(No Model.)

2 Sheets—Sheet 1.

C. W. BALDWIN.

GAS ENGINE.

No. 288,396. Patented Nov. 13, 1883.

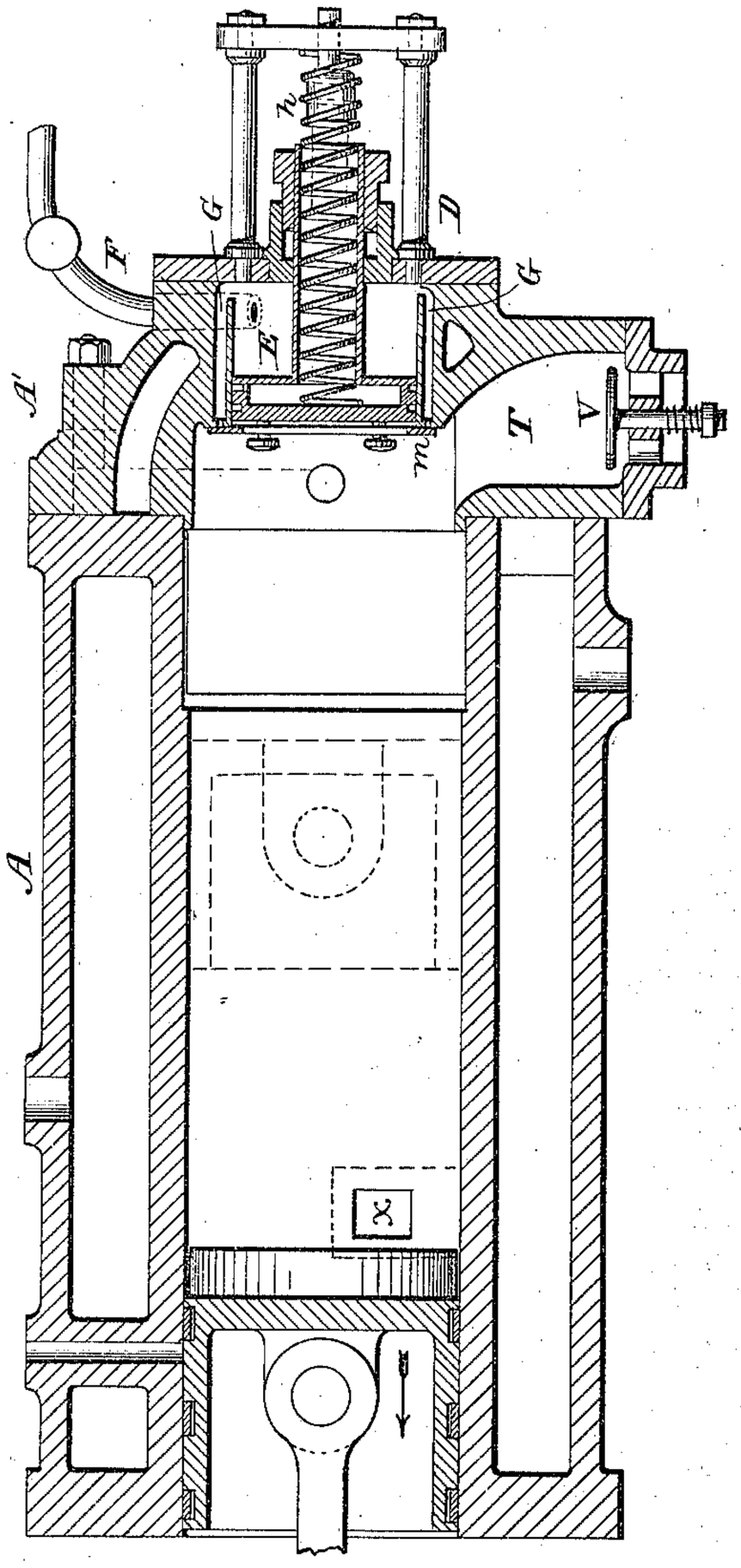

FIG. 1.

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(No Model.) 2 Sheets—Sheet 2

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Fig. 2.

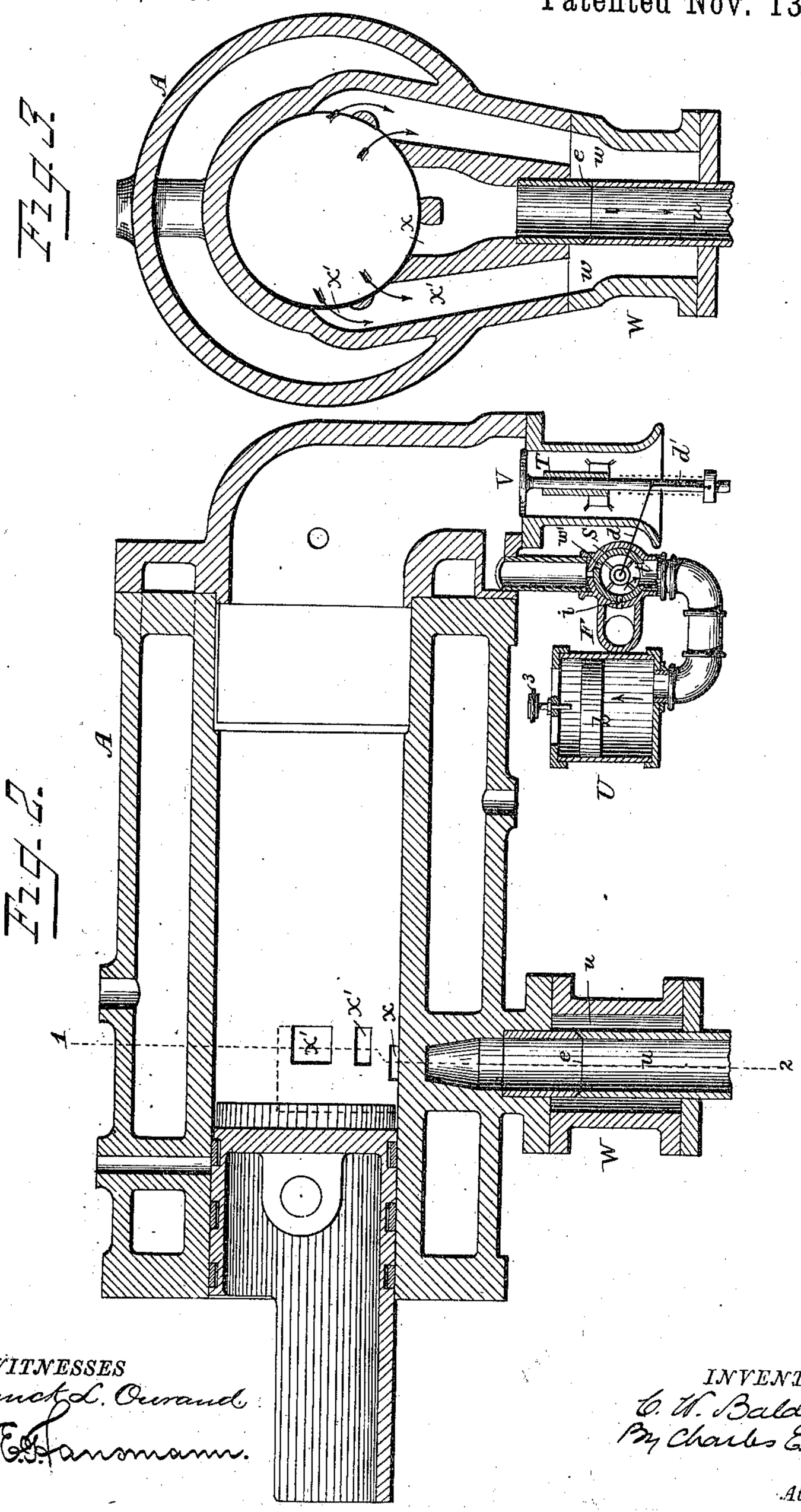

Fig. 1.

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UNITED STATES PATENT OFFICE.

CYRUS W. BALDWIN, OF CHICAGO, ILLINOIS, ASSIGNOR TO WILLIAM E. HALE, OF SAME PLACE.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 288,396, dated November 13, 1883.

Application filed April 11, 1883. (No model.)

To all whom it may concern:

Be it known that I, CYRUS W. BALDWIN, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Gas-Engines, of which the following is a specification.

My invention has for its main objects to simplify the construction and operation of gas-engines and economize power; and these I effect by making the spent gases exhaust themselves, from the cylinder and by drawing in the new charge by an exhausting action, and by the use of automatic mechanism for measuring and introducing the gas-charge, all as fully described hereinafter, and illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal section of a gas-engine illustrating my improvements. Fig. 2 is a longitudinal section, showing another form of engine, ejecting device, and measuring device differing from that shown in Fig. 1. Fig. 3 is a cross-section on the line 1 2, Fig. 2.

After the gas-charge has exploded in the cylinder of a gas-engine, it is necessary to get rid of the spent gases in whole or part, and this necessity has in many forms of engines greatly detracted from the efficiency thereof by requiring the employment of pumps or other devices for forcing out the gases, or the use of the backward movement of the main piston, so that it is not possible to explode a charge to each outward movement. I have discovered that by providing the cylinder with an inlet-port and valve opening inward at one end and with an exhaust-port at the other, and by opening the latter suddenly, the spent gases will rush out with great velocity, and will thereby acquire such a momentum that they will continue to flow after the pressure within the cylinder has become equal to that of the atmosphere, and that this continued motion will open the inlet-valve and draw a fresh charge of air into the cylinder prior to the backward motion of the piston. By this means I clear the cylinder of gases and supply the fresh-air charge without the use of usual pumping appliances, and without using the main piston for expulsion.

In constructing an engine to operate in this manner I may make use of the exhaust to draw in the measured gas-charge. Thus in Fig. 1 the rear head, A′, of the cylinder A may constitute the cylinder of a gas-pump, D, provided with a trunk-piston, E, thrown forward by a spring, *h*, (or by the pressure of the external atmosphere,) a gas-pipe, F, containing a check-valve, communicating with the pump-cylinder, and passages G extending from the latter to the inner face of the head A′, where they are closed by an annular valve, *m*.

The exhaust-port *x* is at the forward end of the main cylinder, and is uncovered as the piston reaches its forward position, and the air-inlet port T is at the opposite end, and provided with an inlet-valve, V, a spring holding the latter to its seat. When the port *x* is uncovered, the gases rush out, and, continuing their movement after the pressure is reduced, draw the air through the port T into the cylinder. When the pressure is reduced, the piston E moves forward and draws into the pump-cylinder a quantity of gas, (or gas and air,) which is thus measured off, and as the main piston moves back, the air in the main cylinder is compressed until the pressure on the piston E, which is greater in area than the valve *m*, becomes sufficient to move back the piston, and by expelling the gas through the channels G raises the valve *m* and permits the gas to mix under pressure with the air in the cylinder. The piston E keeps its backward position until after the explosion and escape of the spent gases. The pressure in the cylinder is then reduced, when the spring or superior atmospheric pressure will throw it forward.

Where it is desirable to secure a stronger or more prolonged exhausting effect, I use an ejecting device which is in communication with the exhaust-port. The motor-fluid in such case may be steam generated by the surplus heat of the waste gases from the cylinder; or any other motor-fluid may be employed. I prefer, however, to use one portion of the spent gases as a motor-fluid for the remainder. A construction suitable for this purpose is shown in Figs. 2 and 3, in which there are

two series of exhaust-ports, x x', the latter being first uncovered by the piston (or a positively-actuated valve may be used) to permit a portion of the gases constituting the motor-fluid to pass to a channel, w, of an ejector, W, from which chamber the gases flow through an orifice, e, into a central tube or channel, u, which is in communication with the exhaust-port x, the latter being opened as soon as the gases have passed to the orifice e, so that the gases will flow to the tube u, and, meeting the other stream under pressure and high velocity, will be carried so rapidly outward as to quickly exhaust the spent gases from the cylinder and lift the air-valve V and admit the fresh charge of air. Any other suitable form of ejecting device may be used.

In connection with this arrangement I may use an automatic gas measuring and delivery device consisting of a cylinder or other vessel, U, receiving a determined quantity of gas from a gas-pipe, F, and a cock, S, controlled by the valve V. The cylinder may contain a loose piston, b, which rises freely when the cylinder is put into communication with the pipe F and descends when the cylinder is in communication with the cylinder A. The cock S has a circular case and hollow cylindrical plug with ports i t w', as shown, the plug being connected by a lever, d, and rod d' with the stem of the valve V. The ports are arranged, as shown, to admit the gas to the measuring cylinder or vessel U when the valve V is down, and to close the communication with the pipe F and open it between the cylinders U and A when the valve V rises, so that the gas will then flow with the entering air into the rear of the cylinder A. An adjustable stop, Z, regulates the play of the piston b, so that the precise quantity of gas required is measured off at each stroke.

A flexible bag of determinate capacity or other flexible vessel may be substituted for the cylinder U, and a slide or lift valve arrangement may be substituted for the plug-valve S, and such valve may be operated by a piston deriving its motion from the varying pressure within the cylinder A, instead of from the valve V.

I do not claim matter claimed in my application No. 91,385, and shown also herein.

I do not abandon or dedicate to the public any patentable features set forth herein and not hereinafter claimed, but reserve the right to claim the same either in a reissue of any patent that may be granted upon this application or in other applications for Letters Patent that I may make.

I therefore claim—

1. A gas-engine provided with an exhaust-port near one end of the cylinder, an air-inlet port near the other end of the cylinder, and with appliances, substantially as described, whereby the opening of the exhaust to the external atmosphere as the piston approaches the limit of its forward motion is made the means of automatically drawing in a charge of air through the air-port, substantially as described.

2. The combination, in a gas-engine, of a cylinder having air and gas inlet ports and valves, an exhaust-port, and appliance, substantially as described, whereby the outward flow of the spent gases is made the means of opening the air and gas valves and of admitting the fresh charge to the cylinder.

3. The combination, with a gas-engine, of a gas-measuring vessel communicating with a gas pipe and valve, an air inlet port and valve, and appliances, substantially as described, whereby the reduction of pressure within the cylinder adjusts the valves to admit a measured quantity of gas with air into the cylinder to constitute the new charge, substantially as set forth.

4. The combination of the working-cylinder of a gas-engine, air-valve, gas pipe and valve, and measuring-vessel, and connections, substantially as described, whereby the movement of the air-valve under the change of pressure within the cylinder is the means of adjusting the gas-valve to pass gas to and from the measuring-vessel, substantially as described.

5. The mode described of facilitating the expulsion of spent gases from the cylinder of a gas-engine by causing one portion thereof to act as an ejecting-stream to expel the remainder against the pressure of the external atmosphere, substantially as set forth.

6. The combination, with the cylinder of a gas-engine, of an ejector device in communication with exhaust-ports arranged to divide the spent gases, and channels whereby one of the gases is carried into the ejector to constitute the motor-fluid of the other portion of the gases, substantially as set forth.

7. The combination, with the gas-engine cylinder, of an ejector device outside the cylinder, and pipe whereby a motor fluid under pressure is admitted thereto, thereby forcibly expelling the spent gases, and an air inlet and valve arranged to admit a fresh charge of air as the spent gases are exhausted, substantially as set forth.

8. The combination, with a gas-engine, of an ejector outside the cylinder, provided with a passage admitting a motor-fluid under pressure thereto, and communicating with the exhaust-port to remove the spent gases, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CYRUS W. BALDWIN.

Witnesses:
HOLMES HOGE,
JNO. J. AKIN.