(No Model.) 2 Sheets—Sheet 1.

J. H. FEDELER.

STEAM MOTOR.

No. 432,391. Patented July 15, 1890.

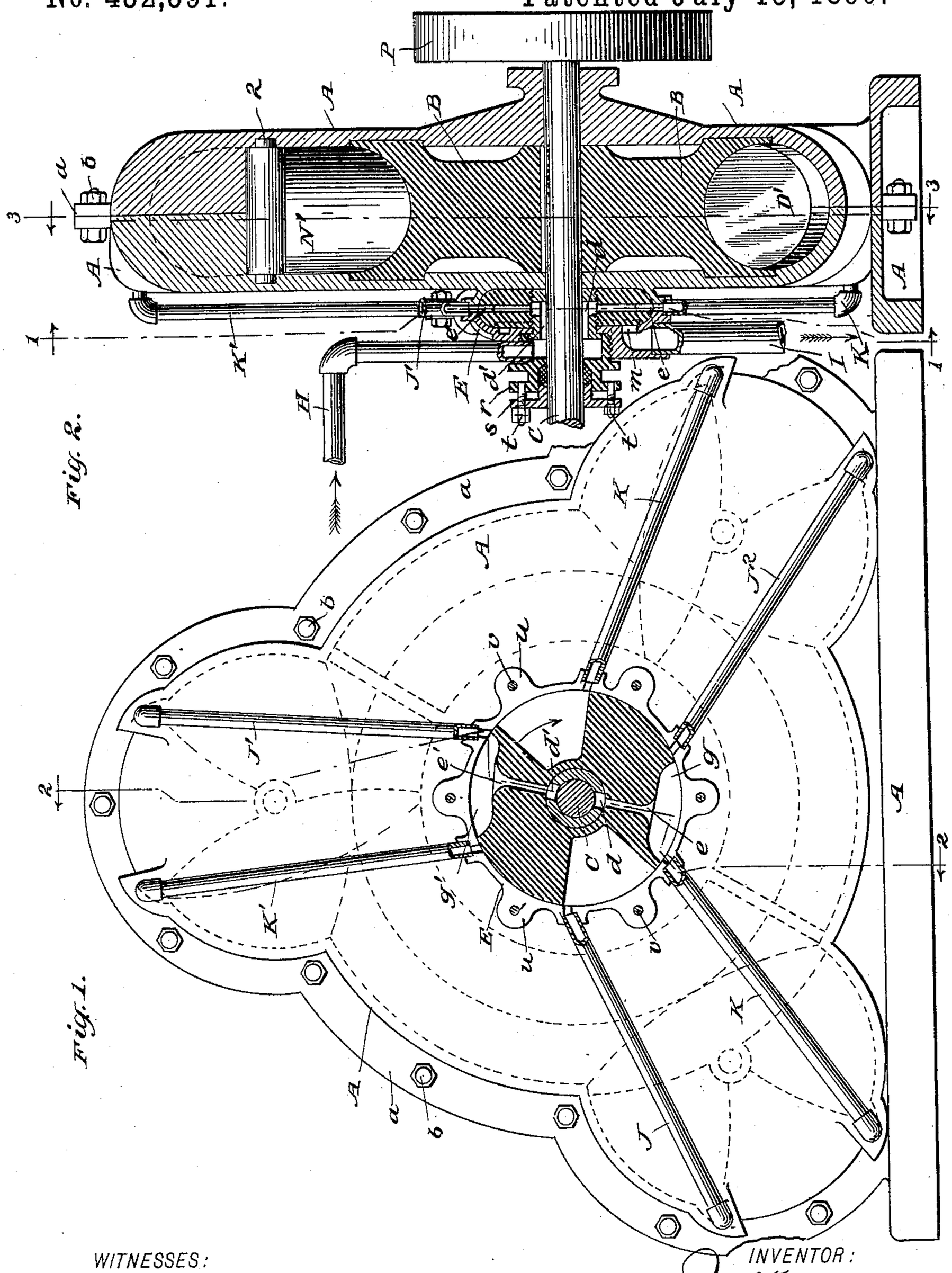

Fig. 2.

Fig. 1.

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Fig. 3.

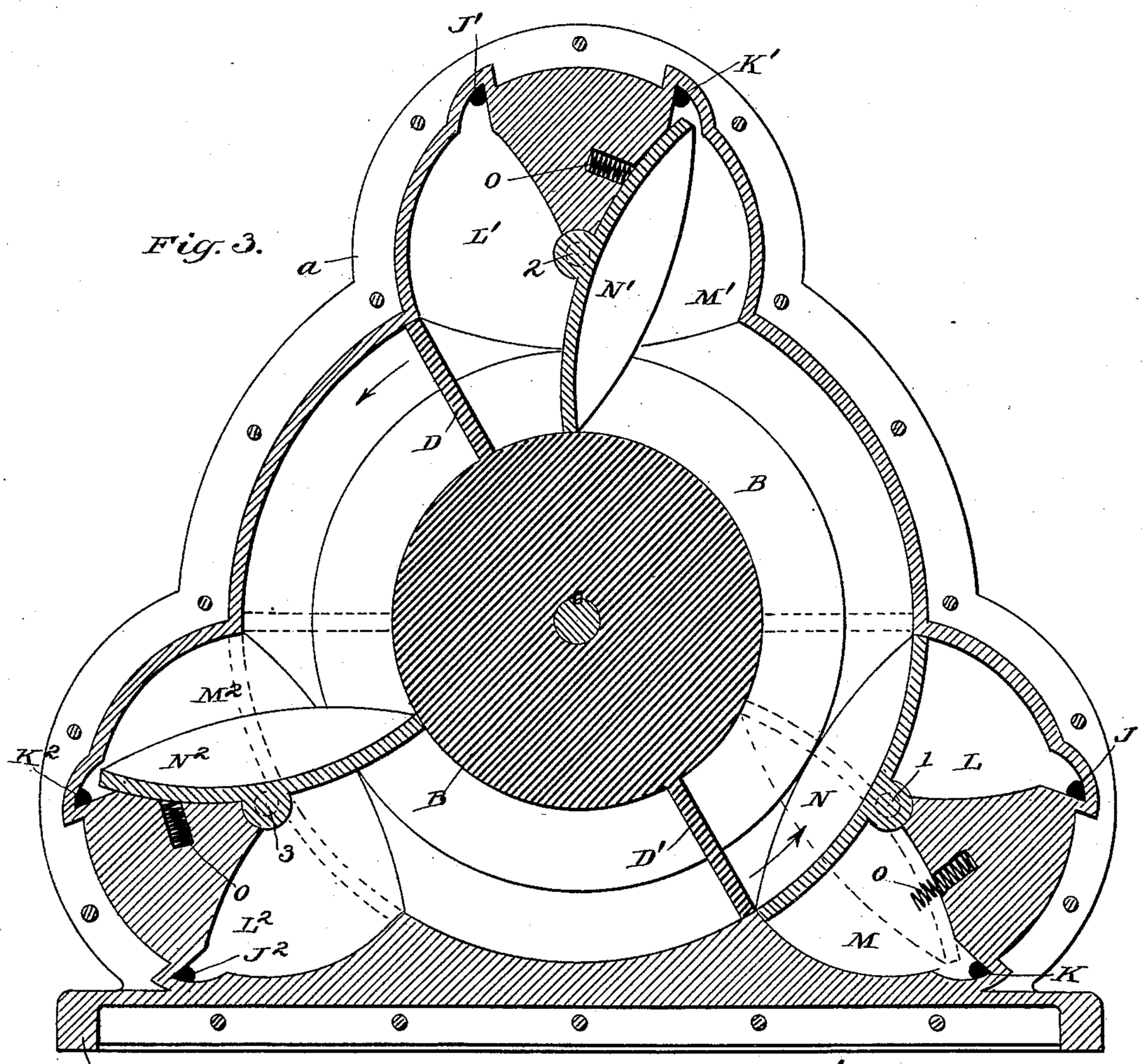


Fig. 4.

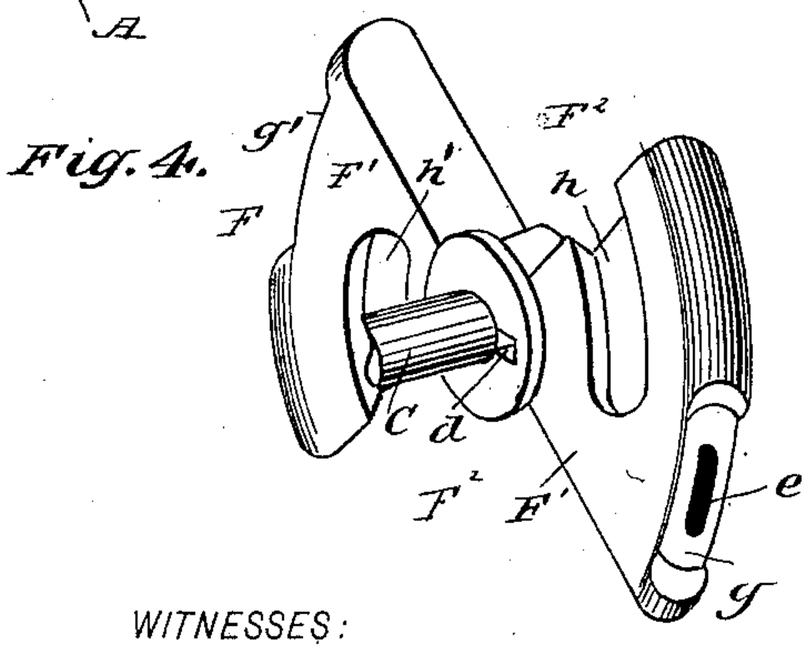
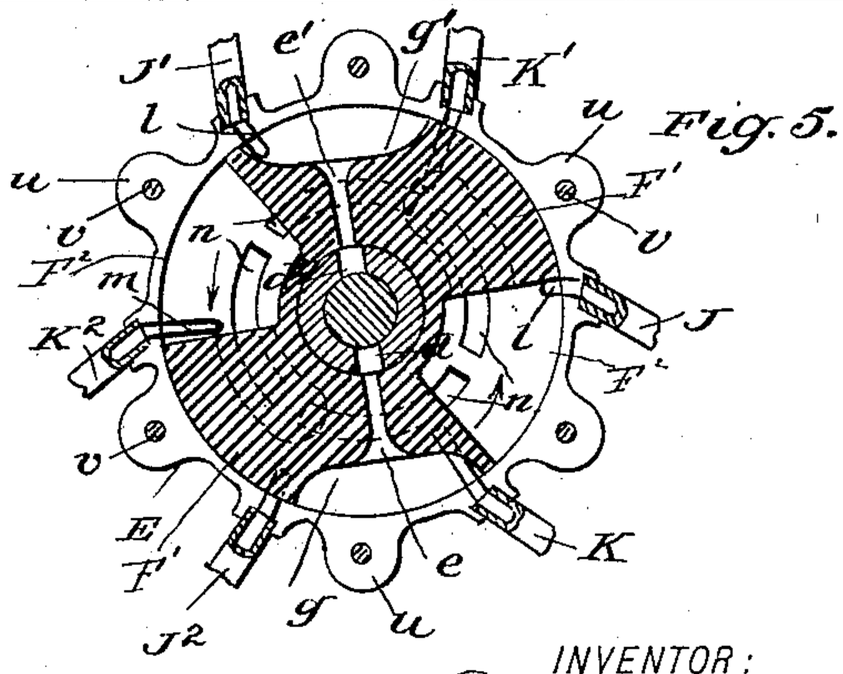


Fig. 5.



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UNITED STATES PATENT OFFICE.

JOHN H. FEDELER, OF NEW YORK, N. Y.

STEAM-MOTOR.

SPECIFICATION forming part of Letters Patent No. 432,391, dated July 15, 1890.

Application filed November 12, 1889. Serial No. 329,979. (No model.)

To all whom it may concern:

Be it known that I, JOHN HENRY FEDELER, a subject of the King of Sweden, at present residing in the city, county, and State of New York, have invented a new and Improved Steam-Motor, of which the following is a full, clear, and exact description.

My invention relates to that class of rotary engines in which the piston proper is inclosed in a stationary case and is propelled by steam, hot air, or other fluid admitted within the case. The engine embodying my invention may be propelled by hot air or other fluid; but it is especially adapted to be operated by steam.

The object of my invention is to provide a rotary engine in which direct steam shall be applied to two or more parts of the periphery of the piston at the same time, thus producing great power, and in which the expansive force of the steam shall be almost wholly utilized before passing out through the exhaust-pipes, thus making an economical engine.

To this end my invention consists in certain features of construction and combinations of parts hereinafter described, and more specifically 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 views.

Figure 1 is a side elevation of the entire engine with the steam chest and valve for regulating the steam and exhaust in section on the line 1 1 of Fig. 2; Fig. 2, a vertical cross-section on the line 2 2 of Fig. 1; Fig. 3, a vertical longitudinal section on the line 3 3 of Fig. 2; Fig. 4, a perspective view of the valve controlling the direct and exhaust steam; and Fig. 5, a section of the valve and casing inclosing it on the line 1 1 of Fig. 2, as seen from the interior of the case.

The casing A, which constitutes the frame of the engine, is provided with a suitable base, upon which it rests, and is made in two parts, each of which is provided with a flange *a*, so that the two parts may be securely fastened together by bolts *b*, passing through the two flanges. At the top and on each side of the casing A and arranged at equal distances around it are the chambers L L′ L² and M, M′, and M², which open into the circular interior of the casing, and the object of which will be hereinafter explained.

Inclosed within the casing A is the body of the motor, which consists of the piston B, having two wings D D′, and which is keyed to the shaft C. The shaft C extends through the case A and piston B. One end of the shaft has a bearing in the case A and is provided with a fly-wheel P. The other end extends through the steam-chest E and has a bearing in the box *r* and gland S. The box *r* is screwed into the side of the steam-chest E, is provided with packing to prevent the steam from escaping around the shaft, and the packing is held in place by the gland S, which fits closely around the shaft and wedges into the box *r*, to which it is attached by the bolts *t*. The piston B is provided with wings D D′, which are placed upon opposite sides of the circumference of the piston, and against which the steam acts to revolve the piston. The sides of the piston B should form practically a steam-tight joint with the sides of the casing A, and the wings D D′ of the piston should fit steam-tight in the casing, so that the whole force of the steam will be directed against the wings of the piston.

Attached to one side of the main casing A and surrounding the shaft C is a circular steam-chest E, which is suitably packed to prevent the steam from escaping around the shaft C, and in which revolves the valve F, which is attached to the shaft C. The steam-chest E is made in two parts that it may be easily cast, and each part is provided with ears *u*, through which pass bolts *v*, which hold the parts together. The supply steam-pipe H connects with the upper side of the steam-chest E near the shaft C, and the main exhaust-pipe I connects with the lower side of the steam-chest. Radiating from the steam-chest E are the direct-steam pipes J, J′, and J² and the exhaust-pipes K, K′, and K². These pipes extend from the steam-chest E along the outside of the casing A and project through it near its circumference, the direct-steam pipes J, J′, and J² entering the cham-

bers L, L′, and L², and the exhaust-pipes K, K′, and K² entering the chambers M, M′, and M², respectively. The outer part of the steam-chest is provided on its inner face with a series of short grooves *l*, extending inward from the steam-pipes J, J′, and J², and with a series of longer grooves *m*, extending from the exhaust-pipes K, K′, and K², and also with a series of disconnected segmental grooves *n*, one of which connects with the exhaust-pipe I.

Within the steam-chest E and keyed to the shaft C is the rotary valve F, which is provided with two diametrically-opposite radial wings F′, extending each at the periphery over one-third of the circumference of the steam-chest, the spaces F² between the wings being respectively one-sixth of said circumference. The valve is provided near the shaft C with two ports *d d′*, through which passes the steam from the pipe II, and which connect with passages *e e′*, running through the two wings of the valve and terminating in oblong openings *g g′* on the edge of the valve. These openings are made of a length nearly half that of the edge of each wing, so as to supply steam to the wings D D′ during about one-sixth of a revolution of the piston at one time. The valve F is also provided with recesses *h h′* upon each wing, adapted to connect with the grooves *m*. The series of short grooves *l* connect the direct-steam pipes J, J′, and J² with the openings *g g′* of the valve F. The series of longer grooves *m* provide for the connection of the exhaust-pipes K, K′, and K² with the recesses *h h′* of the valve F before the spaces F² connect with said exhaust-pipes, and the recesses *h h′* connect at the proper time the segmental grooves *n*, so that the exhaust can pass to the pipe I. The valve should be practically steam-tight in the steam-chest E, so that direct and exhaust steam will have to pass through the grooves and openings of the valve, as described.

Between the chambers L and M, L′ and M′, and L² and M² are movable abutments N, N′, and N², which are pivoted to projections on the inside of the casing A at the points 1, 2, and 3, respectively, and are adapted to direct the steam against the wings D D′ of the piston. The abutments are backed by a spiral spring *o* to prevent them from sticking and are operated as hereinafter described. The abutments and the spaces therebetween are respectively one-sixth of the circumference of the cylinder.

The direct-steam pipes J, J′, and J² never carry exhaust-steam; but the exhaust-pipes K, K′, and K² alternately carry direct steam to operate the abutments N, N′, and N².

The engine is operated as follows: The steam entering from the main pipe II passes into the steam-chest E and through the ports *d d′*, passages *e e′*, and openings *g g′* of the valve F into the steam-pipes J J′ J². As a matter of fact, the steam will enter two steam-pipes at the same time and exert its force simultaneously upon both wings D D′ of the piston; but to more easily follow it let us suppose the steam enters the pipe J′. It will enter the casing A at the top of the chamber L′, as shown in Fig. 3. The abutment N′ will thus be forced down till its lower edge strikes the body of the piston B and its back rests against the solid part of the casing A, to which it is pivoted. As the abutment can be tipped no farther, the expansive force of the steam is exerted against the wing D of the piston B, forcing it around to a position indicated by the dotted lines in Fig. 3, near the chamber M². At this point the valve F will have moved so that steam is cut off from the pipe J′ and live steam can pass by the groove *m* to the exhaust-pipe K² behind the abutment N², and the steam, striking the end of the abutment N², will close the abutment, as indicated by the dotted lines in Fig. 3, and the continued expansion of the steam that enters the chamber L′ will force the wing D of the piston beyond the abutment N². The valve F will by this time have moved sufficiently to cut off the steam from the pipe K² and to allow the direct steam to enter the pipe J², thus opening the abutment N² and forcing the wing D around to the position occupied by the wing D′ in the drawings. After the wing D has passed the abutment N² the steam behind the abutment will exhaust through the pipe K², passing through said pipe and through one of the grooves *m* of the steam-chest E to the recess *h* of the valve F and groove *n* of the steam-chest E, and thence through the main exhaust-pipe I to the air.

While the above-described action is taking place to operate the wing D of the piston the same action will be taking place through the other steam and exhaust pipes to operate the wing D′ of the piston.

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

1. A steam-motor consisting, essentially, of a casing A, having the chambers L, L′, and L² and M, M′, and M² arranged around its circumference, pipes J, J′, and J² and K, K′, and K², communicating with said chambers, the abutments N, N′, and N², pivoted between said chambers, the piston B, having wings D D′ fixed to the shaft C within said casing, the steam-chest E, affixed to the casing, said steam-chest having the grooves *l*, *m*, and *n* in the side thereof, and the valve F, fixed to the shaft C, so as to revolve in the steam-chest, said valve having ports *d d′*, passages *e e′*, and recesses *h h′* to regulate the flow of steam to and from the steam-chest, substantially as described.

2. In a rotary engine, the valve F, adapted to turn with the shaft C and provided with ports *d d′*, passages *e e′*, openings *g g′*, and

recesses *h h'*, adapted to regulate the flow of steam to and from the piston, substantially as described.

3. The combination, with the steam-chest E, having steam and exhaust pipes radiating therefrom and provided with grooves *l*, *m*, and *n*, of the shaft C and valve F, having ports *d d'*, passages *e e'*, and openings *g g'* therein, substantially as described, and for the purpose specified.

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Witnesses:
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