No. 694,557. Patented Mar. 4, 1902.

C. F. LEMBKE.

ROTARY EXPLOSIVE ENGINE.

(Application filed Jan. 26, 1901.)

(No Model.) 2 Sheets—Sheet 1.

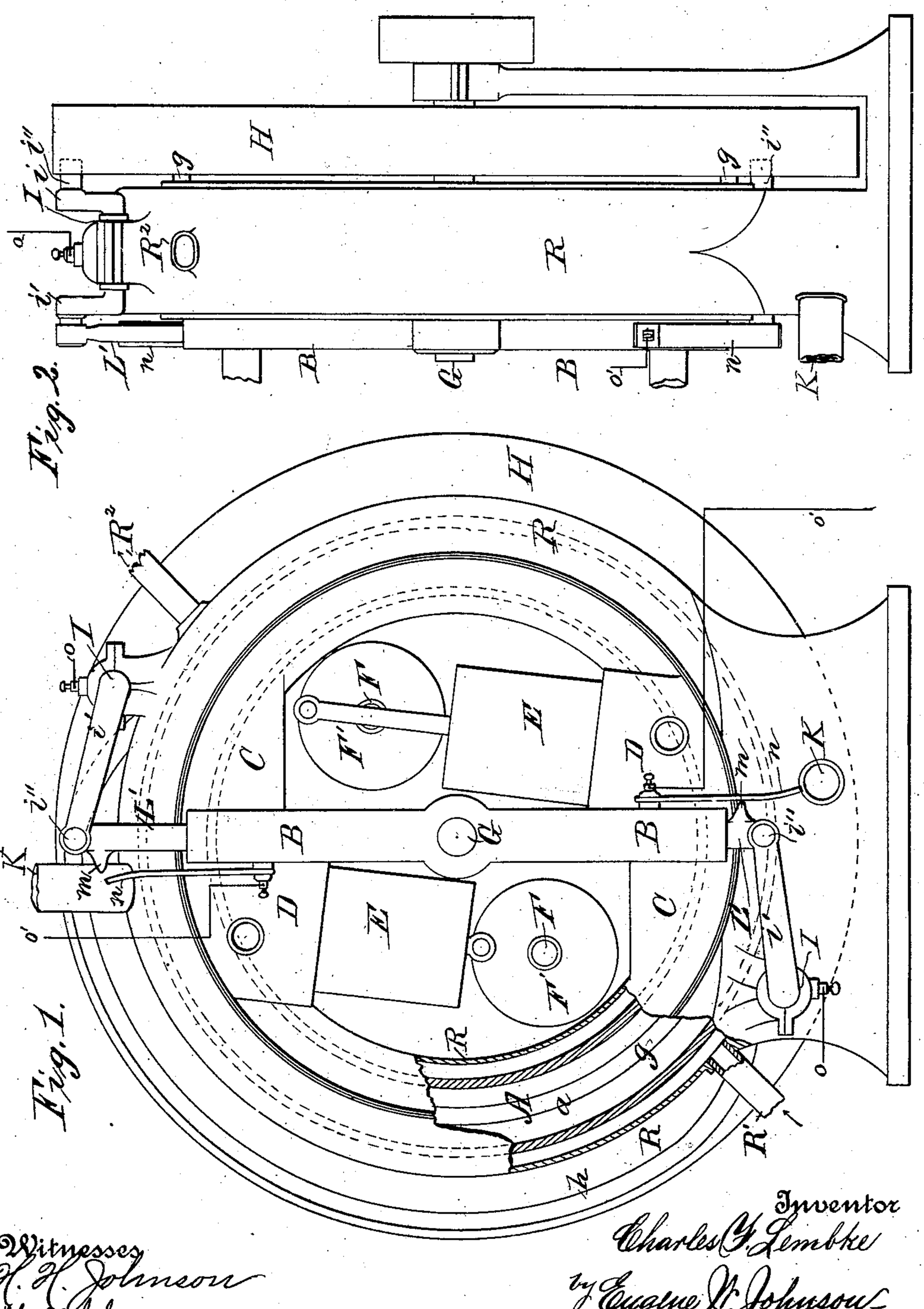

Fig. 1.

Fig. 2.

Witnesses,
H. H. Johnson
T. C. Johnson.

Inventor
Charles F. Lembke
by Eugene H. Johnson
his Attorney

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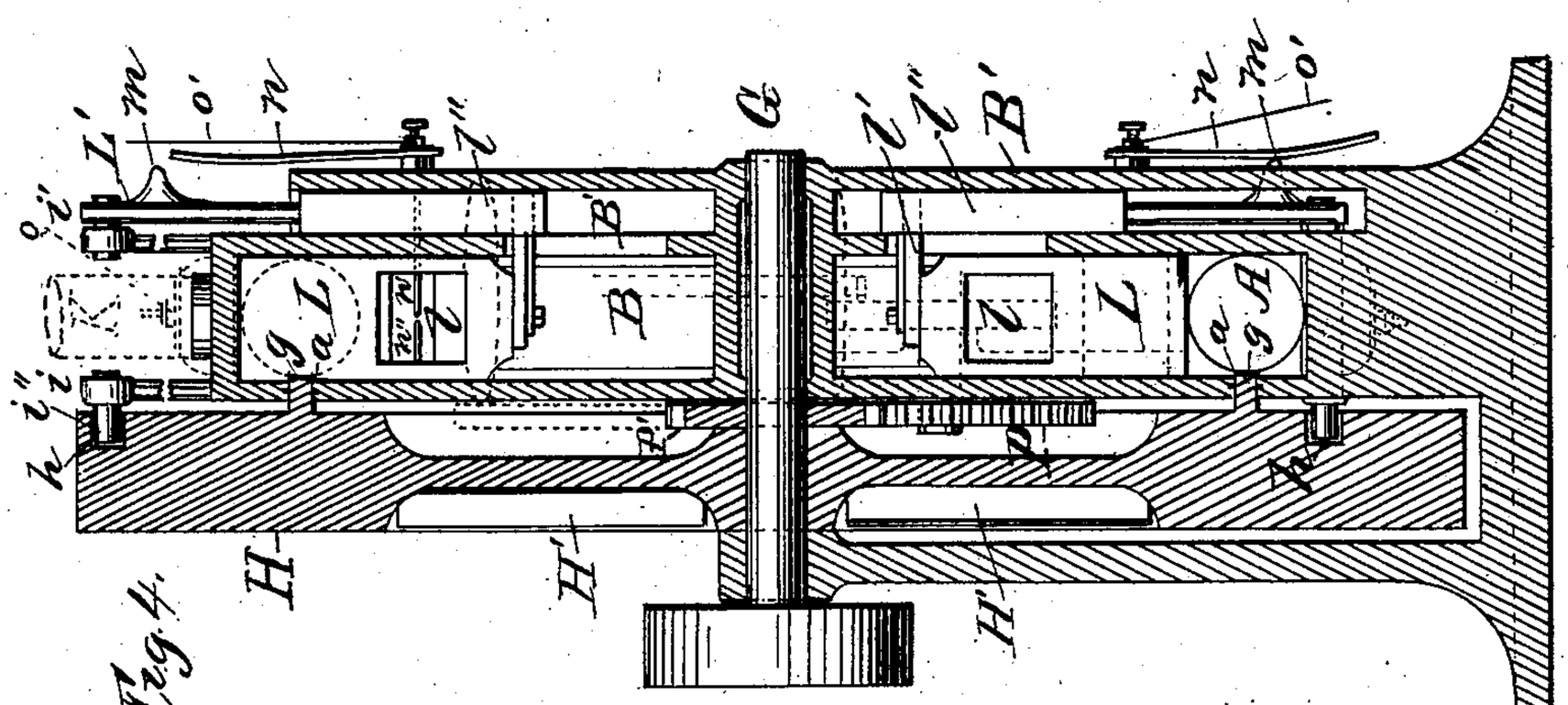

Fig. 4.

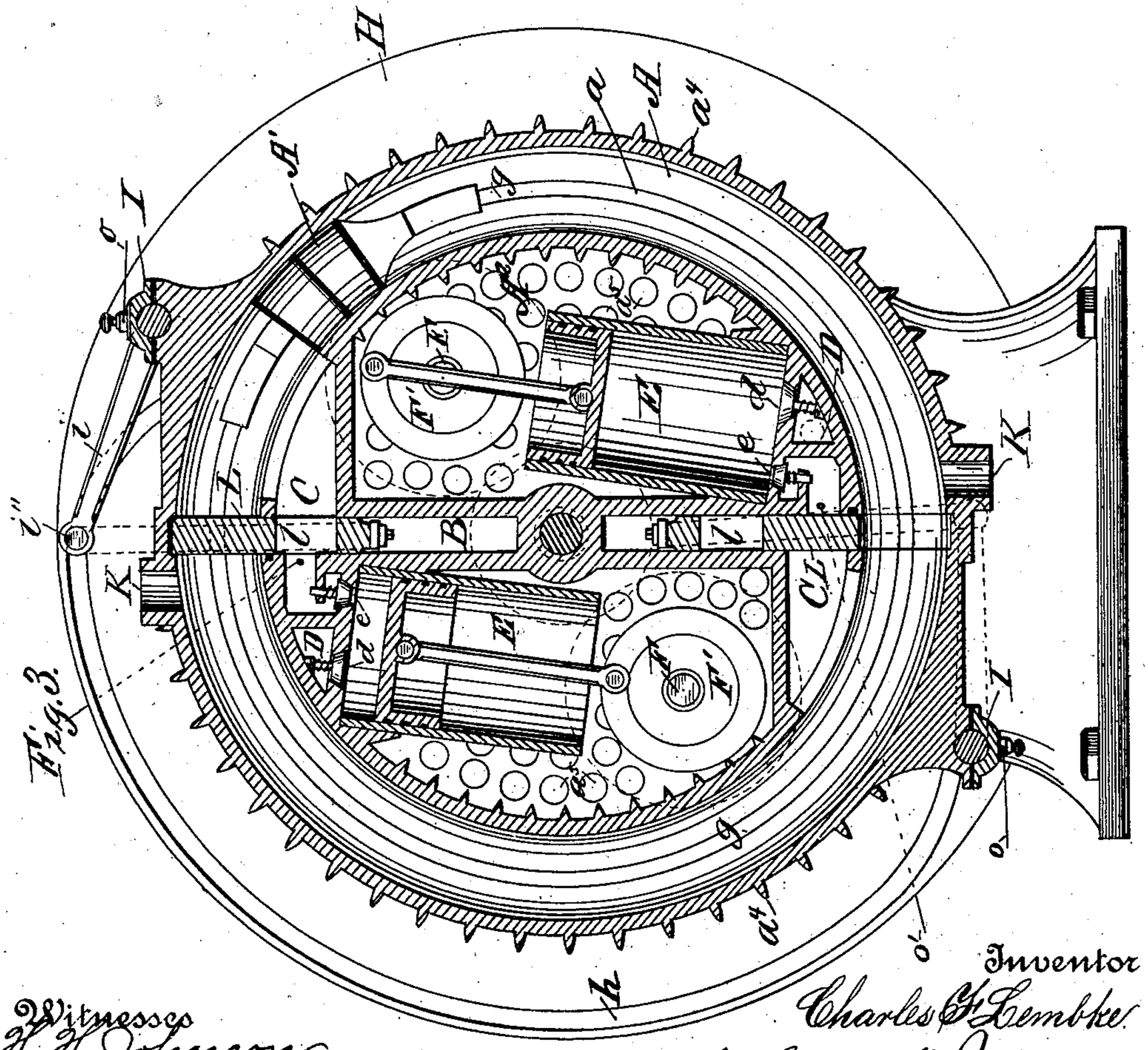

Fig. 3.

Witnesses
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UNITED STATES PATENT OFFICE.

CHARLES F. LEMBKE, OF VALPARAISO, INDIANA.

ROTARY EXPLOSIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 694,557, dated March 4, 1902.

Application filed January 26, 1901. Serial No. 44,905. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. LEMBKE, a citizen of the United States, residing at Valparaiso, in the county of Porter and State of Indiana, have invented new and useful Improvements in Gas-Engines, of which the following is a specification.

This invention relates to improvements in gas-engines, the object being to provide an explosive-engine or gasolene-motor of improved construction which will be compact and of few parts and in which the piston rotates with the fly or balance wheel to which it is connected. In the construction a circular cylinder is provided which has adjacent to the fly-wheel an opening or slot into which fits, for the purpose of closing the same, a flange which projects from the fly-wheel, to which flange the piston is secured.

The invention consists in the construction and combination of the parts, as will be hereinafter set forth, which includes a frame made up to provide a circular cylinder and supports for a balance-wheel, to which balance-wheel the piston is attached, sliding abutments having ports, the abutments being operated from the balance-wheel, and explosion-chambers into which the gas or explosive mixture is forced and ignited, said chambers opening into the cylinder, so that the force of the explosion acts immediately upon the rotary piston to drive it and the fly-wheel without the intervention of mechanism for converting motion, resulting in a saving of power and producing an engine which runs with a minimum of vibration.

In the accompanying drawings, Figure 1 is a side elevation, which is partly in section, showing an engine constructed in accord with my invention, the cylinder in this instance having a water-jacket. Fig. 2 is an end elevation of the engine shown in Fig. 1. Figs. 3 and 4 are sectional views, the cylinder and frame in this type of engine being cooled by an induced circulation of air.

The frame of the engine may be cast or otherwise constructed, and the several parts are connected in any suitable manner, so that when set up there will be provided a base which supports the operative or moving parts as well as the stationary parts, which include a cylinder A, having therethrough a continuous slot or opening *a*. The frame has ways B on each side of the center, and adjacent to the cylinder and communicating therewith are explosion-chambers C, which extend on each side of the ways B, in which move the sliding abutments. Inlet-passages D are provided adjacent to the explosion-chambers, means also being provided to support pump-cylinders E, shafts F, and a central shaft G, upon which is mounted a fly-wheel H. The frame beyond the cylinder has bearings for rock-shafts I, and on opposite sides of the abutments exit-ports K.

The movable part of the engine consists of the fly-wheel H, which is keyed on the shaft G, said fly-wheel having a circular flange *g*, which projects through the continuous slot *a* through the cylinder and closes the same, suitable packings and means for making a tight joint being provided in practice. To the flange is rigidly secured a piston or piston-head A′. The fly-wheel H, beyond the projecting circular flange, has a recess *h*, shaped at opposite points to give the proper throw to arms *i i′*, which are connected to the rock-shaft I, one of the arms having stubs *i″*, which engage the continuous recess *h*, and as the fly-wheel is turned the arms are rocked to impart a reciprocating motion to the abutments or cut-offs L, so that at the proper time they will intersect the cylinder and establish communication between the explosion-chamber and the cylinder, also controlling the sparking mechanism which ignites the charge.

The sliding abutments or cut-offs L have therethrough ports *l* adapted to register with the ports of the explosion-chambers said abutments being connected to arms *l′*, attached to slides *l″*, which reciprocate in ways B′, formed in the main frame parallel with the ways B for the abutments, with which they communicate by a slot, as shown. The bar or rod L′ is connected to the rock-arm *i′* and to the slide *l″*, the rod having a contact-point *m*, which when moved toward the center contacts with the spring *n*, which spring is in electric communication with the electrode *n′*, the other electrode *n″* being electrically connected with the contact-point *m*. The igniting device is of such a character that a spark is produced when the contact-point *m* is moved out of engagement with the spring *n*,

the circuit being broken when the abutment L intersects the cylinder, and the port thereof is opposite the port of the explosion-chamber. Wires *o o'* are connected at suitable points to the binding-post of the contact-spring *n* and to the frame adjacent to the rock-shaft I, the electrode *n'* and binding-post being insulated from the frame.

The gas-inlet ports D have valves *d*, which are held upon their seats by springs, and the port with the valve *e* connects the explosion-chamber, so that when the pump-piston moves away from the valves the explosive charge is drawn into the cylinders E, and by a reversal of the movement of the piston the charge is compressed in that portion of the explosion-chamber on one side of the abutment. The pistons of the pumps are actuated by gear-wheels P P, which mesh with a gear-wheel P', mounted on the shaft G adjacent to the hub of the fly-wheel and between said wheel and the cylinder, the gear-wheels P being mounted on shafts F F, which also carry disks F', to which the piston-rods of the pump are attached.

To start the engine, the fly-wheel may be given a half-turn, which operates the pumps, draws a charge into the pump-cylinder, and forces it into that part of the explosion-chamber to one side of the abutment. A further manual operation of the fly-wheel reciprocates the abutment so that the port will be in line with the explosion-chamber, permitting an expansion of the explosive charge, the piston then being adjacent to the end of the explosive-chamber. In the meantime the rock-arms have almost reached the limit of their movement, and when the charge is ignited it drives the piston beyond the opposite abutment, the advance movement of the piston driving the burned gases out of the exit-ports, both being open for the exit of the spent gases until the piston passes the explosion-chambers. After the engine is once started it is automatic in operation.

Incident to the construction shown the gear-wheels which operate the pump are located between the fly-wheel and cylinder, so as to be partially incased or protected, which obviates an element of danger incident to that style of gearing. The abutments are actuated directly from the fly-wheel, and the piston being connected to the fly-wheel the driving force is expended directly thereon and a long leverage is secured. The fly-wheel having a flange which travels with the piston and engages the cylinder prevents excessive vibrations and insures uniformity of motion.

It will be noted that the moving parts are reduced to a minimum and are solidly connected as near as possible to the center of the frame. In the construction shown the charge is not permitted to expand until the piston has practically reached the point where the explosion will be most effective thereon, and that the abutments or cut-offs, owing to the curvature or pitch of the recess in the fly-wheel, move quickly to open and close the ports and cylinder, and that there is no liability of disarrangement of the operating parts.

In practice it is desirable that means be provided for keeping the engine cool, and this may be effected by a circulation of water in a chamber which incloses the cylinder, as shown in Fig. 1 of the drawings, in which instance a water-jacket R, having an inlet-port R' and an exit-port R^2, is provided. In many types of engines I prefer to provide the cylinder with heat-radiating rings a^4, as shown in Fig. 3, and the web or wall A^2 of the casting with perforations a^5. When such construction is employed, I attach to the arms of the fly-wheel H vanes or blades H', which cause a circulation of air through the perforations and about the cylinder.

The improvements which I have described may be modified and the arrangement varied without departing from my invention. For instance, any suitable type of sparking or igniting device may be employed, operating either with an open or closed circuit, the engine may be made with a single abutment, and a single pump, or the number of the abutments and pumps may be increased beyond what is shown.

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

1. In a rotary engine, an explosive-chamber which communicates with a cylinder, a piston in said cylinder, a wheel to which the piston is directly connected, an abutment having a solid portion which intersects the cylinder and explosion-chamber, a port through the abutment which establishes communication between the explosion-chamber and the cylinder and means for actuating the abutment, substantially as shown.

2. In a rotary engine, the combination of an annular piston-passage, a piston operating therein, a balance-wheel to which the piston is connected, ways which intersect the piston-passage, abutments operating in the ways, explosion-chambers intersected by the way for the abutments, the abutments each having a solid portion and adjacent thereto a port and means for alternately reciprocating the abutments so that when the solid portions thereof intersect the piston-passage the port will establish communication between the explosion-chamber and the piston-passage, substantially as shown.

3. In a rotary gas-engine, the combination of a circular cylinder having through one side a continuous opening or slot, a wheel having a flange which closes the slot, a piston-head attached to the wheel, reciprocating abutments which intersect the piston-passage, explosion-chambers which communicate with the piston-passage and are intersected by the abutments, pumps for forcing the explosive mixture into the explosion-chamber, the abutments having ports which are positioned in line with the explosion-chambers when the

ends of said abutments intersect the piston-passage, and means for igniting the explosive mixture when the ports of the abutments are on a line with the explosive-chambers, substantially as shown and for the purpose set forth.

4. In a gas or explosive engine, the combination with a circular cylinder, of a wheel to which a piston-head is connected, said piston-head operating in the cylinder, the wheel having a groove or recess which is partly concentric and partially eccentric to its periphery, abutments connected to rock-shafts having arms which engage the groove and actuate the abutments, the abutments having solid portions and ports, valved inlet-openings for the explosive mixture, pumps actuated to draw the explosive mixture into the same and force it into an explosion-chamber, the explosion-chamber communicating with the cylinder when the abutments intersect said cylinder, and an igniting device in the explosion-chamber, substantially as shown and for the purpose set forth.

5. In a rotary gas or explosive engine, the combination of an annular piston-passage a continuous slot or opening communicating therewith, a balance-wheel having a flange for closing the slot and a piston carried by said wheel which moves in the piston-passage, ways for reciprocating abutments which extend from one side of the piston-passage to the other side, explosion-chambers communicating with the piston-passage said chambers being intersected by the abutments, pumps for forcing an explosive mixture into the explosive-chambers, reciprocating abutments having solid portions which intersect the piston-passage and ports through the abutments for establishing communication between the explosion-chamber and the piston-passage, igniters within the explosion-chambers, means for actuating the abutments and means connected to the abutments for operating the igniters and exploding the charge when the port of the abutment is opposite the explosion-chamber, substantially as set forth.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

CHARLES F. LEMBKE.

Witnesses:
HANNIBAL H. LORING,
HENRY H. ROWE.