May 26, 1931. J. BRYANT 1,806,608

INTERNAL COMBUSTION ENGINE

Filed March 5, 1928 2 Sheets-Sheet 1

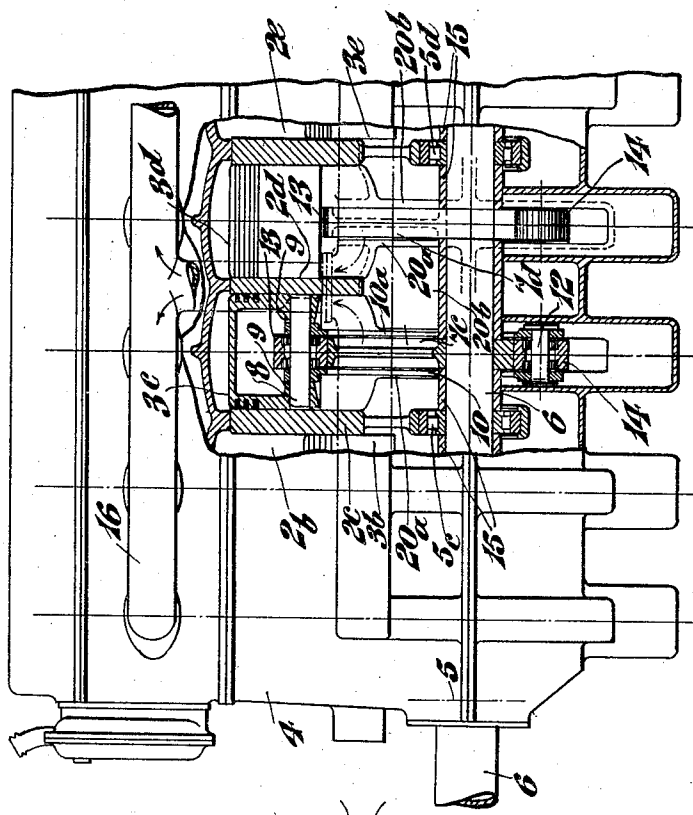


Fig. 2.

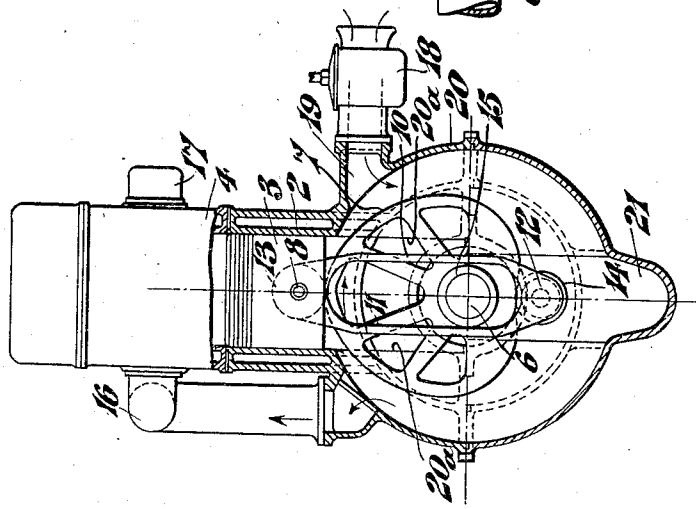


Fig. 1.

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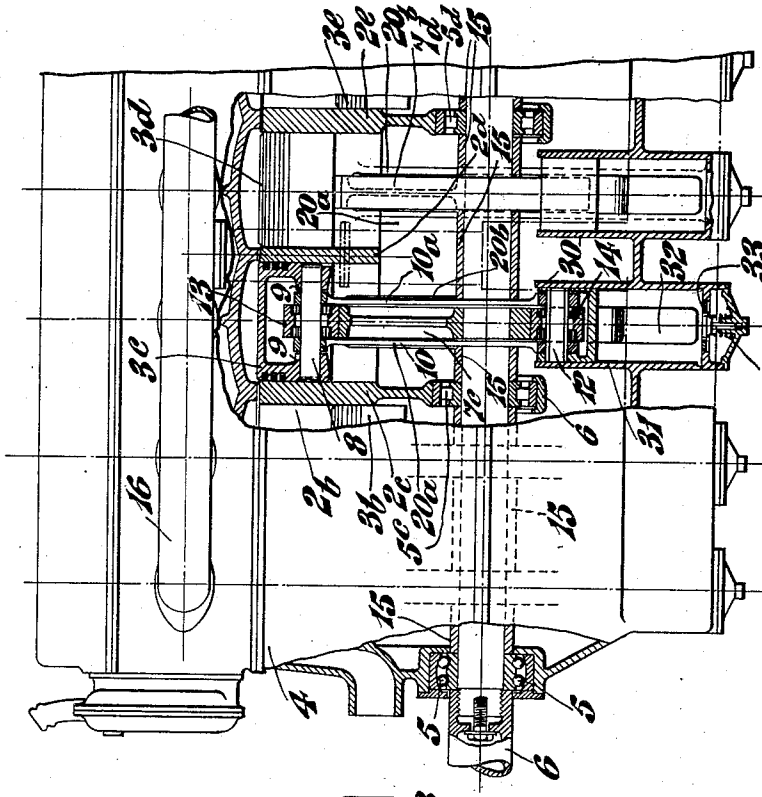


Fig. 5.

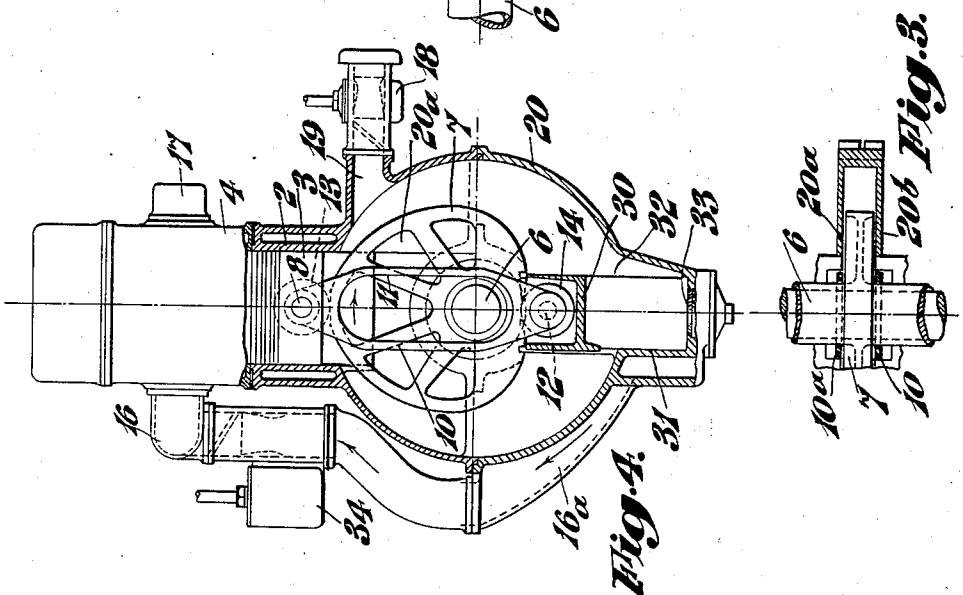


Fig. 4.

Fig. 3.

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1,806,608

UNITED STATES PATENT OFFICE

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INTERNAL COMBUSTION ENGINE

Application filed March 5, 1928, Serial No. 259,025, and in Great Britain April 5, 1927.

This invention relates to internal combustion engines and has for its object to provide improved means for effecting the compression of the charge or air for the charge in such engines.

The present invention comprises an internal combustion engine in which the power is transmitted from the engine piston to the power shaft by a cam, characterized in that the cam is also used for operating a compressor or super-charger, or for operating directly as the displacement member of a rotary compressor or super-charger. The air or charge compression may be effected in the crank case of the engine or in an extension thereof.

The cam mechanism may be of the kind in which the cam is engaged continuously at opposite points by rollers carried by a rectilinearly moving link connected to the power piston, the end of the link opposite the power piston being arranged to operate the piston of a compressor, or a super-charger delivering air to the combustion chamber of the engine.

The sides of the cam may be arranged to rotate between parallel walls in the crank casing, such walls being arranged to form a compression chamber having a periphery over which the outer portion of the cam passes, there being provided near the upper or inlet side of the chamber an opening for air or carburetted air, and at a lower portion or at a suitable distance from the first opening there being also provided an outlet leading through a valve to a container or directly into the combustion chamber of the engine.

According to a further feature of the invention the rotary displacement member may operate in conjunction with a reciprocating piston compressor operated from link mechanism transmitting power from the engine through the cam to the power shaft.

Two methods of carrying out the invention are illustrated by the accompanying drawings wherein Fig. 1 is a transverse partly sectional elevation and Fig. 2 a partly sectional side elevation of a multicylinder engine incorporating one of these methods, Figs. 4 and 5 are similar views of an engine incorporating the second method, while Fig. 3 is a sectional plan of a portion of Figs. 1 and 4.

In these drawings 2, 2*b*, 2*c*, 2*d* and 2*e* are the cylinders of a multicylinder internal combustion engine of the inverted cylinder type, and having truncated pistons, 3, 3*b*, 3*c*, 3*d* and 3*e*.

The main casting 4 of the engine is of the usual type provided with ball bearings at 5 and intermediate roller bearings 5*c* and 5*d* in which rotates the main shaft 6 of the engine.

On the shaft 6 is mounted a series of cams, 7, 7*c* and 7*d*, one for each piston of the engine.

Each piston is provided with a gudgeon pin 8 fitting in bosses 9 formed in the sides of the pistons and extending through one end of a link formed of two members 10 and 10*a* arranged on opposite sides of the cam 7*c*. Each link 10 is provided with a slot 11 through which the shaft 6 passes, the slot being of such a width and length as to enable the links to perform the full strokes of the piston. The ends of the links below the shaft 6 are connected together by a pin or bolt 12.

On the pins 8 and 12 are mounted rollers 13 and 14 arranged to engage diametrically opposite sides of the cam 7 as shown in Fig. 1 and the cam 7*c* as shown in Fig. 2. The cams 7, 7*c* etc. are designed to engage both rollers 13 and 14 at all angular positions of the cam, the distance between the rollers 13 and 14 being a fixed quantity, and the contour of the cam is designed to give the desired angular movement of the shaft 6 corresponding to the axial movement of the piston with which it is associated.

Distance sleeves 15 are provided on the shaft 6 between the cams 7 and the bearings 5, and the engine is provided with an induction pipe 16 and an exhaust 17, a carburetter 18 and charge inlet 19 to the crank case 20. A recess 21 is provided in the lower end of the case 20 to enable the links 10 to move freely to their lowest position.

In this example the crank case forms a

charging chamber, the cam 7 operating as the rotary charging element of a rotary compressor by moving between the walls 20*a* and 20*b* shown in Fig. 3.

The cam 7 sweeps the charge entering the crank casing from the charge inlet 19 and forces it out through the induction pipe 16 into the combustion chamber of the cylinder.

In the construction shown in Figure 1, when the piston is descending, and has descended, and again, while ascending, it forms an obstruction to direct movement of fuel mixture from the inlet 19 to the port of the induction pipe 16. The space between the walls 20*a* and 20*b* forms a charging space, and as the revolving cam, below the piston, sweeps through this space, a quantity of fuel mixture sufficient to form a fuel charge is swept by the cam into the port of the induction pipe 16. By means of a check valve, as indicated by dotted lines in Figure 4, the fuel mixture is prevented from being forced or swept back to the carbureter by the movement of the cam.

In the modification shown in Figs. 4 and 5 the corresponding parts have been given the same reference numerals as in Figs. 1 and 2 and operate as described above. In this modification there is provided on the lower pin 12 of the link 10 a piston 30 operating in a cylinder 31 formed in the lower portion of the crank case. This cylinder is provided with an opening 32 in its side so that as the cam 7 sweeps round the crank casing it forces the charge through the opening 32 into the cylinder 31 from which it is forced by the piston 30 down through a valve 33 provided with a closing spring 33*a*. The charge delivered through the valve 33 passes along a pipe 16*a* through a pressure carburetter 34 and the induction pipe 16 into the combustion space, thus providing the engine with an effective supercharging system.

In both of these cases the device may be arranged to operate as a supercharger, also the charge from the crank case may be arranged to pass through a second carburetter into the combustion chamber of the engine, or the device may be used for supplying scavenging air to the cylinder.

The cam mechanism may be of the kind described in British patent specification No. 276774.

What I claim and desire to secure by Letters Patent is:—

1. In an internal combustion engine, the combination with a cylinder and crank case, the latter having spaced inlet and outlet ports for fuel mixture, of a crank shaft and a cam thereon, a piston adapted to intermittently obstruct passage of fuel mixture between said ports, a cam on the shaft adapted to sweep a fuel charge into the outlet port, and a link connection between said cam and piston.

2. In an internal combustion engine, the combination with a cylinder and a power-shaft-case, the latter having spaced inlet and outlet ports for fuel mixture, of a reciprocating piston operating in the cylinder, a power shaft, a cam on the power shaft adapted to transmit motion from the the piston to the shaft and simultaneously sweep a charge from the shaft case into the outlet port, a link connection between the cam and piston adapted to hold the cam continuously against the piston, and means for preventing free passage of the charge over the side of the cam.

In witness whereof I affix my signature.

JOHN BRYANT.