(No Model.) 3 Sheets—Sheet 1.

J. E. BEAUCHEMIN.

ROTARY ENGINE.

No. 388,522. Patented Aug. 28, 1888.

Fig: 1.

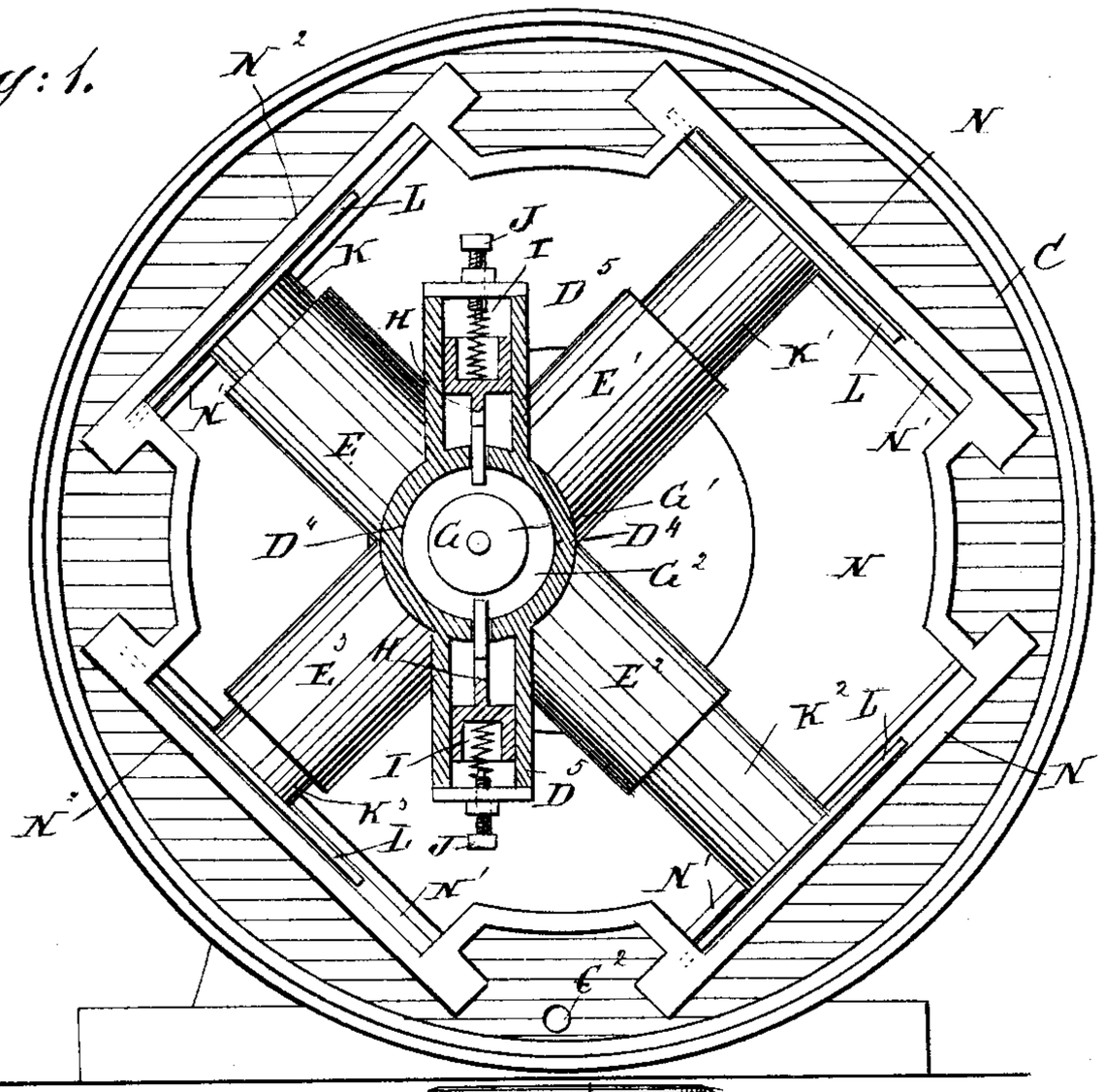
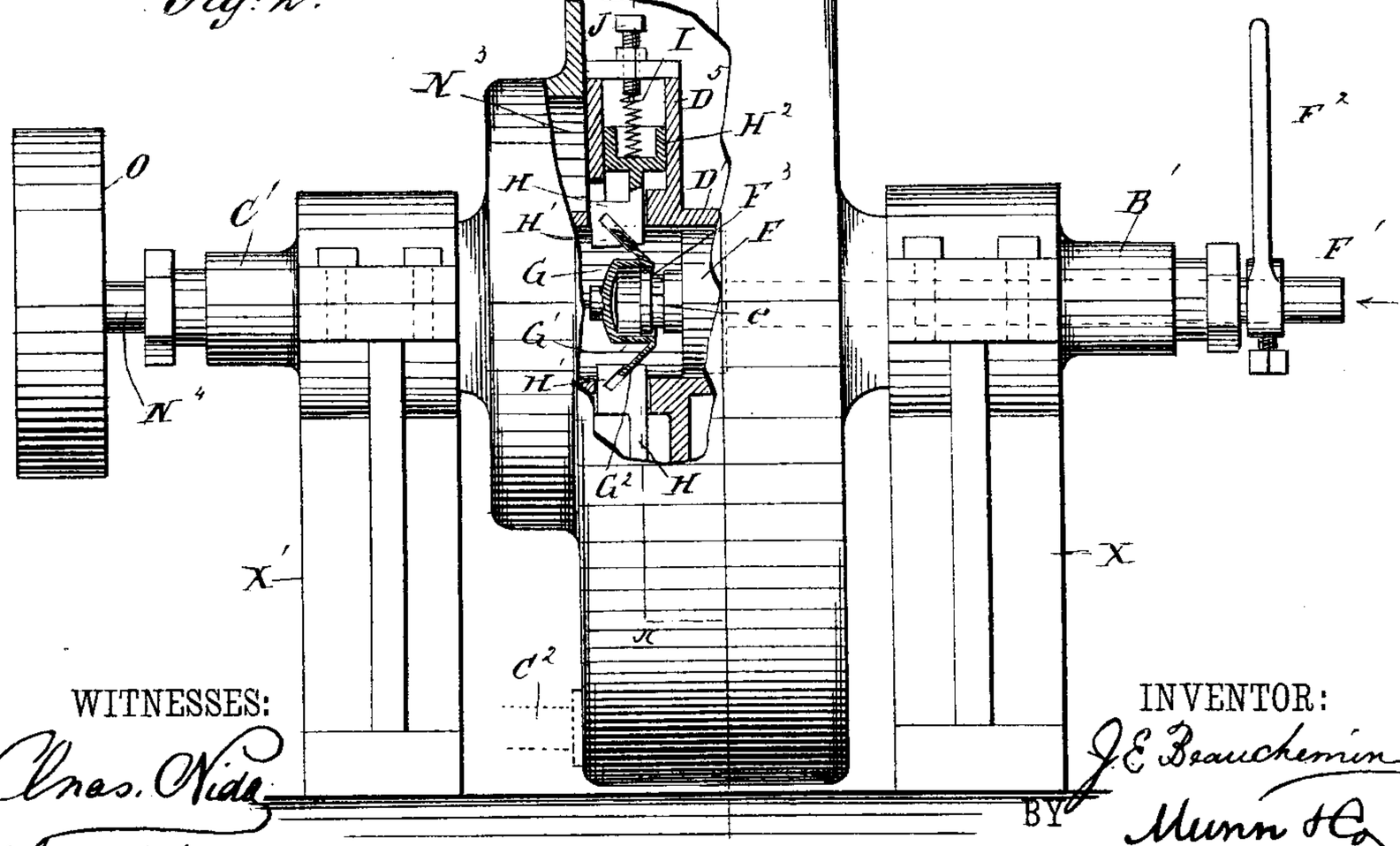


Fig: 2.



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(No Model.) 3 Sheets—Sheet 2.

J. E. BEAUCHEMIN.

ROTARY ENGINE.

No. 388,522. Patented Aug. 28, 1888.

Fig: 3.

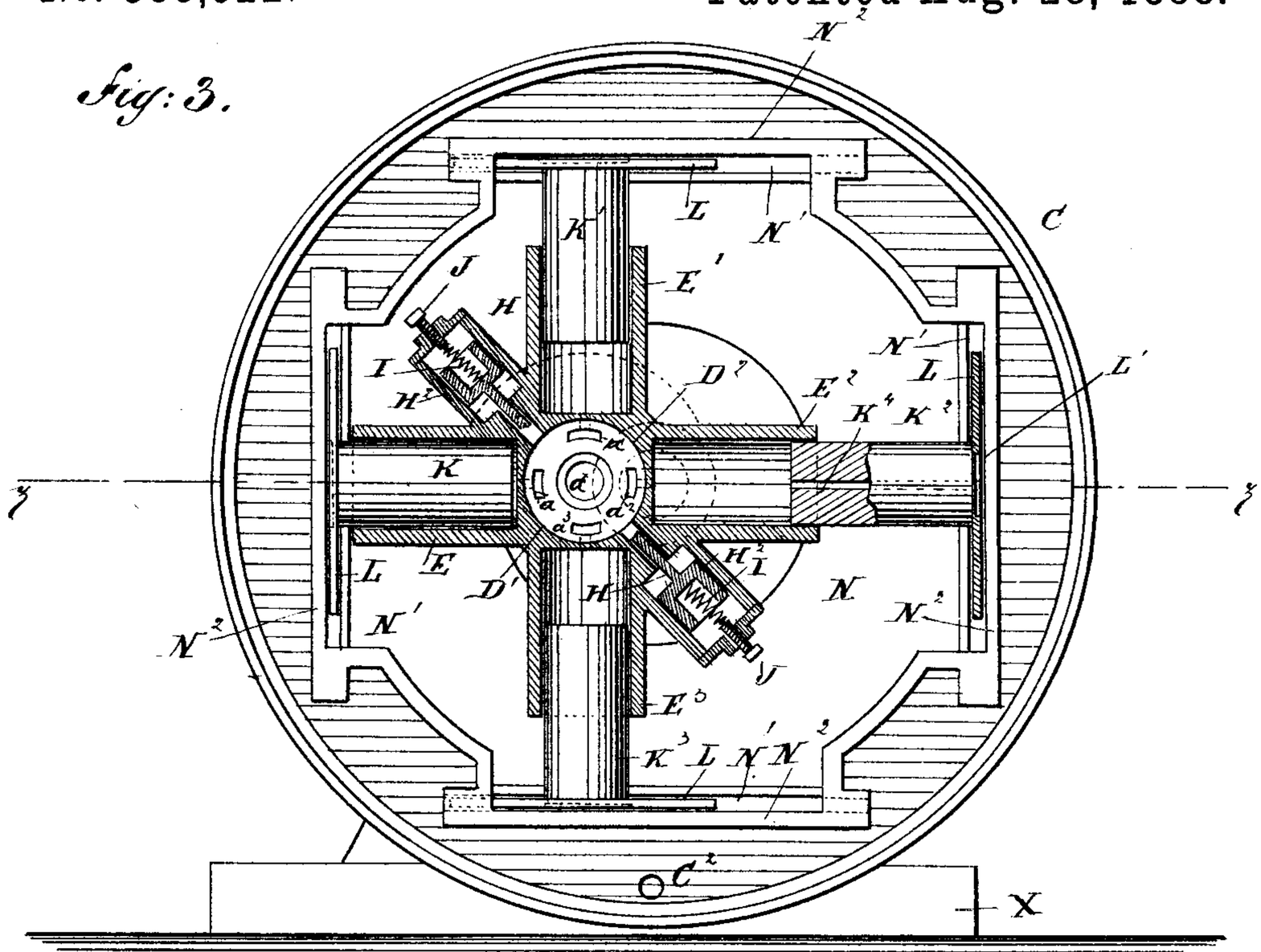
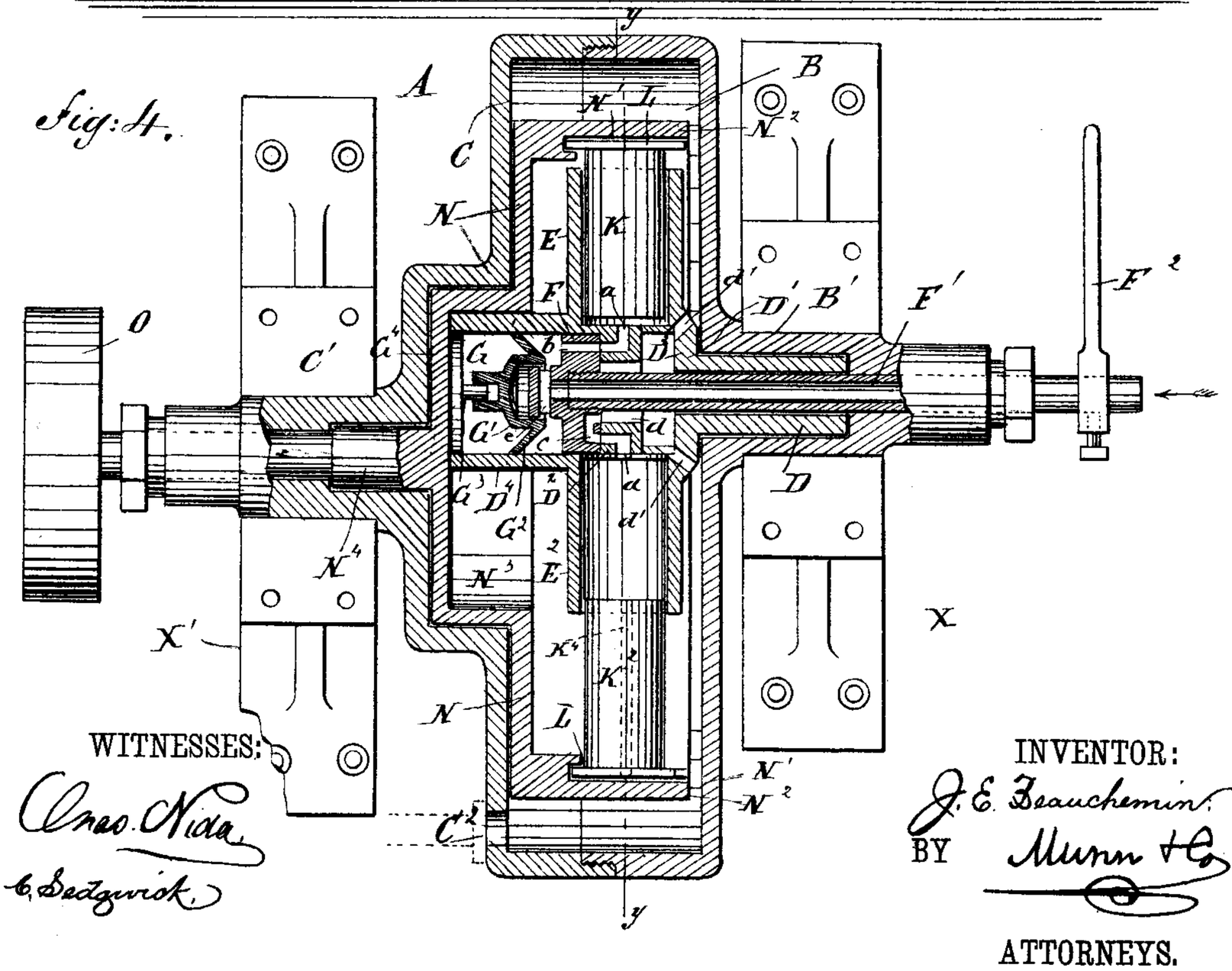


Fig: 4.



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No. 388,522. Patented Aug. 28, 1888.

Fig. 6.

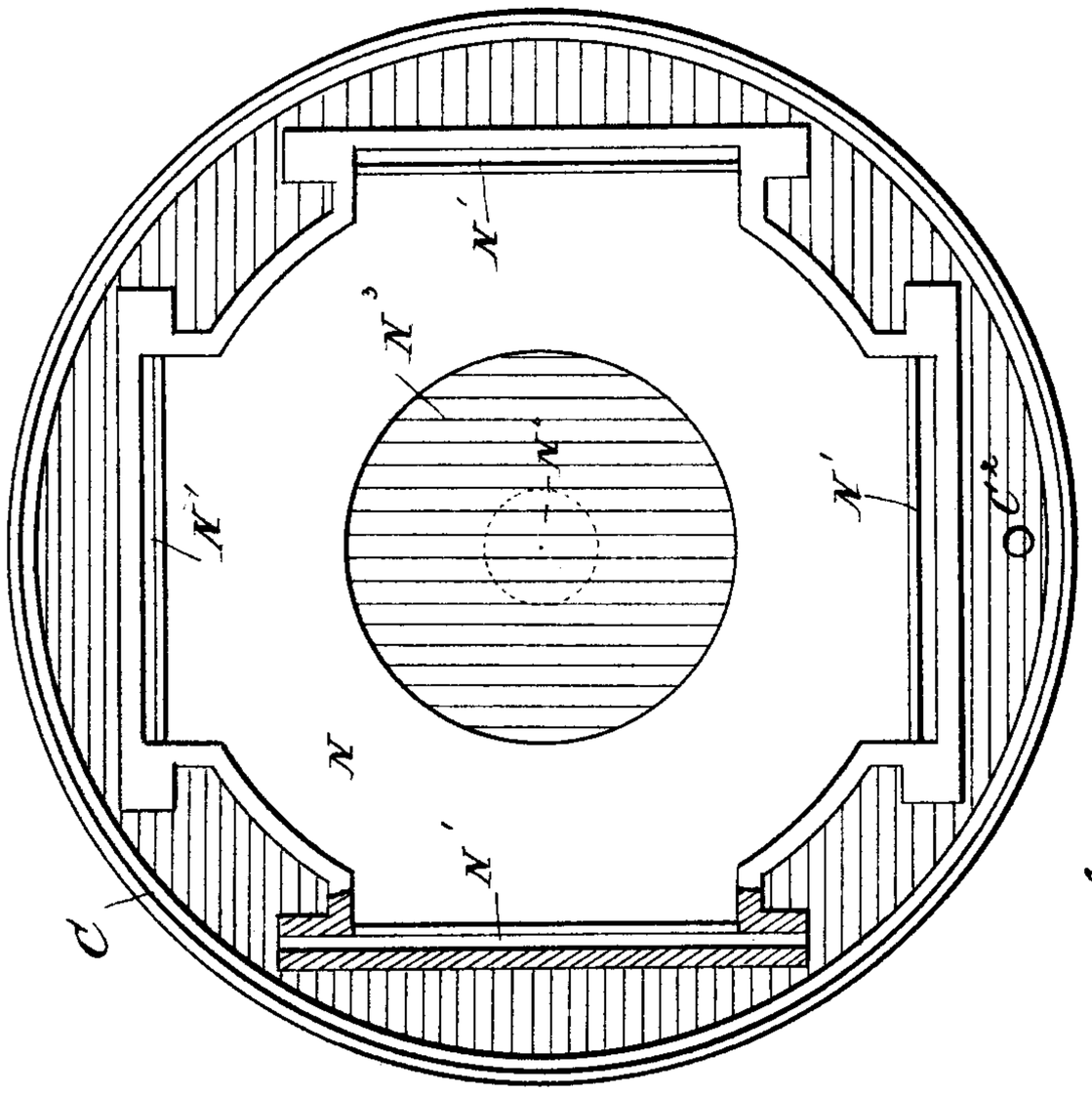


Fig. 5.

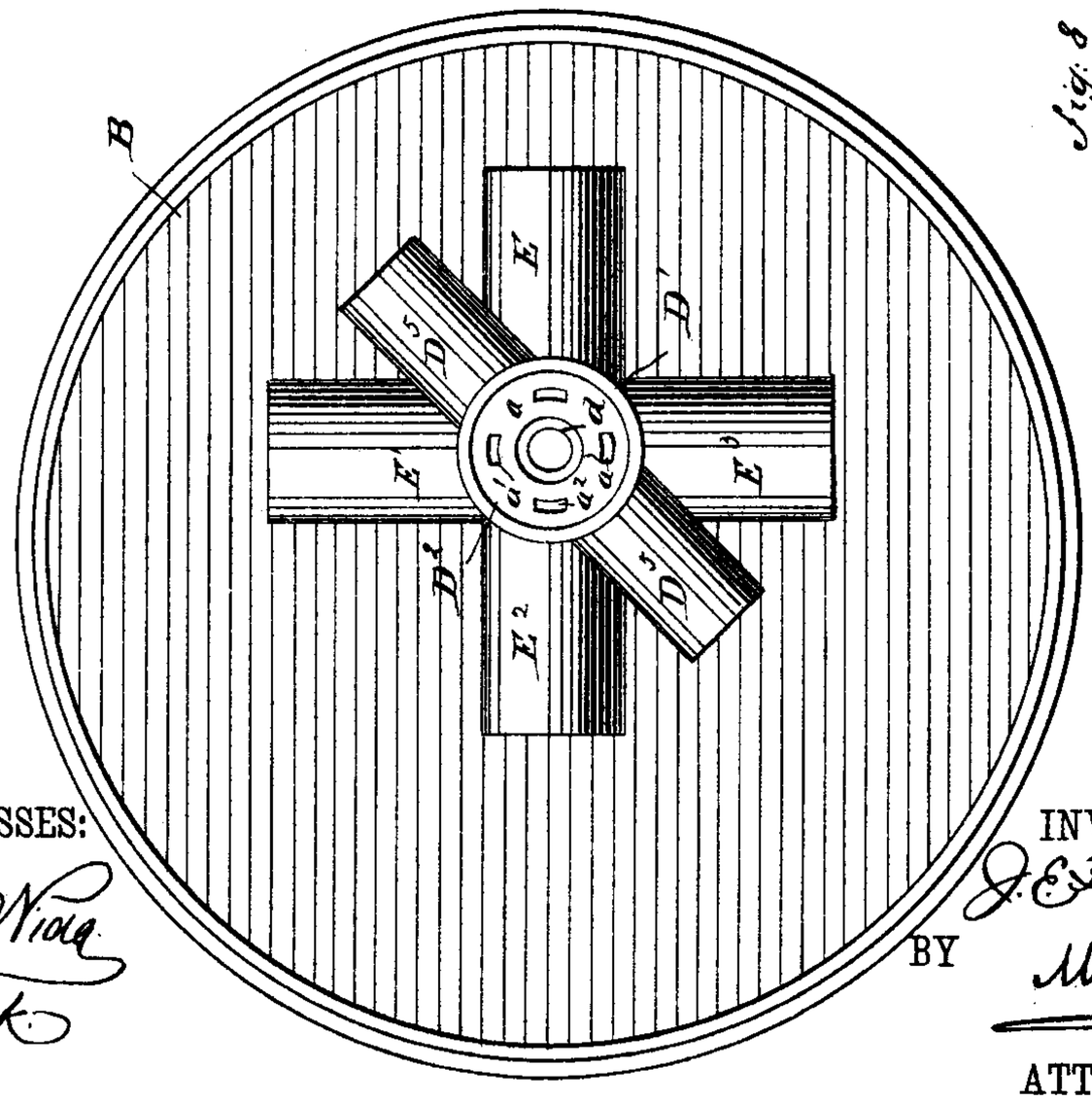


Fig. 10.

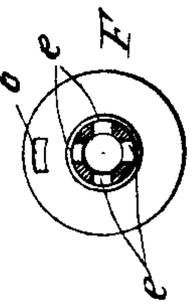


Fig. 9.

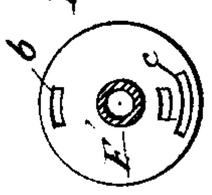


Fig. 8

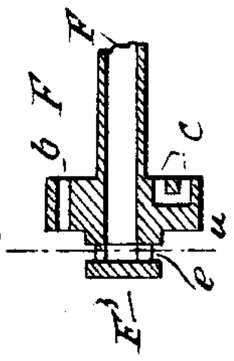
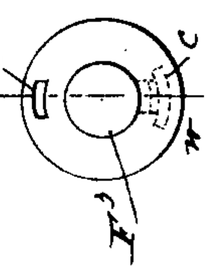


Fig. 7.



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UNITED STATES PATENT OFFICE.

JOSEPH E. BEAUCHEMIN, OF SOREL, QUEBEC, CANADA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 388,522, dated August 28, 1888.

Application filed February 18, 1888. Serial No. 264,471. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH E. BEAUCHEMIN, of Sorel, in the county of Richelieu, Province of Quebec, and Dominion of Canada, have invented a new and Improved Rotary Engine, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved rotary engine which is simple and durable in construction, very effective in operation, and adapted to be operated by water, air, or steam.

The invention consists of certain parts and details and combinations of the same, as will be fully described hereinafter, and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation of the improvement, partly in section, on the line *x x* of Fig. 2. Fig. 2 is an end elevation of the same with parts in section. Fig. 3 is a sectional side elevation of the improvement on the line *y y* of Fig. 4. Fig. 4 is a sectional plan view of the same on the line *z z* of Fig. 3. Fig. 5 is a face view of the cylinders and their axle. Fig. 6 is a like view of the driving-wheel and its casing, parts being in section. Fig. 7 is an end elevation of the valve. Fig. 8 is a longitudinal sectional elevation of the same on the line *w w* of Fig. 7. Fig. 9 is an end elevation of the same, and Fig. 10 is a sectional end elevation of the same on the line *u u* of Fig. 8.

The improved rotary engine is provided with a casing, A, made in two parts, B and C, of which the part B is provided with an eccentric hub, B′, held in a standard, X, and the part C is provided with a central hub, C′, held in a standard, X′, located opposite the standard X. The hubs B′ and C′ are made hollow, and the hub B′ supports a trunnion, D, on the inner end of which is secured a hub, D′, provided with a valve-seat, D^2, in which are formed the ports *a*, *a′*, a^2, and a^3, and on the said hub D′ are secured radially-extending cylinders E, E′, E^2, and E^3, placed at right angles to each other. Into the said cylinders open said ports *a*, *a′*, a^2, and a^3, respectively.

On the valve-seat D^2 is held a fixed valve, F, provided with an inlet-port, *b*, registering alternately with the ports *a*, *a′*, a^2, and a^3 when the hub D′ is rotated. In the inner side of the valve F is formed a U-shaped exhaust-port, *c*, adapted to connect by one end successively with the said ports *a*, *a′*, a^2, and a^3, and the other end of the said exhaust-port *c* leads to a central opening, *d*, formed in the valve-seat D^2. The central opening, *d*, leads to an exhaust-chamber, D^3, formed in the hub D′, and from the said exhaust-chamber D^3 lead the openings *d′* into the interior of the casing A, which thus forms a receptacle for the exhaust-steam. Into the casing A leads a pipe, C^2, for carrying off the exhaust-steam to any convenient place.

The valve F is secured to one end of a pipe, F′, passing through the hollow trunnion D and through the hub B′ of the casing B. The outer end of the pipe F′ is connected with a suitable source of steam, water, or air supply, and on the said outer end of the said pipe F′ is secured an arm, F^2, for turning the said pipe, so as to reverse the motion of the engine whenever desired.

The inner end of the pipe F′ leads to the openings *e*, formed in the cylindrical extension F^3, secured to the outer face of the valve F. Said openings *e* are adapted to be opened and closed by a governor-valve, G, provided with a cap, G′, held to slide on the said extension F^3, and on the said cap G′ is formed an inclined annular flange, G^2, engaged at opposite sides by a slot, H′, formed in the slide H, passing through a slot in the offset D^4, formed on the hub D′ and carrying the said governor-valve G. Each slide extends into a cylindrical offset, D^5, secured to the hub D′, and on the outer end of the slide H is fastened a weight, H^2, held to slide in the said offset D^5 and pressed inward by a spring, I, resting with one end against the said weight H^2 and with its other end against the set-screw J, screwing in the said offset D^5 and serving to regulate the tension of the spring I. A pin, G^3, engages a central recess in the cap G′ of the valve G, so as to guide the latter in the offset D^4, and the said pin G^3 projects from a disk, G^4, held in the outer end of the said offset D^4.

In the cylinders E, E′, E^2, and E^3 are held to slide the pistons K, K′, K^2, and K^3, respectively, each being provided on its outer end with a plate, L, held to slide in a groove, N′, formed in a wheel, N, said groove extending

at right angles to its piston. In each piston K, K′, K², and K³ is arranged a central opening, K⁴, through which a fluid can pass into the recess L′, made in the outer face of the plate L, which is of about the same area as the piston, thus forming a cushion between said plate L and the rear wall, N², of the wheel N, which wall forms a back for the plate L. The wheel N is provided with a central offset, N³, from which extends outward a shaft, N⁴, having its bearing in the hub C′ of the part C of the casing, and carrying on its outer end the pulley O, connected by a belt with the machinery to be driven.

The operation is as follows: A suitable fluid under pressure may be used to operate the machine. Preferably, however, steam is employed. When the machine is in the position shown in Fig. 4, the fluid enters the pipe F′ and passes through the openings *e* into the offset D⁴ of the hub D′, and from the latter through the port *b* in the stationary valve F to the port *a* in the valve-seat D², entering the cylinder E at its bottom and exerting its pressure against the piston K, and then enters through the central opening, K⁴, in the recess L′, which balances the pressure of the piston K, and then exerts its pressure against the back N² of the wheel N, so that the latter is rotated, as it is eccentrically placed in relation to the hub D′, carrying the cylinders E, E′, E², and E³ and their pistons K, K′, K², and K³, respectively. The wheel N on being rotated carries with it the piston K, as the plate L, secured to the latter, travels in the slot N′ of the wheel N. The piston K thus also imparts a rotary motion to the hub D′, as it is held in the cylinder E, secured to the said hub D′, and when the latter is rotated its port *a* is finally cut off from the fluid-inlet port *b;* but the next port, *a′* or *a*³, according to the direction in which the engine is running, then registers with the port *b* and the fluid is admitted to its respective cylinder. The same operation against the respective piston now takes place, as above described, so that a new impulse is given to the wheel N. When the respective cylinder is in its innermost or outermost position, the plate L stands in the middle of the groove N², as shown in Fig. 3. When the piston K, K′, K², or K³ is nearing its outermost position, the port *a*, *a′*, *a*², or *a*³, respectively, registers with the U-shaped exhaust-port *c*, so that the fluid on the return movement of the piston can pass through the ports *a* and *c* into the central port, *d*, of the hub D′, and then the fluid passes into the chamber D³, and from the latter through the openings *d′* into the interior of the casing A, from which the exhaust can escape through the pipe C². Thus it will be seen that the cylinders E, E′, E², and E³ alternately take the fluid under pressure through the port *b*, *a*, *a′*, *a*², and *a*³, respectively, when the pistons K, K′, K², and K³ are in or near their innermost position. The exhaust takes place successively from the cylinders E, E′, E², and E³ when the pistons K, K′, K², and K³ are in or near their outermost position, as above described. The amount of fluid under pressure passing through the pipe F′ into the offset D⁴ is regulated by the governor-valve G, which, with its cap G′, slides on the offset F³, so as to cut off part of the openings *e* whenever the speed of the engine increases over the normal speed. The governor-valve G is operated on automatically by the slides H, which move the said valve G forward or backward on the offset F³ by the weights H², which move outward on an increase of speed of the engine and move inward on a decrease of speed. The inward or outward movement of the slides H causes a forward or backward movement of the valve G as the latter, with its inclined flange G², travels in the inclined slots H′ of the said slides H. It is understood that the weights H² are moved outward by the centrifugal force, on the increase of speed of the engine, and move inward correspondingly by a decrease of speed and by the action of the springs I. The tension of the latter is regulated by the set-screws J, so as to set the governor-valve G at whatever point of cut-off may be desired on the openings *e*. The rotary motion of the wheel N is transmitted to other suitable machinery by the pulley O, or other suitable means, such as gear-wheels and the like. When it is desired to reverse the engine, the operator turns the handle or lever F² the way he wants the engine to run until the inlet-port *b* of the valve F has traveled its length and the length of the port *d*, so that the port *b* opens when the engine runs the other way.

It will be seen that the fluid under pressure is admitted to the cylinders E, E′, E², and E³ successively and in a manner similar to that used in the common slide-valve engine, and the exhaust takes place in a like manner.

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

1. In a rotary engine, the combination, with a hub forming a valve-seat having ports and an exhaust-chamber, of a valve held on the said seat and operating over the said ports, a series of cylinders secured radially on the said hub and into which lead the said ports, pistons having central openings operating in the said cylinders, and a wheel held eccentrically to the said hub, and on the rim of which the said pistons operate, substantially as shown and described.

2. In a rotary engine, the combination, with a hub forming a valve-seat having ports and an exhaust-chamber, of a fixed valve held on the said seat and operating over the said ports, cylinders secured radially on the said hub and into which lead the said ports, pistons operating in the said cylinders, a plate secured to the outer end of each piston, and a wheel provided with slots in which operate said plates, said wheel being held eccentrically to the said hub, substantially as shown and described.

3. In a rotary engine, the combination, with a hub forming a valve-seat having ports and an exhaust-chamber, of a fixed valve held on the said seat and operating over the said ports in the valve-seat, cylinders secured radially on the said hub and into which lead said ports, pistons operating in the said cylinders, plates secured to the outer ends of the said pistons, a wheel provided with slots in which said plates travel, said wheel being held eccentrically to the said hub, and a casing made in two parts, forming bearings for the said hub and the said wheel, and also serving as an exhaust-chest connected with the said exhaust-chamber, substantially as shown and described.

4. In a rotary engine, the combination, with a hub forming a valve-seat having ports and an exhaust-chamber, of an inlet-valve held on the said valve-seat and provided with an inlet-port and an outlet-port operating over the said ports in the valve seat, an inlet-pipe supporting said valve, an offset formed on the said valve and provided with radial openings connected with the said pipe, a governor-valve consisting of a cap held to slide on the said offset over the said openings and an annular inclined flange secured to the said cap, and weighted slides having inclined slots engaging the said annular flange of the governor-valve, so as to move the latter forward or backward in its bearings to open and close the said openings in the valve, substantially as shown and described.

5. In a rotary engine, the combination, with a hub having a valve-seat and having a rotary motion, of a valve held on the said valve-seat and operating on the ports of the said valve-seat, an inlet-pipe carrying said valve and discharging into openings formed in an offset on the said valve, a cap held to slide on the said offset to open and close the openings in said offset, an annular inclined flange formed on the said cap, weighted slides having inclined slots engaging the said inclined flange, said weighted slides being mounted to slide radially on the said hub, and springs pressing against said weighted slides, substantially as shown and described.

6. In a rotary engine, the combination, with a hub having a valve-seat and having a rotary motion, of a valve held on the said valve-seat and operating on the ports of the said valve-seat, an inlet-pipe carrying said valve and discharging into openings formed in an offset on the said valve, a cap held to slide on the said offset to open and close said openings in it, an annular inclined flange formed on the said cap, weighted slides having inclined slots engaging the said inclined flange, said weighted slides being mounted to slide radially in the said hub, springs pressing against the said weighted slides, and set-screws for regulating the tension of the said springs, substantially as shown and described.

JOSEPH E. BEAUCHEMIN.

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