

J. RACLOT & C. ENDERLIN.  
 ROTARY PUMP.  
 APPLICATION FILED APR. 27, 1910.

1,002,176.

Patented Aug. 29, 1911.

3 SHEETS-SHEET 1.

Fig. 1.

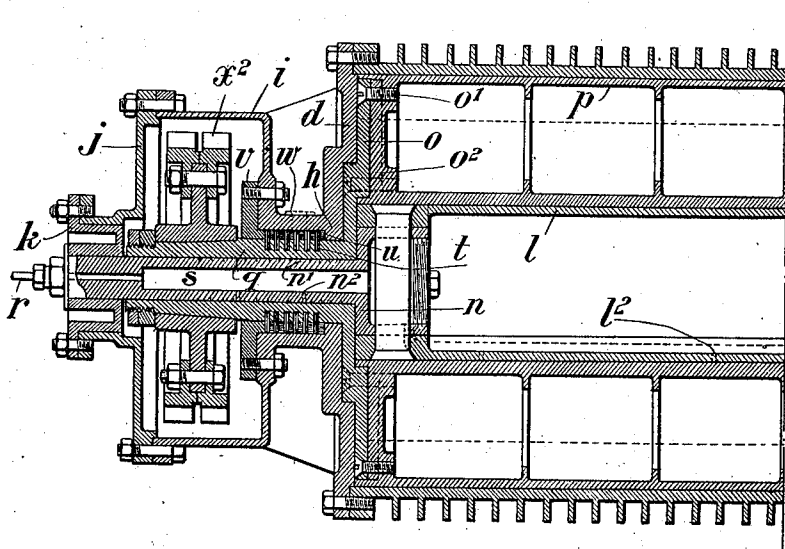
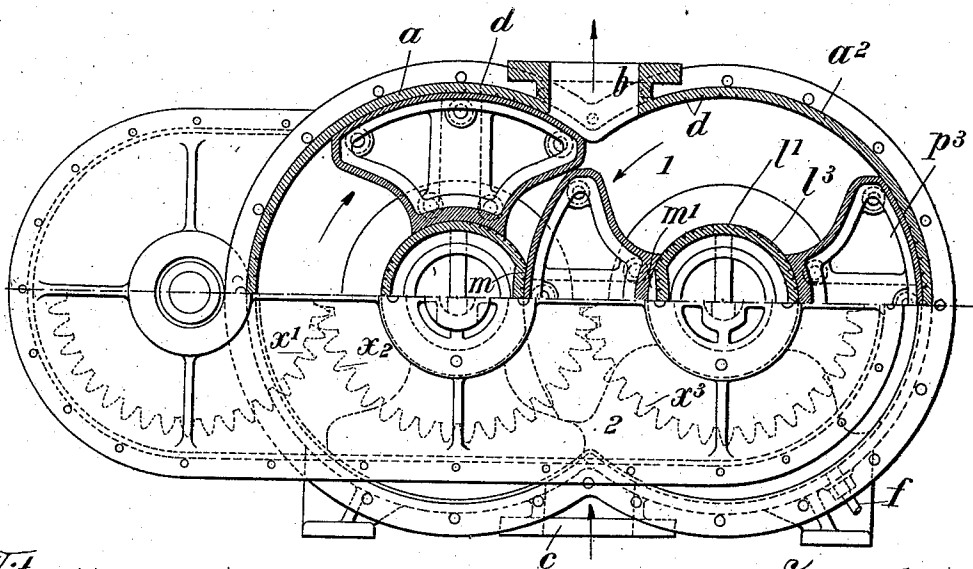


Fig. 2.



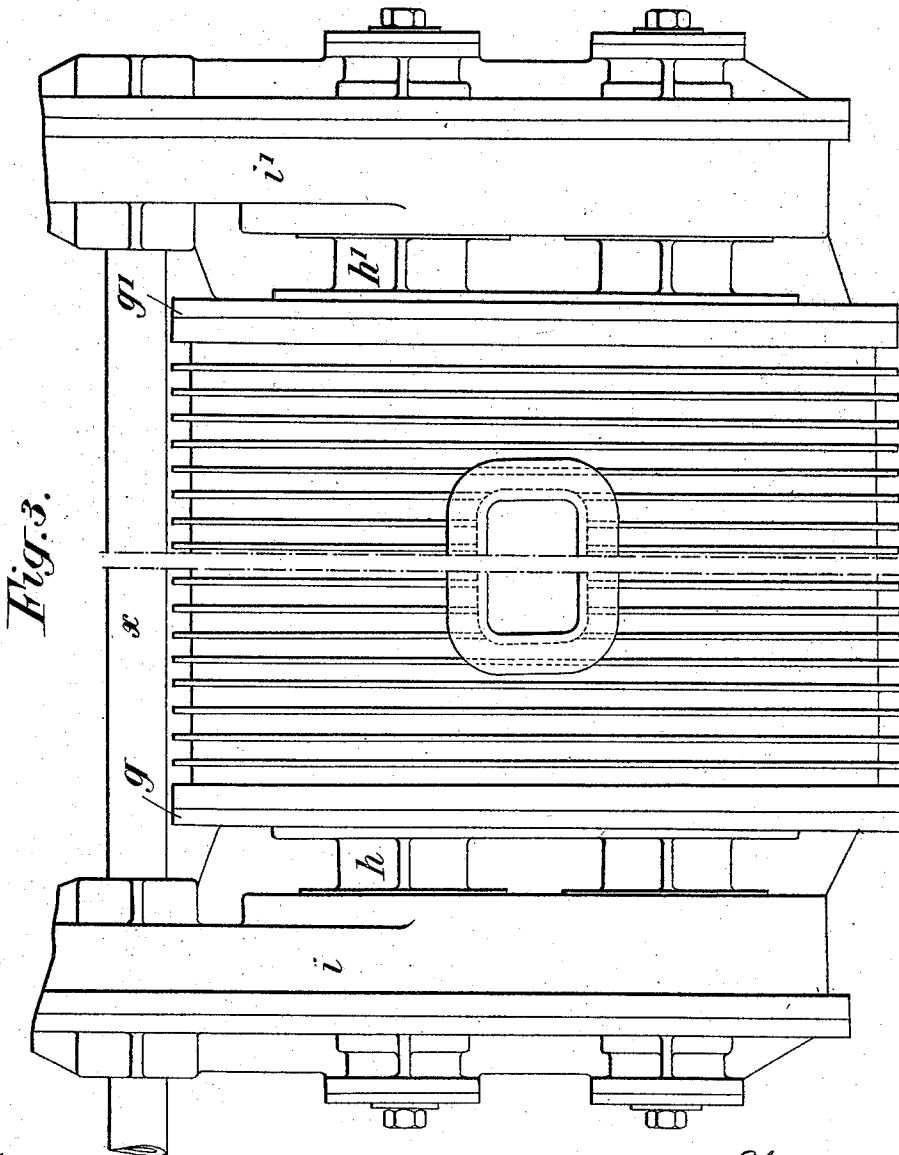
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3 SHEETS—SHEET 2.



*Fig. 3.*

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3 SHEETS—SHEET 3.

Fig. 4.

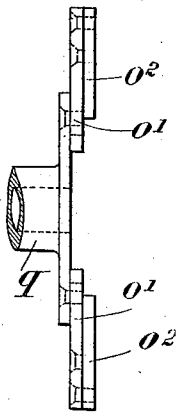


Fig. 5.

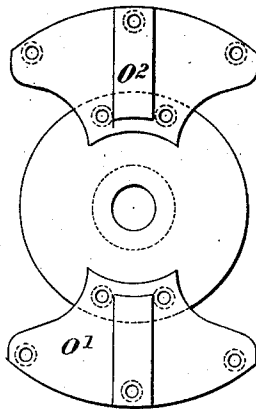


Fig. 7.

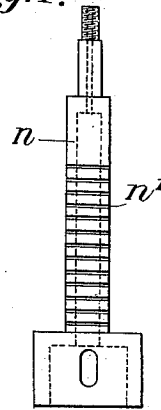


Fig. 6.

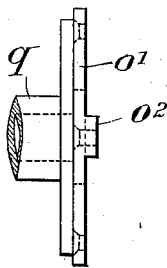


Fig. 9.

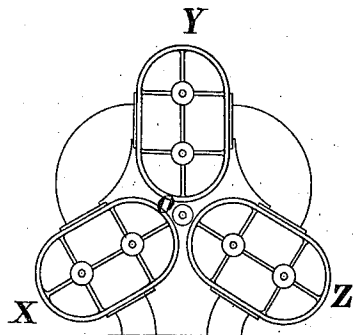
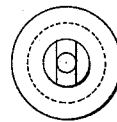


Fig. 8.



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# UNITED STATES PATENT OFFICE.

JULES RACLOT AND CAMILLE ENDERLIN, OF ST.-MAUR-DES-FOSSÉS, SEINE, FRANCE.

## ROTARY PUMP.

1,002,176.

Specification of Letters Patent. Patented Aug. 29, 1911.

Application filed April 27, 1910. Serial No. 557,847.

To all whom it may concern:

Be it known that we, JULES RACLOT and CAMILLE ENDERLIN, both citizens of the French Republic, and residents of St.-Maur-des-Fossés, Seine, France, have invented certain new and useful Improvements in and Relating to Rotary Pumps, of which the following is a specification.

The invention relates to an improvement in rotary pumps designed particularly for use as a vacuum pump, and in its essential details comprises two parallel intersecting cylinders of the same diameter provided with a common admission port and a common delivery port, pistons being arranged to operate within the respective cylinders, the piston of one being arranged to cooperate with a depression formed in the fixed hub of the other. The pistons of the respective cylinders are arranged to rotate in opposite directions and in alternate order, so that each piston in passing the admission port incloses between itself and the adjacent piston a certain quantity of fluid which is carried to and through the delivery port, this successive engagement of the respective pistons with the hubs of the cylinders serving to prevent the flow of fluid at the end of the delivery stroke in any direction other than through the delivery port.

The invention in its preferred details of construction will be described in the following specification, reference being had particularly to the accompanying drawings, in which:—

Figure 1 is a partial longitudinal, vertical section taken on a line through a shaft of one of the cylinders. Fig. 2 is a transverse sectional view of the same, the parts being shown in elevation. Fig. 3 is a top plan view of the pump. Figs. 4, 5 and 6 are detail views. Figs. 7 and 8 are detail views of one of the hollow shafts for the hub. Fig. 9 is a diagrammatic view illustrating the coupling of a plurality of pumps together.

With particular reference to the accompanying drawings, the improved rotary pump comprises a casing made up of two parallel cylinders  $a^2-a'$ , which cylinders are of the same bore and arranged to intersect each other, as shown. The casing is formed with two diametrically opposed ports  $b-c$ , these ports being arranged in the plane of intersection of the cylinders and constituting respectively a delivery and an inlet port.

The inner surfaces of the respective cylinders are provided at appropriate points with grooves or channels  $d$ , whereby to increase the effective action of the pistons and also facilitate the lubrication thereof, as will presently appear.

The respective ends of the casing are closed by heads  $g-g'$  bolted to the casing proper in any desired or appropriate manner. The legs for supporting the pump are formed integral with these heads, and the latter are also provided with laterally extending centrally arranged sleeves  $h-h'$ , to serve as bearings for the driving shaft, as will readily appear. Housings  $i-i'$ , which are preferably cast integral with the cylinder heads, are arranged to inclose the two transmission wheels for the pistons and also serve as oil receivers to receive the lubricant for such gearing. The outer or free ends of the housing are closed by plates  $j'$  which are centrally formed with lateral projecting sleeve-like extensions in which are secured plugs  $k$ .

Secured centrally in each cylinder is a hub, as  $l-l'$ , which hub is preferably of hollow construction and peripherally formed to present a longitudinal depression as  $m-m'$ , which depression is of segmental shape and has its base wall curved in coincidence with the periphery of the opposing cylinder. The respective ends of the hubs are provided with hollow shafts  $n$ , preferably enlarged at their inner ends to seat within the ends of the hubs and secured in place in any desired manner. The forward terminals of the shafts  $n$  are of angular formation in cross section to fit within similarly formed openings in the plugs  $k$ , whereby said hubs are secured in fixed position within the respective cylinders. By this means the hubs are arranged so that the respective depressions  $m-m'$  are in alinement horizontally of the casing and depressed on the proximate sides of the hubs, as will be plain from Fig. 2.

The wings or pistons  $p^3$  are arranged on the hubs  $l-l'$ . These wings are four in number arranged in diametrically opposed pairs, and each is preferably of hollow form having a bearing surface to engage the inner wall of the cylinder in which they operate and a base surface to ride upon the hub. The base surfaces are of such circumferential length as compared with the similar dimension of the cylinder bearing

surfaces that during the operation of the device the bearing surface of one of the wings of one cylinder rides out of the depression of the hub of the opposing cylinder immediately succeeding the engagement of the wing of said other cylinder with the hub of the first mentioned cylinder.

The wings of each cylinder are made integral throughout and connected at each end to a supporting plate, as *o*, as by means of a screw *o'*, said plates *o* being preferably formed with a tenon *o<sup>2</sup>* designed to fit within a mortise formed in the wings whereby to provide a substantial connection to secure the fixed relation of the wings and plate. Sleeves *q* are formed integral with the plates *o* and project laterally and centrally therefrom being arranged to encircle the shafts *n* and to be thus rotatively mounted on said shafts. The shafts *n* are circumferentially formed with grooves *n'* serving as oil channels between the shafts and sleeve, the oil supply finding its own way to said grooves through a pipe *r* communicating with a channel *s* centrally of the shaft *n*. The oil delivered to the channel *s* will, in part, enter the hub *l—l'*, escaping therefrom through hole *l<sup>2</sup>* in said hubs to reach channels *l<sup>3</sup>* formed in the peripheral surface of the hub, as will be obvious. The sleeves *q* are supported in the fixed sleeve *h* of the casing heads, and positioned between these sleeves *q* and *h* are a series of washers *t* made of anti-friction metal preferably each constructed of two pieces to provide for their introduction and these washers engage in annular channels formed in sleeve *h*. Between these washers *t* are washers constructed of any appropriate material such as india-rubber, rubber-coated asbestos, anti-friction paste, etc., and their dimensions are such that they may be put in place without strain and exactly fill the hollow spaces they are intended to occupy. A cap *v* is bolted to the housing *i* to secure the parts just described in position, and the sleeve *h* is formed with an opening as *w* through which oil may be introduced between said sleeves *h* and *q*, as will be obvious.

The sleeves *q* which, as before described, are fixedly secured to the wings, receive their rotary motion from a driving shaft *x*, positioned lengthwise the body of the pump parallel with the cylinders, and driven in any suitable manner. This shaft carries at its ends toothed wheels *x'*, having straight teeth, or herring bone teeth designed to mesh with the teeth of wheels *x<sup>2</sup>*, which latter operate toothed wheels *x<sup>3</sup>*. The gears *x<sup>2</sup>—x<sup>3</sup>* are keyed on the sleeves *q* of both cylinders, and all the gear wheels noted are interchangeable. The parts are so relatively disposed that when the middle radial plane of one cylinder wing passes through the center line of the other cylinder, the wings of said

other cylinder are in alinement at right angles to the line of the wings of the first cylinder. The wings of the respective cylinders travel in opposite directions, as will be obvious from Fig. 2 of the drawings.

The operation of the improved pump is as follows:—When the wings rotate in the direction of the arrows in Fig. 2, the port *c* becomes the inlet or suction port and the port *b* the outlet or delivery port. In the position illustrated in said figure, the wing *p<sup>3</sup>* delivers the fluid contained in space 1 through the port *d*, while at the same time it draws through the port *c* an additional quantity of fluid to fill the space 2. As soon as the forward edge of the wing *p<sup>2</sup>* passes in front of the port *c*, the fluid contained in space 2 will be held between the adjacent edges of the wings and the cylinder wall, and forced through the port *b* as soon as the rear edge of the piston wing *p<sup>3</sup>* begins to uncover this delivery port. The wings of the respective cylinders operate in the same manner, it being understood, as a very essential detail of the present improvement, that before the wing, as *p<sup>2</sup>* of one cylinder, has left the surface of the depression *m* in the opposing hub, the wing *p* of the other cylinder will have engaged the depression *m'* of the other hub, so that at all times the admission side of the pump will be effectively and entirely separated from the delivery side.

If the pump is designed for use as a compressor its construction will permit several of such pumps being mounted in series relation, as for example, as illustrated in Fig. 9, the relation of the pumps being on radial lines as at OX, OY, and OZ, starting from the main driving shaft. The pumps under these circumstances are arranged to deliver one to the other in series, intermediate reservoirs being preferably used to maintain an adequate operation and supply under all conditions.

In connection with the present improvement, it will be noted that all valves are dispensed with and in addition to this advantage the diametrically opposed arrangement of the wings within each cylinder and the right angular disposition of the wings of one cylinder with relation to those of the other insures a perfectly balanced operation of the pump, permitting high speeds without liability of injurious results. Furthermore, in comparison with the space required for the improved rotary pump, a greater output can be obtained than with the reciprocating piston pump, rendering the improvement particularly advantageous for use as a condensing pump for ships. Again an increased efficiency over the ordinary type of rotary pump is maintained by reason of the comparatively large cooperating surfaces of the hub depressions of one cylinder with the

wing surfaces of the opposing cylinder, whereby leaks are reduced to a minimum.

Having thus described the invention, what is claimed as new is:—

5 1. A rotary pump including relatively fixed intersecting cylinders, a hub secured in each cylinder, each hub being formed with a depression having its base wall in an arc coincident with the arc of curvature of the  
10 opposing cylinder, diametrically opposed wings mounted for rotation about each hub, the wings of one cylinder engaging the depression in the hub of the opposing cylinder, and means for operating the wings to cause  
15 said wings of one cylinder to alternate with the wings of the opposing cylinder in their cooperation with the hub depressions said means including a plate for each end of said wings, a sleeve extending outward from  
20 said plate and surrounding said hub, and driving mechanism fixed upon said sleeves.

2. A rotary pump including relatively fixed intersecting cylinders, a hub secured in each cylinder, each hub being formed with a depression having its base wall in an arc coincident with the arc of curvature of the  
25 opposing cylinder, diametrically opposed wings mounted for rotation about each hub, the wings of one cylinder engaging the depression in the hub of the opposing cylinder, and means for operating the wings to cause  
30 said wings of one cylinder to alternate with

the wings of the opposing cylinder in their 35  
coöperation with the hub depressions, the coöperation between the wing of one cylinder and the hub depression of the other cylinder being continued subsequently to the coöperation of the succeeding wing of the other cyl- 40  
inder with the hub depression of the first cylinder said means including a plate for each end of said wings, a sleeve extending outward from said plate and surrounding said hub, and driving mechanism fixed upon 45  
said sleeves.

3. A rotary pump including fixed intersecting cylinders, a hub fixed within each cylinder, each hub being formed with a peripheral depression, piston wings rotatively 50  
mounted on each hub, the wings of the respective cylinders alternately coöperating with the depressions of the opposing hubs, head closing the respective cylinders, a shaft secured to each hub and projecting beyond 55  
the adjacent head, and a plate secured to the wings of each cylinder and formed with a sleeve to encircle said shaft.

In testimony whereof we have hereunto set our hands in presence of two witnesses. 60

JULES RACLOT.  
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Witnesses:

H. C. COXE,  
JACK F. C. BAKER.