June 22, 1937. R. PATERAS PESCARA 2,084,822

AUTO COMPRESSOR

Filed Sept. 7, 1935

Fig. 4.

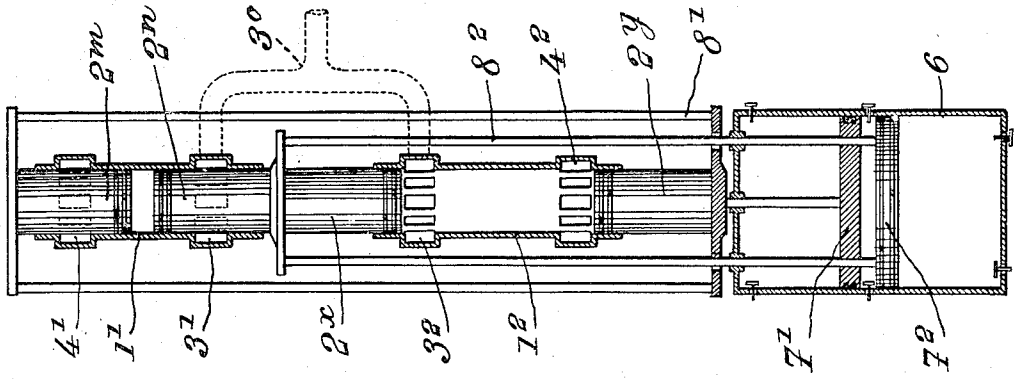


Fig. 3.

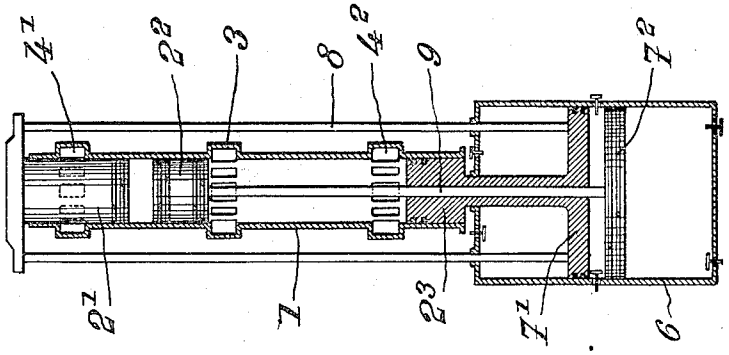


Fig. 2.

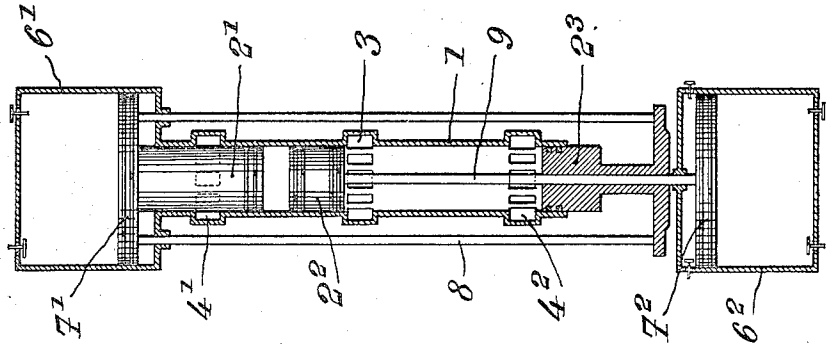
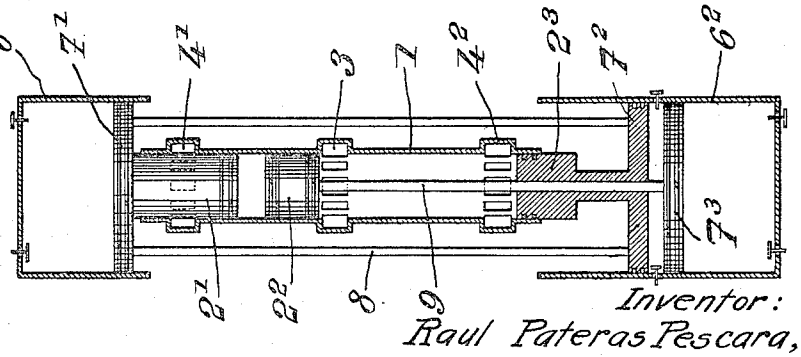


Fig. 1.



Inventor:
Raul Pateras Pescara,

Bailey & Carson

Attorneys

Patented June 22, 1937

2,084,822

UNITED STATES PATENT OFFICE

2,084,822

AUTO-COMPRESSOR

Raul Pateras Pescara, Paris, France.

Application September 7, 1935, Serial No. 39,641
In Belgium September 7, 1934

10 Claims. (Cl. 230—56)

The present invention relates to auto-compressors having free pistons, this general term including not only engines working under pressure as generators of compressed and superheated fluids and transforming directly (therefore without any intervention of a mechanical energy) the calorific energy of a fuel (either liquid or gaseous, or eventually of a powdery nature) into energy stored up in the form of pressure in a compressed fluid, but also engines working according to a pressure feed cycle, as generators of compressed and superheated gases.

The object of the present invention is to provide engines of this kind which are better adapted to meet the requirements of practice than engines of this type made up to this time, and especially very powerful engines of the type above mentioned which occupy very little space and are relatively light, these engines giving a uniform output, especially when they are intended to feed fluid to receiving apparatus such as turbines.

The essential feature of the present invention consists in providing in engines of this type at least two motive chambers in a common cylinder, said chambers being preferably arranged in such manner that they have common exhaust or inlet ports.

Another feature of the present invention consists in providing, in a single cylinder of an engine of the type above referred to, three motive pistons forming between them two variable volume motive chambers, advantageously with "equiflow" scavenging, the intermediate piston moving in a direction opposed to that of the two end pistons.

Other features of the present invention will result from the following detailed description of specific embodiments thereof.

Preferred embodiments of the present invention will be hereinafter described, with reference to the accompanying drawing, given merely by way of example, and in which:

Fig. 1 shows a tandem compressor according to the invention including three driving, or motive, pistons, and three compressor pistons coacting with two compressor cylinders;

Fig. 2 is a view similar to Fig. 1 including only two compressor pistons;

Fig. 3 shows another modification including only one compressor cylinder;

Fig. 4 shows, in a similar manner, still another modification, with coupling rods disposed on the outside of the motive cylinder.

According to the present invention, the driving, or motive, portion of the machine is made as follows:

In the embodiments of Figs. 1, 2, and 3, there is provided, in the central part of the machine (the end parts of which consist of the compressing devices), a single motive cylinder 1 in which are movably fitted three pistons 2^1, 2^2 and 2^3, the end pistons 2^1 and 2^3 moving in a direction opposite to that of the intermediate pistons 2^2. These three pistons also divide the cylinder into two distinct motive chambers.

In the embodiment of Fig. 4, there are two motive cylinders 1^1 and 1^2, disposed in line with each other (and which can, therefore, be combined into a single cylinder unit), with which cooperate two pairs of pistons 2^m–2^n and 2^x–2^y, respectively, the pistons of each pair moving in opposite directions with respect to each other, and with respect to the pistons of the other pair, said pistons thus forming also two distinct motive chambers.

In the embodiments of Figs. 1, 2, and 3, the exhaust ports 3 are common to the two motive chambers, and the intermediate piston 2^2, when reciprocating inside the cylinder past these ports, alternately brings them into communication with one or the other of the motive chambers.

In the embodiment of Fig. 4, I provide two series of exhaust ports 3^1 and 3^2, respectively controlled by the adjacent pistons 2^n and 2^x of the cylinders 2^1 and 2^2, in such manner that these series of ports can be located close to each other and open into a common exhaust port 3^o.

When the ends of two motive chambers of a given cylinder 1 are closed by three pistons, as in the embodiments of Figs. 1, 2 and 3, the flow of gases through the motive chambers preferably takes place according to the "equiflow" principle, that is to say the orifices 4^1 and 4^2 for the scavenging air are provided at the ends of the cylinder and they are uncovered, at the proper time, by the end pistons 2^1 and 2^3.

In the embodiment of Fig. 4, the same principle of "equiflow" scavenging is also applied, and the scavenging orifices 4^1 and 4^2 of the two motive chambers are controlled by the end pistons 2^m and 2^y.

Of course the driving elements are completed by distributing valves and other elements essential for their operation, but these elements have not been shown in the drawing, for the sake of clearness.

As for the compressor elements, they are made in the following manner:

In the embodiment of Fig. 1, there are two compression cylinders 6^1 and 6^2, located on opposite sides of the motive part of the apparatus. Compression cylinder 6^1 cooperates with a single

piston 7^1 which is rigidly connected with the driving piston 2^1, while the two other driving pistons 2^2 and 2^3 are connected to the two compression pistons 7^2 and 7^3, working in opposite directions in compression cylinder 6^2. Furthermore the compression pistons 7^1 and 7^2 are connected together through a rigid system 8 in such manner that said pistons move together.

In the embodiment of Fig. 2, the arrangement of the compression elements is similar to that above described but is simpler since in each compression cylinder 6^1 or 6^2 there is provided a single compression piston 7^1 or 7^2, piston 7^1 being rigidly interconnected with the two end pistons 2^1 and 2^3 while piston 7^2 is connected, through an inside rod 9, with the intermediate driving piston 2^2.

In the arrangement of Fig. 3, the arrangement of the compression elements is still simpler, the compression pistons 7^1 and 7^2 being disposed in a single compression cylinder 6.

In the embodiment of Fig. 4, there is a single compression cylinder 6, with two double acting pistons 7^1 and 7^2 moving in opposite directions, piston 7^1 being connected through an external connecting device 8^1 with the end driving pistons 2^m and 2^y and piston 7^2 being connected, through an external coupling device 8^2, with the intermediate driving pistons 2^n and 2^x, so that any inner coupling means can be eliminated.

It should be noted that the embodiments shown are especially well adapted to the case of vertical machines, since in this case a part or the whole of the compression elements can be housed in a pit.

In a general manner, while I have, in the above description, disclosed what I deem to be practical and efficient embodiments of the present invention, it should be well understood that I do not wish to be limited thereto as there might be changes made in the arrangement, disposition and form of the parts without departing from the principle of the present invention as comprehended within the scope of the appended claims.

What I claim is:

1. A fluid compressing machine of the free piston type which comprises, in combination, at least one motor cylinder, one or more piston means for forming in said cylinder at least two motor chambers for the combustion of a fuel, said cylinder having motor ports cooperating with said piston means and common to both of said chambers, and compressor means directly driven by said piston means for compressing fluid.

2. A fluid compressing machine of the free piston type which comprises, in combination, a motor cylinder having at least one outlet port in its intermediate part, three pistons fitting slidably in said cylinder so as to form therein two motor chambers, said outlet port being common to both of these motor chambers, and fluid compressing means cooperating with these three pistons respectively.

3. A fluid compressing machine of the free piston type described which comprises, in combination, a motor cylinder, three pistons fitting slidably in said cylinder so as to form therein two motor chambers, two compressor cylinders fixed in line with said motor cylinder on either side thereof respectively, means for rigidly connecting the two end pistons together, a piston rigid with each of said end pistons fitting slidably in each of said compressor cylinders respectively and a piston rigid with the intermediate one of the three first mentioned pistons fitting slidably in one of these compressor cylinders.

4. A fluid compressing machine of the free piston type which comprises, in combination, a motor cylinder, three pistons fitting slidably in said cylinder so as to form therein two motor chambers, two compressor cylinders arranged in line with said motor cylinder on either side thereof respectively, in fixed position with respect thereto, means for rigidly connecting the two end pistons together, a piston rigid with one of said end pistons fitting slidably in one of said compressor cylinders, and a piston rigid with the intermediate one of said three first mentioned pistons fitting slidably in the other compressor cylinder.

5. A fluid compressing machine of the free piston type which comprises, in combination, a motor cylinder, three pistons fitting slidably in said cylinder so as to form therein two motor chambers, a compressor cylinder fixed in line with said motor cylinder on one side thereof, means for rigidly connecting the two end pistons together, a piston rigid with said end pistons fitting slidably in said compressor cylinder, and a piston rigidly connected with the intermediate one of the three first mentioned pistons fitting slidably in said compressor cylinder.

6. A fluid compressing machine of the free piston type which comprises, in combination, a motor cylinder, three pistons fitting slidably in said cylinder so as to form therein two motor chambers, and fluid compressing means cooperating with these three pistons respectively.

7. A fluid compressing machine of the free piston type described which comprises, in combination, a motor cylinder, at least one outlet port in the intermediate part of said cylinder and at least two inlet ports, one at each of the ends of said cylinder, three pistons fitting slidably in said cylinder so as to form therein two motor chambers, said outlet port being common to both of these motor chambers, and fluid compressing means cooperating with these three pistons respectively.

8. A fluid compressing machine of the free piston type which comprises, in combination, a motor cylinder, three pistons fitting slidably in said cylinder so as to form therein two motor chambers, means for rigidly connecting the two end pistons together, at least one compressor piston rigid with said two end pistons and one compressor piston rigid with the intermediate piston of the three first mentioned pistons.

9. A fluid compressing machine of the free piston type which comprises, in combination, a motor cylinder, three pistons fitting slidably in said cylinder so as to form therein two motor chambers, the intermediate piston moving oppositely to the two outer pistons, and fluid compressing means cooperating with these three pistons respectively.

10. A fluid compressing machine of the free piston type which comprises, in combination, a motor cylinder, three pistons fitting slidably in said cylinder so as to form therein two motor chambers, the intermediate piston being a double acting one and moving oppositely to the two outer pistons which are of the single acting type, and fluid compressing means cooperating with these three pistons respectively.

RAUL PATERAS PESCARA.