Aug. 30, 1927. 1,640,950

C. E. LUCKE

INTERNAL COMBUSTION ENGINE

Filed May 24, 1923

Fig. 2.

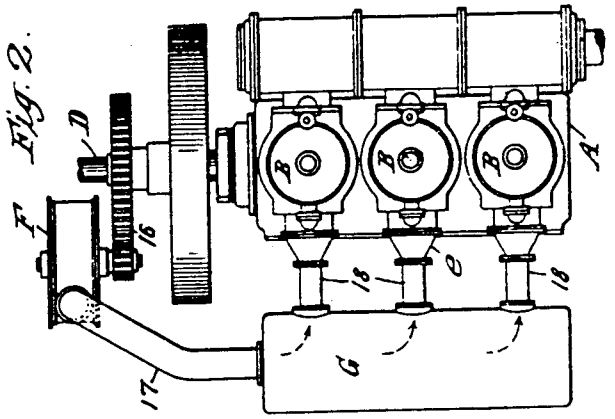
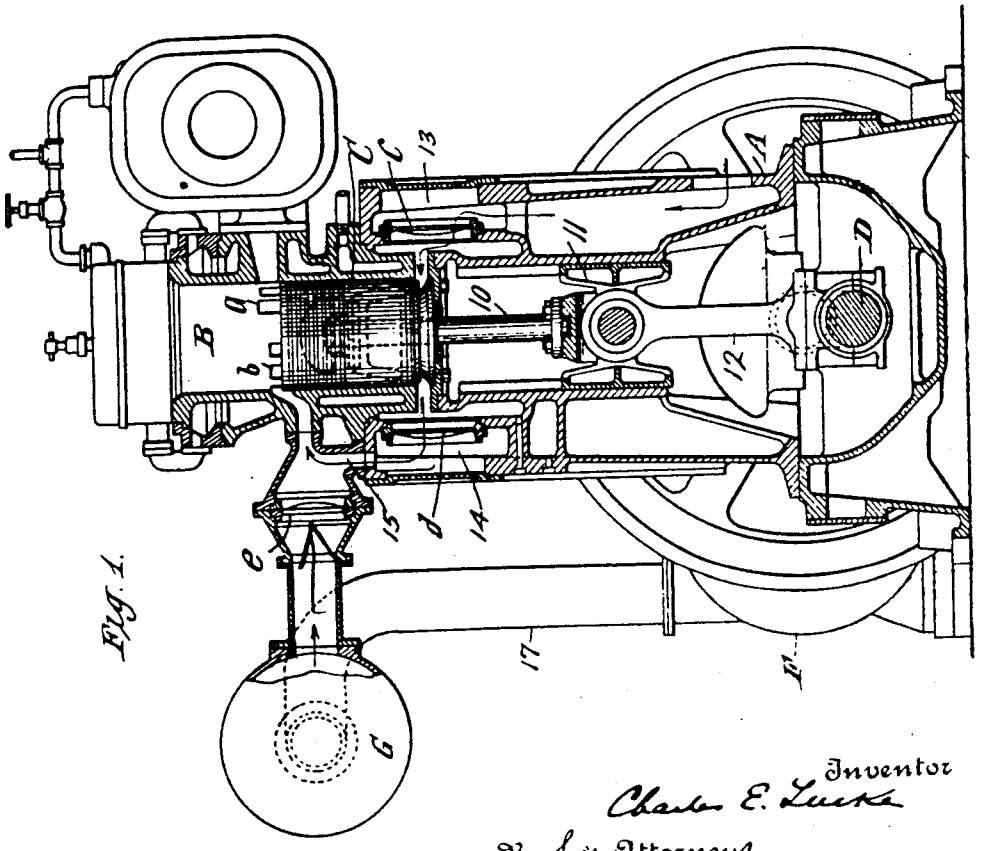


Fig. 1.



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Patented Aug. 30, 1927. 1,640,950

UNITED STATES PATENT OFFICE.

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INTERNAL-COMBUSTION ENGINE.

Application filed May 24, 1923. Serial No. 641,043.

This invention relates to improvements in internal combustion engines, and especially to two-cycle engines of that class in which scavenging air is admitted through side ports in the cylinder wall, opened and closed by the piston.

One object of the invention is to provide a construction in which the scavenging air or part of it is compressed by the piston on its outward stroke, with the air thus compressed delivered to the cylinder through short passages from the compressing chamber, and in which automatic suction and discharge valves are arranged close to the piston, so as to provide comparatively small clearances for the piston in its outward stroke, with the result that there is no considerable body of scavenging air between the cylinder and rear side of the piston to be affected by irregularities in the combustion cylinder pressure. I thus obtain a more steady and uniform flow of scavenging air to the cylinder, with consequently more satisfactory operation and greater efficiency.

A further object is to provide simple and efficient means for augmenting the supply of scavenging air to the cylinder above that supplied by the displacement compressor formed by the engine piston. For this purpose I use a blower driven by the engine, so as to maintain a constant supply of compressed air which is delivered through suitable check valves to the cylinder when the pressure therein is reduced below that of the supply from the blower. This blower supply of scavenging air may be at a lower pressure than that furnished by the displacement compressor or by the engine piston, the scavenging air from the displacement compressor then supplying scavenging air during the first part of the scavenging and air supply operation, until the pressure drops to such a point that the valve from the blower supply opens. Thus the supply of high pressure scavenging air from the displacement compressor may be comparatively small and relied upon only for high pressure air to produce thorough scavenging, and the desired cylinder supply be secured by the blower.

In the accompanying drawings forming a part of this specification, the invention is illustrated as applied in its preferred form to a three-cylinder two-cycle engine of well-known type, and this construction will now be described and the features forming the invention specifically pointed out in the claims.

In the drawings—

Figure 1 is a sectional elevation of the engine transversely to the shaft, and

Figure 2 is a plan view of the engine.

A is the engine frame, B the cylinders, C the piston shown as connected by piston rod 10, crosshead 11 and pitman 12 to the crank on engine shaft D, the engine being shown as of the crosshead type. *a* are the exhaust ports connected to the exhaust manifold, and *b* the scavenging and air supply ports, these ports being opened and closed by the piston in the usual manner. The cylinder space at the rear side of the piston below the ports *a*, *b* forms a compressing chamber coacting with the rear side of the piston C as a displacement compressor, this compressor having suction valves *c* and discharge valves *d* connecting the compressing chamber with inlet 13 and discharge chamber 14, which discharge chamber 14 is of small size and connected by a short passage 15 directly to the scavenging ports *b*. The valves *c*, *d* may be of any suitable automatic type opening under light pressure, but preferably and as shown, are the same as shown and described in United States Letters Patent No. 1,341,145, dated May 25, 1920, to Robert Meyer.

With the construction shown and described above, it will be seen that the scavenging air is substantially free from irregularities due to cylinder action, there being no considerable body of scavenging air to be affected thereby, but the compressor delivering through a small cylinder clearance and discharge valves to the cylinder with only a small discharge chamber and short passage between the compressor and cylinder.

The cylinder air supply is increased above that of the displacement compressor by a suitable rotary blower or compressor, which may be driven and connected to the cylinder in any suitable manner. As shown, the blower F is driven by gearing 16 directly from the engine shaft D and delivers through pipe 17 to a header G from which the air passes to the respective cylinders through separate pipes 18, each controlled by automatic valves *e* which preferably and as shown are of the same form as the valves *c*, *d*. Each cylinder thus receives

its supply independently of the other cylinders, such supply to each cylinder being dependent upon the pressure in that cylinder. If the blower pressure is lower than that of the displacement compressor, the valves *e*, of course, are closed at the time of first opening the scavenging ports *b* by the piston and until the cylinder or scavenging pressure has dropped sufficiently to permit the opening of the valves *e*. It will be understood that the blower for increasing the air supply may be used with displacement pumps and cylinder ports of other arrangement within the broader features of the invention. Also that the invention is not limited to the exact form or arrangement of parts illustrated, but that modifications may be made within the scope of the claims.

What I claim is:

1. The combination with the piston and cylinder of an internal combustion engine having scavenging ports in the side wall of the cylinder opened and closed by the piston, of an air compressing chamber on the rear side of the piston forming with the latter a displacement compressor, suction and discharge valves for the compressor arranged close to the compressing chamber, a passage of small capacity directly from the discharge valves to the scavenging ports, and a blower and connections to the cylinder for augmenting the supply of air furnished by said displacement compressor.

2. The combination with the piston and cylinder of an internal combustion engine having scavenging ports in the side wall of the cylinder opened and closed by the piston, of an air compressing chamber on the rear side of the piston forming with the latter a displacement compressor, suction and discharge valves for the compressor arranged close to the compressing chamber, a passage of small capacity directly from the discharge valve to the scavenging ports, a blower for augmenting the supply of scavenging air furnished by said displacement compressor, a connection from said blower to the cylinder scavenging ports, and an automatic check valve opening toward the cylinder in said blower connection.

3. The combination with the pistons and cylinders of a multicylinder internal combustion engine having scavenging ports in the side walls of the cylinders opened and closed by the pistons, of an air compressing chamber on the rear side of each of said pistons forming with said pistons a displacement compressor for each cylinder, suction and discharge valves arranged close to said compressing chambers, short passages from the discharge valves to the scavenging ports, a header having a connection to each cylinder, an automatic check valve between the header and each cylinder, said check valves opening toward the cylinders, and a blower for supplying air to said header to augment the supply of air furnished by the displacement compressors.

4. The combination with the piston and cylinder of an internal combustion engine having scavenging ports in the side wall of the cylinder opened and closed by the piston, of a displacement compressor, suction and discharge valves for the compressor arranged close to the compressing chamber, a passage of small capacity directly from the discharge valves to the scavenging ports, and a blower and connections to the cylinder for augmenting the supply of air furnished by said displacement compressor.

5. The combination with the piston and cylinder of an internal combustion engine having scavenging ports in the side wall of the cylinder opened and closed by the piston, of a displacement compressor, suction and discharge valves for the compressor arranged close to the compressing chamber, a passage of small capacity directly from the discharge valve to the scavenging ports, a blower for augmenting the supply of scavenging air furnished by said displacement compressor, a connection from said blower to the cylinder scavenging ports, and an automatic check valve opening toward the cylinder in said blower connection.

6. The combination with the pistons and cylinders of a multicylinder internal combustion engine having scavenging ports in the side walls of the cylinders opened and closed by the pistons, of a displacement compressor for each cylinder, suction and discharge valves arranged close to said compressing chambers, short passages from the discharge valves to the scavenging ports, a header having a connection to each cylinder, an automatic check valve between the header and each cylinder, said check valves opening toward the cylinders, and a blower for supplying air to said header to augment the supply of air furnished by the displacement compressors.

7. The combination with the piston and cylinder of an internal combustion engine having scavenging ports in the side wall of the cylinder opened and closed by the piston, of a displacement compressor and its compressing chamber, suction and discharge valves for the compressor, a passage of small capacity from the discharge valves to the scavenging ports, said compressing chamber, valves and passages being arranged to provide small air capacity between the compressor and engine cylinder, whereby irregularities in the air supply are avoided, and a blower and connections to the cylinder for augmenting the supply of air furnished by said displacement compressor.

In testimony whereof, I have hereunto set my hand.

CHARLES E. LUCKE.