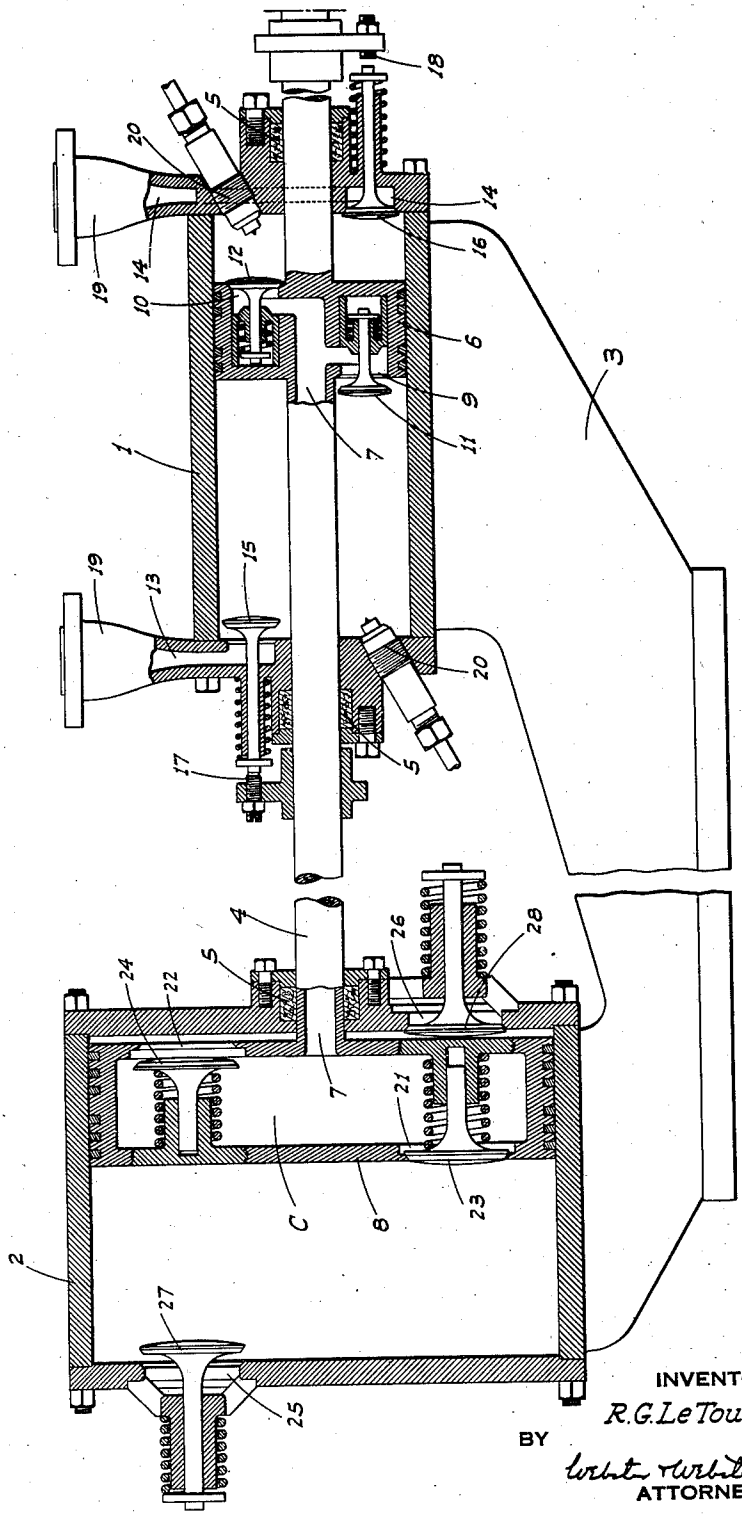
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RECIPROCATING PRESSURE GENERATOR

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RECIPROCATING PRESSURE GENERATOR

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This invention relates to air or gas pressure generators, the present application being a substitute for abandoned application, Serial No. 474,996. One object is to provide a generator of this general character which is self-powered, and in which the power element itself forms a compressing medium besides actuating the generator.

The generator includes a compressor cylinder having a piston slidable therein, and another object of the invention is to operate the compressor so that the reciprocation of the piston through a stroke of predetermined length is controlled without the use of a crankshaft and connecting rod, so that the construction is considerably simplified over conventional apparatus.

The generator essentially comprises a low-pressure first-stage cylinder unit and a high-pressure second-stage and power cylinder unit; and a further object is to provide for the reciprocation of the piston of the power unit by Diesel fuel, which also increases the compressive action of the piston, and which is only consumed in a sufficient amount to reciprocate the piston.

These objects I accomplish by means of such structure and relative arrangements of parts as will fully appear by a perusal of the following specification and claims.

The figure on the drawing is a sectional elevation of my generator.

Referring now more particularly to the characters of reference on the drawing, the generator comprises a double acting power cylinder 1 and a primary compressor cylinder 2 disposed in axial alinement with cylinder 1, but in spaced relation thereto; the cylinders being mounted as a unit on a suitable base 3. The cylinders are substantially the same length but the area of the cylinder 2 is considerably greater than that of the cylinder 1. A rod 4 projects through cylinder 1 and into the cylinder 2 from the end of the latter adjacent the cylinder 1, said rod being engaged by suitable pressure-tight packing glands 5 on said cylinder.

Within the cylinder 1 a hollow piston 6 is fixed on the shaft, from the interior of which piston a passage 7 leads through the shaft and into a chamber C formed in a hollow piston 8 fixed with the shaft in the cylinder 2. The passage 7 within the piston 6 communicates with a port 9 in said piston opening into the portion of the cylinder nearest the cylinder 2 and also with another port 10 in said piston opening into the portion of the cylinder on the opposite side of the piston. Spring closed outwardly opening

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valves 11 and 12 respectively of the common poppet type are mounted in the piston 6 to control the flow through the ports.

Passages 13 and 14 lead from the ends of the cylinder 1 corresponding to the piston ports 9 and 10 respectively, the flow through said passages being controlled by spring-closed poppet valves 15 and 16 respectively, opening into the cylinder. The opening of said valves at a predetermined point in the stroke of the piston is controlled by adjustable stops 17 and 18 respectively, mounted on the shaft 4. The passages 13 and 14 extend into fittings 19 adapted for connection to the intake of a conventional gas turbine or the like. Fuel injector devices 20 of the type commonly used in Diesel engines, and similarly operated by movement of the shaft 4 at the proper times relative to the position of the piston 6, project into the cylinder 1 at its opposite ends.

The chamber C in the piston 8 has ports 21 and 22 opening into the cylinder 2 on opposite sides of the piston; spring-closed automatically opening poppet valves 23 and 24 respectively being mounted in said piston to control the flow through the ports, the valves opening into the chamber. The cylinder 2 has air intake ports 25 and 26 in its opposite ends, the flow through which is controlled by spring-closed poppet valves 27 and 28, respectively, opening into the cylinder, and functioning automatically upon a reduction of pressure relative to atmosphere within the cylinder as induced by movement of the piston 8 in one direction or the other.

In operation after the generator has been started by an external power source, or by admission of compressed air, the cycle of events is as follows:

As the piston 8 moves, for example, from the left-hand toward the right-hand end of cylinder 2, atmospheric pressure opens the valve 27, admitting air into the first stage compression chamber formed in the cylinder 2 between the piston and the adjacent end of the cylinder. On the return stroke the valve 27 is closed by its spring and the entrapped air in the cylinder is compressed until the pressure (approximately six atmospheres) is sufficient to force the valve 23 open against its spring. Air thus compressed fills the chamber C and the passage 7 contained within the piston 8 and said shaft. A similar air compressing action takes place on the opposite side of the piston, by reason of the valves 28 and 24, in alternate order to the action above described.

At the same time that the piston 8 starts from the outer or left-hand end of the cylinder 2 the piston 6, which occupies a similar position in the cylinder 1, also starts from the left-hand end of said cylinder. At this time, outlet valve 16 is being held open by stop 18, and due to the difference in pressures, air previously taken into chamber C will flow through rod passage 7 and into cylinder 1 past valve 12, and will pass into passage 14 through the open valve 16 and thence of course to the turbine (not shown), scavenging the cylinder of a previous combustion. After piston 6 has moved a short distance from said left-hand end, valve 16 closes, and with further movement of the piston, the compressed air already entrapped in the cylinder is further compressed to about 16 atmospheres abs.

As the piston nears the end of its stroke, fuel is admitted through the adjacent injector 20 by any well known means (not shown), but in synchronism with the piston movement, the heat of compression at sixteen atmospheres abs. being sufficient to ignite the fuel. An increase in pressure thus created by the ignition forces the piston 6 in the opposite direction, and compressing the charge in the cylinder on the opposite side of the piston. As the piston reaches the end of this stroke, the valve 16 is again opened by the stop 18 and the heated and high compressed charge flows through the passage 13 and into the turbine. This valve remains open, upon the start of the return stroke of the piston, a sufficient time to provide a scavenging action of the charge, as previously described.

A similar compressing, igniting, and charge-discharging action of course takes place in the cylinder 1 on the opposite side of the piston, in alternate order to the action above described. Only sufficient fuel is consumed to force the pistons through their strokes against compression; the momentum of the pistons being sufficient to carry the piston 6 through the portions of its stroke which open the valves 15 and 16. It will thus be seen that all of the compressed air taken into cylinder 1 and further compressed by the action of piston 6 and the burning fuel, ultimately passes to the turbine to drive the same; no outlets to atmosphere from the generator being provided.

As plainly shown in the drawing, the valves 15 and 16 are disposed with their stems parallel to the shaft 4, so that the stops 17 and 18 act to open the valves in a direct manner and with a minimum of friction.

From the foregoing description it will be readily seen that I have produced such a device as substantially fulfills the objects of the invention as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described my invention, what I claim as new and useful and desire to secure by Letters Patent is:

1. A power gas forming compressor comprising a power cylinder, a piston in said cylinder dividing the cylinder into two compression chambers, the cylinder being provided with an outlet passage leading from each compression chamber, a spring pressed valve normally closing each passageway, a piston rod on the piston and projecting through an end of the cylinder, means responsive to piston movement in the cylinder to alternately open said valves, a compression cylinder, said piston rod projecting into said compression cylinder, a piston on the rod within the compression cylinder and dividing the latter into two compression chambers, the compression cylinder being provided with a passageway leading from atmosphere into each such last named compression chambers, a spring pressed valve normally closing each of said last named passageways and adapted to alternately open and close in response to pressure differentials imposed in the compression cylinder in response to the movements of the piston therein whereby air will be alternately drawn into each of the chambers in the compression cylinder and compressed therein, means for admitting the compressed air from each such chamber into one of the compression chambers of the power cylinder when the valve in such latter chamber is open, means for then admitting fuel to the other of said compression chambers of the power cylinder and while the valve therein is closed, and outlet means to exhaust the compressed air and combustion gas mixture.

2. A power gas forming compressor comprising a power cylinder, a piston in said cylinder dividing the cylinder into two compression chambers, the cylinder being provided with an outlet passage leading from each compression chamber, a spring pressed valve normally closing each passageway, a piston rod on the piston and projecting through an end of the cylinder, means responsive to piston movement in the cylinder to alternately open said valves, a compression cylinder, said piston rod projecting into said compression cylinder, a piston on the rod within the compression cylinder and dividing the latter into two compression chambers, the compression cylinder being provided with a passageway leading from atmosphere into each such last named compression chambers, a spring pressed valve normally closing each of said last named passageways and adapted to alternately open and close in response to pressure differentials imposed in the compression cylinder in response to the movements of the piston therein whereby air will be alternatey drawn into each of the chambers in the compression cylinder and compressed therein, each of said pistons being hollow and the rod having a central passageway in open communication with the interior of each piston, each face of each piston being provided with an opening leading from the adjacent compression chamber into the interior of the piston, a spring pressed valve normally closing each opening, the valves in the piston in the compression chamber being operable to alternately open and close with the compression and suction strokes, respectively, of such piston whereby compressed air will flow with each such compression stroke from the adjacent compression chamber through the hollow rod and to the interior of the piston in the power cylinder and open that valve therein which is in communication with the compression chamber in the power cylinder which faces away from the direction of the then compression stroke of such latter piston, the valve in the passageway leading from such compression chamber being then open, means to admit fuel into the opposite compression chamber in the power cylinder, the valve in the passageway leading from such latter chamber being then closed, and outlet means to exhaust the compressed air and combustion gas mixture.

3. A power gas forming compressor comprising a power cylinder, a piston mounted for reciprocating movement in said cylinder and dividing the latter into two compression chambers, the cylinder being provided with a passageway leading from each of the compression chambers, a valve in each passageway, means to alternately open and close each valve in response to piston movements, means to admit fuel to each compression chamber when the valve in the passageway leading from such chamber is closed and the piston is operating on its compression stroke in that chamber, means for admitting compressed air into each compression chamber when the valve in the passageway leading from such chamber is open

and the piston is moving in a direction opposite to that in which it moves on its compression stroke in such chamber, and exhaust valve means to exhaust the compressed air and combustion gas mixture.

4. A structure as in claim 3 in which the exhaust valve operating means comprises a spring pressed valve stem on each valve projecting through one end of the cylinder, a rod on the piston projecting through both ends of the cylinder, stops on the rod each alternately engageable with one of the valve stems upon reciprocation of the rod through piston movement for opening the valve.

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