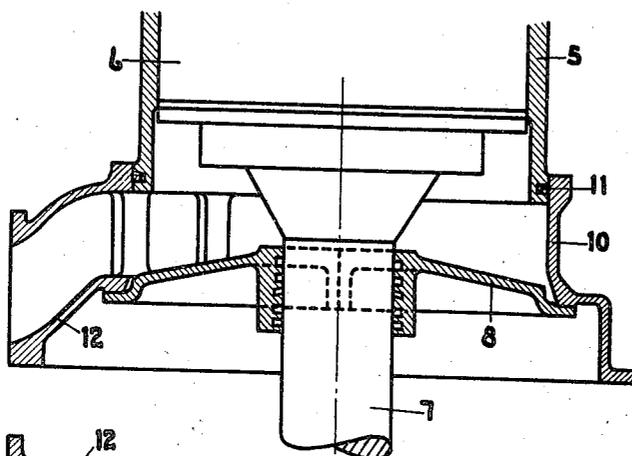
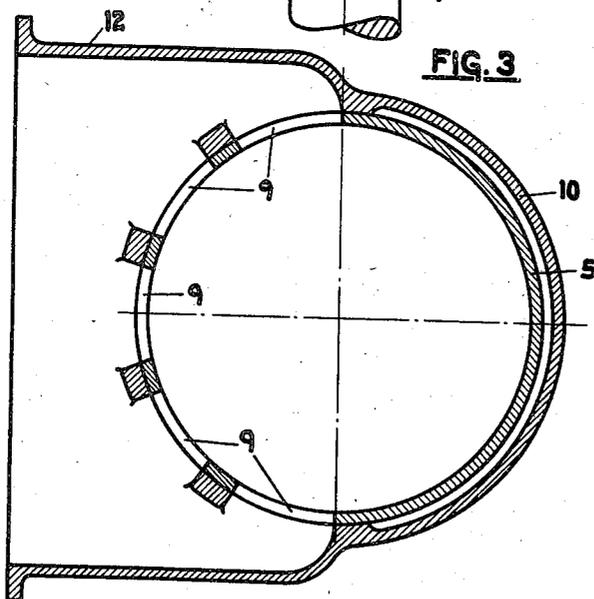


FIG. 3



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# UNITED STATES PATENT OFFICE

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## CYLINDER CONSTRUCTION

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8 Claims. (Cl. 123—193)

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This invention relates to a four stroke internal combustion engine of the kind, in which the side of the engine piston facing the crank is utilized for a pumping action for producing compressed air for the scavenging or charging (contingently super-charging) or both of the engine cylinder, the pumping cylinder being made up of part of the working cylinder proper and a cylinder extension fitted detachably to the latter or contingently of the said cylinder extension alone, whereby the end of the pumping space facing away from the engine cylinder is closed by a cover with stuffing box, through which the piston rod has been tight-fitting carried, and the purpose of the invention is to attain a construction by which in a comparatively simple way it is made possible to obtain access for inspection and overhaul of the piston.

Internal combustion engines of the said kind are known, in which at the end of the cylinder extension there is a pipe or ring co-axial with the latter, which pipe or ring serves for communicating the pumping chamber with openings or pipe lines for the suction and discharge of air, normally with a valve box for the air pump, and in which the said pipe or ring has been made in two or more parts, so that by the disconnection and removal of the said pipe it will be possible to remove the cylinder extension a certain distance from the engine cylinder, so that access to the piston is obtained.

In this invention such an access to the piston has been made possible in a considerably simpler way, i. e., so that no disconnection or removal is required of the pipe or ring situated at the end of the cylinder extension and serving for communicating the pumping chamber with the valve box of the air pump, but that this pipe can remain in its place, it having in accordance with the invention so large a bore that the cylinder extension, which is axially detachable from the engine cylinder, may be carried through the pipe on being removed from the engine cylinder, whereby access to the engine piston is obtained through the clearance produced between the end of the engine cylinder and the removed cylinder extension.

The size of this clearance all but corresponding to the distance between the end of the engine cylinder and the end of the said pipe or ring facing the latter, the pipe or ring is in accordance with an especially expedient embodiment of the invention fitted at such a distance from the end of the engine cylinder that at the removal (lowering) of the cylinder extension from the

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engine cylinder a clearance is attained, through which the engine piston may be removed to the side for a contingent change or overhaul.

The said pipe or ring may enclose the end of the cylinder extension, whereby the latter is shaped with one or more communication openings which open out into the interior of the ring, and the pumping chamber cover may hereby expediently be attached to the end of the cylinder extension so that it need not be detached from the cylinder extension at the removal of the latter from the engine cylinder through the said enclosing ring.

It may, however, also be made so that the cylinder extension opens out into the said pipe or ring, whereby the pumping chamber cover is expediently bolted to the ring situated at the end of the cylinder extension. In this embodiment the cover must be taken off before it is possible to remove the cylinder extension from the engine cylinder.

The pumping chamber cover may advantageously be so as to have a diameter of mainly the same size as the external diameter of the cylinder extension, whereby furthermore in itself it may be performed as piston rod stuffing box, but the latter may also be made separately and be bolted to the cover, either on the topside or the underside of the latter.

The cylinder extension may expediently be sealed in relation to the said pipe or ring by means of one or more piston rings or contingently a stuffing box.

The invention has been illustrated on the drawing where

Fig. 1 shows part of a four stroke internal combustion engine in accordance with an embodiment of the invention, in side elevation, in part in section,

Fig. 2 part of what is shown in Fig. 1 showing a modification, and

Fig. 3 a cross section along the line 3—3 in Fig. 1.

In Fig 1 there have by 1, 2 and 3 been indicated parts of the engine framing, while 4 designates the lower part of an engine cylinder. To the lower end of the latter there has, by a bolt connection not shown, been attached a cylinder extension 5 detachably, the interior of which forms part of the pumping chamber for the pumping action effected by the underside of the engine piston 6. The piston rod 7 of the latter has been carried through a cover 8 which closes the pumping chamber downwards and which is attached to the underside of the cylinder extension 5, it

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having mainly the same diameter as the latter. The cover 8 is furthermore shaped so as to serve as a piston rod stuffing box. The lower end of the cylinder extension 5 is shaped with openings 9 opening out into the interior of a ring or pipe 10, which encloses the lower end of the cylinder extension, sealed in relation to the latter by means of piston rings 11, and which is shaped with a pipe length 12, which is connected with a socket 13 on a valve box 14, which in a way known 10 contains suction and pressure valves and is in communication with suction and discharge pipes for air to and from the pumping chamber.

When access to the pumping chamber is desired, contingently for the removal of the piston, 15 the connection between the engine cylinder 4 and the cylinder extension 5 is disconnected, after which the latter together with the cover 8 attached to it may be lowered through the ring 10 to the position shown in stippled lines, where the top flange 5a of the cylinder extension rests on the top side of the ring. The piston has hereby been made freely accessible, and after having been detached from the piston rod 7 it will be possible to remove the piston 6 to the side through the opening produced, the ring 10 in the shown embodiment being placed so far below the end of the engine cylinder 4 that such a removal is made possible.

The modification shown in Fig. 2 differs from the one shown in Fig. 1 by the cylinder extension not being carried all the way down through the ring or pipe 10, but only opens out in the top of the latter, whereby a sealing has been effected by means of a single piston ring 11. The pumping chamber cover 8 is hereby attached to a downwards-facing surface in the ring or pipe 10, so that it must be detached from this, before the cylinder extension 5 may be lowered through the ring 10. In this embodiment the interior of the latter is in direct communication with the interior of the cylinder extension 5.

The cover 8 is expediently composed of two parts, which are interconnected along a vertical dividing joint 15, so that the said connection must be disconnected if it be desired to remove the cover.

The invention is, however, not bound to the embodiments shown and described, but may be amended as to particulars without departing from the principle of the invention.

I claim:

1. In an internal combustion engine, a piston,

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a working cylinder receiving said piston, a cylinder extension detachably connected with the working cylinder and constituting a pumping chamber, a bushing receiving the cylinder extension and having a port for the passage of fluid to or from the pumping chamber; a rod carried by said piston, and a cover for the pumping chamber slidably receiving said rod, said cylinder extension being movable axially through said bushing after detachment from the working cylinder to render the piston accessible.

2. An engine as claimed in claim 1 wherein said bushing is so spaced from the working cylinder that the piston may be removed laterally after axial movement of the cylinder extension.

3. An engine as claimed in claim 1 wherein sealing rings are provided between the cylinder extension and the bushing to provide a fluid tight joint.

4. An engine as claimed in claim 1 wherein the cylinder extension is provided with ports communicating with the port in said bushing.

5. An engine as claimed in claim 1 wherein said cover is secured to the cylinder extension and movable therewith axially through said bushing.

6. An engine as claimed in claim 1 wherein said cylinder extension is formed with an open end surrounded by said bushing.

7. An engine as claimed in claim 1 wherein said cover is detachably secured to said bushing.

8. An engine as claimed in claim 1 wherein said cover is of substantially the same external diameter as the cylinder and constitutes a stuffing box for the piston rod.

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