Feb. 13, 1923. 1,445,073.

D. CORPI ET AL.

PORTABLE COMPRESSOR.

FILED OCT 25, 1919.

Fig. 1

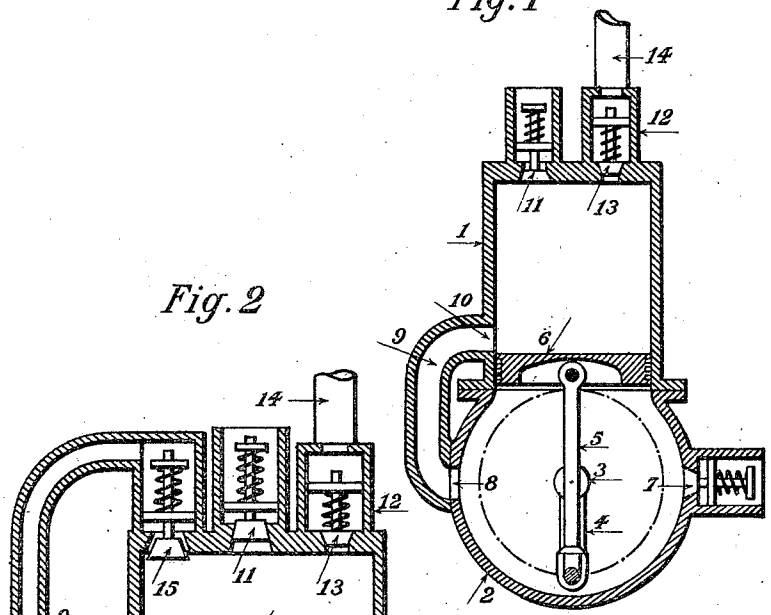
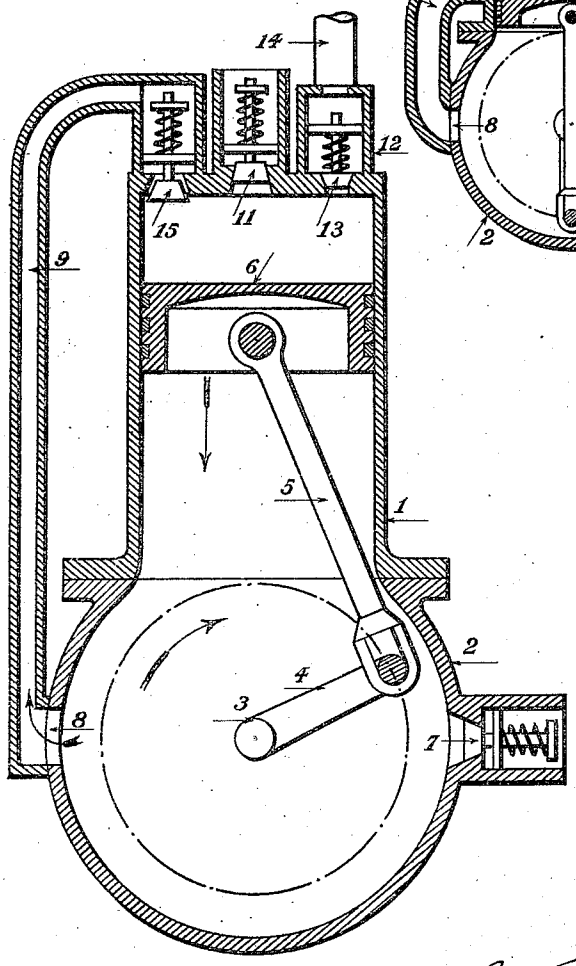


Fig. 2



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UNITED STATES PATENT OFFICE.

DOMENICO CORPI, OF CONSTANTINOPLE, TURKEY, AND MARCEL PRÉTOT, OF MULHOUSE, FRANCE.

PORTABLE COMPRESSOR.

Application filed October 25, 1919. Serial No. 333,228.

To all whom it may concern:

Be it known that we, DOMENICO CORPI, citizen of the Kingdom of Italy, and MARCEL PRÉTOT, citizen of the French Republic, and residing at 68 Muhurdar Djadessi, Moda-Kadikeuy, Constantinople, Turkey, and 4 Rue d'Alsace, Mulhouse, France, have invented certain new and useful Improvements in Portable Compressors (for which we have filed application in France September 3, 1918, Patent No. 497,208), of which the following is a specification.

The present invention consists in a single cylinder, single piston high speed air compressor which compresses the air in two phases. The first compression of the air is effected by one of the faces of the piston in the crank casing, whilst the final compression is effected in the cylinder under the action of the other face of the piston.

Two forms of construction of the compressor which constitute the invention are illustrated more or less diagrammatically in vertical section and by way of example in Figs. 1 and 2 of the accompanying drawing.

The cylinder 1 of the compressor (Fig. 1) is mounted on an impermeable crank casing 2 through which a shaft 3 runs that carries the crank 4, which actuates the piston 6 through the medium of the connecting rod 5. A suction valve 7 is mounted at a suitable point in the crank casing 2 which has formed in it at another suitable point an opening 8 over which a tube 9 is mounted which is connected with the opening 10 at a point in the cylinder situated immediately above the upper face of the piston when the latter is at the lowest point of its course. A suction valve 11 identical with the valve 7 and a valve crown or cap 12 containing a compression valve 13 are arranged in the upper part of the cylinder. The cap 12 carries the pipe 14 through which the compressed air issues.

The apparatus thus constituted acts in the following manner: The shaft 3 being actuated by any suitable motor, the piston 6 occupying the position shown that is to say that it has reached the end of its course in the cylinder 1. In descending the piston 6 has created a suction behind it. The valve 11 has opened and the cylinder has filled with air at the atmospheric pressure. At the same time it has compressed in the crank casing 2 the air contained and the valve 7 has closed. If V be taken as the volume of the cylinder and K that of the crank casing when the piston has reached the bottom of its course there will be on the one hand above the piston a volume of air V at atmospheric pressure Pa and on the other hand below the piston a volume V+K brought to the volume K and the pressure of which consequently will be $Px > Pa$. At the moment when the piston arrives at the lowest point in its course it frees the opening 10. Thus the air will pass through the opening 8 and the tube 9 from the crank casing into the cylinder above the piston 6 and a pressure Px' will be established that is less than Px but greater than Pa.

When the piston moves up again it covers the opening 10 and isolates the cylinder (upper part) from the crank casing. It compresses once more the air that is above its upper face and the compressed air escapes through the valve 13, the cap 12 and the tube 14. On the other hand the piston which moves up causes a suctional effect behind it in the crank casing 2 and in the lower part of the cylinder 1. When the pressure has become lowered, in this space, below Pa the valve 7 will open and allow a fresh quantity of air to enter the crank casing. This air will be compressed when the piston descends again. The double cycle is thus reproduced during the working of the apparatus.

In comparing this arrangement with another of equal dimensions but taking in and compressing the air by means of the same face of the piston it will be found that both take in at first a volume V at the pressure Pa. But the arrangement that constitutes the invention then receives in its cylinder a quantity of supplementary air at a pressure that is variable according to the value of the volume K so that at last the cylinder contents is fully equal to V but the pressure of the air therein will be greater than Pa. The capacity of this new arrangement is thus greater than that of the

other with equal diameter and stroke of piston. This is a very important point in an apparatus that must be portable and consequently light, for the weight is scarcely increased.

The value of the final compression, that is to say of the pressure existing in the cylinder above the upper face of the piston depends on the ratio of the volume K of the crank casing and of the tubular piece 9 to the volume V of the cylinder. The greater the volume K in relation to the cylinder the smaller will be the valve of the final precompression. On the contrary this value will increase in proportion as K diminishes, the lower limit of K being determined by the necessities of the construction (situation of the connecting rod, of the crank, etc.).

The apparatus which has just been described is mounted in the form of a compression group comprising two compressing cylinders and two driving cylinders with two stroke cycle explosions mounted on the same shaft, on a single frame or chassis so that the whole is easily portable. The driving cylinders form a block, one compressor being placed at each end of the shaft, the different devices necessary for the action of the group being included: magneto, carburetter, radiator, starting device, oil and water pumps, pretol and oil reservoirs, flywheel, etc.

The group is formed principally for boring mine holes, for war purposes but is also applicable to removable installations or installations of a temporary character for which it is suitable in consequence of its slight weight and its simplicity.

It should be clearly understood that the compressing engine which constitutes the invention may be utilized for the compression of gases other than air that there may be any number of cylinders and that the compressing pistons may be actuated by a motor of any kind, that the valves may be operated mechanically, the cylinder ends not set in.

The connection between the crank casing and the cylinder may be effected by a tube 9 connecting the crank casing in the upper part of the cylinder with a valve cap or crown containing a valve 15, as shown in Fig. 2.

The working is thus as follows:

The piston 6 in descending creates a suction. The valve 11 opens and the gas is compressed in the crank casing. The spring acting on the valve 15 is arranged so that this valve opens when the pressure in the crank casing attains a value approximating to the pressure Px and the phenomena described above are reproduced.

The arrangements described above may also be applied to a compressor working at any speed whatever.

The drawing in of the air introduced below the piston may be effected either by means of an automatic valve or a mechanically operated valve mounted on a space or receptacle which communicates with the crank casing or the lower part of the cylinder or through an opening formed in the lower part of the cylinder in the crank casing or in any device whatever that communicates with the lower part of cylinder or with the crank casing. The opening may be alternately freed and obstructed by the piston itself or by any other mechanism whatever.

What we claim is:

In a two stage air compressor a cylinder having its head end adapted for high compression and its crank end adapted for low compression, a crank case closing the crank end, a piston adapted to be reciprocated in said cylinder, an inlet valve in the head of the cylinder, an exhaust valve in the head of the cylinder, an inlet valve in the crank case, a pipe connecting the crank case with the head end of the cylinder, and a valve in the head of the cylinder adapted to admit air thereto from the crank case when the pressure in the crank case exceeds a predetermined limit.

In testimony whereof we affix our signatures in presence of two witnesses.

ING. DOMENICO CORPI.
MARCEL PRÉTOT.

Witnesses:
JOHN VOMICE,
PAUL COULOMB.