(No Model.)

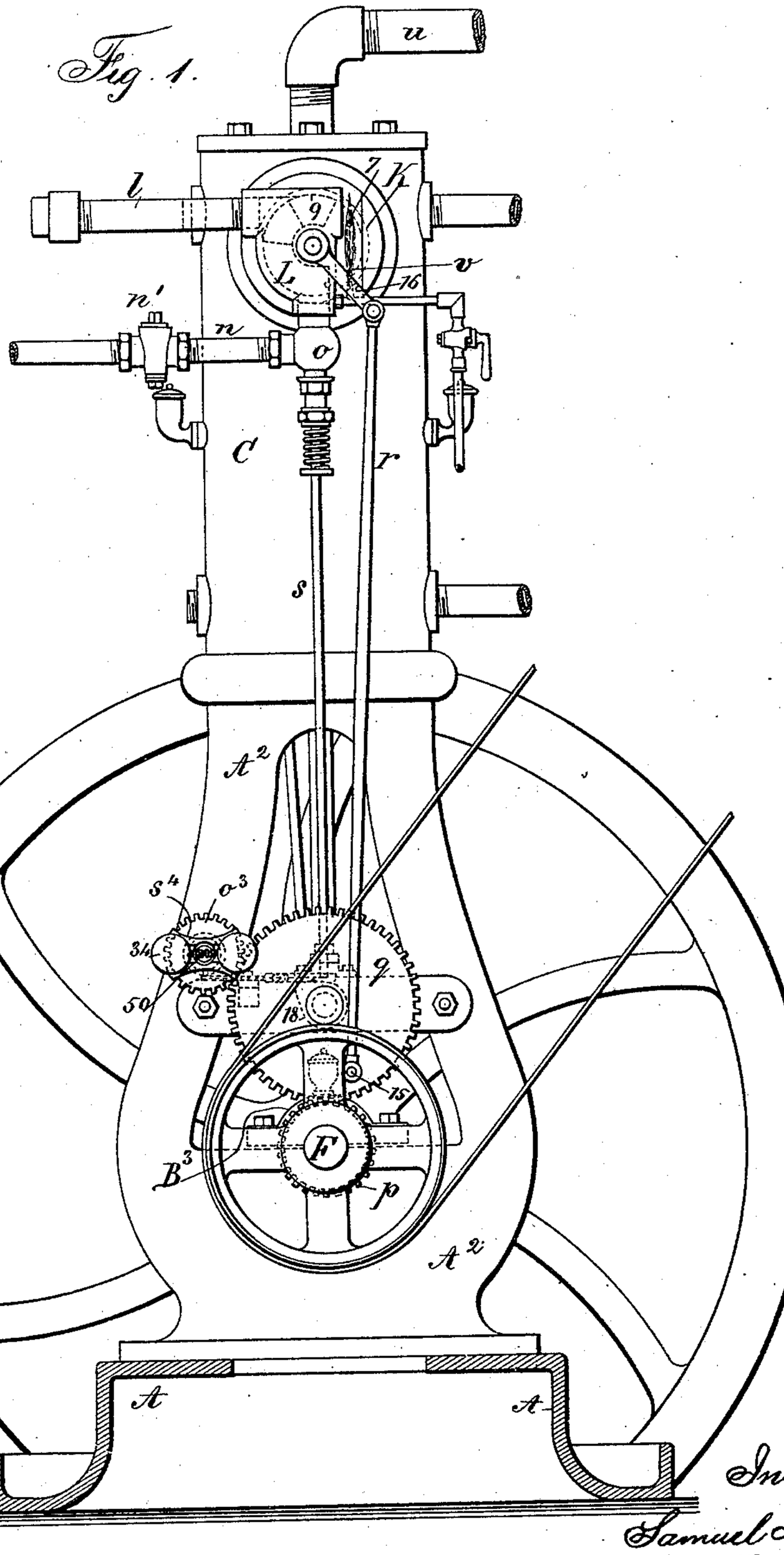
3 Sheets—Sheet 1.

S. LAWSON.

GAS ENGINE.

No. 307,057. Patented Oct. 21, 1884.

Fig. 1.



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Inventor:
Samuel Lawson
per Lemuel W. Serrell
atty

(No Model.)

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GAS ENGINE.

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Fig. 3.

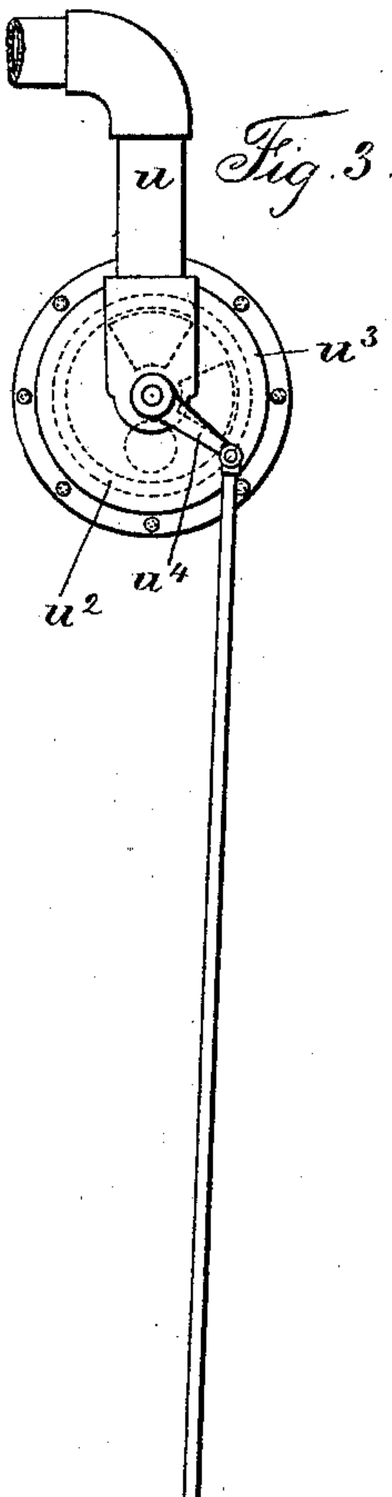
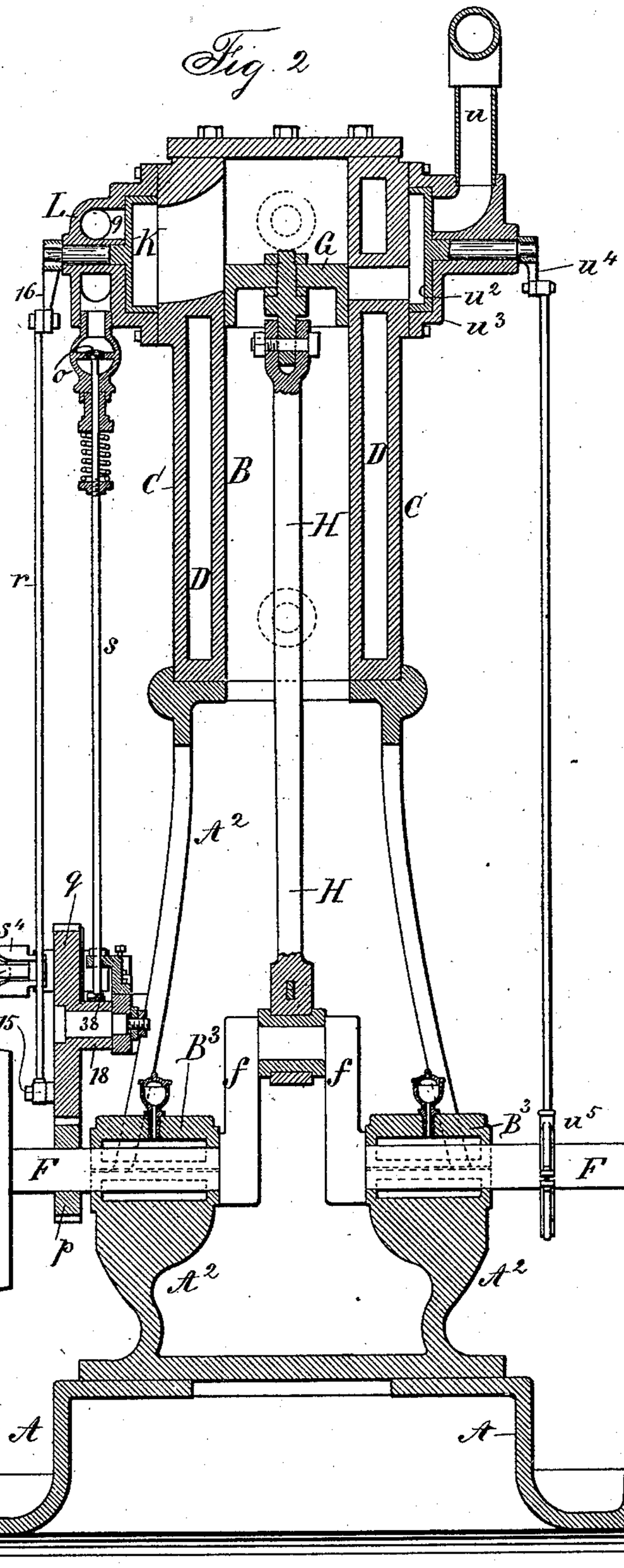


Fig. 2.



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(No Model.) 3 Sheets—Sheet 3.

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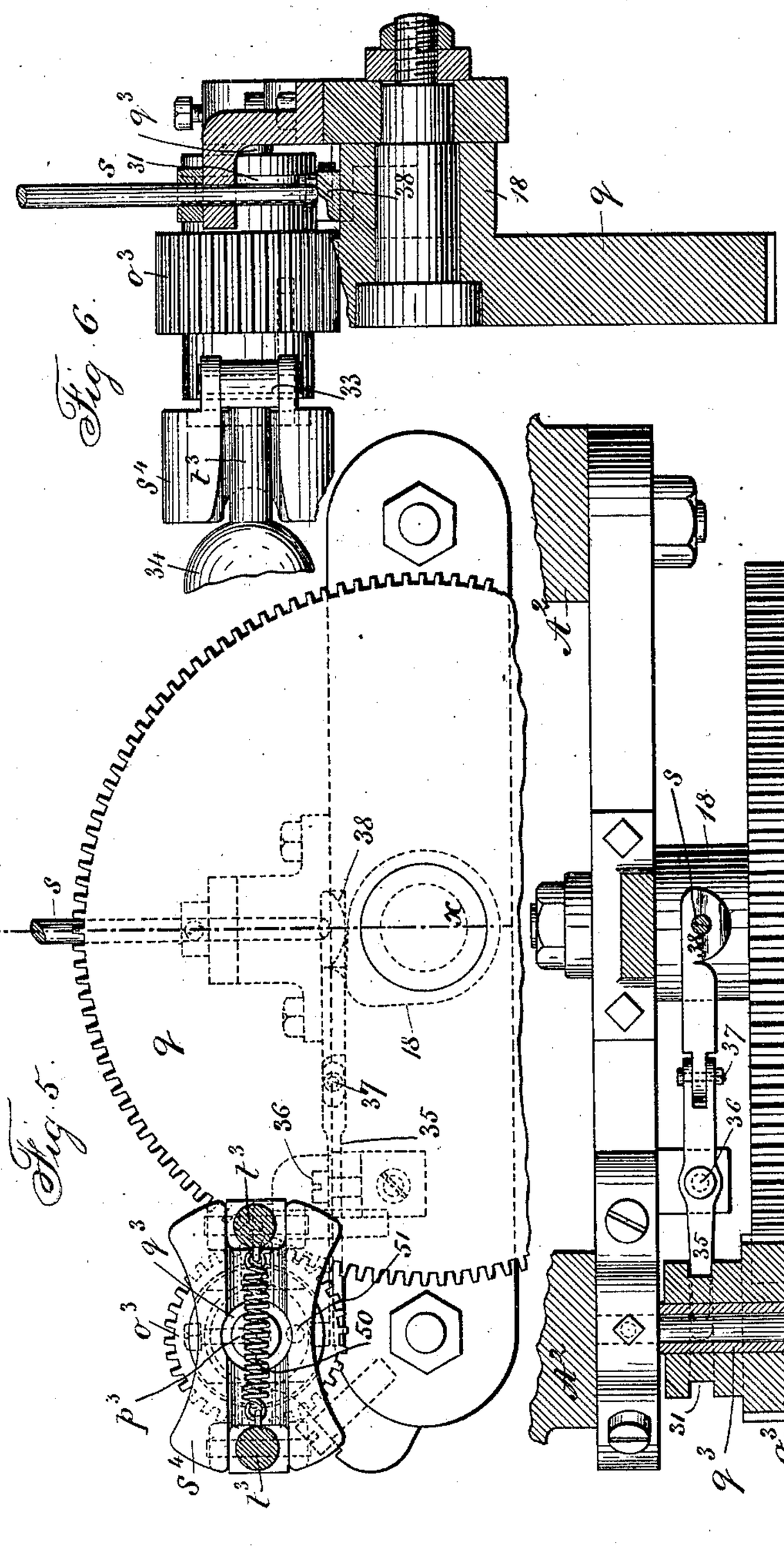

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UNITED STATES PATENT OFFICE.

SAMUEL LAWSON, OF NEW YORK, N. Y., ASSIGNOR TO HIMSELF AND ALONZO T. WELCH, OF SAME PLACE.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 307,057, dated October 21, 1884.

Application filed January 31, 1884. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL LAWSON, of the city and State of New York, have invented an Improvement in Gas-Engines, of which the following is a specification.

This invention is a modification of and improvement upon the device for which I have filed an application for a patent March 23, 1883, No. 89,176.

The present improvements relates to an engine that is provided with a cylinder supported by frames that rise above the pillar-blocks of the fly-wheel shaft, so that the cylinder is inverted, in order that the gas may be in the upper portion of the cylinder, being lighter than the atmosphere, and occupy the position required for the igniting-flame to reach it in the most efficient manner. I also provide an oscillating valve for the exhaust-opening, in order that there may not be noise in opening and closing, and that the valve may be kept tight by the pressure in the cylinder. I combine with the oscillating inlet-valve a governor that operates to regulate the amount of gas introduced, and thereby to maintain a nearly uniform speed under varying loads.

In the drawings, Figure 1 is an elevation of the engine. Fig. 2 is a vertical section. Fig. 3 represents the exhaust-valve and its mechanism. Fig. 4 is a plan, partially in section, of the governor. Fig. 5 is an elevation of the same. Fig. 6 is a section at *x x*, and Fig. 7 is a detached view of the governor-balls and the stock and pinion. Figs. 4 to 7, inclusive, are drawn on a larger scale than Figs. 1, 2, 3.

The cylinder B is provided with a water-jacket, C, with a water-space, D, and with a valve, K, air-inlet pipe *l*, gas-inlet pipe *n*, cock *n'*, and valve *o*, as in my aforesaid application; but the parts are inverted, so that the gas as it rises will commingle with the atmosphere and pass into the upper end of the cylinder B; and I place the gas-jet *v* and the hole 7 as high as convenient on the valve-case L, so that the flame as it is drawn into the cylinder will reach the upper portion of the mixture of air and gas, where the gas will be in the greatest proportion, so as to ignite and be more fully and rapidly consumed. This is of importance in cases where the cut-off, hereinafter described, is employed to almost exclude the admission of gas when the engine is running with a light load.

The valve K is constructed in a manner similar to that shown in my aforesaid application. It is in the form of a disk with a rim, and is introduced into the valve-case L from the side next to the cylinder, so that it is held to place by the pressure within the cylinder, and turns with but little friction when there is a low pressure in the cylinder during the drawing in of air and gas and the expulsion of the waste products; hence there is but little wear upon the valve. There is a segmental opening in the valve, and a corresponding opening in the valve-case at 9, and the valve has a crank-arm, 16, upon its axis, to which the connecting-rod *r* is attached, and there is a pin, 15, upon the gear-wheel, *q*, by which the valve receives the required partial rotation, first in one direction and then in the other, and the gear-wheel *q* is driven by the gear-wheel *p* upon the crank-shaft F, the wheels being proportioned, so that said wheel *q* revolves once to every two revolutions of the crank-shaft, as in aforesaid application.

In order to sustain the cylinder B, I make use of a bed-plate or frame, A, and vertical frame A^2, that extends up to the lower and open end of the cylinder B. The parts are bolted together and the journal boxes or bearings B^3 are upon the lower part of the frame A^2, as shown in Figs. 1 and 2. The connecting-rod H extends from the piston G to the crank *f* on the shaft F.

Instead of employing a conical valve upon a seat to close the exhaust or discharge pipe *u*, I employ the disk-valve u^2. Within the valve-case u^3 and u^4 is a crank-arm upon the valve stem or axis, with a rod to the eccentric u^5 upon the crank shaft F. There is an opening in the disk-valve and a corresponding port in the valve-case, which latter port opens into the discharge-pipe *u*. The parts are so placed and timed that the valve u^2 opens to discharge the contents of the cylinder upon the return-stroke as the momentum of the fly-wheel acts to raise the piston after the propulsive power has been given to the engine by the explosion of the gases. The gas-valve *o* is operated by a rod, *s*, and a cam, 18, upon the hub of the

wheel *q;* but I use in connection with the same a governor that regulates the distance to which the gas-valve *o* is opened and the consequent quantity supplied into the cylinder B in proportion to the power required from the engine. The pinion o^3 receives motion from the gear-wheel *q*, and upon the hub of such pinion there are peripheral grooves 30 and 31. There is a stud or gudgeon, p^3, that projects horizontally from the frame A^2, or a piece bolted to the same, and upon this stud is a sleeve, q^3, which sleeve is within the pinion o^3, and upon which sleeve the pinion may be moved endwise. At the end of the sleeve is the stock s^4 connected to and rotating with such sleeve, and to the stock the arms t^3 are pivoted at 33, and these arms have at one end fingers that project into the groove 30, and at the other end the balls 34, the arms being drawn toward each other by a spring, 50. A pin, 51, projecting from the stock enters a hole in the pinion o^3, by which stock and pinion rotate together with the sleeve around the stud or gudgeon by the action of the pinion; but the pinion and its hub have an endwise movement upon the sleeve by the opening or closing of the governor-arms. The lever 35 is pivoted at 36, and one end is provided with a finger passing into the groove 31, and the other end is jointed at 37 to the valve-rod block 38, that occupies a position between the cam 18 and the lower end of the gas-valve rod *s*. The joint 37 allows the block 38 to rise and fall under the action of the cam 18, and the block 38 is wedge-shaped, or thicker at one side than the other, with a compound curved surface.

The parts are constructed and adjusted, so that when the speed increases over the normal amount the governor-balls fly out beyond their normal position and move the pinion endwise and swing the lever 35, so that a thinner portion of the block 38 is beneath the valve-rod; hence the cam 18 will not open the valve *o* as far as usual, and less gas will be admitted. If the speed of the engine slackens, the governor-balls will be drawn toward each other by their spring, and the thicker part of the block 38 will intervene between the cam and the gas-valve rod, and cause the cam to open the gas-valve wider and supply more gas to the engine.

It will be understood that any suitable character of governor can be supplied in place of the balls shown.

I do not herein lay claim to the governor mechanism in itself, and I reserve the right to claim in a future application any novel feature thereof.

Some of the devices herein shown, especially the circular valve and case containing the same, form the subject of my application No. 89,176, filed March 23, 1883. The same are therefore expressly herein disclaimed.

I claim as my invention—

1. In a gas-engine, a cylinder supported upon a frame, a piston within the same, a crank-shaft in pillar-blocks in the lower part of the frame, and a connecting-rod from the piston to the crank, in combination with gas and air supply pipes, a circular valve, *k*, within a case at the side of the cylinder B, a circular valve, w^2, and discharge-pipe *u*, and mechanism, substantially as specified, for moving the respective valves, substantially as set forth.

2. The combination, with the cylinder B, valve K, gas-supply valve *o*, and air and gas pipes, of the disk-valve w^2, having an opening through it, a valve-case and discharge-pipe, a crank-arm, and an eccentric or cam for giving to the disk-valve an oscillating motion, substantially as set forth.

3. In a gas-engine, the combination, with the cylinder, piston, connecting-rod, crank, and main shaft, of two circular valves, *k* and w^2, and their respective cases, an eccentric and rod to open the discharge-valve w^2 during each revolution of the crank-shaft, a crank revolved once for each two revolutions of the main shaft and rod, and arm for moving the valve *k*, a gas-supply valve, *o*, and a cam for opening the same, substantially as set forth.

4. In a gas-engine, the combination, with the cylinder, piston, connecting-rod, crank, and main shaft, of two valve-cases opening into the cylinder, two circular valves kept to their seats by the pressure within the cylinder, mechanism, substantially as specified, for moving such valves, a gas-supply valve, a cam for operating the same, a governor, a jointed lever having a wedge-shaped end intervening between the governor, the valve-rod, and the cam for regulating the gas-valve, substantially as set forth.

Signed by me this 17th day of January, A. D. 1884.

SAMUEL LAWSON.

Witnesses:
A. T. WELCH.
GEO. T. PINCKNEY,
WILLIAM G. MOTT.