No. 649,546. Patented May 15, 1900.

E. F. PORTER.

MOTOR.

(Application filed Apr. 28, 1899.)

(No Model.) 2 Sheets—Sheet 1.

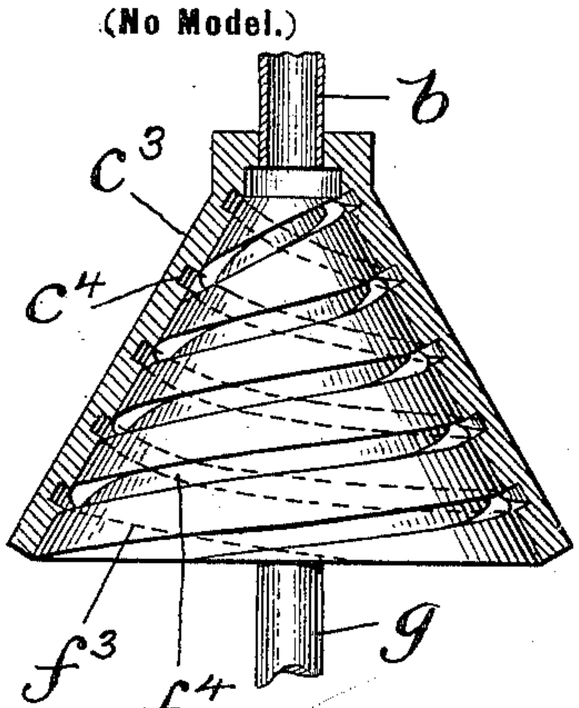

Fig. 5.

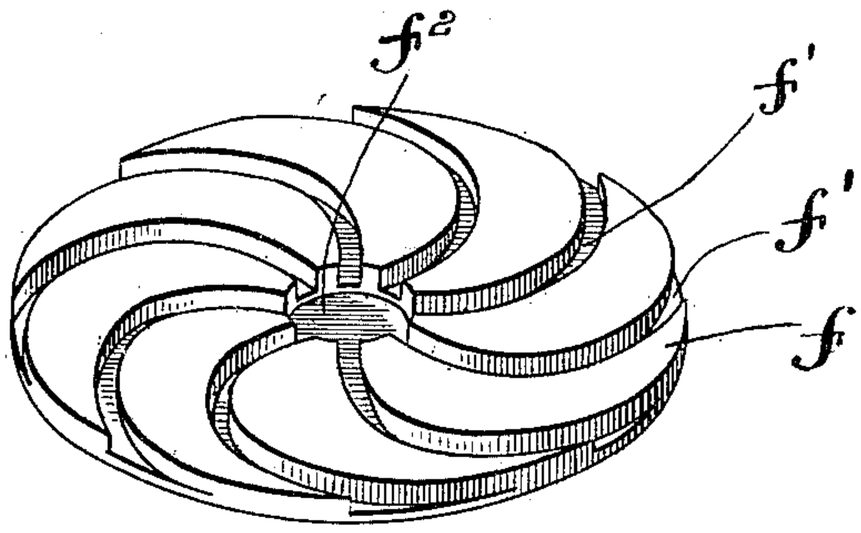

Fig. 4.

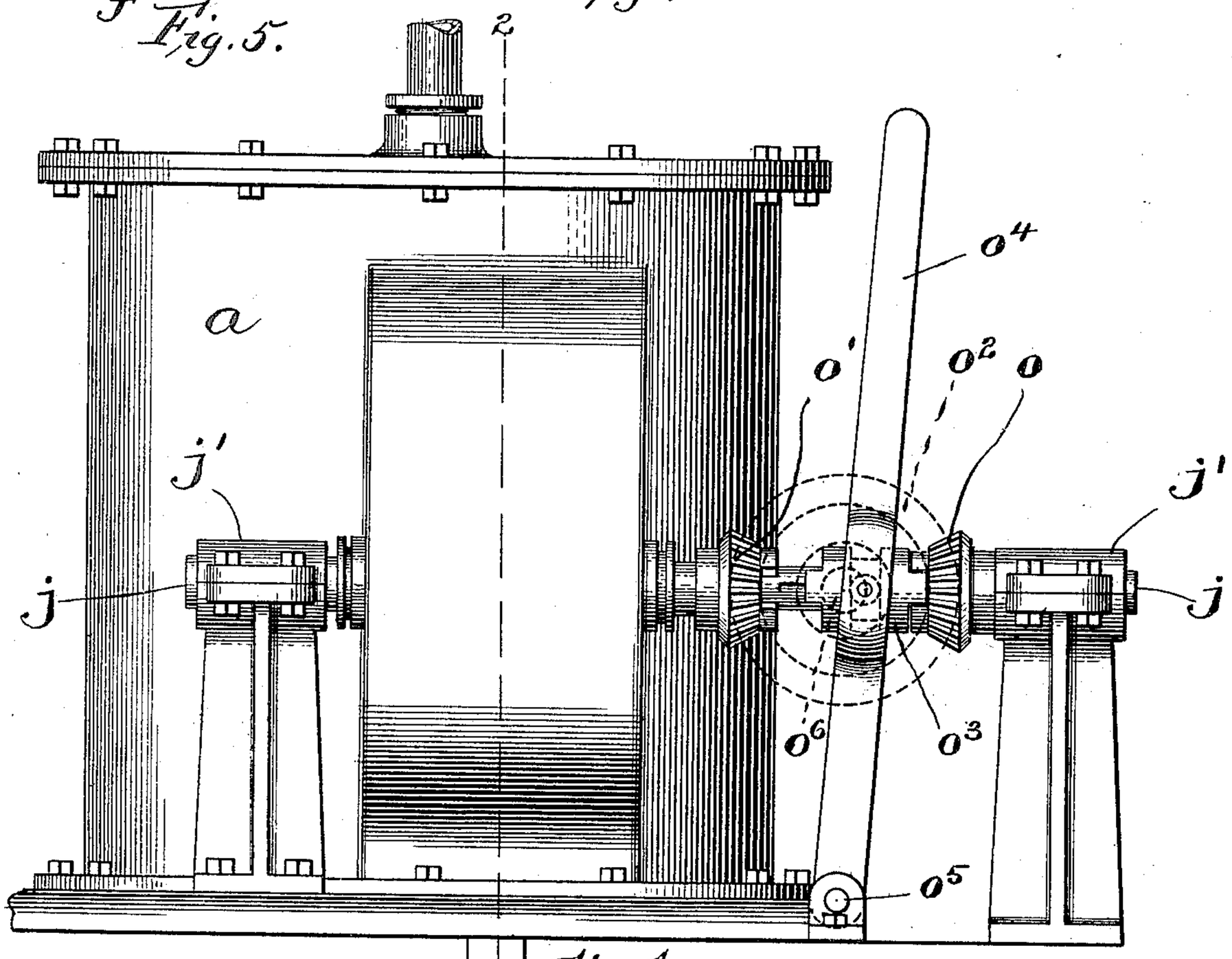

Fig. 1

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Fig. 3.

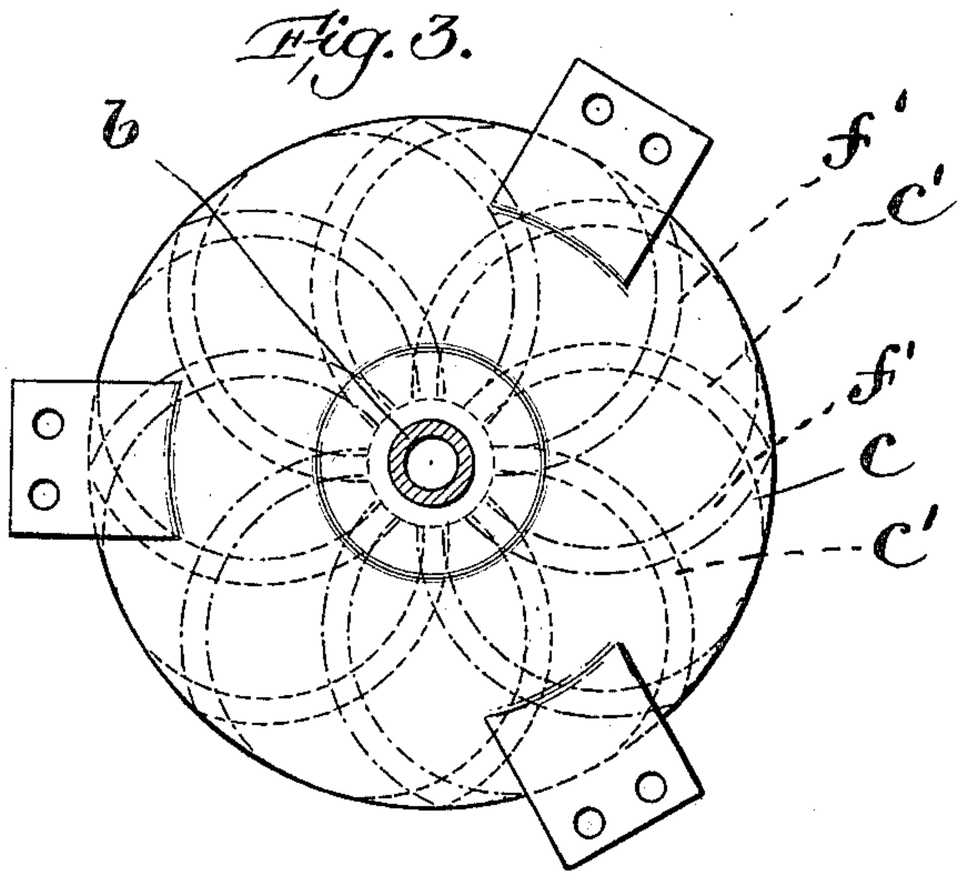

Fig. 2.

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UNITED STATES PATENT OFFICE.

EDWIN F. PORTER, OF BOSTON, MASSACHUSETTS.

MOTOR.

SPECIFICATION forming part of Letters Patent No. 649,546, dated May 15, 1900.

Application filed April 28, 1899. Serial No. 714,828. (No model.)

To all whom it may concern:

Be it known that I, EDWIN F. PORTER, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Motors, of which the following is a specification.

This invention relates to motors to be operated by steam, water, gas, or other fluid; and it consists in the novel features of construction and arrangement which I shall now proceed to describe and claim.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a side elevation of a motor constructed in accordance with my invention. Fig. 2 represents a part-sectional view thereof. Fig. 3 represents a detail plan view of parts hereinafter referred to. Fig. 4 represents a detail perspective view of the revolving fluid-actuated part or wheel. Fig. 5 represents a view, partly in section and partly in side elevation, showing a modified form of my invention.

The same reference characters indicate the same parts in all the figures.

Referring to the drawings, Figs. 1 to 4, inclusive, *a* designates a casing inclosing the working parts of the motor and made fluid-tight and having suitable packed joints or glands where the various shafts, rods, &c., enter the casing. *b* designates the fluid-supply pipe entering the top of the casing and passing through the center of a stationary disk *c*, supported on standards *d d*. *f* is a second disk mounted to revolve below the disk *c* with its face in contact with the lower face of said disk, the contacting faces being flat, and *g* is a vertical shaft carrying said disk *f* at its upper end, the said shaft having an upper bearing in a yoke or cross-frame *d'*, attached to the side standards *d*, and a lower bearing or step, which may comprise, as shown, an annularly-grooved bearing-block stationarily mounted or attached to the bottom of the casing *a*, a revolving block *h'*, provided with a similar annular groove and secured to the lower end of the shaft *g*, and a row of antifriction-balls h^2, interposed between the two blocks. Intermediate of the shaft *g* is formed a worm *g'*, meshing with the teeth of a large worm-gear *i*, secured to a shaft *j*. The shaft *j* passes through suitable stuffing-boxes in the casing and is journaled outside of said casing in bearings or boxes *j' j'*, supported on suitable standards. *b'* is an outlet or exhaust pipe leading from the interior of the casing *a*. At the upper end of the shaft *g*, below the disk *f*, is secured a brake disk or wheel *k*, surrounded by a brake-band *k'*, having one end attached to a stationary stud k^2 and the other end attached to the end of a rod k^3, which passes through a stuffing-box in the side of the casing *a*. The outer end of said rod is pivoted to a lever *m*, which is fulcrumed on a stud *m'*, the said lever having a latch m^2, adapted to engage the notches in a notched segment m^3, attached to the side of the casing. The latch is operated by a spring-pressed handle or lever m^4, pivoted to the lever *m*. Loosely mounted on the shaft *j* are two bevel gear-wheels *o o'*, having toothed hubs adapted to be engaged by teeth formed on the ends of a sliding block o^3, splined to and revolving with the shaft *j*. A groove in said block is engaged by pins on a lever o^4, pivoted on a stud o^5 at its lower end. The bevel-gears *o o'* are in mesh with a gear o^2, attached to a shaft o^6. It will be seen that this arrangement is a well-known form of reversing-gear, whereby the shaft *j*, which revolves in one direction only, can be made to transmit motion to the shaft o^6 in either direction. The disks *c* and *f*, as will be seen in the drawings, are formed with central recesses c^2 f^2, which when placed together form a central chamber into which the working agent or fluid is admitted from the supply-pipe *b*. Each disk is also provided in its face with radial curved grooves or ducts *c' f'*, leading from said central recesses or chamber to the peripheries of the disks. These ducts when the disks are superposed are curved in opposite directions and cross each other, as indicated by the dotted lines in Fig. 3. The operating fluid when admitted to the chamber in the center of the disk starts to flow out through the ducts *c' f'* toward the periphery of the disks, and in so doing it exerts a reactionary force on the walls of the ducts which tends to rotate the disk *f* and the shaft *g*. The walls of the two sets of ducts form abutments for the operating fluid, and the curvature of these ducts in opposite directions in the two disks tends to augment this reactionary effect, with the result that the lower or

movable disk *f* is rotated at a high rate of speed. Owing to the fact that the working agent or fluid is admitted to the chamber at the center of rotation of the movable disk or member, said fluid simultaneously and with equal pressure enters all of the plurality of ports or ducts which lead from the central chamber. The said working agent acts continuously without being cut off from the ducts as the movable member or disk rotates. When said working agent is of a gaseous nature, such as steam, it expands equally in different directions as it enters the plurality of ducts, and any resistance afforded by the action of any one duct is opposed by the resistance afforded by the action in another duct, and hence such working agent is to some extent employed expansively. These advantages are due to the central chamber into which the working agent or fluid is admitted from the supply-pipe *b* and from which chamber said fluid passes to the plurality of ducts simultaneously and with equal pressure. The rotation of the shaft *g* is transmitted through the worm *g'* to the gear *i* and thence to the shaft *j*, which in turn transmits it to the shaft o^6 when the block o^3 is engaged with one of the gears *o* or *o'*. A suitable throttle or valve (not illustrated) may be provided in the pipe *b* for admitting, shutting off, and regulating the flow of the fluid into the motor. The fluid is exhausted from the outer ends of the ducts *c' f'* into the interior of the casing *a*, and from thence it passes out through the pipe *b'* into the outer atmosphere or into a suitable receptacle, condenser, or the like. When the fluid is shut off from the motor, the latter may be immediately stopped by grasping the upper end of the lever *m*, unlatching it, and pulling it in a direction away from the casing, thereby operating the band-brake.

In Fig. 5 I have shown duct-carrying members c^3 and f^3 in the form of male and female cones fitting the one within the other and having on their respective contacting surfaces oppositely-directed grooves or ducts c^4 f^4. The operating fluid enters between the upper ends of the cones through a supply-pipe *b* and exhausts from their lower margins or peripheries. In this form of motor the operating fluid enters a central chamber, as shown in Fig. 5, at the upper end of the cone c^3, and the action of the fluid is the same as above stated in connection with the operation of the form shown in Figs. 1 to 4.

In Fig. 2 it will be seen that the bearing-block *h'* on the lower end of shaft *g* is fixed to said shaft by means of a set-screw h^3, the surface of the shaft being smooth on that portion which enters the block. Above said portion the shaft is screw-threaded and bears adjusting and lock nuts h^4 h^5, which are adapted to be screwed down against the block *h'*. This adjustment or its equivalent constitutes the novel feature of my invention, and its function is to regulate the distance between the disks or members of the motor—that is, to adjust them so as to get the best operative relation between their opposed or contacting faces and to take up the wear on said faces. By loosening the set-screw h^3 and turning the adjusting-nut *h* in one direction or the other the shaft *g*, and with it the lower or movable member, may be raised or lowered with respect to the upper or fixed member. When the new adjustment is obtained, the lock-nut h^5 is screwed down and the screw h^3 is set up against the shaft, thereby fixing the adjustment.

I claim—

In a motor, two opposed members such as disks or cones adapted to have a relative rotary movement and provided with contacting faces transverse to the axis of said movement, means for supplying operating fluid thereto, a plurality of ducts or ports between said members and communicating with said supplying means, a shaft supporting one of said members, a stationary end bearing-block for said shaft, a coöperating bearing-block fixed to the end of said shaft, and means for effecting longitudinal adjustment of said shaft with respect to the last-said block to regulate the axial adjustment of the last-said member with respect to the opposed member, substantially as set forth.

In testimony whereof I have affixed my signature in presence of two witnesses.

EDWIN F. PORTER.

Witnesses:

R. M. PIERSON,

P. W. PEZZETTI.