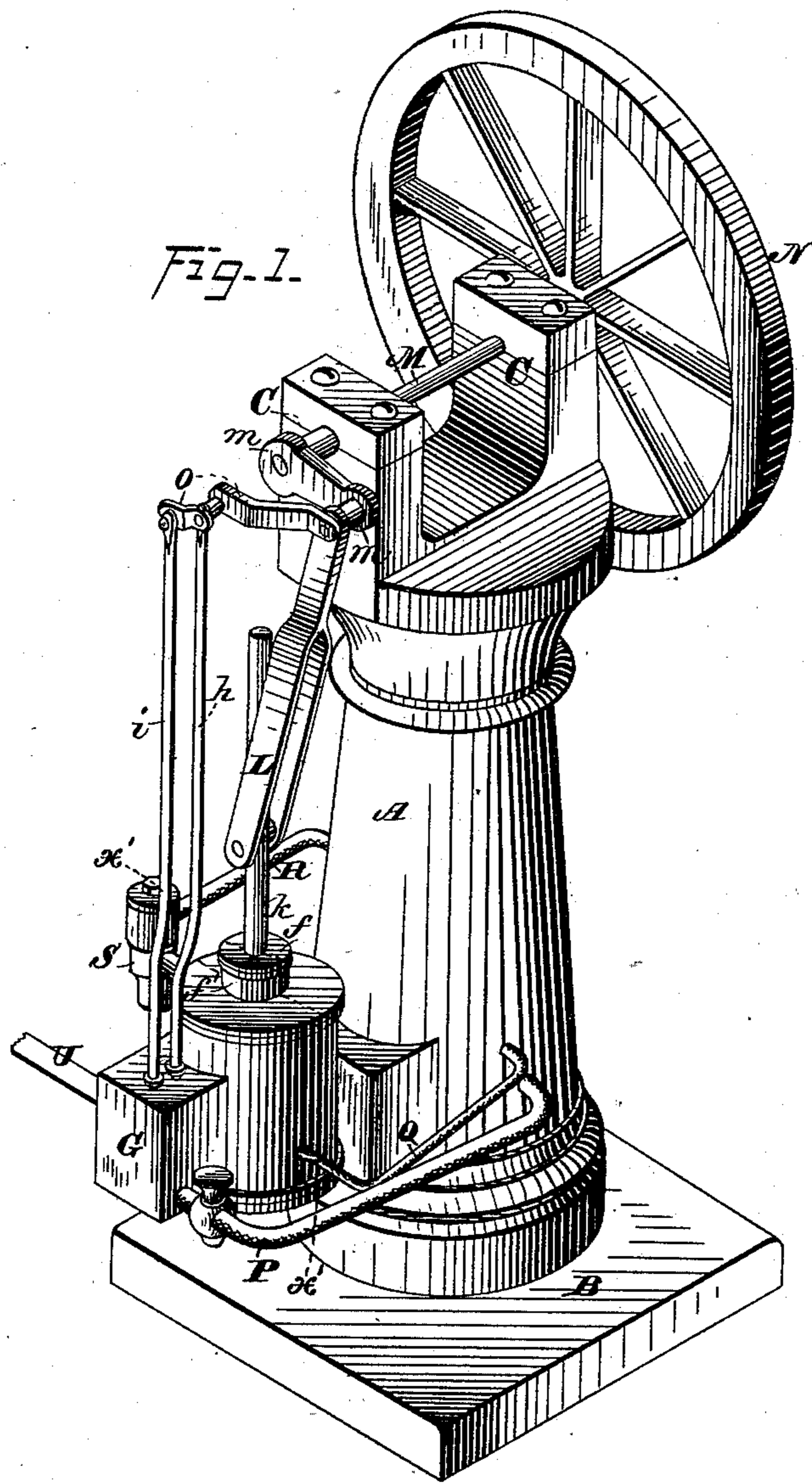


F. BÜRGER.
Gas-Engine.

No. 222,660.

Patented Dec. 16, 1879.



WITNESSES=

Jas. E. Hutchinson.
Henry C. Hazard.

INVENTOR-

Frank Binger, by
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Fig. 2.

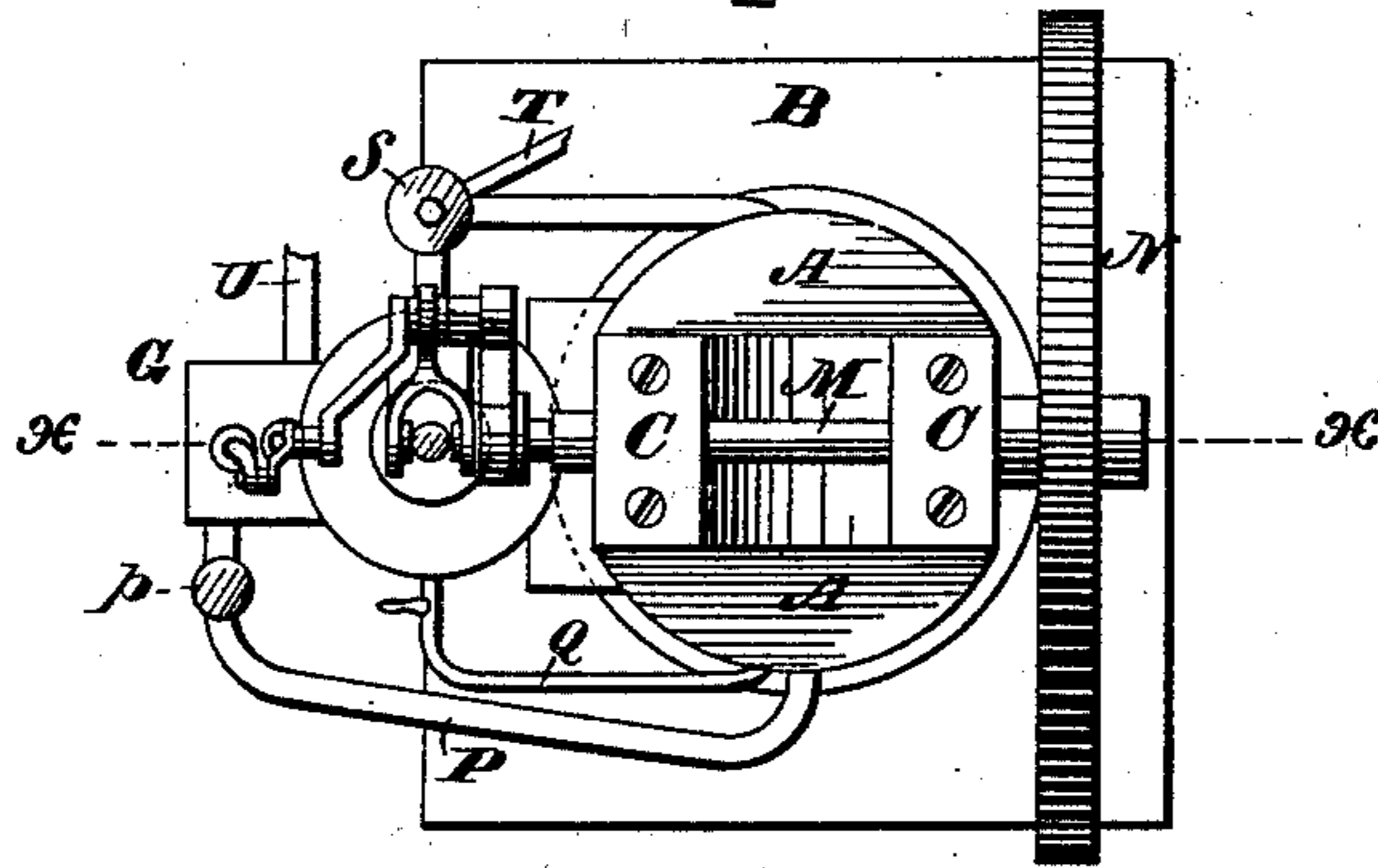
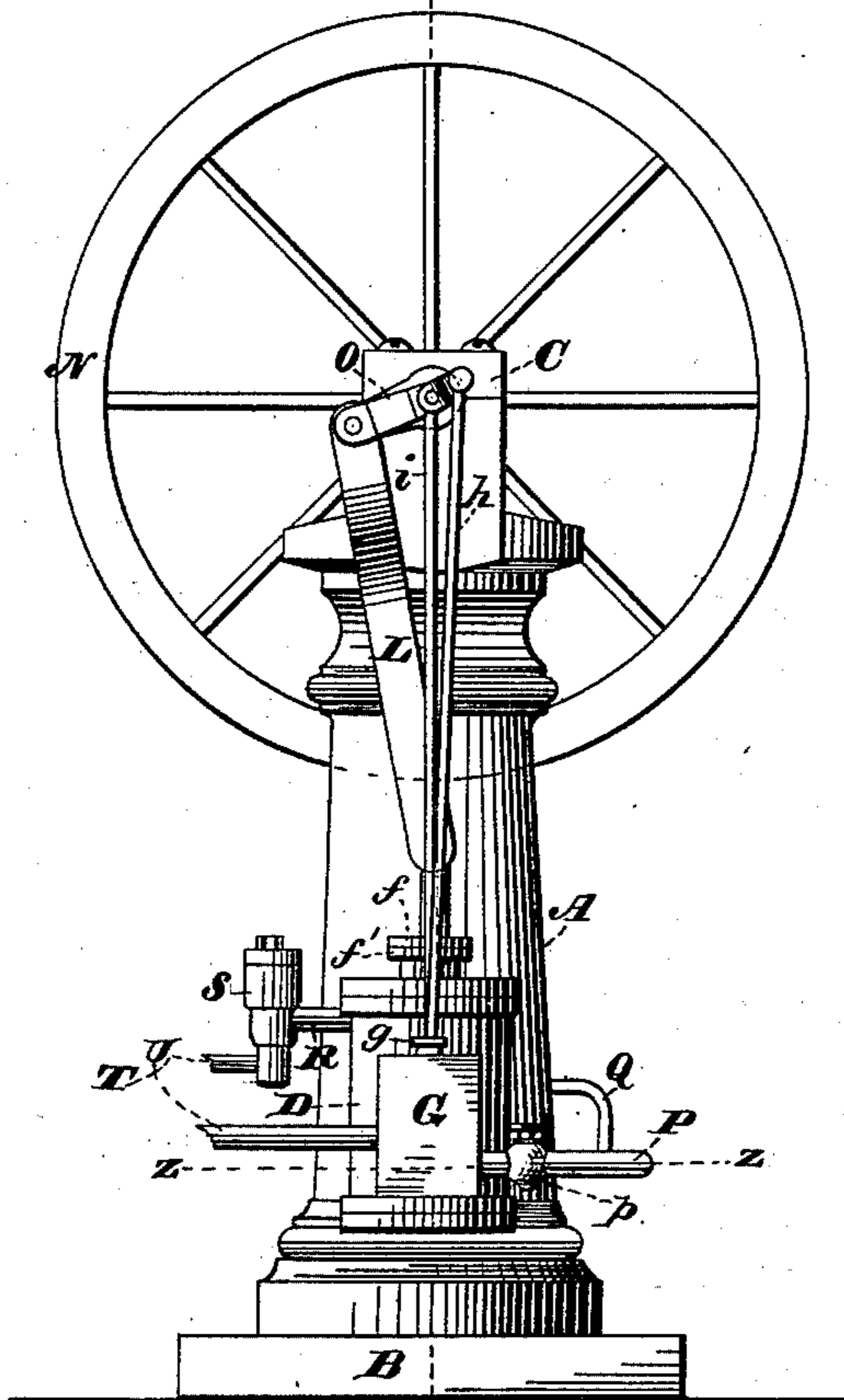


Fig. 3.



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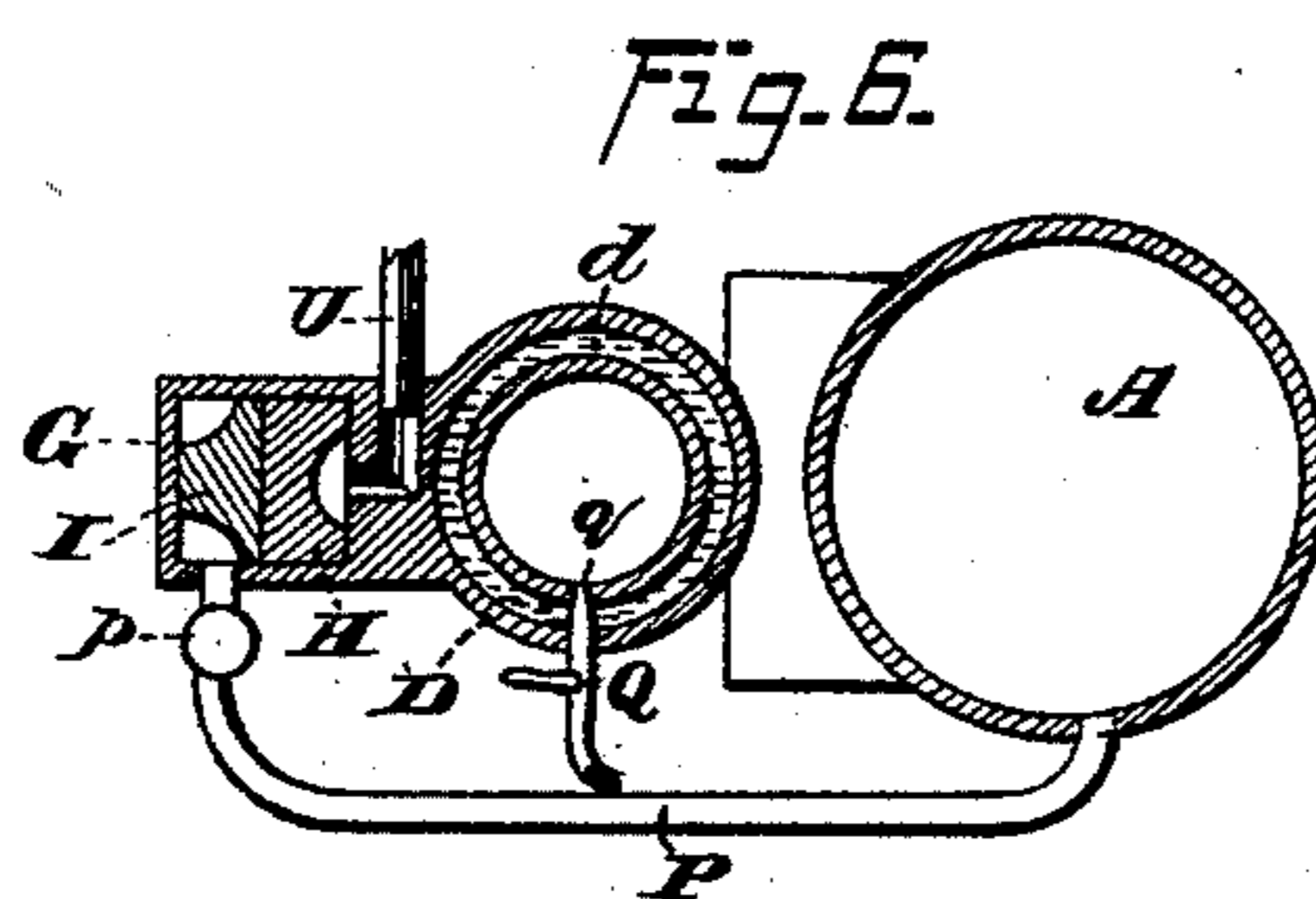
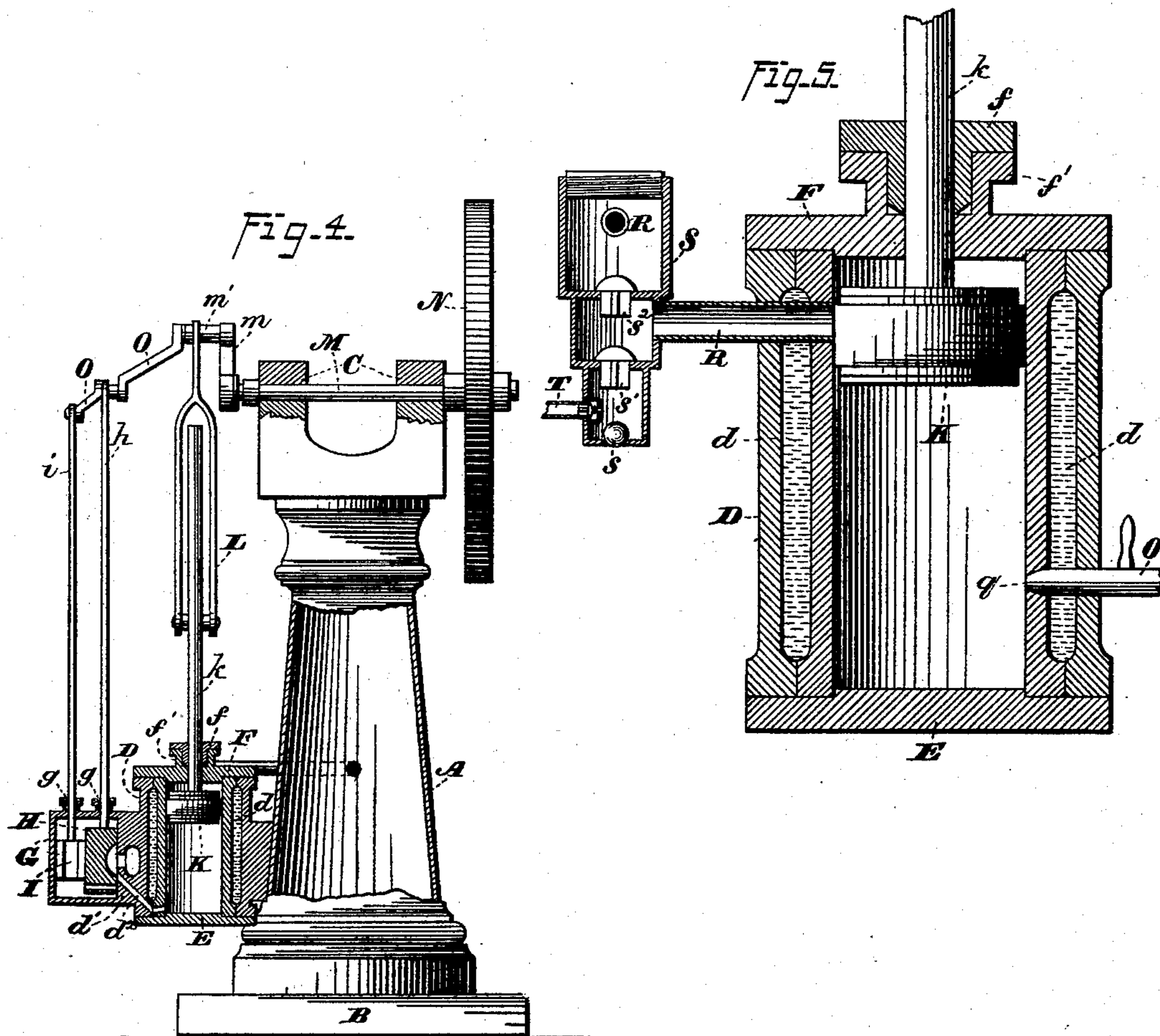
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UNITED STATES PATENT OFFICE.

FRANZ BÜRGER, OF WASHINGTON, DISTRICT OF COLUMBIA.

IMPROVEMENT IN GAS-ENGINES.

Specification forming part of Letters Patent No. 222,660, dated December 16, 1879; application filed May 19, 1879.

To all whom it may concern:

Be it known that I, FRANZ BÜRGER, of Washington, in the county of Washington, and in the District of Columbia, have invented certain new and useful Improvements in Gas-Engines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a perspective view of a vertical engine constructed in accordance with my improved method. Fig. 2 is a plan view of the upper side of the same. Fig. 3 is an elevation of the front side of said engine. Fig. 4 is a vertical section of the same upon line $x x$ of Figs. 2 and 3. Fig. 5 is an enlarged vertical section of the cylinder upon line $x' x'$ of Fig. 1, and Fig. 6 is a horizontal section of the engine upon line $z z$ of Fig. 3.

Letters of like name and kind refer to like parts in each of the figures.

The design of my invention is to render practicable the use of gas as a motive power; and to this end it consists, principally, in an engine in which is combined the following elements, viz: a reservoir for containing gas and air, a cylinder having a reciprocating piston, valves for admitting the explosive mixture to and permitting the same to escape from one end of said cylinder, a gas-jet for igniting said explosive mixture after a full charge has entered the cylinder, pipes and valves for connecting the opposite end of the cylinder with the open air, with a gas-supply, and with said reservoir, and means whereby the reciprocating motion of said piston may be converted into a rotary motion, substantially as and for the purpose hereinafter specified.

It consists, further, in the construction of the valve-chamber and valves located between the air-compressing end of the cylinder and the reservoir, substantially as and for the purpose hereinafter shown and described.

It consists, further, in a gas-engine in which the cylinder is inclosed by means of a water-jacket, substantially as and for the purpose hereinafter set forth.

It consists, finally, in the engine as a whole, its several parts being constructed and combined to operate in the manner and for the purpose substantially as hereinafter specified.

In the annexed drawings, A represents a

column, which is supported in a vertical position by means of a base, B, and at its upper end is provided with two pillow-blocks, C and C, of usual form.

Secured to or upon one side of the column A, near its base, is a cylinder, D, which has its axis placed vertically, and is inclosed at its lower and upper ends by means of two heads, E and F, respectively, the latter of which heads is provided with a stuffing-box, f , and gland f' , all in the usual manner.

The cylinder D is provided with double walls, between which is an annular space, d , that is intended for the reception of water for the purpose of preventing said cylinder from becoming too hot.

Upon the outer side of the cylinder D is provided a valve-seat, d' , from which a port, d^2 , communicates with the lower end of the interior of said cylinder. Said valve-seat is inclosed by a valve-chest, G, within which is placed two slide-valves, H and I, the first of which valves bears upon said valve-seat, while said valve I bears upon the outer face of said valve H and operates as a cut-off.

Within the cylinder D is fitted a piston, K, which is provided with a rod, k , that extends upward through the stuffing-box d , and, by means of a connecting-rod, L, is connected to or with the crank m of a shaft, M, which shaft is journaled within the pillow-blocks C, and at the end opposite to said crank is provided with a balance-wheel, N, the arrangement being such as to cause a reciprocating movement of said piston to produce a rotary motion of said shaft in the usual manner.

To the crank-pin m' of the crank m is secured a double crank, O, to which are pivoted the upper ends of two valve-rods, h and i , that from thence extend downward through suitable stuffing-boxes, g , and are connected, respectively, with the valves H and I.

The column A is hollow and serves as a reservoir for the motive power—gas and air—which is conveyed therefrom to the valve-chest G by means of a pipe, P, that is furnished with a valve, p , for closing said pipe when desired.

A second pipe, Q, passes from the reservoir A to the side of the cylinder D, and enters the same at a point about one-fourth the distance from its lower end to its upper end. At the inner end of said pipe Q is provided a cham-

ber, within which the gas and air may be constantly burned, the jet q of flame thus produced being used for the ignition of the charges of explosive mixture within said cylinder.

Suitable arrangement is made for controlling the quantity of gas and air passing to said jet, and for its ignition when it is desired to start the engine. If, now, the valve p is opened and the shaft turned so as to cause the valves to admit a charge of the explosive mixture to the cylinder D, and to close the latter as soon as the piston K has passed upward sufficiently to uncover the jet q , said mixture will be ignited and exploded, and a pressure of several hundred pounds per square inch created within said cylinder, which pressure will force said piston to the upper limit of its motion.

When the piston reaches its upper limit the change in position of the valves will enable the gaseous product of combustion within the cylinder to escape, and said piston will be returned to its lower limit of motion by the momentum of the fly-wheel N, after which the explosive mixture will be again admitted to said cylinder, and the operation before described will be repeated, the result being a continuous rotary motion of the driving-shaft M.

In order that air and gas may be properly mixed within the reservoir A, the upper portion of the cylinder D is caused to perform the office of an air-pump, the piston K operating as the plunger or piston of said pump. A pipe, R, extends from said reservoir to said cylinder, and at a suitable point between said parts is provided with a valve-box, S, which is closed at its upper end and open at its lower end, and at the latter point is provided with an upward-lifting ball-valve, s , and at suitable intervals above the latter has two upward-lifting puppet-valves, s' and s^2 .

Between the valves s and s' a gas-supply pipe, T, enters the box S. The cylinder end of the pipe R enters between the valves s' and s^2 , and the reservoir end of said pipe R enters between said valve s^2 and the upper end of said valve-box, by which arrangement the downward motion of the piston K will cause air to be drawn into said valve-box through its lower end, and gas to be drawn into the same through said pipe T, which air and gas will pass into the cylinder D and become thoroughly mixed, after which, upon the upward movement of said piston, the mixture of gas and air will be forced through said valve-box and the pipe R into the reservoir A, said valves s and s' being raised while said cylinder is being filled and being closed, and said valve s^2 raised while said cylinder is emptied.

The supply of gas is regulated by means of a valve, so as to cause the mixture within the reservoir to contain from five to ten per cent. of gas, such proportion having been found most advantageous.

For engines of small capacity it will be sufficient to fill the space d within the wall of the

cylinder with water, and to occasionally insert a small quantity to supply the place of such as is evaporated; but in engines of much size it will be necessary that said water-space be connected with a tank or other source of supply, so that a circulation of water can be had.

As the pressure within the reservoir A will vary more or less, it will be advantageous to attach a pressure-regulator to the pipe Q, for the purpose of maintaining a uniform supply of gas and air to the burner or jet q .

For small engines it will not be necessary to attach a pipe to the exhaust U, the combustion of the explosive mixture being sufficiently perfect to prevent any unpleasant odor, and but little heat being thrown off; but in large engines it may prove advantageous to convey the products of combustion to the exterior of the building in which the engine is placed.

Having thus fully set forth the nature and merits of my invention, what I claim as new is—

1. An engine in which is combined the following elements, viz: a reservoir for containing gas and air, a cylinder having a reciprocating piston, valves for admitting the explosive mixture to and permitting the same to escape from one end of said cylinder, a gas-jet for igniting said explosive mixture after a full charge has entered the cylinder, pipes and valves for connecting the opposite end of the cylinder with the open air, with a gas-supply, and with said reservoir, and means whereby the reciprocating motion of said piston may be converted into a rotary motion, all constructed and arranged substantially as and for the purpose specified.

2. The valve-box S, having inlet-openings for air and gas, provided with the valves s , s' , and s^2 , and combined with the cylinder D and reservoir A, substantially as and for the purpose shown and described.

3. The hereinbefore-described engine, consisting of the reservoir A, cylinder D, having the water-space d , valve-seat d' , and port d^2 , the heads E and F, the valve-chest G, the valves H and I, having the valve-rods h and i , respectively, the piston K, provided with the rod k , the connecting-rod L, the shaft M, having the cranks m and O, and the balance-wheel N, the supply-pipe P, the pipe Q, having the jet or burner q , and the valve-box S, provided with the valves s , s' , and s^2 , and gas-pipe T, and connected with said reservoir A and with the upper end of said cylinder D by means of the pipe R, said parts being constructed and combined to operate in the manner and for the purpose substantially as specified.

In testimony that I claim the foregoing I have hereunto set my hand this 21st day of March, 1879.

Witnesses: FRANZ BÜRGER.

GEO. S. PRINDLE,
WILLIAM FITCH.