RESERVE COPY

PATENT SPECIFICATION

Convention Date (Germany): Jan. 31, 1930.

365,802

Application Date (in United Kingdom): Jan. 28, 1931. No. 2833 / 31.

Complete Accepted: Jan. 28, 1932.

COMPLETE SPECIFICATION.

Improvements in Internal Combustion Engines and Charging Pumps therefor.

We, CENTRA HANDELS & INDUSTRIE A.G.., a corporation organized under the laws of Switzerland, of Quaderstrasse, Chur, Switzerland, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The invention relates to internal combustion engines of the kind wherein a plurality of opposed pistons are connected to separate crank shafts, which have supplementary cranks coupled with each other by a frame, so that the crank shafts must work in unison, one of them being generally used as the main or driving shaft.

In connection with engines of this kind it has been proposed to use the coupling frame as an actuating member for accessory parts of the engine, for example for a fuel pump or an air pump, with appropriate transmission gear.

According to our invention the frame itself is made to constitute part of the accessory machine, in that it serves as, or is formed integrally with, the rotor of a rotary pump coacting with part of the main frame or casing, or with a member fixed to, or engaged with the said main frame or casing, so that the coupling frame and this part or member are both parts of the accessory machine, and no transmission gear is required.

The accessory machine may, for example, be an air pump serving the engine, and as the coupling frame is usually comparatively large a large air pump can be provided without increasing, or materially increasing, the bulk of the engine.

The invention is illustrated in the annexed drawings, in which

Fig. 1 is a vertical section on the line A—B of Fig. 2, showing one form of construction.

Fig. 2 being a section on the line C—D of Fig. 1, partly broken away.

Figs. 3, 3*a*, 3*b*, 3*c*, 3*d* and 3*e* diagrammatically illustrates a modification. Fig. 3*a* being a cross-section of the apparatus in the position shown in Fig. 3, and Fig. 3*d* being a cross-section of the apparatus in the position shown in Fig. 3*c*.

[*Price* 1/-]

Fig. 4 is a vertical section showing another form of construction, in vertical section on the line E—F of Fig. 5, and

Fig. 5 is a section on the line G—H of Fig. 4, partly broken away.

Referring first to Figs. 1 and 2, the engine therein shown is a two stroke cycle engine having a plurality of groups of cylinders, each comprising three cylinders 1*a*, 1*b*, 1*c* radiating in star fashion, these cylinders being within a casing 2. The cylinders contain pistons 3, and each group or star-unit has a common combustion chamber 4, the piston rods 5 being connected to cranks 6*a*, 6*b*, 6*c* of three crank shafts 7*a*, 7*b*, 7*c* mounted in the casing. The cylinders 1*b*, 1*c* have ports 8 for scavenging air, and the cylinder 1*a* has exhaust ports 9. The phase relation of the cranks is such that the piston 3 in the cylinder 1*a* has a slight lead with respect to the pistons in the cylinder 1*b* and 1*c*, so that the exhaust ports are opened in advance of the scavenging ports.

Each of the crank shafts 7*a*, 7*b*, 7*c* has one end mounted in an internal partition wall 10 of the casing, through which it passes, and at the ends of the shafts there are cranks 11*a*, 11*b*, 11*c*. These cranks are parallel with each other, and are coupled with each other by a rigid frame 35, so that they must rotate in the same direction. By virtue of this frame power is transmitted by the cranks 11*b* and 11*c* to the crank 11*a*, and the shaft of this crank is used as the driving shaft.

A portion of the frame 35 constitutes a hollow cylinder 36 having its ends abutting respectively against the wall 10 and a cover 37 of the casing 2. Within the cylinder 36, and eccentric in relation thereto, is a hollow cylinder 38 having an opening at one side and fixed by bolts 39 to the cover and the wall 10. The cylinder 38 is divided by a double wall 40 into two compartments 41 and 42, and within the cavity of the double wall there is a slide 43 connected by a ball and socket joint 44 to a shoe 45. A spring 46 acting on the slide 43 holds the shoe 45 firmly against the inner surface of the cylinder 36. The shoe, in conjunction with the slide 43, divides the interior of the cylin-

Price 4s 0d

Price 25p

der 36 into two compartments 47 and 48. The slide does not fill the opening in the wall of the cylinder 38, but leaves gaps 49, 50, by means of which the compartments 47 and 48 communicate respectively with the compartments 41 and 42.

The cylinder 36 and the cylinder 38 with the shoe 45 constitute in effect the rotor and stator of a rotary pump. The chamber 41 has a port 51 for admission of atmospheric air, and constitutes the suction chamber. The chamber 42 is the compression chamber, and delivers air through a port in the wall 10 into the space 52 within the air-tight casing 2, with which the scavenging ports 8 communicate. The inflow and outflow of air are indicated by arrows in Fig. 2.

Rotation of the cranks 11*a*, 11*b*, 11*c* as indicated by arrows in Fig. 1 causes the frame 35 to perform a rotary movement, whereby the chambers 47 and 48 are alternately expanded and contracted, and air is sucked through the port 51, compressed and delivered through the chamber 52 to the scavening ports 8.

The air pump described adds little to the bulk of the engine, as it is incorporated within the frame 35, which constitutes the actuating member and a portion of which is part of the pump itself. There is generally ample room for a comparatively large frame, so the air pump can also be large, for propelling an ample supply of air without excessive air velocity, and the working of the pump is comparatively noiseless.

In the modification illustrated in Figs. 3, 3*a*, 3*b*, 3*c*, 3*d* and 3*e*, the working chamber of the pump is rectangular, instead of having the crescent shape shown in Fig. 2. The coupling frame 35 has within it a rectangular casing 53, divided by a sliding member 54 into two chambers 55, 56. The slide works in a guide 57, which has ports 57^1 and is fixed to the main casing 2. The slide is capable of up and down movement in the guide, but can take no part in the rocking movement of the frame, indicated in Figs. 3, 3*b*, 3*c* and 3*e* by arrows. The slide 54 has four pairs of passages. One pair, 80, 80, serves to establish communication, between the chamber 56 and a port 81 in a part 82 of the machine, the said port opening into a chamber similar to the chamber 52 shown in Fig. 2. Another pair of passages, 83, 83, serves to establish communication between the chamber 55 and a port 84 opening into the atmosphere, when the frame 35 is in the position shown in Figs. 3 and 3*a*. The third pair of passages (85, 85) establishes communication between the port 84 and chamber 56 when the frame 35 is in the position shown in Figs. 3*c* and 3*d*, and the fourth pair (86, 86) serves to connect the chamber 55 to the port 81. Consequently the slide admits atmospheric air to the chambers 55 and 56 when these are under suction, and it expels the air to the scavenging ports 8 (Fig. 2) when the chambers are under pressure. Successive positions of the frame and slide are shown in Figs. 3, 3*b*, 3*d* and 3*e*, and in Figs. 3, 3*a*, 3*c* and 3*d* arrows indicate the flow of air.

In the construction shown in Figs. 4 and 5 the cranks 11*a*, 11*b*, 11*c* are coupled with each other by a hollow frame 59, and the space 60 within this frame is in permanent communication with the space 52 by means of a port 61 in the wall 10. The frame 59 is in close contact with this wall and with a cover 62 of the casing. The space around the frame, within the cover 62 is divided by partitions 63 into three compartments 64, 65, 66. The partitions have eyes, whereby they are mounted rotatably on the crank pins, and they are slidable in substantially airtight roller packings 68 at the three corners of the cover 62.

Flap valves 69 controlling ports 70 in the sides of the cover 62 open into the chambers 64, 65, 66 and similar valves 72 control ports 71 in the walls of the frame 59, but open into the space 60 within the frame.

When the frame 59 moves from the position shown in Fig. 4, in the course of rotation of the cranks as indicated by the arrows, there is compression of air in the chamber 65, with discharge through the ports 71 of that chamber into the space 60 and thence into the space 52. At the same time there is suction of air into the chamber 64, through the ports 70 of that chamber. In due course the chamber 65 takes up the function of suction chamber, and compression then takes place in the chamber 66.

It will be seen that in this form of construction the cover 62, which is part of the main casing, constitutes part of the air pump, coacting with the frame 59, which is another part of the pump.

It will be understood that the air pump can be modified in many ways as regard details, as for example by substituting slide valves for the flap valves.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. An internal combustion engine having a plurality of opposed pistons, each operating on a separate crank shaft, with supplementary cranks on the crank shafts, coupled with each other by a frame, the

said coupling frame serving as, or being formed integrally with, the rotor of a rotary pump having a member fixed to, or forming part of, or engaged with, the main frame or casing of the engine.

2. An internal combustion engine as claimed in claim 1, wherein a portion of the coupling frame is a hollow cylinder coacting with a smaller hollow cylinder within it, fixed to the main frame, to form a crescent shaped pump chamber, said fixed cylinder having an opening to said pump chamber and being divided into two compartments by a partition guiding a slidable device which extends through said opening and is held in continuous contact with the inner surface of the larger cylinder, the compartments in said fixed cylinder being portions of the suction chamber and the compression chamber respectively.

3. An internal combustion engine as claimed in claim 1 wherein a portion of the coupling frame is a rectangular casing divided into two compartments by a member slidably engaged with a member fixed to the main frame, said slidable member being hollow and divided into two compartments which function as suction and compression chambers and have parts whereby they communicate alternately with the compartments in the rectangular casing.

4. An internal combustion engine as claimed in claim 1, wherein the coupling frame works within a portion of a main casing enclosing the supplementary cranks.

5. An internal combustion engine as claimed in claim 1, 2, 3 or 4, wherein the compression chamber of the pump discharges into a chamber with which air ports of the engine are in communication.

Dated this 28th day of January, 1931.

For the Applicants,
HERBERT HADDAN & Co.,
Chartered Patent Agents,
31 and 32, Bedford Street, Strand,
London, W.C. 2.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1932.

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1

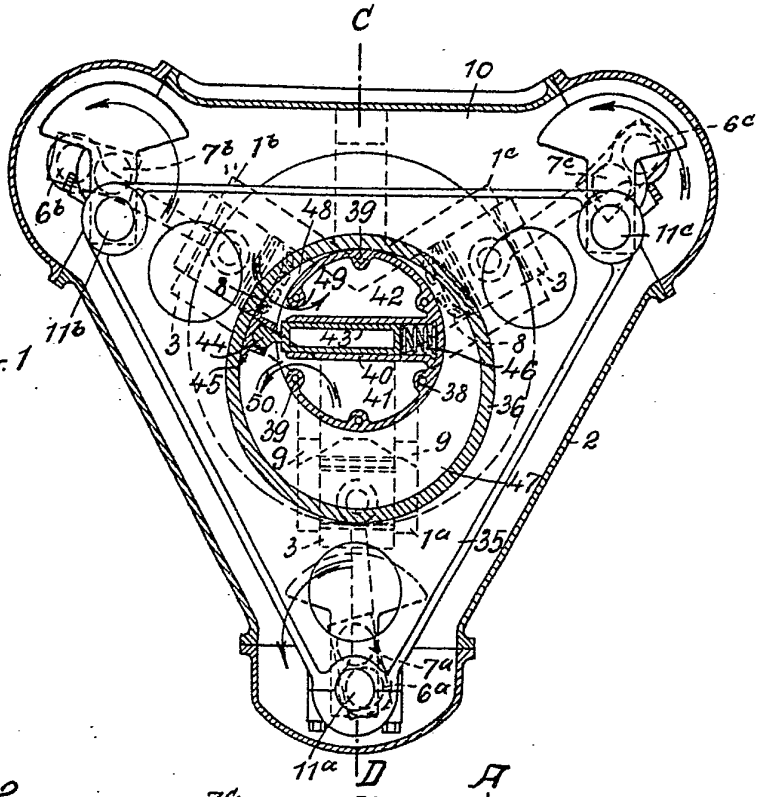


Fig. 2

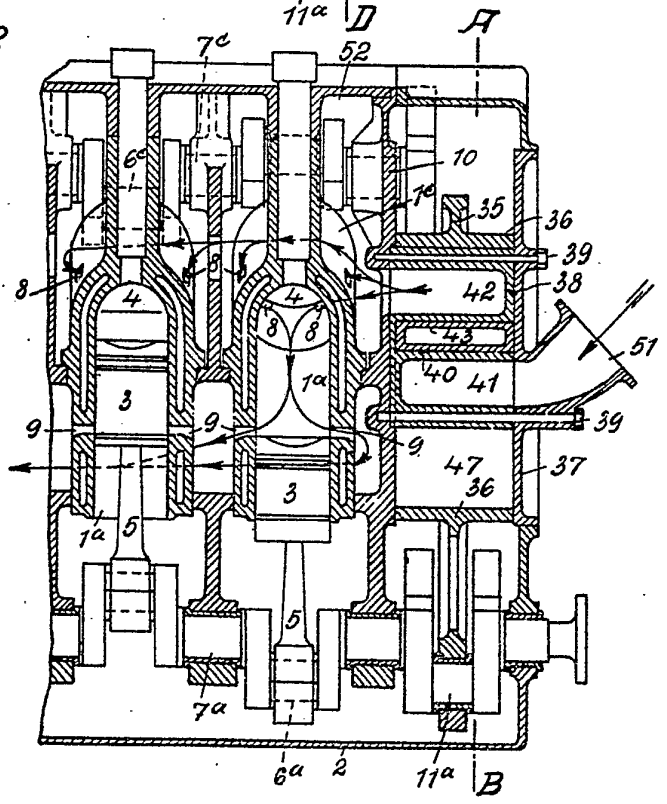


Fig. 3

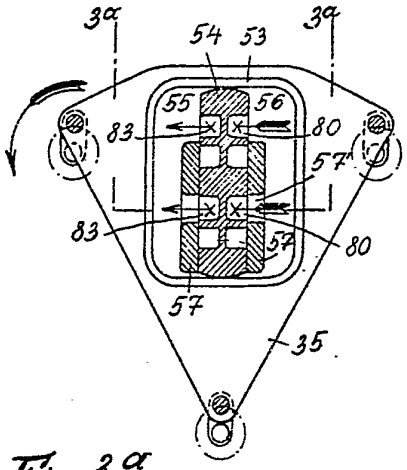
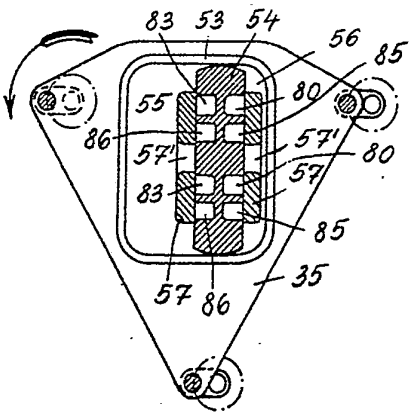


Fig. 3a

Fig. 3b



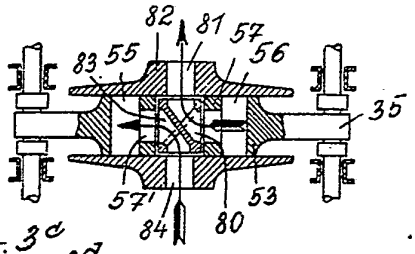
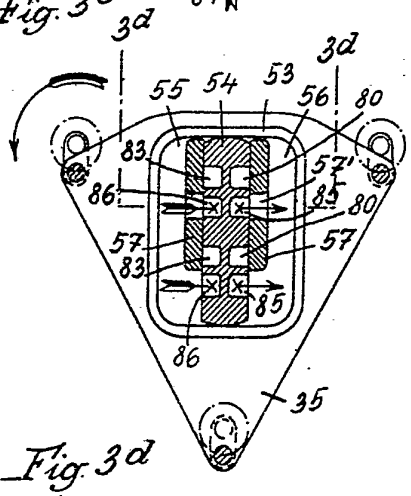


Fig. 3c

Fig. 3e



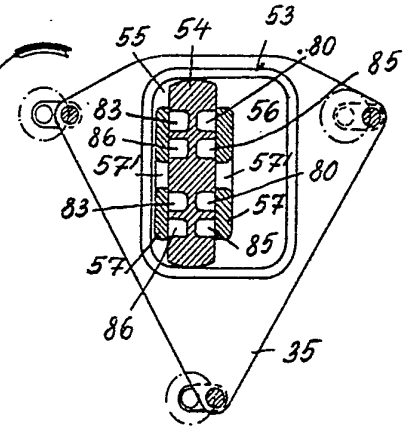
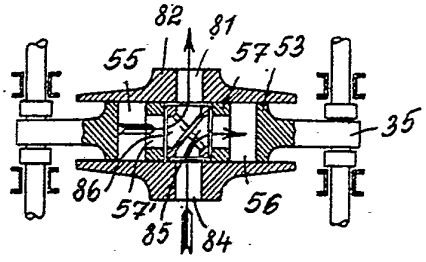


Fig. 3d



Charles & Read Ltd. Photo Litho.

365,802 COMPLETE SPECIFICATION

[This Drawing is a reproduction of the Original on a reduced scale]

Fig. 1

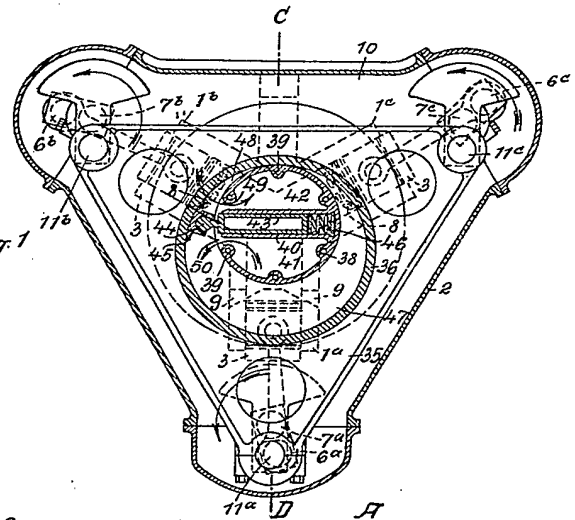


Fig. 2

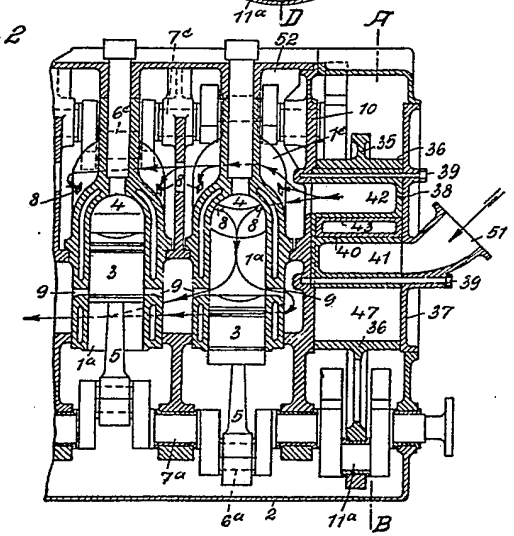


Fig. 3

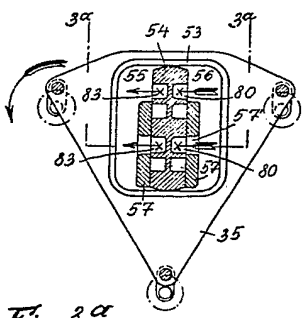


Fig. 3b

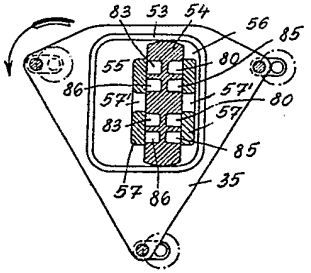


Fig. 3a

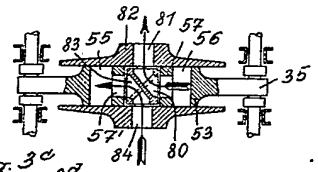


Fig. 3c

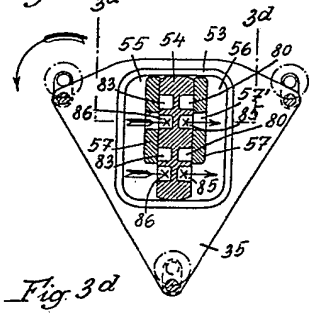


Fig. 3e

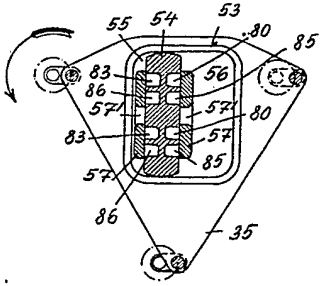
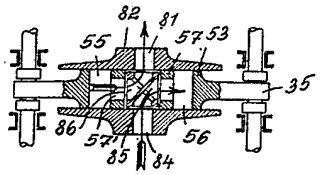


Fig. 3d



[This Drawing is a reproduction of the Original on a reduced scale.]

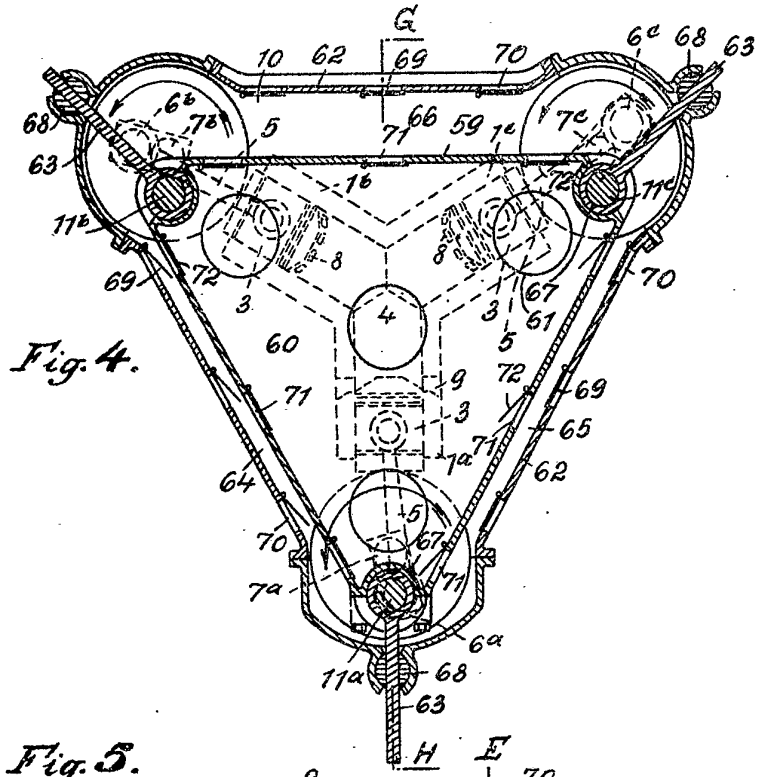


Fig. 4.

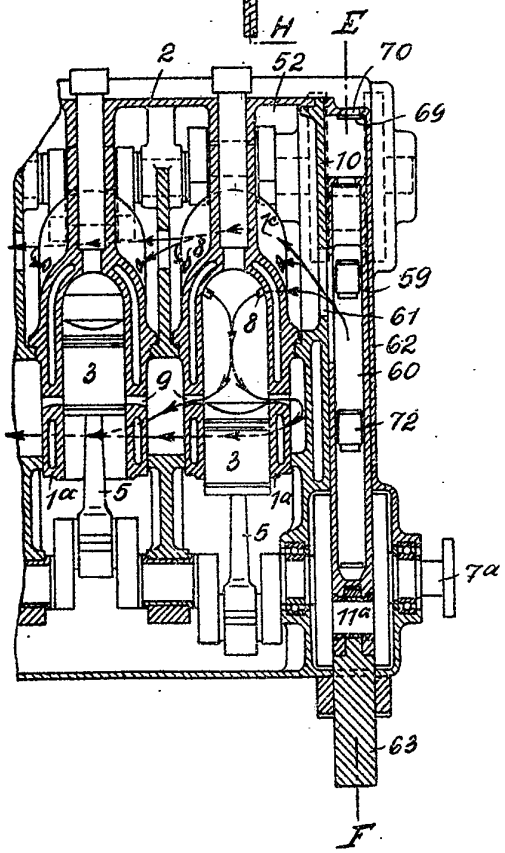


Fig. 5.

Charles & Read Ltd. Photo Litho.