

# RESERVE COPY PATENT SPECIFICATION



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373,730

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Complete Accepted: June 2, 1932.

## COMPLETE SPECIFICATION.

### Improvements in Charging Pumps for Multi-cylinder Two-stroke Internal Combustion Engines.

We, WALTHER STEIGER, a Swiss Citizen, and FRITZ GOCKERELL, a German Citizen, trading as the firm STEIGER & GOCKERELL, of Bollwerk 15, Berne, 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:—

10 The present invention relates to charging pumps for multi-cylinder two-stroke internal combustion engines.

The object of the present invention is to provide in high-speed and crude oil 15 motors the quantity of air required for a good combustion.

The invention consists in the combination with an internal combustion engine of the two-stroke type with crank case 20 pumping and a double acting auxiliary charging pump arranged on the side of the crank shaft remote from the power cylinders and adapted to suck into the casing and to compress the air, of at least 25 two complete sets of working and pump cylinders working with their cranks at 180°, each of the two pump cylinders comprising each set, being in constant open communication with the crank casing of 30 the other pump cylinders in said set.

A working example is represented diagrammatically in the drawing for a four cylinder motor. Therein is

Figure 1 a longitudinal section,

Figure 2 a plan,

Figure 3 a cross-section, and

Figure 4 a diagram.

According to the drawing the cylinders are arranged in groups each including 40 a pair. The cylinders 1, 2 and 3, 4 constitute two such groups. 5, 6, 7 and 8 are the appertaining charging pumps. Not only the cranks of the power pistons and the pump pistons are mutually displaced at 180° but also the cranks of the two 45 power pistons forming each group are displaced relatively to one another at the same angle and similarly with those of the two pump pistons. Besides, the chambers 5<sup>1</sup>, 6<sup>1</sup> of the pump cylinders are connected with the chambers 10 and 9 of the crank cases alternately by conduits 5<sup>2</sup> and 6<sup>2</sup>, which discharge at the bottom of the

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pump chambers 5<sup>3</sup>, 6<sup>3</sup>. In a similar way are arranged the pistons of the power cylinders 3, 4 and the pump pistons 7 55 and 8 and crank cases 11, 12. The exhaust opening 13 and the intake opening 14 of the air are so disposed, that the first will be overlapped by the power 60 cylinder piston in its upper dead point and the latter in the lower dead point position of the piston. Each crank case chamber is connected with the chamber of the power cylinder by an overflow conduit 15 which discharges between the 65 exhaust and the intake of the air into the cylinder.

Owing to the described arrangement the working of the device is as follows: 70

If in the first group, as is especially shown by fig. 4, the piston of the first cylinder is at the outer dead point position and that of the second cylinder at the inner dead point a depression will 75 have been produced between the pistons 1 and 5 in the crank case 9 and under the piston 6. This depression will cause the filling with air of these chambers through the air intake 14 which is now left free. 80 On the other side the air will be compressed between the pistons 2 and 6 and under the piston 5 and be pressed through the conduit 15 in the upper chamber of cylinder 2. But since here also the 85 exhaust opening 13 is free, this cylinder will be scavenged and filled while in the cylinder 1 the compressed gases are ready for the injection and ignition.

Moreover, the pump pistons are double 90 acting and the conditions of space are such, that these pumps are able to convey a multiple of the volume of the cylinder.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to 95 be performed, I declare that what I claim is:—

1. In an internal combustion engine of the two stroke type with crank case pump- 100 ing and a double acting auxiliary charging pump arranged on the side of the crank shaft remote from the power cylinders and adapted to suck into the casing and to compress the air, the combination of at least two complete sets of 105

working and pump cylinders working with their cranks at 180°, each of the two pump cylinders comprising each set, being in constant open communication with the crank casing of the other pump cylinder in said set.

2. Improved internal combustion engine of the two stroke type substantially as described and illustrated in the accompanying drawings.

Dated this 16th day of April, 1931.

MARKS & CLERK.

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Fig 1

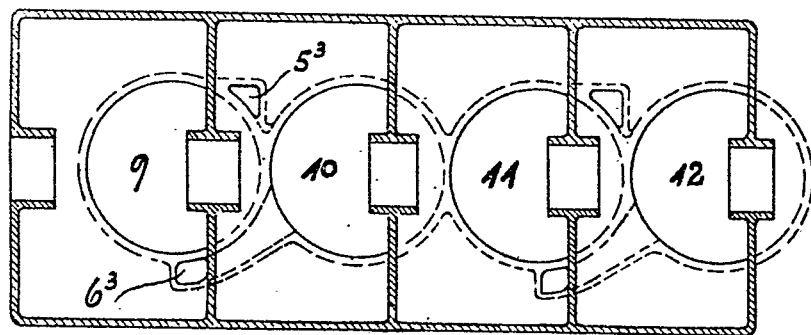
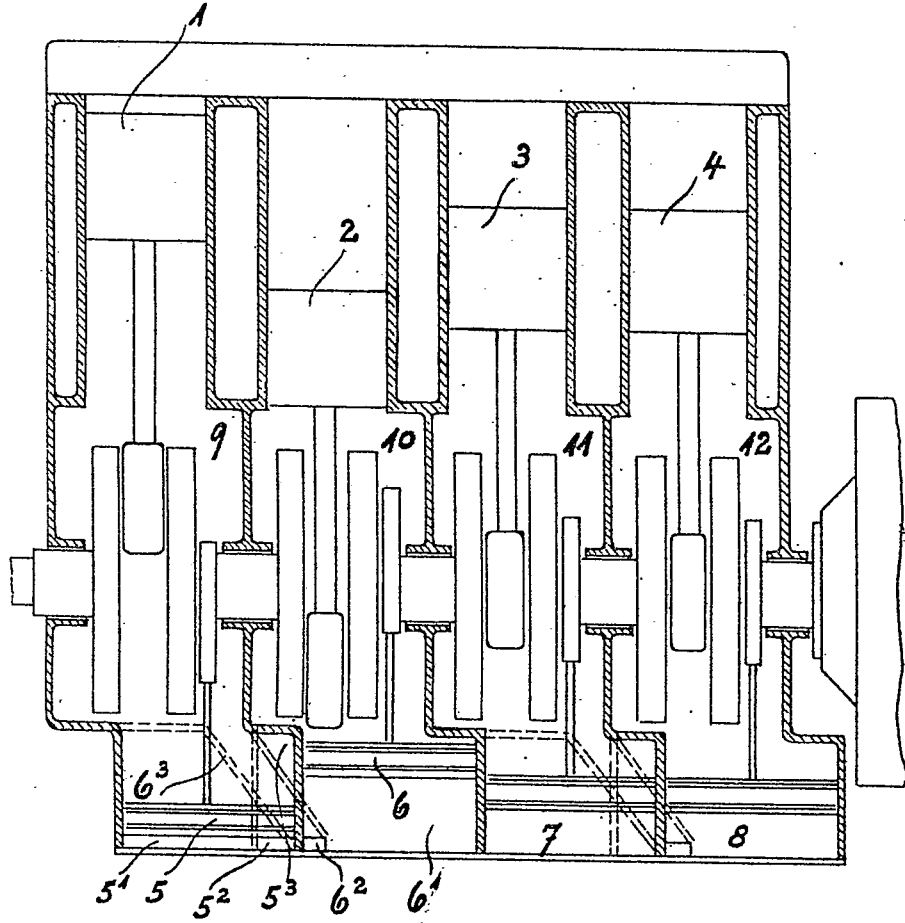


Fig. 2.

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

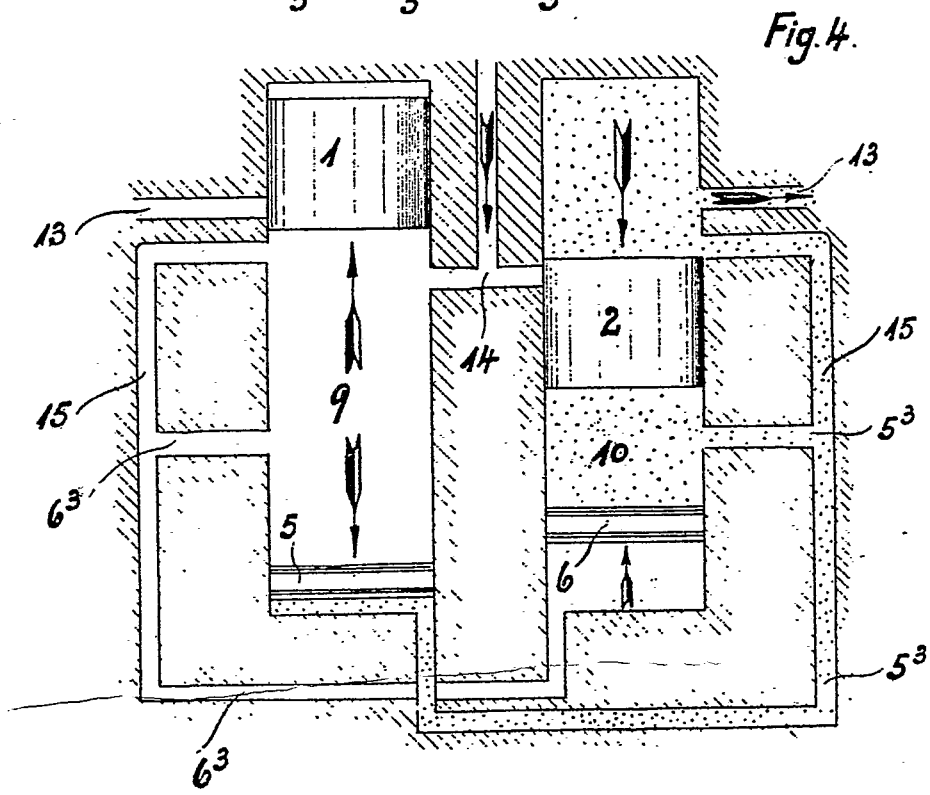
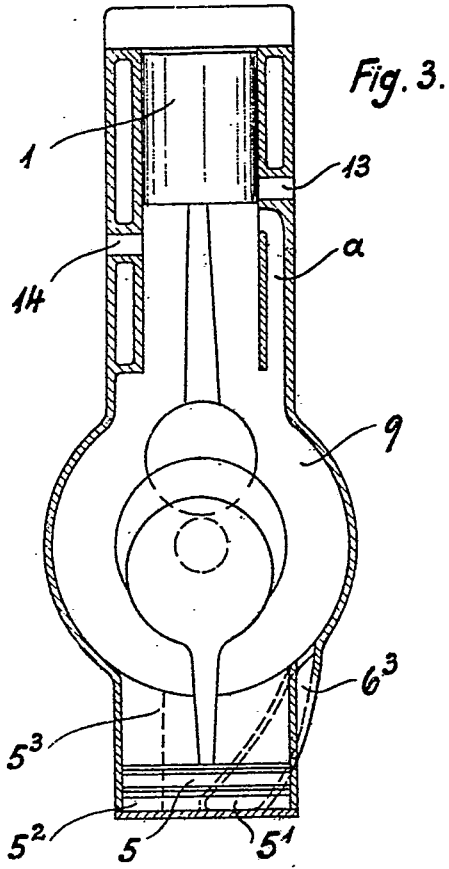


Fig 1

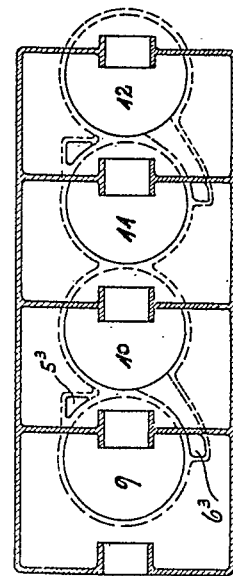
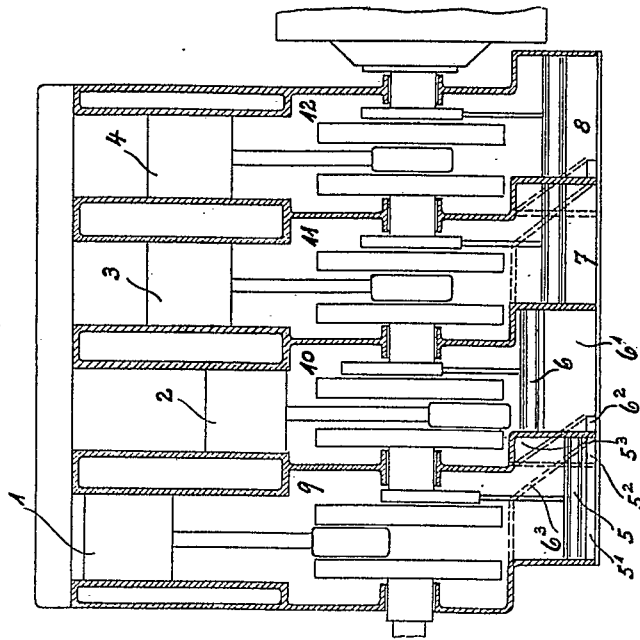


Fig 2.

Fig. 3.

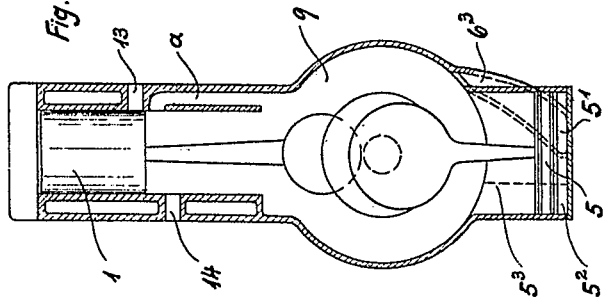
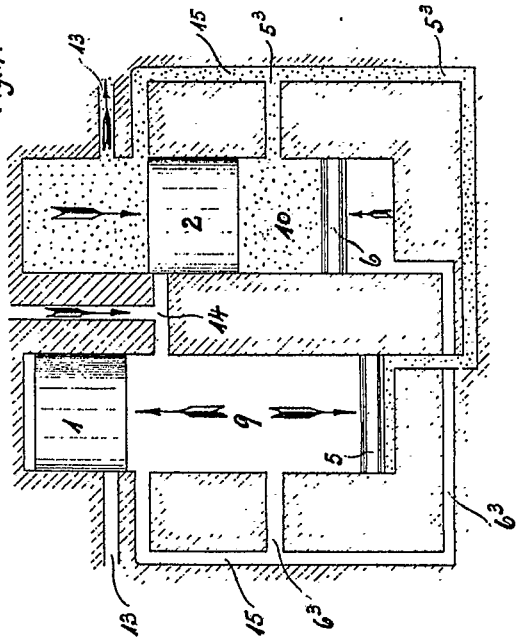


Fig 4.



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