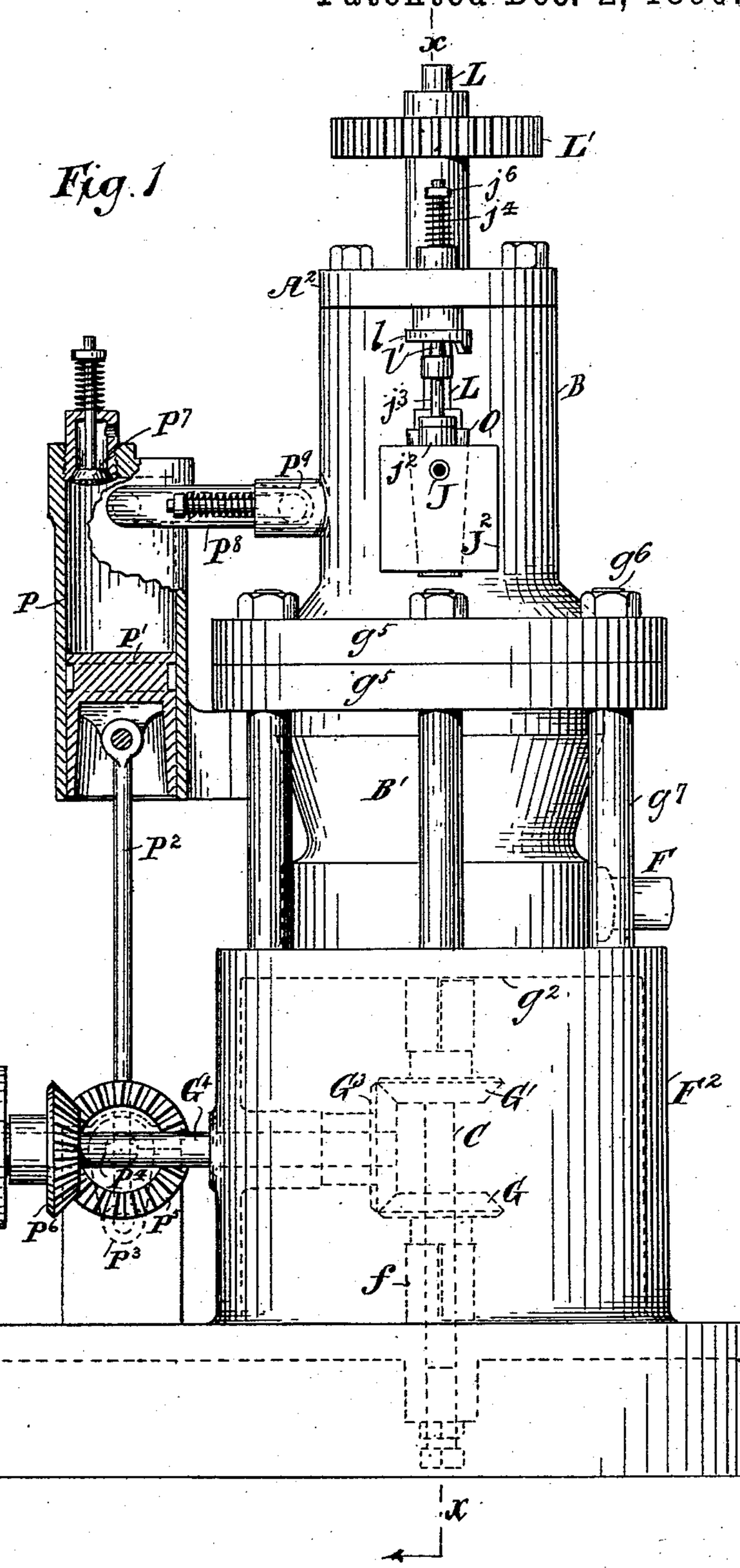
(No Model.) 3 Sheets—Sheet 1.

J. A. PEER.

MOTOR.

No. 441,696. Patented Dec. 2, 1890.

Fig. 1



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 2

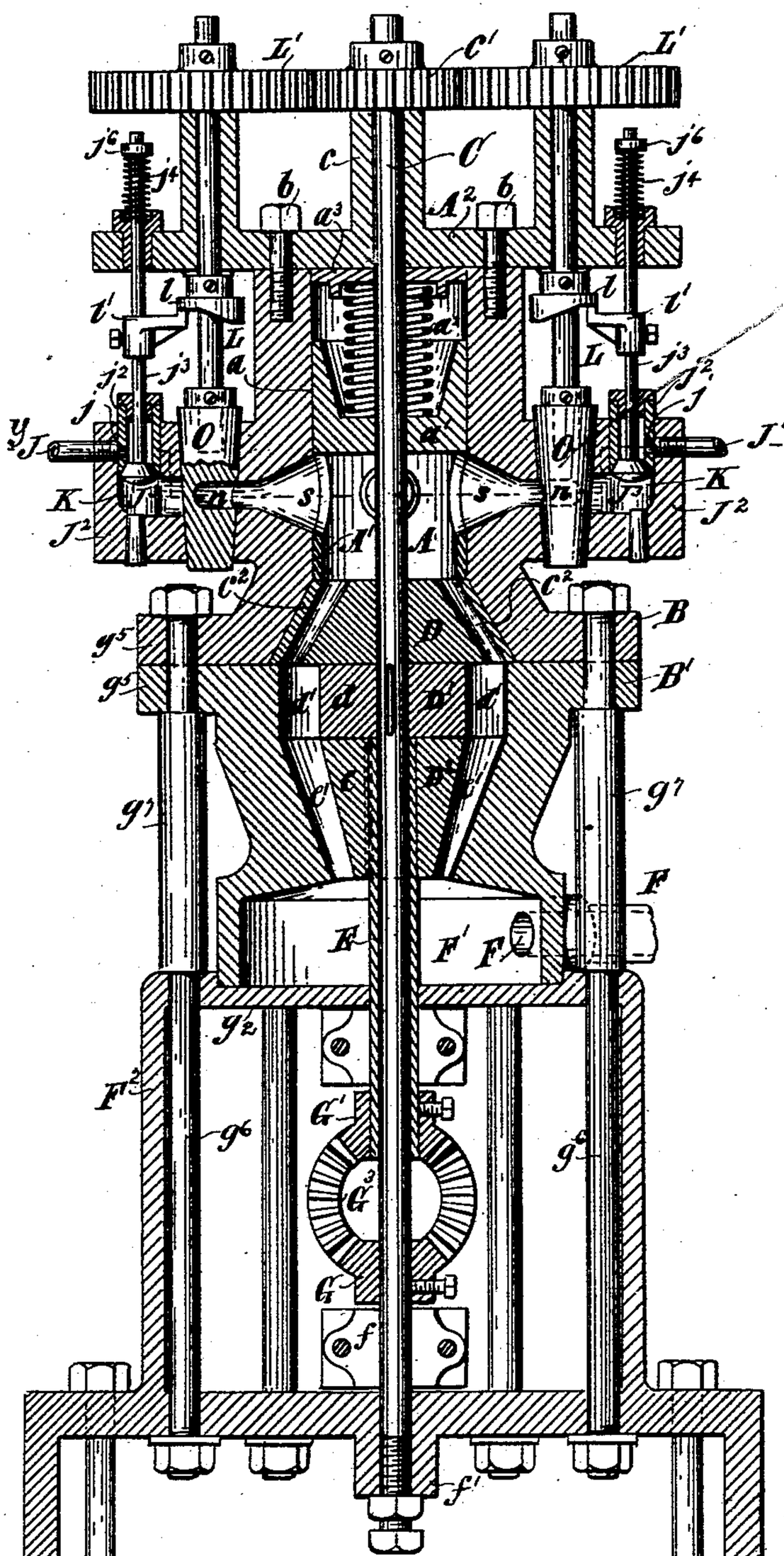
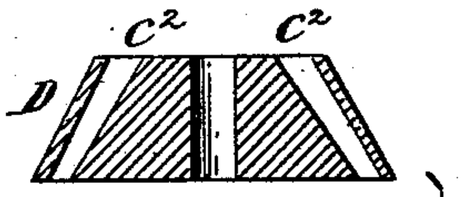


Fig. 5



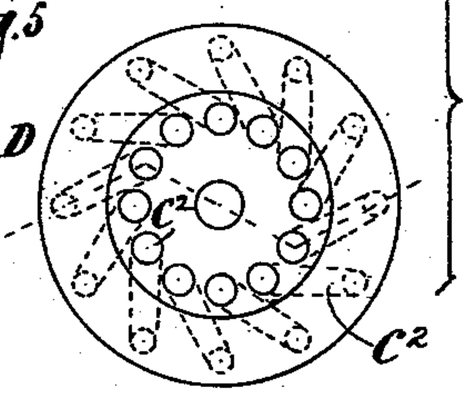
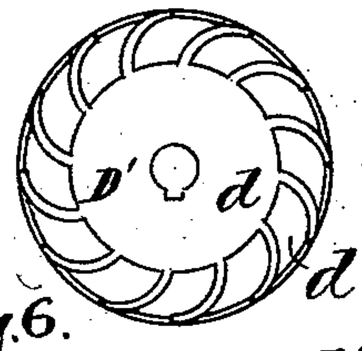


Fig. 6.



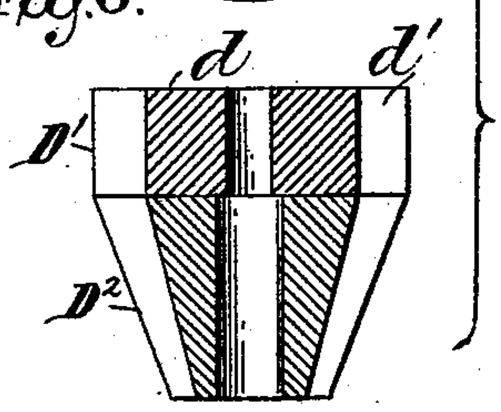


Fig. 7

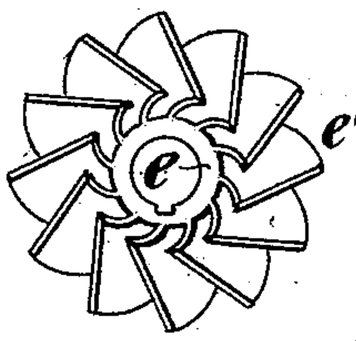
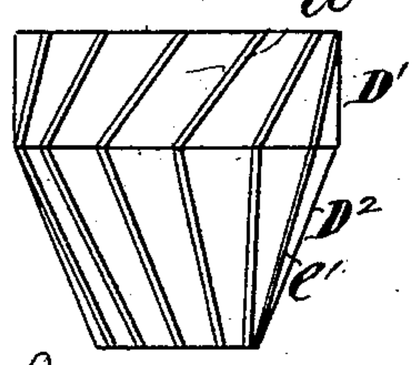


Fig. 8.



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(No Model.) 3 Sheets—Sheet 3.

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Fig 3.

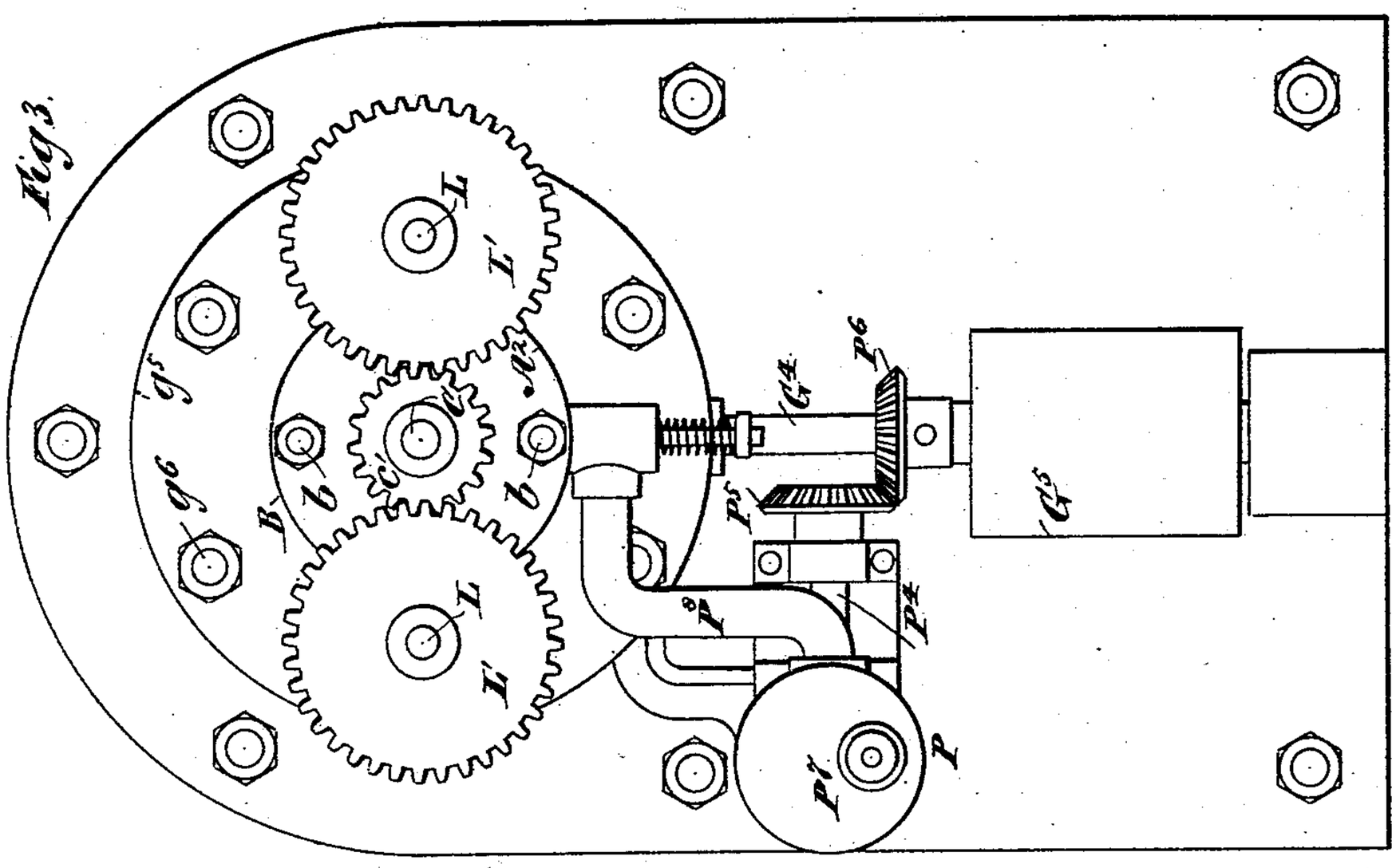

Fig 4

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UNITED STATES PATENT OFFICE.

JOHN A. PEER, OF BROOKLYN, NEW YORK.

MOTOR.

SPECIFICATION forming part of Letters Patent No. 441,696, dated December 2, 1890.

Application filed January 31, 1888. Serial No. 262,560. (No model.)

To all whom it may concern:

Be it known that I, JOHN A. PEER, of Brooklyn, in the county of Kings and State of New York, have invented a certain new and useful Improvement in Motors, of which the following is a specification.

My improvement relates to motors in which power is developed by the explosion of gases.

I will describe a motor embodying my improvement in detail, and then point out the novel features in claims.

In the accompanying drawings, Figure 1 is a side elevation of a motor embodying my improvement, shown partly in section. Fig. 2 is a vertical section of the same, taken on the plane of the line *x x*, Fig. 1, and looking in the direction of the arrow, same figure. Fig. 3 is a plan or top view thereof. Fig. 4 is a horizontal section taken on the plane of the line *y y*, Fig. 2. Fig. 5 is a detail showing in plan and vertical section the arrangement of certain outlets from a combustion-chamber. Fig. 6 is a detail showing in plan and vertical section certain motor-wheels. Fig. 7 is a bottom view of the same. Fig. 8 is a side view of the same.

Similar letters of reference designate corresponding parts in all the figures.

A designates an explosion-chamber. As shown, this chamber is cylindrical, its side wall being formed by a cylindrical metal bushing A′. This bushing, if used, will preferably be made of bronze. It fits snugly in a cylindrical passage *a*, extending centrally through a portion B of a shell B B′. The explosion-chamber A is not, as shown, permanently closed at either end. A piston *a′*, arranged in the passage *a*, normally closes the upper end of said chamber. This piston is maintained in position with a yielding pressure by means of a coil-spring a^2 abutting at one end against said piston and at the other against a plate a^3, secured to the plate A^2. Preferably the piston *a′* and the plate a^3 will be provided with recesses to receive the ends of the spring. The piston constitutes, in effect, a yielding end to the explosion-chamber, and its object is to compensate for any undue expansion due to explosions occurring in the chamber. The plate A^2 is secured to the upper end of the portion B of the shell B B′ by bolts *b*. This plate closes the upper end of the passage *a*.

The spring a^2 surrounds a main or driving shaft C. In this example of my improvement the shaft is arranged vertically. It extends centrally through the chamber A and through suitable apertures in the piston *a′* and plates a^3 A^2. Above the plate A^2 the shaft extends, as shown, through a sleeve *c*. Near its upper end the shaft bears a gear-wheel *c′*. Below the explosion-chamber said shaft extends centrally through a suitable aperture in an outlet-nozzle D. The shaft C may rotate freely in the apertures in the nozzle D, the piston *a′*, and plates a^3 A^2. Said nozzle and piston may be provided with suitable stuffing-boxes, if desired. The outlet-nozzle D is arranged within a suitably-shaped recess formed in the portion B of the shell at the lower end thereof, and is secured from turning therein by any suitable means. Said nozzle is preferably made in the shape of the frustum of a cone, and I have so shown it; but it need not necessarily be so shaped. A number of passages c^2 extend through the nozzle from end to end. These passages extend at a transverse angle to the vertical axis of the cone, as is more clearly shown in Fig. 5, and will preferably have a gradually-decreasing diameter from their upper to their lower ends. The tendency of the force of explosions within the explosion-chamber is downwardly through the passage c^2.

D′ designates a motor-wheel. This wheel is keyed rigidly on the shaft C and is cylindrical. It has a central body portion *d*, and is provided circumferentially with spirally-extending blades or buckets *d′*. (See more particularly Fig. 8.) The direction of longitudinal extension of the blades or buckets *d′* is contrary to that of the passages c^2 in the nozzle D. These blades or buckets will also preferably be horizontally curved, as shown more particularly in Figs. 6 and 7. The force of the explosions occurring in the chamber A passes downwardly through the passages c^2 and strikes the blades or buckets *d′* angularly, causing the wheel D′ to rotate, and with it the shaft C. Rigidly keyed to a sleeve E, surrounding the shaft C, is another motor-wheel D^2. This wheel is directly below the wheel

D′. The wheel D² is, as shown, in the shape of the frustum of a cone with an inverted base. It has a central body portion *e*, and is provided circumferentially with spirally-extending blades or buckets *e′*. These buckets are shown as of gradually-lessening projection from their upper to their lower ends. The direction of longitudinal extension of the blades or buckets *e′* is contrary to that of the blades or buckets *d′* on the wheel D′. The wheels D′ D² are arranged and rotate in a suitable recess in the portion B′ of the shell B B′. The force of the explosions after, operating upon the wheel D′, is deflected angularly against the blades or buckets *e′* on the wheel D², causing the latter to rotate, and with it the sleeve E. The direction of rotation of the wheel D² and sleeve E is contrary to that of the wheel D′ and shaft C.

F designates an exhaust-aperture formed in the portion B′ of the shell and opening into an exhaust-chamber F′, formed in said portion of the shell below the wheel D².

The shaft C near its lower end extends through a suitable bearing *f*, and is stepped below the bed or base plate of the machine in a step-bearing *f′*. Keyed to the shaft C a short distance above the bed-plate is a bevel gear-wheel G. The sleeve E extends through a suitable aperture in a plate g^2, constituting the bottom of the exhaust-chamber F′, and forming, as shown, part of a frame F², extending upwardly from the bed of the machine. Below the plate g^2 the sleeve E has keyed upon it a bevel gear-wheel G′. The bevel gear-wheels G G′ mesh with another bevel gear-wheel G³, mounted upon a shaft G⁴, extending at approximate right angles to the shaft C and journaled in suitable bearings on the top of the machine. The gear-wheel G on the shaft C meshes with the gear-wheel G³ at the lower part of the latter, and the gear-wheel G′ meshes with the gear-wheel G³ at the upper part of the latter. It is evident, therefore, that as the gear-wheels G G′ rotate in reverse directions they will operate in conjunction to rotate the wheel G³. On the shaft G⁴ is keyed a driving-pulley G⁵. The portions B B′ of the shell are provided with circumferential flanges g^5. Bolts g^6, passing through suitable apertures in these flanges and in the bed of the machine, secure the portions B B′ together and to the bed. I have shown sleeves g^7 surrounding the bolts g^6 and extending between the flange g^5 on the portion B′ of the shell and the plate g^2 on the frame F².

Explosions are caused in the explosion-chamber by the admixture of certain gases and atmospheric air. These gases may be oxygen and hydrogen.

J J′ designate inlet-pipes for the gases. Oxygen may enter through one of these pipes and hydrogen through the other under any desired pressure and supplied from any suitable source. The pipes J J′ communicate with gas-passages *j*, extending horizontally through the walls of gas-chambers K, formed in projecting portions J², constituting parts of the portion B of the shell. Valves J³ are arranged in the projecting portions J² and control the admission of gas to the gas-chambers K. The valves are seated, as shown, at the lower ends of metallic tubes j^2, secured gas-tight in suitable vertically-extending apertures on the projecting portions J². The outer ends of the tubes j^2 are closed by suitable stuffing-boxes, through which valve-rods j^3 for the valves extend. The tubes j^2 are provided with suitable apertures in their sides, which register with the gas-passages *j*. The tubes j^2 are of such length that they inclose a considerable space between the valves and their upper ends. Into these spaces the gas first enters. The valves are maintained normally against their seats by coil-springs j^4, as shown, surrounding the valve-rods j^3 above the plate A². These springs abut at one of their ends against nuts j^6 on the rods and at their other ends against the plate A². The valve-rods j^3 are intermittently moved longitudinally, and the valves are therefore intermittently moved away from their seats to admit gas to the gas-chambers K. This intermittent movement is imparted to the valve-rods by means of cams *l*, rigidly mounted upon shafts L, journaled in the plate A² and bearing at their upper ends gear-wheels L′. These gear-wheels mesh with and derive motion from the gear-wheel *c′*. As shown, the diameter of the gear-wheel *c′* is such that every two complete rotations of the main shaft will cause a single rotation of the gear-wheels L′, and consequently of the shafts L. The cams *l* are so constructed that at each rotation of the shafts L they will be brought to bear during about one-quarter of the time of their rotation upon toes or projections *l′* upon the valve-rods j^3. By this means the valve-rods are moved downwardly and the valves away from their seats, whereby gas is admitted to the gas-chambers.

I prefer to measure the quantity of gas to be admitted to the explosion-chamber. For this purpose I employ measuring apparatus, consisting in this example of my improvement of rotary conical plugs O. These plugs are secured to the lower ends of the shafts L and rotate therewith. They extend through suitable apertures in the projections J² on the portions B of the shell and are gas-tight in said apertures. As shown, they extend wholly through the projections J². Each of the plugs O has formed in it horizontally-extending recesses *n*. These recesses are so arranged that as the plugs are rotated they will alternately open into the gas-chambers K and into gas-passages *s*, constituting portions of the explosion-chamber A. Each time the recesses *n* are caused to open into the gas-chambers K the recesses become filled with gas, and each time the recesses are caused to open into the explosion-chamber the gas in the recesses is discharged into the explosion-cham-

ber. Uniform quantities of gas are thereby delivered into the explosion-chamber. There is at no time any direct communication between the chambers K and A.

P designates the cylinder of an air-pump. This cylinder is secured, as shown, to one of the bolts g^6. Within the shell is a piston P′, which may be of the usual construction. This piston derives motion from a piston-rod P^2, pivotally connected to a crank P^3, mounted on a shaft P^4, deriving motion from a gear-wheel P^5, meshing with a gear-wheel P^6, mounted upon the shaft G^4.

P^7 designates an inwardly-opening spring-actuated valve admitting air, when the piston is drawn downwardly, to the interior of the cylinder P. When the piston is raised, this valve is closed and the air in the cylinder is forced out through a pipe P^8, communicating with the cylinder and a valve-chamber P^9, secured upon and extending through the portion B of the shell in such manner as to communicate with the explosion-chamber. A spring-actuated valve P^{10} is arranged to normally close the inner end of the valve-chamber P^9. The valve P^{10} is forced outwardly to admit air to the explosion-chamber by pressure from the air-pump. The operations of the pump and the rotations of the plugs O are so timed that air will be admitted to the chamber somewhat in advance of the gas.

In order to facilitate the starting of the engine, I may cause an electric spark within the explosion-chamber, if desired. I have shown wires *w* extending into said chamber and connected to opposite poles of an electric battery T. The wires may be provided with any suitable sparking device within the chamber. I have shown a circuit-closer *w′* arranged in one of the wires. This circuit-closer when closed will cause an electric spark within the chamber.

I do not herein wish to be limited to the use of but two motor-wheels, as I may obviously use more than two, and they may be arranged in different relations to the explosion-chamber.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a motor, the combination, with an explosion-chamber, of a yielding end therefor controlled by a spring, a main shaft, and a wheel rigidly mounted on said shaft provided with blades or buckets and receiving the force of the explosions in said chamber, substantially as specified.

2. In a motor, the combination, with an explosion-chamber, of a main shaft, an outlet-nozzle therefrom provided with passages arranged at transverse angles to the axis of the nozzle, a wheel rigidly mounted on said shaft and provided with blades or buckets, said blades or buckets extending longitudinally in a reverse direction to the passages in the outlet-nozzle, and oppositely-rotating gear-wheels on the main shaft meshing with a gear-wheel on another shaft, substantially as specified.

3. In a motor, the combination, with a combustion-chamber, of a main shaft, a wheel rigidly mounted on said shaft and provided with blades or buckets, a sleeve surrounding said shaft, a wheel mounted on said sleeve and provided with blades or buckets, a gear-wheel on the said shaft, a gear-wheel on the sleeve, and a third gear-wheel on a second shaft meshing with the gear-wheels on the main shaft and sleeves, substantially as specified.

4. In a motor, the combination, with an explosion-chamber, of a main shaft, a wheel rigidly mounted on said main shaft and provided with spirally-extending blades or buckets, a sleeve surrounding said main shaft, a wheel mounted on said sleeve and provided with blades or buckets extending spirally in a reverse direction to the blades or buckets on the wheel on the main shaft, a gear-wheel on said shaft, a gear-wheel on the sleeve, and a third gear-wheel on a second shaft meshing with the gear-wheels on the main shaft and sleeve, substantially as specified.

5. In a motor, the combination, with an explosion-chamber, of a main shaft, a gas-chamber, a measuring apparatus for the gas, consisting of a recessed rotary plug, an air-pump for supplying air to the explosion-chamber, and mechanism, substantially such as described, for admitting air to the explosion-chamber in advance of the gas, substantially as specified.

6. In a motor, the combination, with an explosion-chamber, of a main shaft, a gas-chamber, an intermittently-operating valve for admitting gas to the gas-chamber, and a measuring apparatus for the gas, consisting of a chambered rotary plug, substantially as specified.

7. In a motor, the combination, with an explosion-chamber, of a main shaft, two gas-chambers, measuring apparatus for gas admitted to these chambers, and gearing operated by the main shaft to cause the operation of the measuring apparatus alternately, substantially as specified.

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Witnesses:
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