No. 649,859. Patented May 15, 1900.

M. O'CONNELL.

TURBINE MOTOR.

(Application filed Mar. 3, 1899. Renewed Mar. 23, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1,

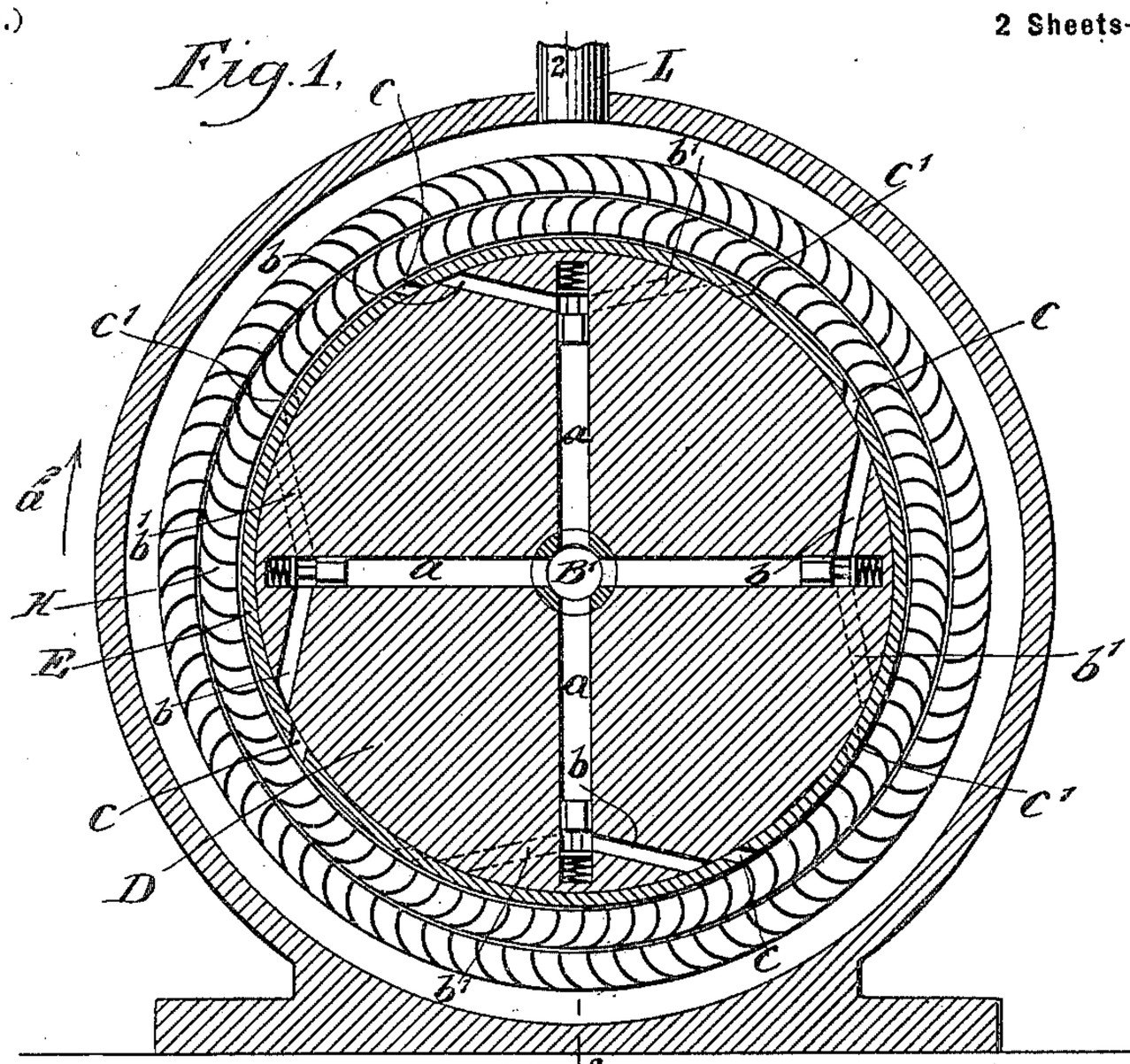

Fig. 2,

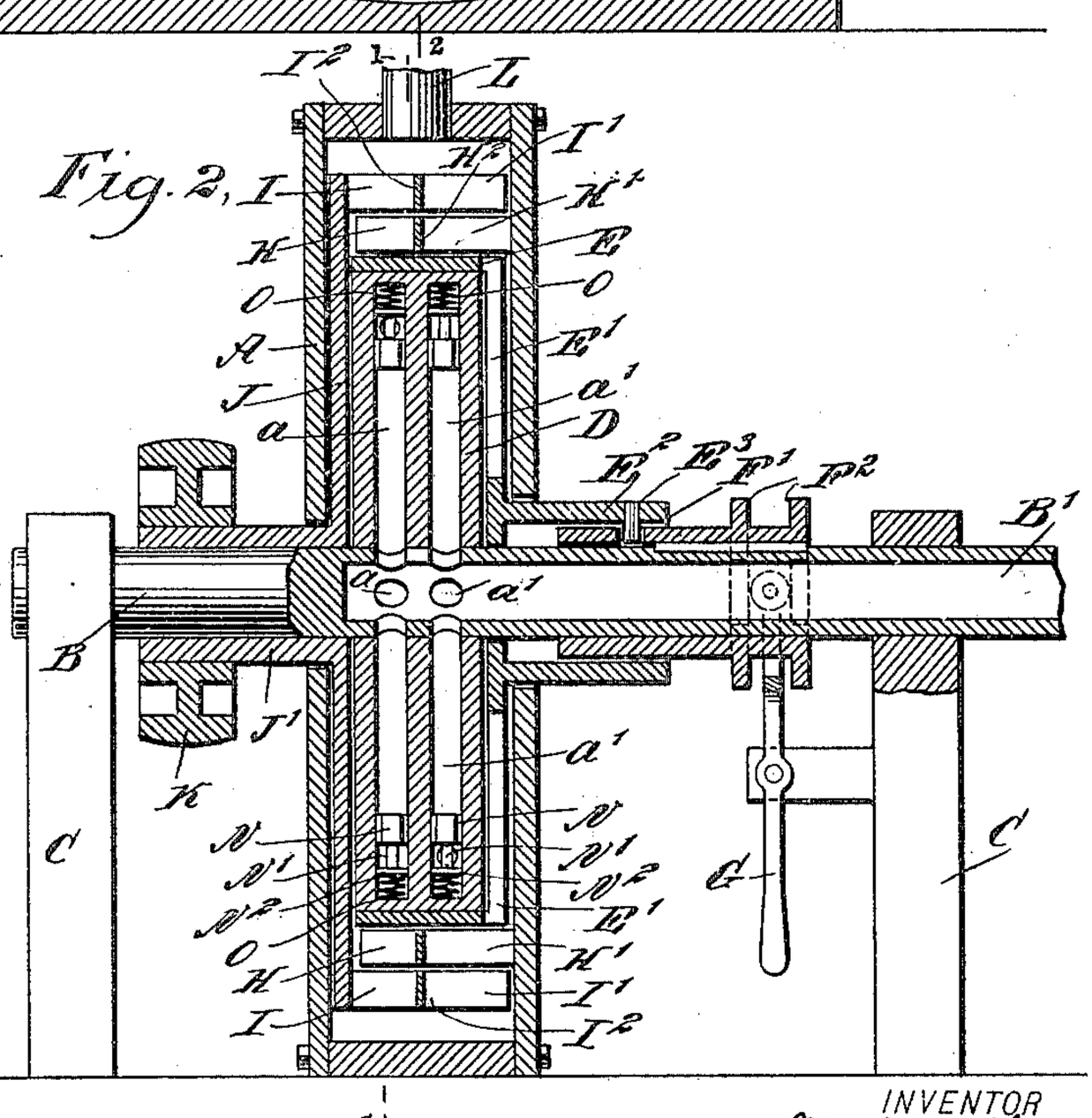

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Fig. 3,

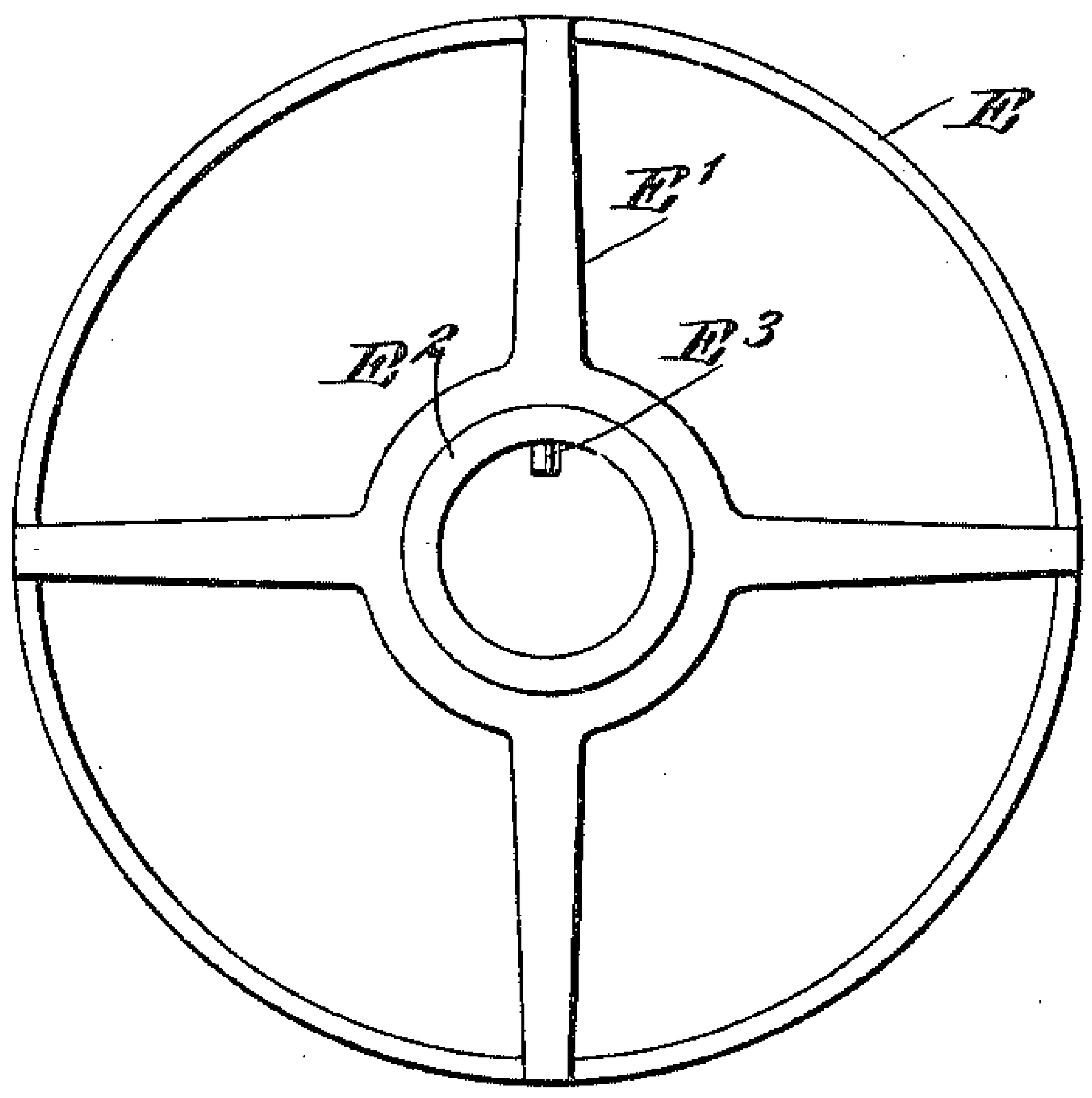


Fig. 4,

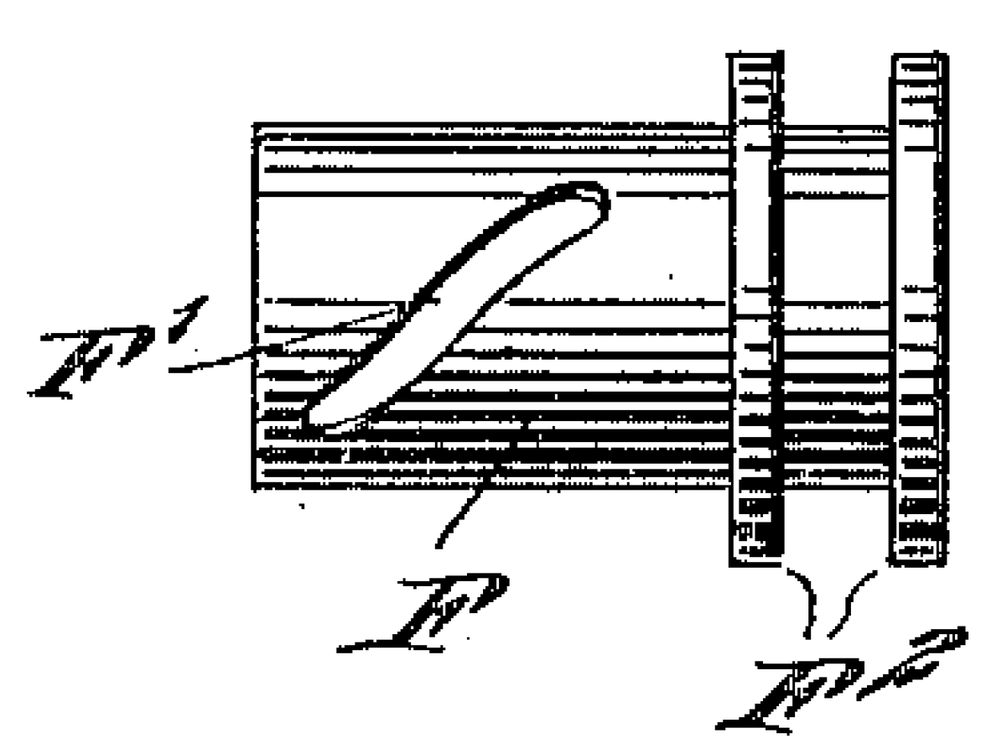


Fig. 5,

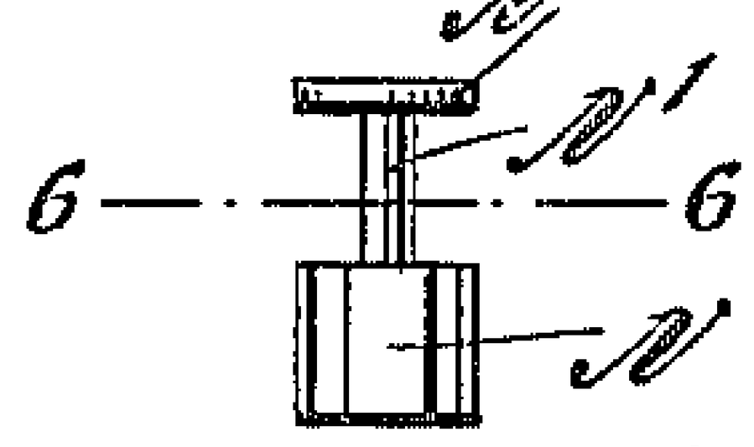


Fig. 6,

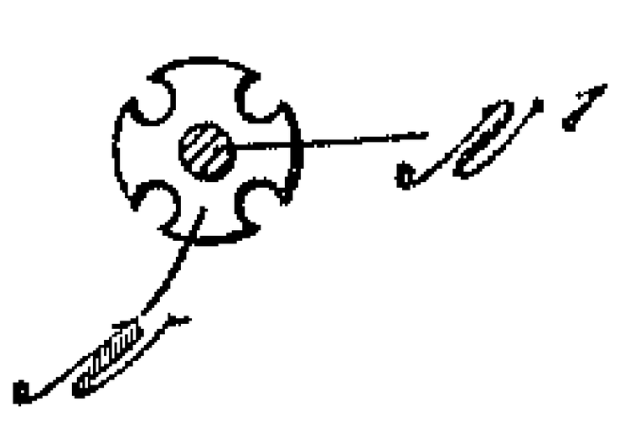
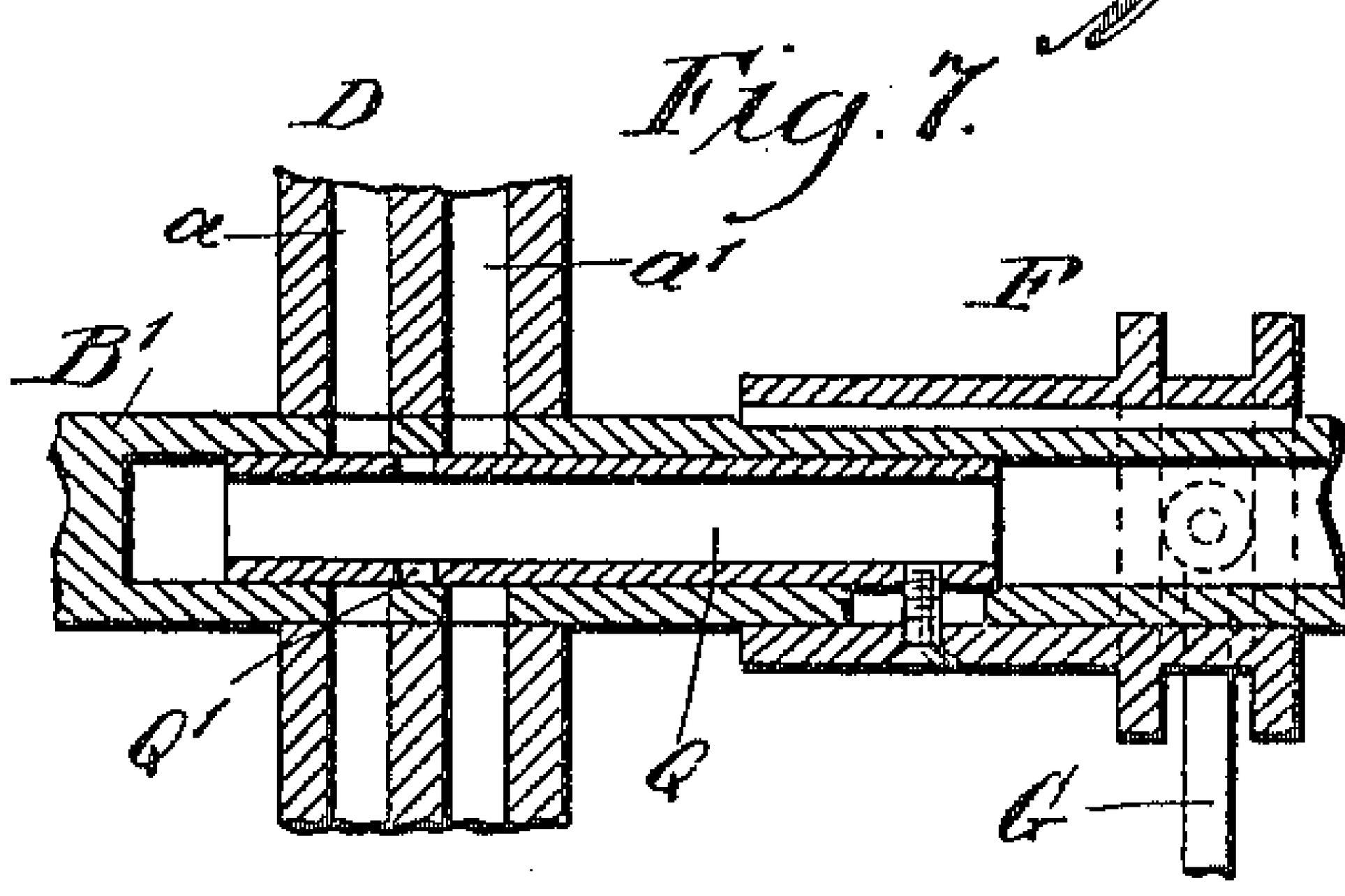


Fig. 7.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

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TURBINE MOTOR.

SPECIFICATION forming part of Letters Patent No. 649,859, dated May 15, 1900.

Application filed March 3, 1899. Renewed March 23, 1900. Serial No. 9,964. (No model.)

To all whom it may concern:

Be it known that I, MICHAEL O'CONNELL, a subject of the Queen of Great Britain, residing at Cappoquin, in the county of Waterford, Ireland, have invented a new and Improved Turbine Motor, of which the following is a full, clear, and exact description.

The invention relates generally to reaction and radial flow turbines; and its object is to provide a new and improved turbine motor, which is simple and durable in construction, very effective in operation, and arranged to utilize the motive agent to the fullest advantage and to permit the operator to conveniently stop, start, or reverse the motor whenever desired.

To this end the invention comprehends certain new combinations, embodying, among other things, a reaction-wheel and an impact-wheel, which may or may not be associated with fluid-deflecting buckets, thereby making it possible to drive both the reaction and impact wheels or to drive either to the exclusion of the other. In the present instance I have shown the deflecting-buckets and reaction and impact wheels, the wheels being fast with each other, thus to drive both wheels synchronously and producing a highly-effective motor.

A practical embodiment of my invention is represented in the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a sectional side elevation of the improvement substantially on the line 1 1 in Fig. 2. Fig. 2 is a transverse section of the same substantially on the line 2 2 in Fig. 1. Fig. 3 is a face view of the ring-valve. Fig. 4 is a plan view of the sleeve for shifting the ring-valve. Fig. 5 is an enlarged side elevation of part of the centrifugal governor. Fig. 6 is a sectional plan view of the same on the line 6 6 in Fig. 5, and Fig. 7 is a sectional elevation of a modified form of reversing-valve.

The improved turbine motor is provided with a suitably-constructed casing A, through which extends centrally a shaft B, mounted to turn in suitable bearings C, a portion B′ of the shaft being made hollow to connect with a suitable source of motive-agent supply.

On the shaft B, within the casing A, is secured a reaction-wheel D, having sets of radial channels $a\ a'$, which may be of any number desired. In the present instance I have shown two sets. From near the outer ends of these channels a and a' lead branch channels $b\ b'$, respectively, in opposite directions to the peripheral surface of the wheel and to a ring-valve E, mounted to turn on the periphery of the wheel D. The channels b and b', as well as the ports of the ring-valve, should be of a number corresponding with the channels a and a'. This ring-valve E is formed with two sets of ports $c\ c'$, of which the set of ports c is adapted to register with the branch channels b, and the other set of ports c' is adapted to register with the branch channels b'. When the ring-valve E is in an intermediate position, as shown in Fig. 1, both sets of ports $c\ c'$ are cut off from the channels $b\ b'$; but when the ring-valve is shifted in the direction of the arrow a^2, then the ports c connect with the channels b, and when the ring-valve is turned in the said direction the ports c' register with the channels b'.

The ring-valve E is provided with spokes E′, attached to a hub E^2, concentric to the shaft B, and provided with a pin E^3, engaging a spiral groove F′ in a sleeve F, mounted to slide longitudinally and turn with the shaft B. The sleeve F is provided with shifting flanges F^2, engaged by a shifting-lever G under the control of the operator to impart a sliding motion to the sleeve F and cause a turning of the ring-valve E in either a forward or backward direction by the action of the pin E^3 in the slot F′, for the purpose previously mentioned.

The ring-valve E is surrounded by a stationary deflector in the form of two sets of vanes or buckets H H′, arranged one alongside the other, a partition H^2 separating the buckets, the latter being secured to one side of the casing A, as is plainly indicated in Fig.

2. The buckets H H′ are curved, but in opposite directions, and open at their outer edges into buckets or vanes I I′, likewise curved, but in opposite direction to the curvature of the buckets H H′. The buckets I I′ are separated by a partition I^2 and form part of the direct-impact wheel J, having its hub J′ secured to the shaft B, the hub being provided with a pulley K for transmitting the rotary motion of the wheels J and D to other machinery.

The operation is as follows: When the several parts are in the position shown in Figs. 1 and 2, then the steam is cut off from the buckets or vanes by the position of the ring-valve; but when the latter is shifted in the direction of the arrow a^2 to connect the ports *c* with the branch channels *b* then the motive agent passing into the hollow portion B′ of the shaft B and into the radial channels *a a′* can pass from the channel *a* by way of the branch channels *b* and the ports *c* and through the buckets H into and against the buckets I to rotate the impact-wheel J in the direction of the arrow a^2, the wheel D being rotated in the same direction by the reaction of the motive agent on leaving the ring-valve, which latter rotates with the shaft B on which the wheel D is secured. The steam after leaving the buckets passes into the casing A and is conducted from the latter by a pipe L to the outside. When the ring-valve E is turned in the opposite direction and the ports *c′* are connected with the branch channels *b′*, then the motive agent can pass from the main channels *a′* through the channels *b′* and ports *c′* into and through the buckets H′ to pass into and act against the buckets I′ to turn the wheels J and D in the inverse direction of the arrow a^2. When the ring-valve is shifted to an intermediate position, as shown in Fig. 2, and the motive agent is cut off from the buckets, the machine comes to a standstill.

In order to automatically cut off the steam from the corresponding branch channels *b b′* in case the wheel J rotates beyond a normal rate of speed, I provide centrifugal governors, one for each channel *a a′*, each governor consisting of a valve N, having grooves in its periphery for the passage of the motive agent through the channel *a* or *a′* to the branch channel at the time the valve N is in an innermost position, as shown in Fig. 1. Each valve has a stem N′ and a disk N^2 engaged by a spring O, set in the outer end of the corresponding channel *a* or *a′*. Now when the wheel D runs at a high rate of speed the valves N move outward against the tension of the springs O to partly or wholly close the entrance-openings to the channels *b b′* to shut off the steam or other motive agent from the said channels and the buckets until the speed is reduced. When this takes place, the springs O return the valves N back to their normal position. (Shown in Fig. 1.)

The reversing-valve Q (shown in Fig. 7) consists of a tube fitted to slide in the hollow portion B′ of the shaft B and connected to the shifting sleeve F. The inner end of the tubular valve is provided with ports Q′ to register with either set of channels *a* or *a′*, according to the movement given to the sleeve by the operator to the shifting-lever G. In the position shown in Fig. 7 the ports Q′ are cut off from both sets of channels *a* and *a′*.

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

1. A turbine motor, provided with a central reaction-wheel, a direct-impact wheel receiving the motive agent from the said central reaction-wheel, a stationary deflector intermediate of the said reaction-wheel and the impact-wheel, and a reversing-valve intermediate of the deflector and the reaction-wheel, substantially as shown and described.

2. A turbine motor, provided with a central reaction-wheel, connected with a motive-agent supply, and having main channels and branch channels leading from the main channels, an impact-wheel having sets of buckets, a stationary deflector intermediate of the reaction-wheel and the impact-wheel, and a reversing, stopping and starting device for controlling the motive agent passing through the branch channels, substantially as shown and described.

3. A turbine motor, provided with a central reaction-wheel connected with a motive-agent supply, and having main channels and branch channels leading in opposite directions from the main channels, a ring-valve movable on said reaction-wheel, and having sets of ports, one set for each set of branch channels, and an impact-wheel mounted to turn and having sets of curved buckets or vanes on which the motive agent acts after leaving the ring-valve ports, substantially as shown and described.

4. A turbine motor, provided with a reaction-wheel connected with a motive-agent supply, and having main channels and branch channels leading in opposite directions from the main channels, a ring-valve movable on said wheel, and having sets of ports, one set for each set of branch channels, an impact-wheel mounted to turn in unison with the reaction-wheel and having sets of curved buckets or vanes on which acts the motive agent after leaving the ring-valve ports, and sets of fixed vanes intermediate of said wheel-vanes and said ring-valve, substantially as shown and described.

5. A turbine motor, provided with a reaction-wheel connected with a motive-agent supply, and having main channels and branch channels leading in opposite directions from the main channels, a ring-valve movable on said wheel, and having sets of ports, one set for each set of branch channels, an impact-wheel mounted to turn and having sets of curved buckets or vanes on which acts the motive agent after leaving the ring-valve ports, and a deflector having sets of fixed

vanes intermediate the said impact-wheel vanes and said ring-valve, and a governor for controlling the connection between the motive agent in the said channels, substantially as shown and described.

6. A turbine motor, provided with a reaction-wheel connected with a motive-agent supply, and having main channels and branch channels leading in opposite directions from the main channels, a ring-valve movable on said wheel, and having sets of ports, one set for each set of branch channels, an impact-wheel mounted to turn and having sets of curved buckets or vanes on which acts the motive agent after leaving the ring-valve ports, and means for manually shifting said ring-valve, to connect or disconnect its ports with or from the outer ends of the branch channels, substantially as shown and described.

7. In a turbine motor, the combination with a casing, of a reaction-wheel mounted to turn therein, impact-buckets supported to turn in unison with the reaction-wheel and disposed outside of the periphery of said wheel, and duplicate vanes or buckets supported stationarily with the casing and projected between the periphery of the reaction-wheels and the impact-buckets, whereby to deflect the fluid against the impact-buckets and tend to drive the buckets and reaction-wheel in the same direction.

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Witnesses:
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