April 28, 1931. F. FEYENS 1,802,887

ROTARY COMPRESSOR

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Fig. 1.

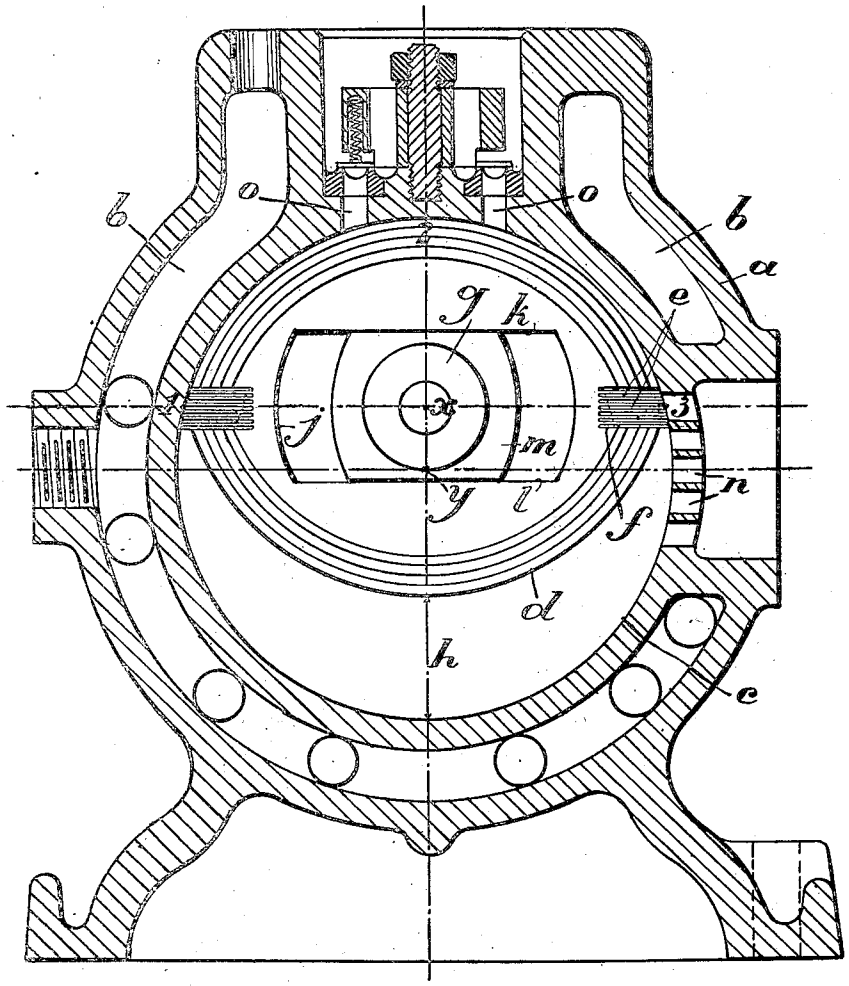

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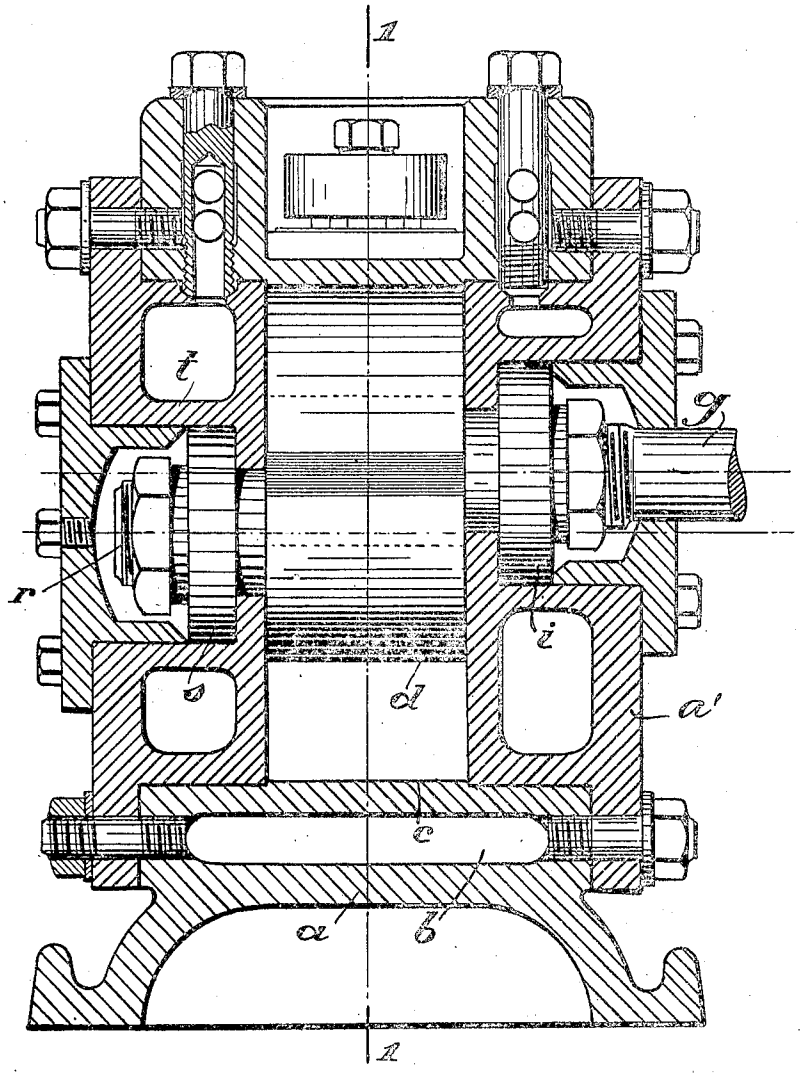
Fig. 2.



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ROTARY COMPRESSOR

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Fig. 3.

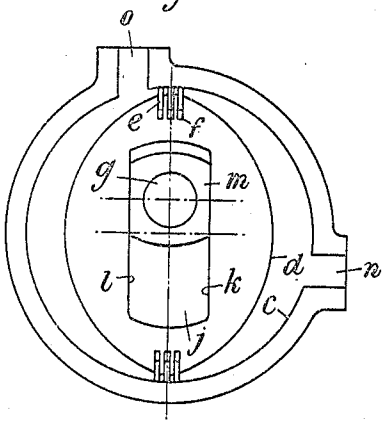


Fig. 4.

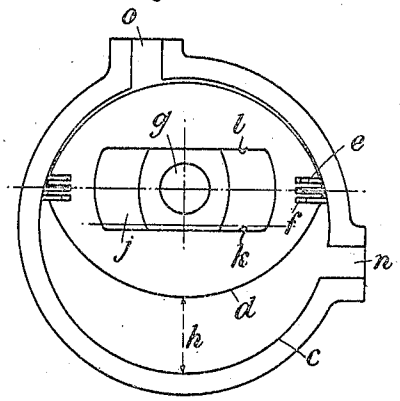


Fig. 5.

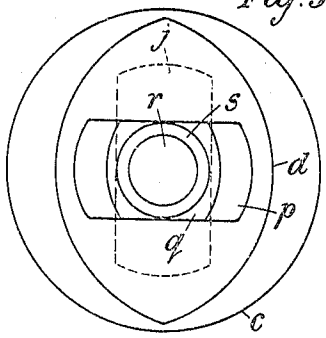


Fig. 6.

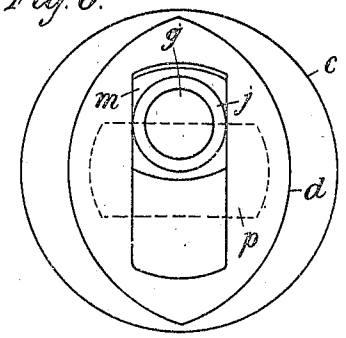


Fig. 7.

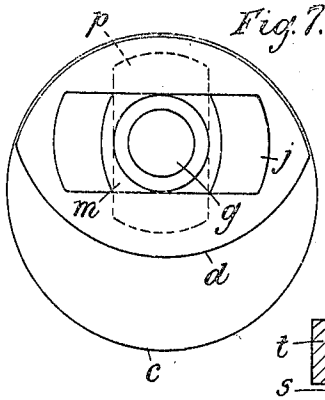


Fig. 8.

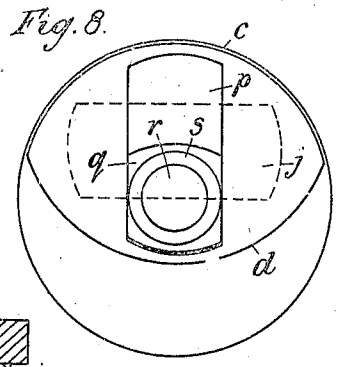
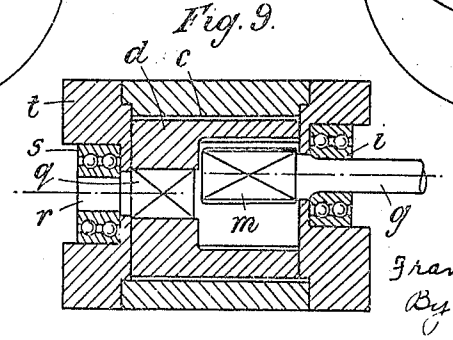


Fig. 9.



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By B. Singer,
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Patented Apr. 28, 1931 1,802,887

UNITED STATES PATENT OFFICE

FRANÇOIS FEYENS, OF BRUSSELS, BELGIUM, ASSIGNOR TO SOCIETE GENERALE D'ETUDES INDUSTRIELLES (GENERAL RESEARCH CORPORATION), SOCIETE ANONYME, OF BRUSSELS, BELGIUM

ROTARY COMPRESSOR

Application filed July 7, 1927, Serial No. 204,068, and in Belgium December 30, 1926.

The present invention concerns a rotary compressor in which compression is obtained by the rotation within a cylindrical chamber of a piston, of which the operative surfaces are the peripheral surfaces of two segments of a cylinder of equal radius to that of the chamber and the greatest width of each said segment diametral of the chamber is less than half of the diameter of said cylinder, the diameter and length of said piston being the factors which determine the output. The piston which may be designated as lenticular in shape is rotated by a shaft located eccentrically with respect to the cylindrical chamber, and the arrangement is such that although the piston may be closely adjacent to or even in contact with the wall of the chamber, at given parts of its rotation, there is no actual friction between it and the said chamber.

As an example, one form in which the compressor could be designed in accordance with the present invention is described hereafter, reference being made to the accompanying drawings in which:

Fig. 1 is a vertical section of the compressor along line 1—1 of Fig. 2, showing the piston in end elevation;

Fig. 2 is a vertical section taken practically centrally of Fig. 1;

Figs. 3 and 4 are diagrammatic views showing the different positions taken up by the piston and its guide during the exhaust and suction periods respectively;

Figs. 5, 6, 7 and 8 are diagrammatic views showing the different positions assumed by it during its cycle of rotation, and

Fig. 9 is a diagrammatic cross section of the piston and its guiding means.

As shown in Fig. 1 the compressor comprises a casing *a* with a water jacket *b* surrounding the cylinder *c* in which moves the piston *d*. The piston *d* is of elongated form, having the shape of two juxtaposed segments whose convex surfaces or outer configuration have the same radius as has the chamber *c* in which said piston operates, this piston being fitted with packing strips *e* housed in grooves *f* in which they can move, so as to remain in permanent contact with the cylindrical wall of the chamber *c* whatever may be the position of the said piston in the chamber.

The piston *d* is operated by a shaft *g* mounted in a bearing *i* located eccentrically in the end or cover *a'* of the casing *a*. The eccentricity of this bearing *i* with respect to the cylinder *c* corresponds to the distance between the centres *x* and *y* of the bearing and cylinder respectively, whose value is half the height *h* separating the middle of the face of the piston *d* from the cylinder *c* when the piston is in the position shown in Fig. 1, i. e. when it completely fills the upper portion of the cylinder. One of the lateral faces of the piston *d* has formed in it a slot or guide *j* which engages with a substantially square block or boss *m* mounted on the shaft *g* and serving for driving the piston *d*. The longitudinal edges *k* and *l* of the guide *j* as well as the engaging surfaces of the boss *m* are parallel; further, the longitudinal axis of the said guide *j* coincides with the longitudinal axis of the lateral face of the piston *d*.

The reference *x* used above in connection with Fig. 1, for identifying the centre of the bearing *i*, also serves in that figure, to indicate the point or line at which cross the two planes containing the longer axes of the slots *j* and *p*, as well as the longitudinal axis of the piston, all of which are in coincidence in that figure.

The cover *t* closing the opposite end of chamber, rotatably supports, in a bearing *s*, a short shaft *r* whose inner end *q* is of practically square contour and engages with a sliding fit within a parallel-sided slot or guide *p* formed in the juxtaposed end of the piston *d*. The shaft *r* is concentric with the chamber *c*, and the longitudinal axis of the guide *p* is perpendicular to that of the guide *j*. The parallel shafts *g* and *r* whose axes are out of alignment, are hereinafter referred to as deaxial.

If, for convenience, it be assumed that the compressor is at the stage of its operative cycle indicated by Fig. 1, the operation may be described as follows:

At the stage indicated, the slot or guide *j*

is horizontal with the face *k* upwards, and the piston *d* completely fills the portion of of the cylinder comprised between the points 1, 2, and 3 (Fig. 1).

If the shaft *g* is then rotated, say clockwise, as viewed in Figs. 1, 2, 3, 4, 6 and 7, the piston *d* will move on the square *m* through a distance varying with the angle through which the shaft turns, finally arriving in the vertical position shown in Fig. 3 when the shaft *g* has made a quarter of a revolution.

During this movement the upper face of the piston *d* moves progressively away from the wall of the cylinder *c* and begins to inhale fluid through the inlet orifices *n* provided in the casing *a*.

If the shaft *g* and consequently the piston *d* rotate through a further quarter of a revolution, it is evident that the piston *d* will again find itself in a horizontal position, smilar to that occuped by it in Fig. 1, but on this occasion the side *l* of the guide will take the place of the side *k*.

It follows therefore, that for a half revolution of the shaft, passing from the position shown in Fig. 1 to the position shown in Fig. 4, the piston has forced the liquid, which was under it and which has been admitted through the inlet orifices *n*, through the outlet orifices *o*.

If the movement of rotation is continued for a further half revolution of the shaft, the piston *d* will effect the same movement as above, repeating the work of suction, compression and delivery, and will return to the position shown in Fig. 1 in which the side *k* of the guide will have come back to its starting point. Two phases of suction and delivery will therefore have taken place for each complete revolution of the shaft *g*.

As can be clearly seen in Figs. 5 to 8, given the perpendicularity of the guides *j* and *p* and the relative position of the square *q* on the guide *p*, the function of the device is at all times to guide the piston *d*, which will continue to rotate without ever rubbing on the wall of the cylinder with which the packing strips *e* alone are in contact. Figs. 6 and 7 show the relative positions of the guide *j* and of its driving boss *m* compared with the position occupied at that moment by the opposite guide *p* and the square *q* (Figs. 5 and 8). It is obvious that the shaft *r* could be used for transmitting the movement of rotation to a second, third or fourth unit according to the size of the compressor set.

The output of a compressor of this kind can be determined in the following manner:

The area of the crescent shaped space having the height *h* (Fig. 1) comprised between the wall of the cylinder and the piston is multiplied by the length of the cylinder which gives the output for a half revolution of the piston.

The arrangement described above enables a compressor to be designed in such a way that the piston is cooled on all its faces, the result being rapid transfusion of the calories and consequently an increase in the volumetric efficiency of the compressor, the leakage in the latter being very limited.

What I claim is:

A rotary compressor comprising a casing having a substantially cylindrical chamber provided with inlet and outlet ports spaced apart, a lenticular piston arranged in said chamber and having guide slots in opposite sides, one parallel with the longer center lines of the piston and the other at right angles thereto, a driving shaft mounted in a bearing in said casing and arranged eccentrically of the chamber, the inner end of said driving shaft having a block fixed thereto which is slidably arranged in the said longer slot of the piston, a shaft mounted in a bearing in the opposite side of the casing from that of the driving shaft, said last named shaft being concentric with said chamber and provided at its inner end with a block which is arranged in the other slot of the piston.

In testimony whereof I affix my signature.

FRANÇOIS FEYENS.