Oct. 18, 1927. 1,645,834

P. VOREAUX

VALVELESS PUMP

Filed March 11, 192 2 Sheets-Sheet 1

Fig. 1.

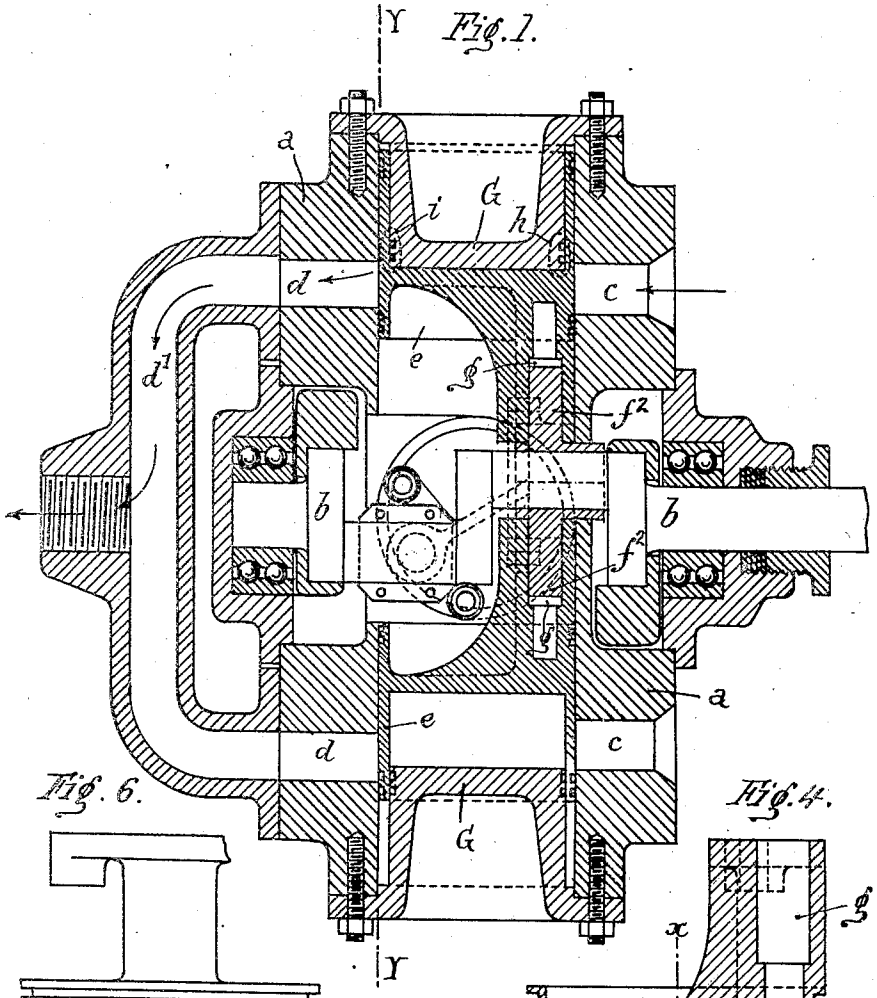


Fig. 6.

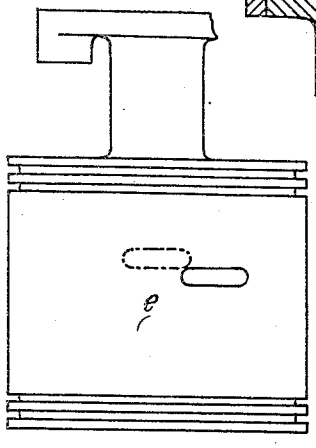
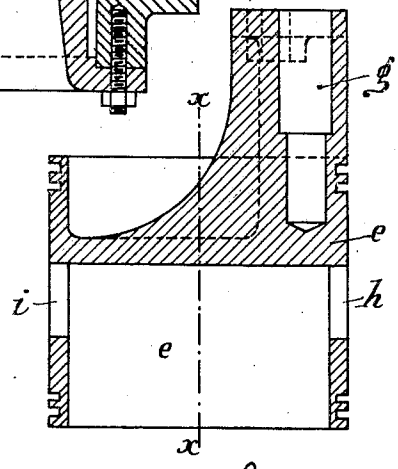


Fig. 4.



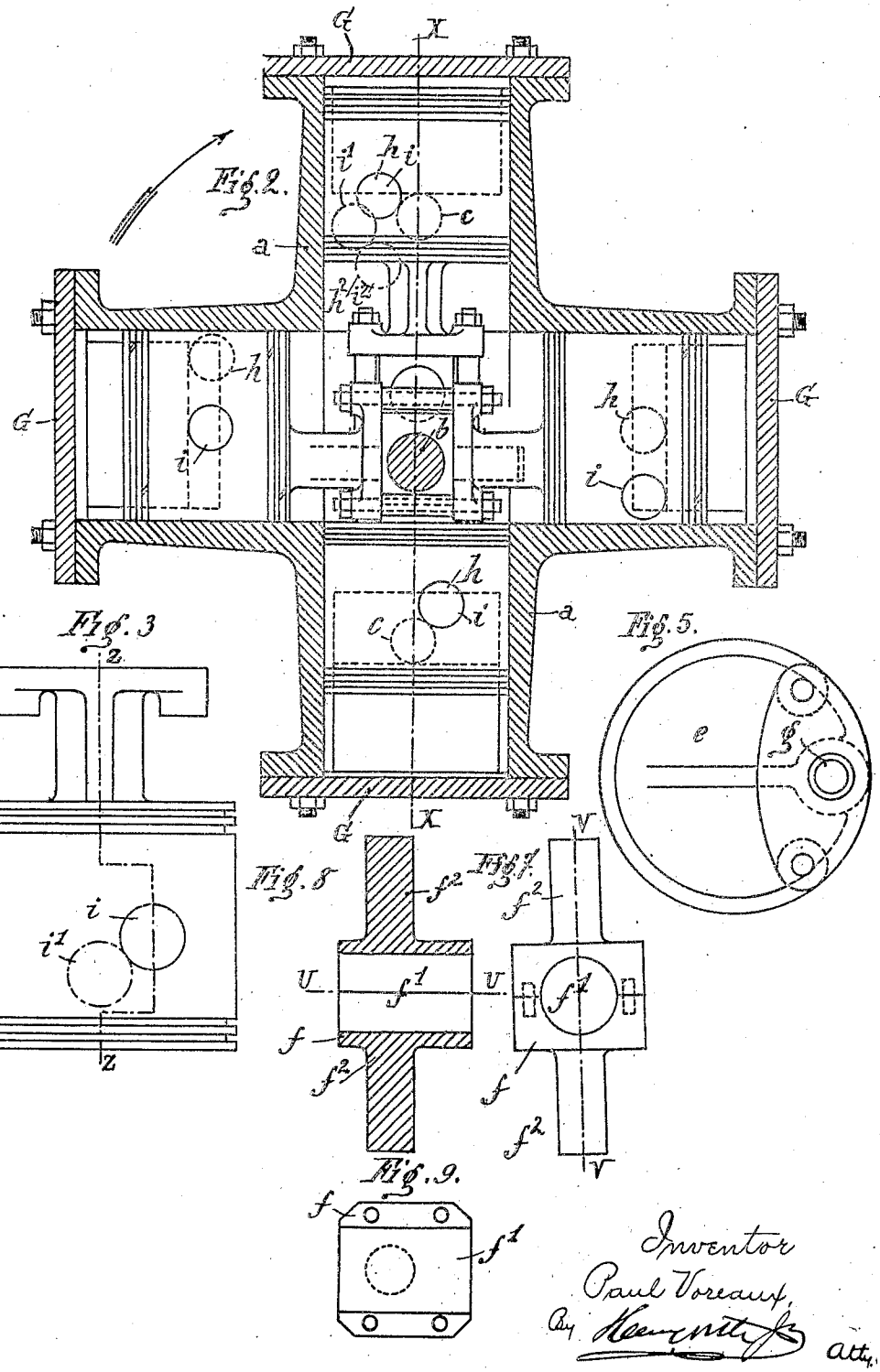
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VALVELESS PUMP

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UNITED STATES PATENT OFFICE.

PAUL VOREAUX, OF PARIS, FRANCE, ASSIGNOR TO ETABLISSEMENTS SAMGA ET BAVOX REUNIS, OF PARIS, FRANCE.

VALVELESS PUMP.

Application filed March 11, 1924, Serial No. 698,479, and in France July 13, 1923.

The present invention has for its object a pump adapted to revolve at a great speed which has the minimum of weight, occupies as little space as possible and is easily driven by the modern-style high rate motors.

The characteristic feature of this pump consists in the way in which the pistons are connected with the crank-shaft by means of pivot-bearings allowing the piston to effect, besides their reciprocating motion, a revolving motion about themselves around their axis, so that the piston will execute a resulting helical or "tacking" motion within its cylinder, which motion is used for securing the delivery and the normal sucking and forcing or exhausting operation of the pump.

The following description made with reference to the accompanying drawing, given by way of example, will allow to easily understand the way in which the invention is carried out.

Fig. 1 is a longitudinal section of the pump made through X—X of Fig. 2.

Fig. 2 is a section made through Y—Y of Fig. 1.

Fig. 3 is a detail view of a piston.

Fig. 4 is a sectional view through Z—Z of Fig. 3.

Fig. 5 is a plan view of Fig. 4.

Fig. 6 is a modified form of Fig. 3.

Fig. 7 is a front view of the pivot-bearings.

Fig. 8 is a section through V—V of Fig. 7.

Fig. 9 is a horizontal section through U—U of Fig. 8.

The apparatus essentially comprises a fixed frame a formed by two cylindrical pump barrels which are arranged crosswise, at 90° the one with reference to the other, and acting as support for the crank-shaft b with two elbows whose axis is normal to those of the pump barrels.

In the barrel a are provided ports or orifices c and d for the admission and exhaust of air. Pistons e which are rigidly connected together two by two, are mounted on the crank-shaft through the medium of pivot-bearings f, shown in Figs. 7, 8 and 9. These bearings can be formed of two parts and comprise an internal cylindrical cavity f^1 into which one of the cylindrical bearings of the crank-shaft b is adapted to enter as shown in Fig. 1. On the other hand, the ends f^2, acting as pivots, freely enter into cylindrical recesses g, see Fig. 4, which are arranged parallel but eccentric to the axis x—x of the piston e. It will be noted that I use no connecting rods between pistons and cranks, the pivot pins being all that is required. Bottoms or heads G close the pump barrel and secure tightness.

Accordingly, it will be understood that a revolution of the crank-shaft b will impart to a group of two diametrally opposed pistons a tacking or helical motion, which means that every piston, while having a reciprocating motion within its cylinder, will rotate about its own axis x—x.

The motion of each of the crank pins may be considered as resolved into two components, one parallel to the axis of the pistons it actuates, and the other at right angles to it. The first of these motions communicated to the pistons through members f f^2 will reciprocate the pistons, while the second motion at right angles to the axis and at a distance from it oscillates the pistons. As the member f oscillates with the piston it slides back and forth on the crank pin, the crank pin being made longer than the member f to provide for this motion. This helical motion is utilized for insuring, on the one hand, the volumetric variation causing the suction and the exhaust and, on the other hand, the delivery. To this purpose, every piston is provided with two opposite holes h, i which are adapted to sucessively uncover the ports c d, of the pump barrel.

Referring to Figs. 1 and 2, it will be seen that the upper piston e is at the end of its up stroke. Under these conditions, its orifice h will uncover, at the down stroke of the piston e, the port c in moving in the direction of the arrow shown in full lines at Fig. 2. On the contrary, the port i will move away from the port d, whereas, in virtue of the revolution of the piston about its axis x—x, the said port i will come to the position which is indicated in mixed lines at i', the port or hole h being above the port c; this moment will correspond to the full suction.

When the piston has achieved its suction stroke and is at the end of its down stroke, the ports h, i of the piston being then the one above the other at h^2, i^2, as shown in mixed lines, in Fig. 2, the reverse motion will take place again during the up motion

of the piston, that is to say the piston, in rising again, will revolve about its axis in the opposite direction to that in which it has been revolving during the down motion and consequently it is the port *i* which comes opposite the exhaust or forcing port *d*, thereby allowing the air contained between the piston and the head of the cylinder to escape through the said exhaust pipe d^1, as shown in Fig. 1.

It will be understood that the degree of compression of the pump can be varied according to the position and the form of the ports or orifices *c*, *d*, *h*, *i*. More particularly, it is possible to use ports or orifices having an oval or flattened action, as shown in Fig. 6.

In the construction which is shown in Figs. 1 and 2, the pump sucks and forces without compressing that is to say that the forcing or exhausting ports open as soon as the suction ports are closed. The pump which is thus constructed forms a compact mass, which is well balanced, has light moving members and a reduced number of parts, the pistons acting by themselves as distributors.

Of course, some modifications can be made in the construction of the pump which has just been described without departing from the principle of the invention.

What I claim is:

In a pump, a casing having two opposite cylinders and pistons, a crank shaft mounted in the casing, means forming a sole connection between the crank of said shaft and eccentrically with the opposed ends of the pistons, each of said means having sliding movement longitudinally of the crank, and said casing and pistons having cooperating ports.

In testimony that I claim the foregoing as my invention, I have signed my name hereto.

PAUL VOREAUX.