No. 801,182. PATENTED OCT. 3, 1905.

L. CREUX.

ROTARY ENGINE.

APPLICATION FILED JUNE 26, 1905.

6 SHEETS—SHEET 1

fig. 1.

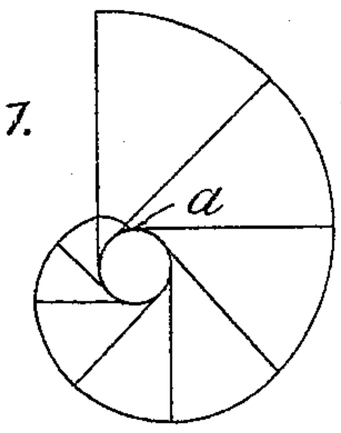


fig. 2.

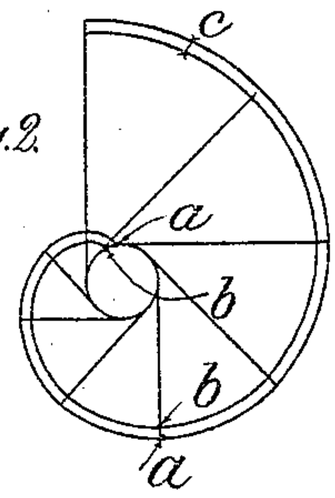


fig. 3.

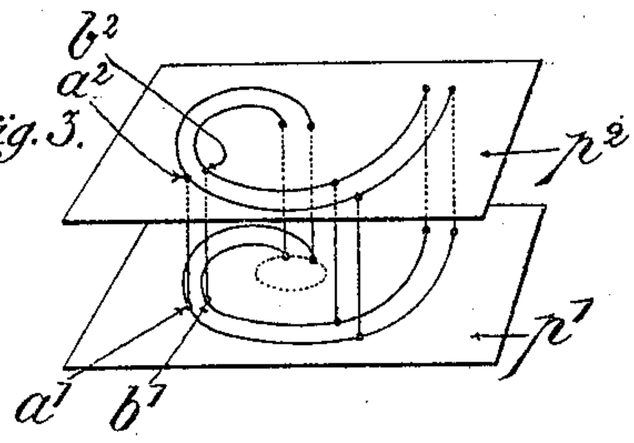


fig. 4.

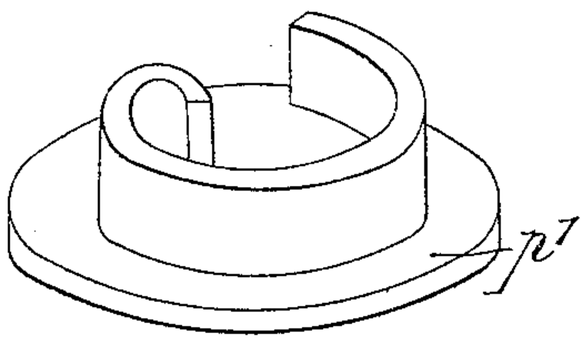


fig. 5.

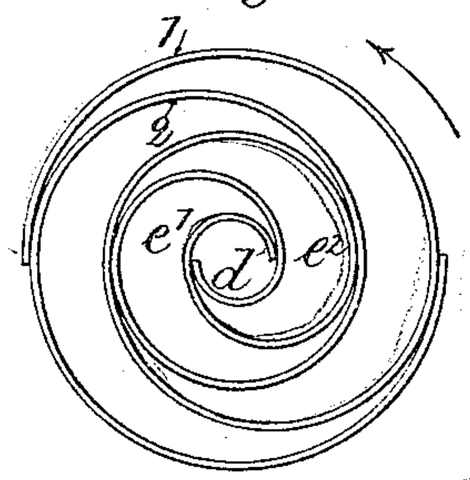


fig. 6.

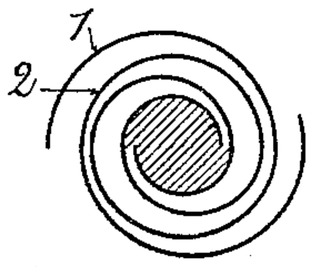


fig. 7.

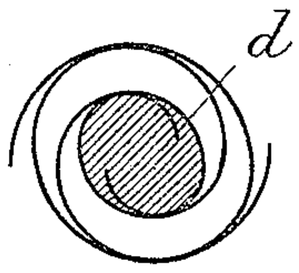


fig. 8.

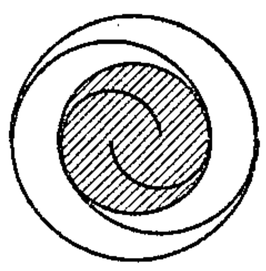


fig. 9.

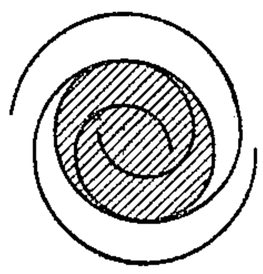


fig. 10.

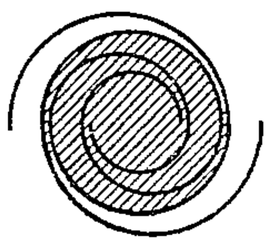


fig. 11.

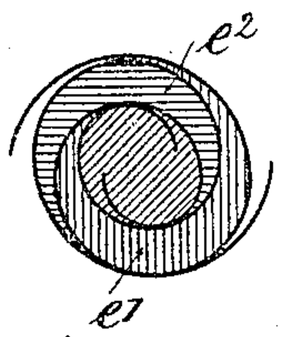


fig. 12.

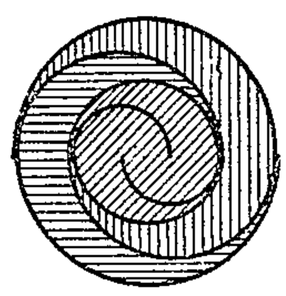
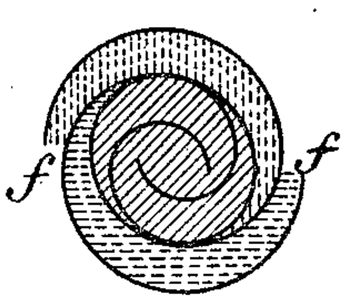


fig. 13.



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Attorney

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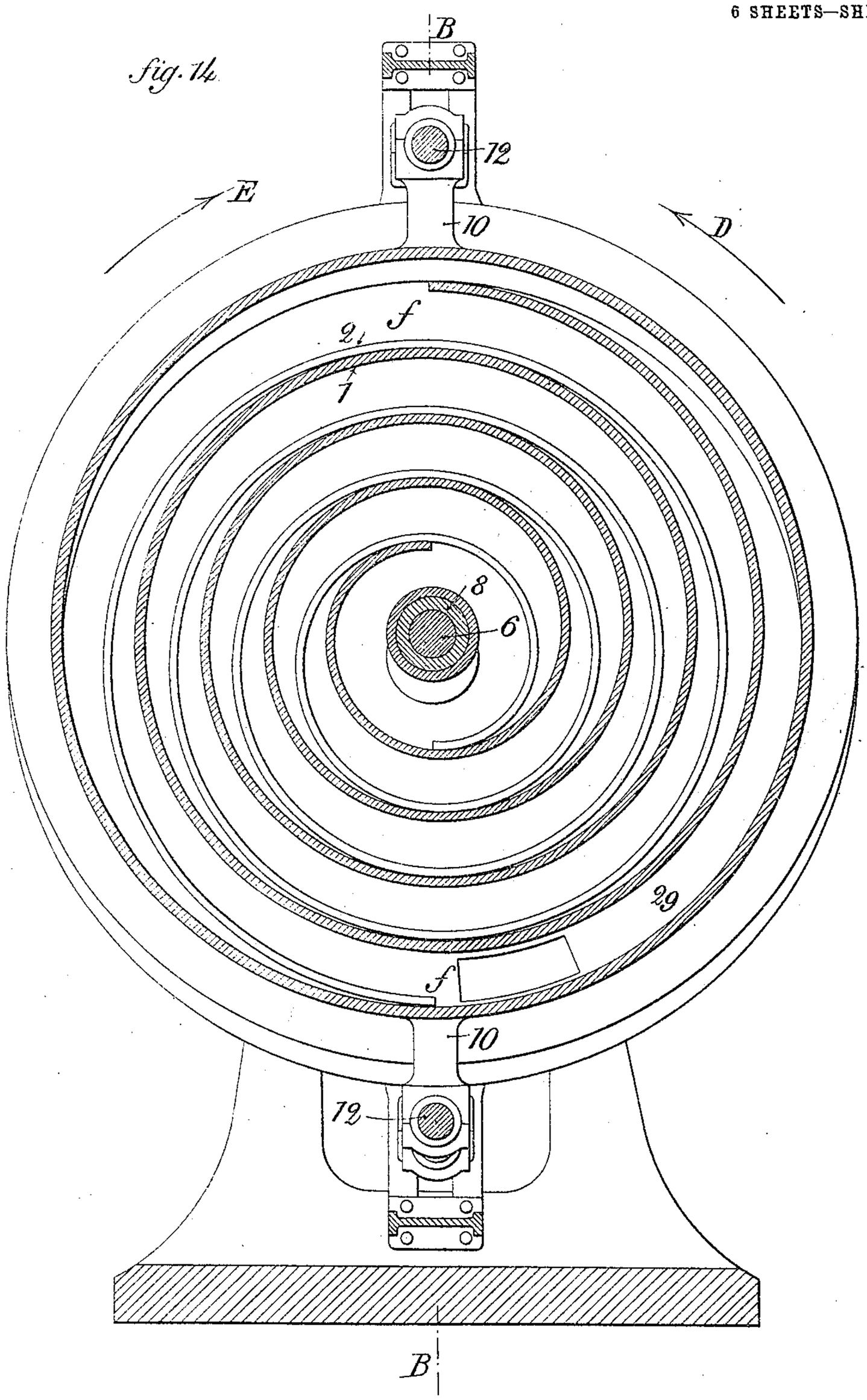
6 SHEETS—SHEET 2.

Fig. 14.



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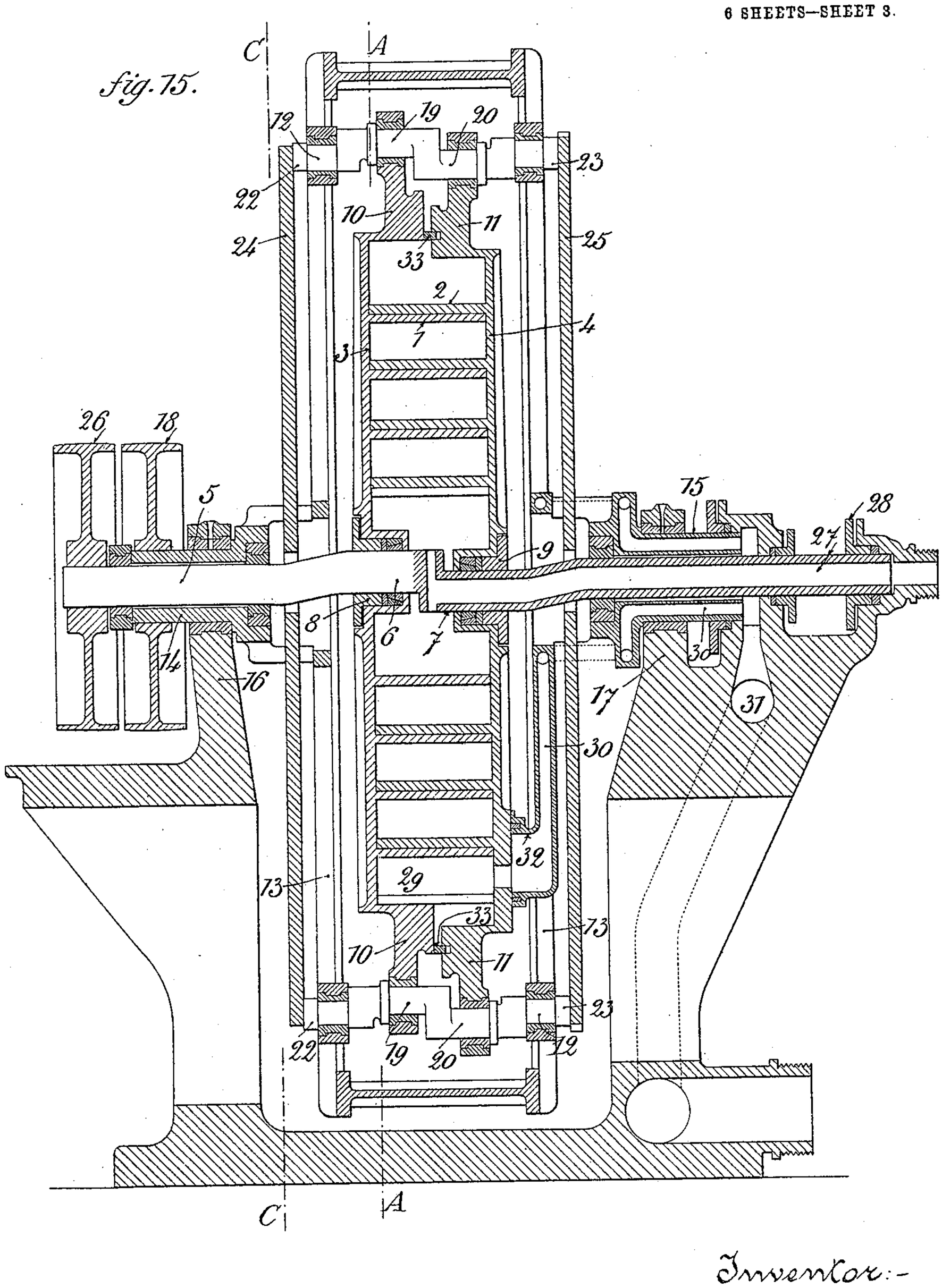
6 SHEETS—SHEET 3.

Fig. 75.



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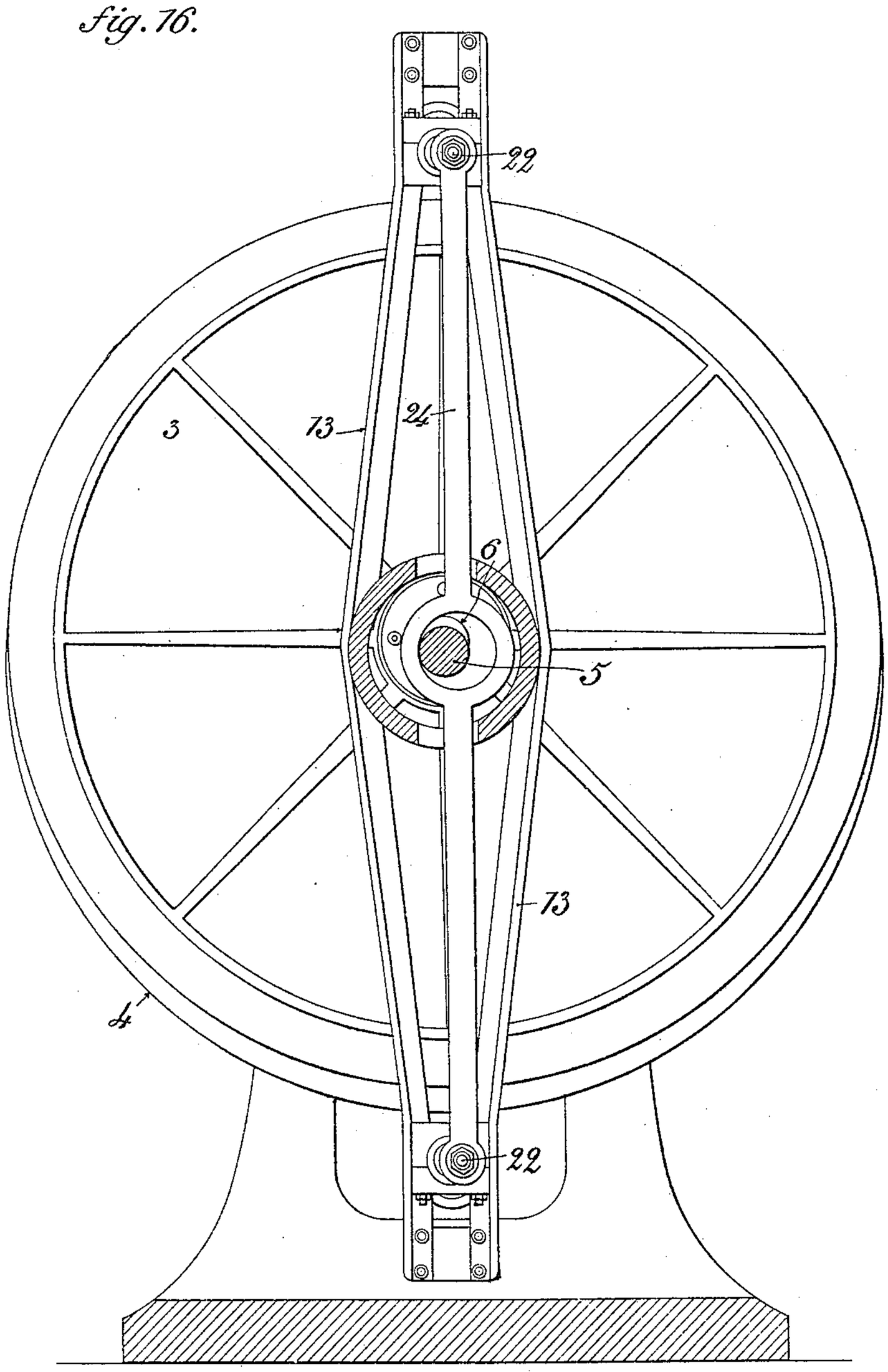
6 SHEETS—SHEET 4.

Fig. 16.



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No. 801,182. PATENTED OCT. 3, 1905.

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ROTARY ENGINE.

APPLICATION FILED JUNE 26, 1905.

6 SHEETS—SHEET 5.

Fig. 17.

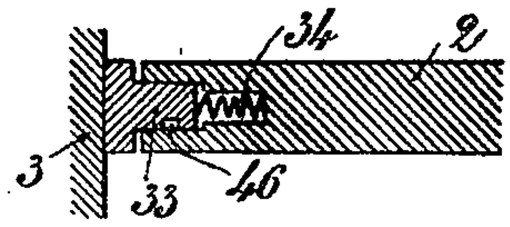


Fig. 18.

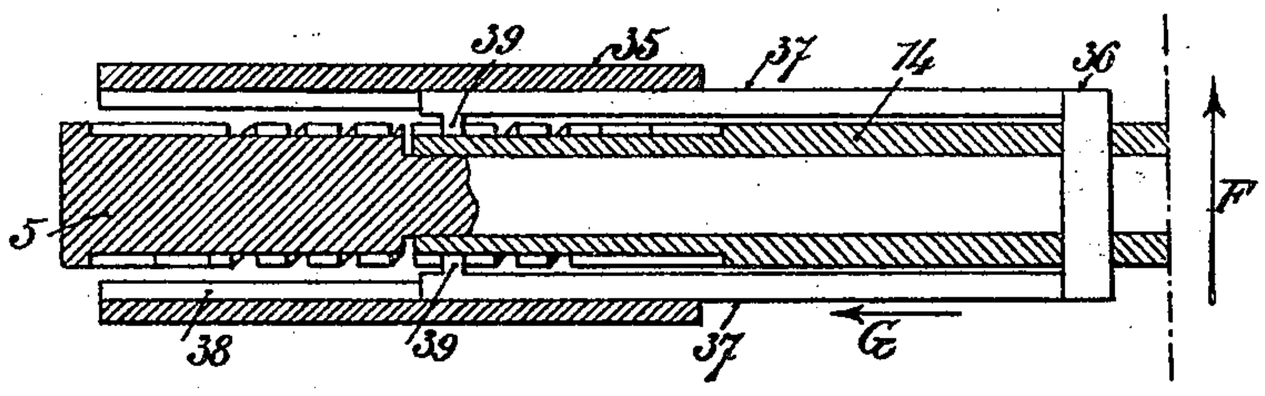


Fig. 19.

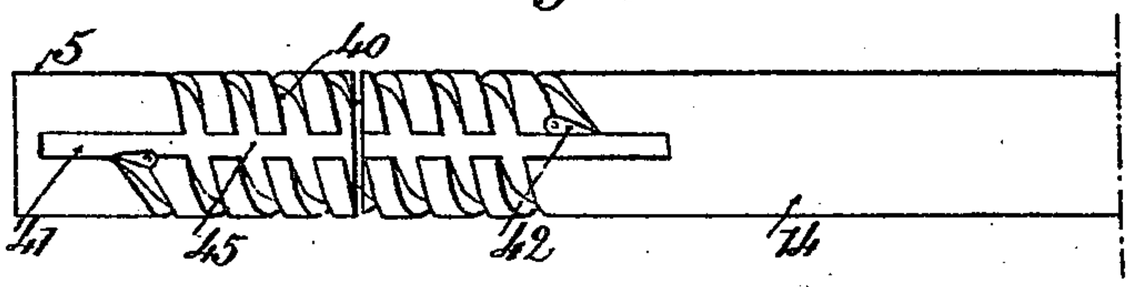


Fig. 20.

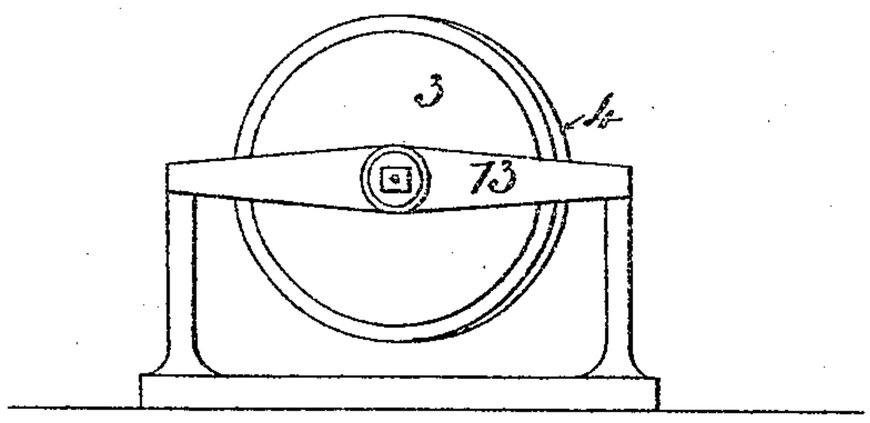
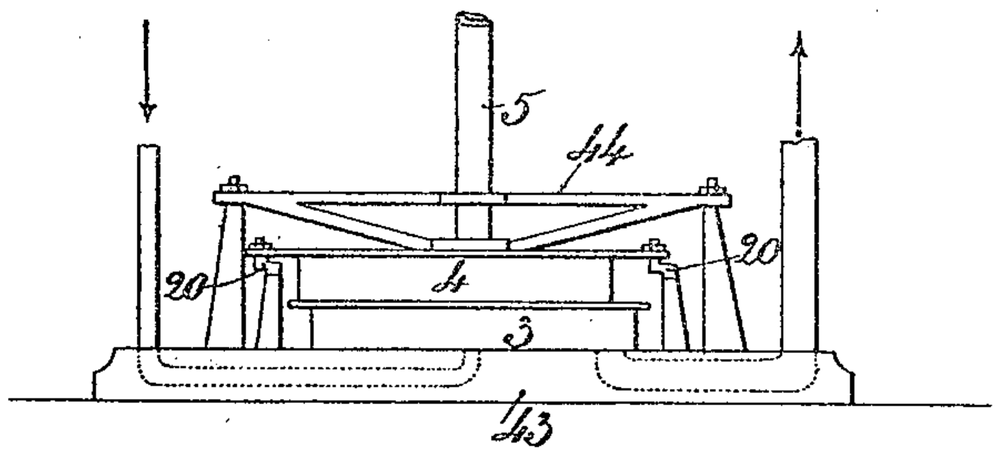


Fig. 21.



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No. 801,182. PATENTED OCT. 3, 1905.

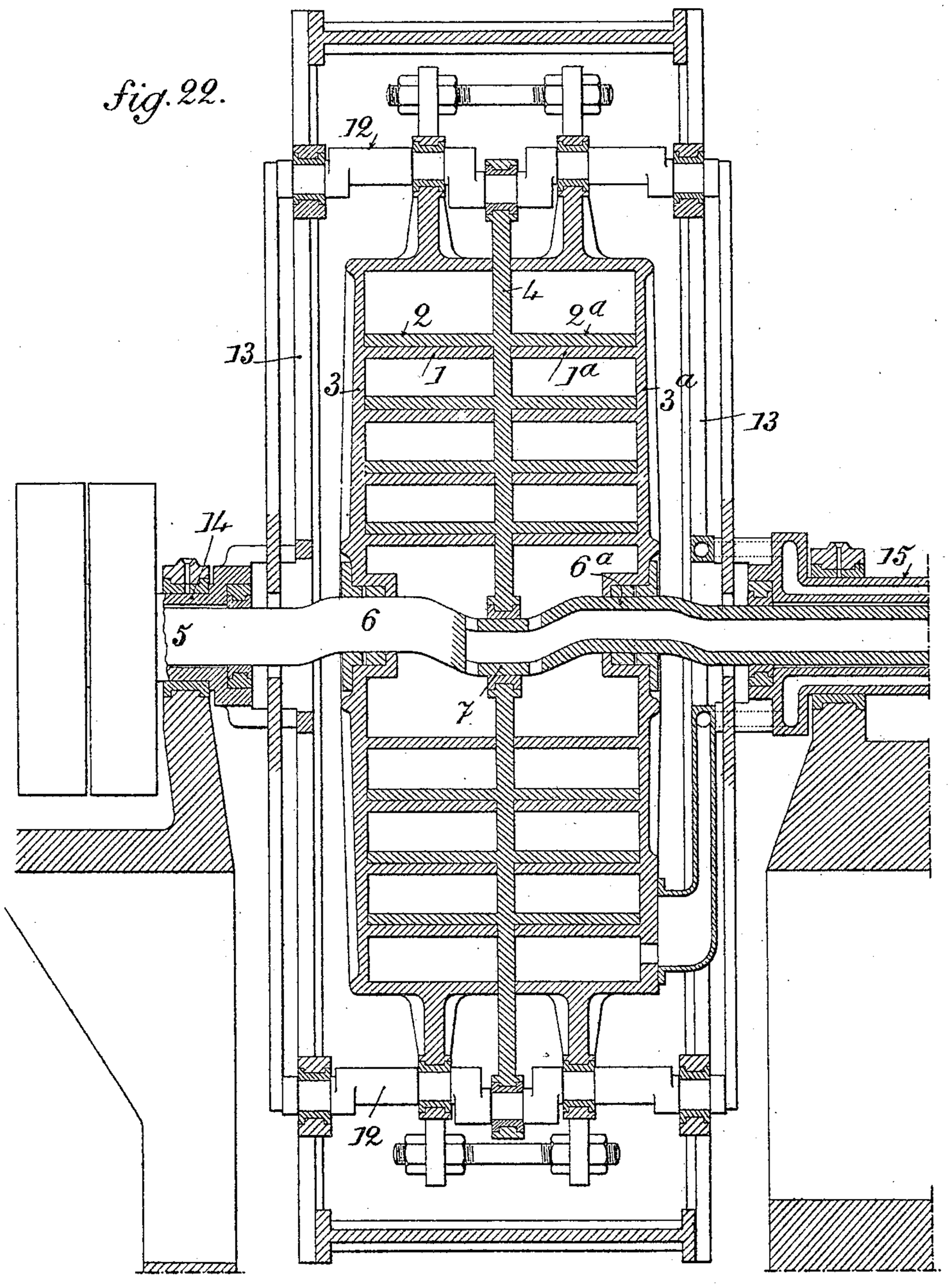
L. CREUX.

ROTARY ENGINE.

APPLICATION FILED JUNE 26, 1905.

6 SHEETS—SHEET 6.

fig. 22.



Witnesses:-
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Geo. Hilton

Inventor:-
Léon Creux
by A. B. Wilson
Attorney

UNITED STATES PATENT OFFICE.

LÉON CREUX, OF PARIS, FRANCE.

ROTARY ENGINE.

No. 801,182. Specification of Letters Patent. Patented Oct. 3, 1905.

Application filed June 26, 1905. Serial No. 267,091.

To all whom it may concern:

Be it known that I, LÉON CREUX, engineer, a citizen of the Republic of France, residing at 54 Rue Taitbout, Paris, in the Republic of France, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification.

The present invention relates to a rotary engine designed to be operated by an elastic fluid under pressure. The said engine may of course be used also as a pump for compressing an elastic fluid. The said engine comprises, essentially, between two parallel plates two spiral strips or bands having the shape of developed arcs of circles of the same pitch, the coils of which are engaged one in another and touch at a certain number of points, so as to form between the said bands and the said plates a certain number of separate chambers which become greater as the said points of contact are displaced from the starting-point of the said developed arcs of circles toward the ends of the same. The said displacement of the points of contact, which involves a circular movement of translation of one of the spiral bands with respect to the other, is produced naturally by the expansion of the elastic fluid inclosed in the chambers, the said fluid being introduced at the center of the spirals and escaping at the periphery.

In the accompanying drawings, which show several embodiments of the present invention, Figures 1 to 13 are diagrams for the purpose of explaining the invention. Fig. 14 is a vertical section of the engine on the line A A of Fig. 15. Fig. 15 is a sectional view on the line B B of Fig. 14. Fig. 16 is a sectional view on the line C C of Fig. 15. Fig. 17 is a detail of a joint. Figs. 18 and 19 are respectively a vertical section and a plan of a shifting device as to the direction of rotation. Figs. 20, 21, and 22 show modified forms of the engine.

The developed arc of a circle is the curve described by the end a, Fig. 1, of an inextensible wire which unrolls from a fixed circumference while still remaining stretched and without moving out of the plane of the circumference. A point b on the wire, Fig. 2, at a distance c from a describes a developed arc of a circle equal to the first one and of which each point is at a distance c from the first curve. If two perpendicular lines $a' a^2$ and $b' b^2$, Fig. 3, drawn from a plane p' are so moved as to describe curves, they give rise to two curved surfaces. The space comprised between the said curved surfaces and the planes p' and p^2 constitutes a spiral band. Such a band secured to a circular plate p', as seen in perspective in Fig. 4, constitutes one of the essential members of the engine. A similar band secured to the plate p^2 constitutes the other member of the engine.

If the two spiral bands 1 and 2 are engaged one within the other, as shown in Fig. 5, each coil of the band 1 is tangent at two points to the corresponding coil of the band 2. If a movement of translation is imparted to the band 1 with respect to the band 2, in keeping the said bands in the same direction, one with respect to the other, so that the curved surfaces still remain tangent the one to the other, each point of the band 1 will describe a circumference.

The spaces $d e' e^2$, &c., are entirely inclosed, and if the circular movement of translation takes place in the direction shown by the arrow the said spaces increase in size during the operation.

If steam is introduced at d and if the bands 1 and 2 are caused to move as just described, the expansive power of the steam will produce the relative movement of the bands in the direction shown by the arrow. The steam will occupy successively the spaces shaded in Figs. 6 to 13. Figs. 6 to 9 show the several phases during the first revolution. Figs. 10 to 13 show those of the second revolution. The steam will always operate at full pressure in the central chamber d and will expand at each revolution in the lateral chambers $e' e^2$ and will escape at f. The oblique hatchings in Figs. 6 to 13 show the steam at full pressure. The vertical or horizontal hatchings show the steam when expanding, and the dotted hatchings show the steam escaping.

To cause the spiral bands to move suitably one with respect to the other, all that need be done, as will be understood, is to connect the same by a suitable number of equal and parallel cranks or other similar connecting devices. According to the manner in which the bands or their connecting members are connected with the main frame of the engine, one of the bands may be fixed, or circular movements of translation may be imparted to both the bands, or a general or other movement of rotation may be imparted to the two bands

taken together independently of the relative circular movement of translation which takes place between the bands.

I will first describe a steam-engine in which there may be secured to the main frame now a point of the bands themselves and then a point of their connecting members, so that a change in the direction of rotation may be obtained.

1 and 2 designate spiral bands which are integral with the plates 3 and 4, respectively. Through the plates passes a bent shaft 5, having two cranks 6 7 at one hundred and eighty degrees. The center of the plate 3 is mounted on the crank 6 by means of a stuffing-box 8, and the center of plate 4 is mounted on the crank 7 by means of a stuffing-box 9. On the other hand, the plates carry extensions 10 11, through which pass bent shafts 12, mounted in a frame 13. The latter is carried by the sleeves 14 15, loosely mounted on the shaft 5 and which rest in the bearings 16 17 of the main frame, so as to revolve therein. If the frame is rendered motionless—say by the application of a brake on the pulley 18, carried by the sleeve 14—the axes of the shafts 12 are fixed, so that the cranks 19 20 of the said shafts, connected, respectively, with the plates 3 4, only allow each of the latter to make a circular movement of translation the radius of which is equal to the radius of the cranks 6 and 7. In order that the guiding of the plates may not be interfered with by the passage at the dead-points, the shafts 12 are provided with other cranks 22 23, directed at right angles to the cranks 19 20 and connected together by lateral links or rods 24 25. If, on the other hand, by braking the pulley 26 of the shaft 5 the latter is rendered motionless, together with the cranks 6 and 7, and if at the same time the pulley 18 is set free, the plates 3 4 and the frame 13 are still capable of rotating, and during this general movement of rotation the relative circular movement of translation of the two plates and bands will still take place.

To allow of steam being introduced into the central chamber of the engine, the shaft 5 is provided with a duct 27, the shaft terminating in a stuffing-box 28, which is connected to a suitable source of steam. The steam after flowing through the coils and escaping at *f* is exhausted into an annular chamber 29, connected by conducts 30 with an exhaust-pipe 31, provided across the main frame. The said conducts 30, which terminate in the sleeve 15, must allow the plate 4 to move. For that purpose they may be provided with either jointing or telescopic parts or, as shown in the drawings, with a nozzle 32, sliding against the plate 4 in the same manner as a drawer having a circular movement.

The joints between the lateral edges of the bands 1 and 2 and the plates 4 and 3 and between the lateral edges of the circular casings 29 may be rendered steam-tight by means of suitable means—such, for instance, as segments 33, inserted in grooves in the said edges and pressed by springs 34. (See Fig. 17.) The said segments may be provided in their lateral faces with one or several stuffing-grooves 46. The joints between the curved surfaces of the bands are easily rendered steam-tight by polishing, the contacts between the same being comparatively wide.

As mentioned above, either the pulley 18 or the pulley 26 may be braked at will to render motionless the frame 13 or the shaft 5. In the former case the pulley 26 rotates in the direction of the arrow D, Fig. 14; in the latter case the pulley 18 rotates in the direction of the arrow E. The transmission of power will be obtained by means of a belt which can be brought alternatively on the pulleys 18 and 26. The direction of rotation may also be changed by means of other suitable devices—such, for instance, as that shown in Figs. 18 and 19. The sleeve 35 may be put in connection either with the shaft 5 or with the socket 14 by means of a piece composed of a ring 36, sliding on the socket 14, and of two branch parts 37, sliding in the rectilinear grooves 38, provided on the inner side of the sleeve 35. Each of the said branch parts carries a spur 39, sliding in the spiral grooves 40 and 45 of the shafts 5 and 14. In the position shown in Fig. 18 if the socket 14 rotates in the direction of the arrow F the sleeve 35 rotates in the same direction, the shaft 5 remaining motionless.

To change the direction of rotation of the engine, the incoming steam is shut off and the piece 36 is moved forward in the direction of the arrow G. The spurs 39, sliding in the rectilinear grooves 45 and then coming in contact with the shaft 5, become engaged in the spiral grooves 40, which terminate in a rectilinear part 41. A shock is thus avoided which the system of mechanism would not be capable of resisting, and the shaft 5 takes gradually the same speed as the sleeve 35. Then all that need be done is to render the socket 14 motionless and to turn the steam slowly on again. To change the rotation in the opposite direction, a shifting piece 42 will cause the spur 39 to follow the rectilinear groove 38 by closing the entrance of the spiral groove 40. When the spur will be in contact with the socket 14, it will become engaged in the spiral groove 40 and will then operate in the same manner as previously.

In case the change in the direction of rotation is not necessary the engine may be arranged as shown in Fig. 20—that is, the frame 13 may be secured to the main frame of the machine.

The engine may also be so arranged that the axes shall be vertical, as shown in Fig.

21. One of the plates—say plate 3—together with the spiral band, will then be secured to the main frame 43, and the other plate 4 is movable on plate 3 and guided by the cranks 20. The bent shaft 5 is held in an upright position by a cross-bar 44, secured to the main frame.

As will be understood, the construction may be modified in many ways. It may again be modified in combining two or more pairs of spiral bands. For instance, in Fig. 22 the engine comprises two pairs of spiral bands 1 2 and 1^a 2^a. The bands 1 and 1^a are secured on the lateral plates 3 and 3^a, and the bands 2 and 2^a are secured on the middle plate 4. The cranks 6 and 6^a, which carry the plates 1 and 1^a, are in front one of the other, and the crank 7, which carries the plate 4, is diametrically opposed to the same with respect to the axis of shaft 5. The plates are guided and the engine operates in the same manner as hereinbefore described with reference to Figs. 14 to 16.

In all the embodiments of the present invention, as herein shown and described, the rotation of the engine is obtained by the continuous admission of a motive fluid, and the expansion of the latter is as complete as may be desired, the motive effort is regular, the operation is soft and silent, and the engine can be started under a load.

I claim—

1. A rotary engine comprising two parallel plates two spiral bands located between the plates and engaged the one in the other and guiding means to cause one of the bands to make a circular movement of translation with respect to the other band.

2. A rotary engine comprising two parallel plates, two spiral bands engaged the one in the other and integral with the two plates respectively, and guiding means to cause one of the bands or one of the plates to make a circular movement of translation with respect to the other band or the other plate.

3. A rotary engine comprising two parallel plates two spiral bands between the said plates and engaged the one in the other, guiding means to cause one of the bands to make a circular movement of translation with respect to the other band, and a duct or conduit to conduct the incoming motive fluid under pressure to the center of the said spiral bands.

4. A rotary engine comprising a bent shaft having two opposite cranks, two parallel plates loosely mounted on the said cranks a frame loosely mounted on the shaft, cranks to connect the plates with the frame in causing the same to make a circular movement of translation with respect to the said frame, spiral bands integral with the said plates and engaged the one in the other, and means to render motionless at will either the said shaft or the said frame.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

LÉON CREUX.

Witnesses:
HANSON C. COXE,
MAURICE ROUX.