2 Sheets—Sheet 1.

F. BROWN.

CALORIC ENGINE.

No. 186,535. Patented Jan. 23, 1877.

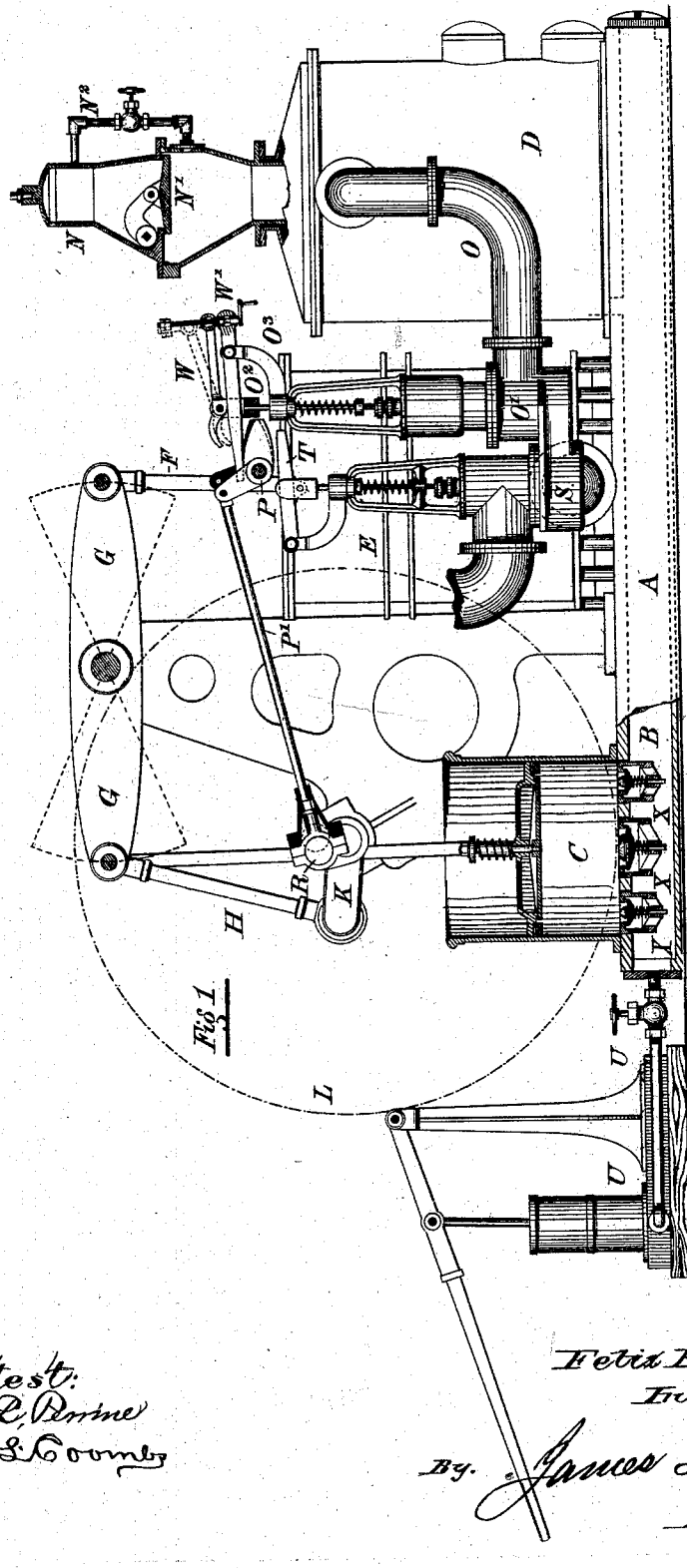

Fig. 1

Attest:
H. C. Dorne
Jno. S. Coombs

Felix Brown.
Inventor.
By. James L. Norris.
Attorney

2 Sheets—Sheet 2.

F. BROWN.

CALORIC ENGINE.

No. 186,535. Patented Jan. 23, 1877.

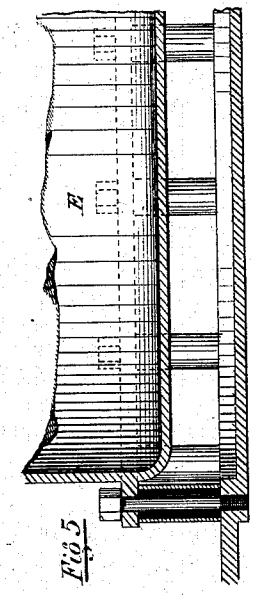

Fig 5

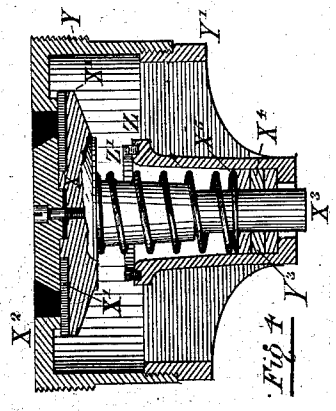

Fig 4

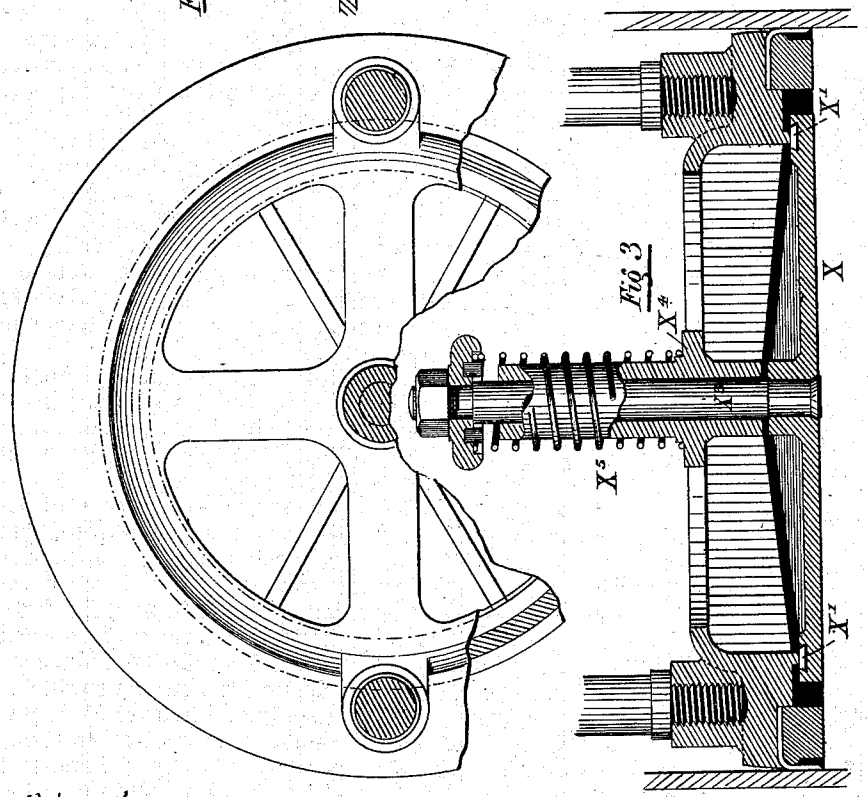

Fig 3

Fig 2

Attest
H. L. Perrine
J. L. Toomey.

Felix Brown.
Inventor:
By. James L. Norris.
Attorney.

UNITED STATES PATENT OFFICE.

FELIX BROWN, OF NEW YORK, N. Y.

IMPROVEMENT IN CALORIC-ENGINES.

Specification forming part of Letters Patent No. **186,535**, dated January 23, 1877; application filed December 20, 1876.

To all whom it may concern:

Be it known that I, FELIX BROWN, of the city, county, and State of New York, have invented a new and useful Improvement in Caloric-Engines, which improvement is fully set forth in the following specification and accompanying drawings, in which—

Figure 1 is a side elevation of the engine, with fuel-feeder and air-pump in section. Fig. 2 is a plan of the lower end of the air-pump. Fig. 3 is a vertical section of the same. Fig. 4 is an enlarged view of the valves in the air-pump; and Fig. 5 is a partial view, in section, of the lower end of the working-cylinder, and shows its method of being mounted on the bed-plate.

This invention pertains to certain improvements in caloric-engines, whereby an engine may be caused to work at variable pressures, independent of the pressure due to the expansion of the air in the heater; and the invention consists, chiefly, in the combination, with the inlet and exhaust valves of a caloric-engine, of a cut-off mechanism, with double eccentrics, whereby the engine may work with a full exhaust and cut-off at any desired point of the stroke, and by which an increase of pressure is provided in the fire-box greater than is due to the initial expansion of the air, as will hereinafter appear.

At A is shown the bed-plate of the engine, on the under side of which is shown the cold-air passage B, or channel-way from the air-pump at C to the heater at D. The working-cylinder is shown at E, and the connecting-rod of the piston at F is attached to one end of a working-beam, as at G, to the opposite end of which the pitman H is connected for giving motion to the crank-shaft K, upon which is the driving-pulley or fly-wheel, indicated in Fig. 1 by the circle in a broken line, as at L. The fuel is supplied to the heater through the hopper or feeder at N, the top of which can be removed to introduce the coal, the bottom being closed by a valve, as at N^1, to prevent the escape of the air when the engine is working, but which is dropped or opened as soon as the cover is fastened on the top to resist the pressure of the air in the heater. But as the valve N^1 is of very large area it will be very difficult to force it down against the air-pressure in the heater. Therefore, to give it the required relief, a tube, as at N^2, connects the lower chamber or heater with the upper one, and it is provided with a valve or stop-cock, so that as soon as the cover is replaced the air from the heater is let into the fuel-chamber, and balances the pressure on the valve N^1, when it drops, and permits the fuel to descend upon the grate-bars below.

The hot-air pipe from the heater to the working-cylinder is shown at O, and the inlet-valve in the chamber at O^1 is raised by the lever at O^2 working through the valve-stem, which is pivoted in the bracket at O^3, and the free arm of said lever is operated by a lifting or right-angled lever-arm on an axis, as at P, which is operated by an eccentric, as at R, on the crank-shaft, the two being connected by a rod, as at P′. The exhaust-valve in the chamber at S is depressed by a corresponding right-angled lever on the axis P, and is operated by a second eccentric on the crank-shaft, just behind the first, as shown in Fig. 1, which at the proper time depresses the lever T over the exhaust-valve stem, and thus the two valves may be set to work independently of each other, as may be desired.

To facilitate the starting of the engine, a small air-pump, to be worked by hand, is attached to the cold-air channel B, as shown at U, and is operated to charge the heater with a sufficient supply of air to set the engine in motion after being heated; and, to enable the operator to start the machine without working against a vacuum below the piston, there is provided an adjustable lever, as at W, in combination with the lever that lifts the inlet-valve, so that the air may be worked full stroke at the start, and then reduced to whatever it is desired to run the engine at afterward. This adjustable lever W is pivoted in the upper end of the inlet-valve stem, and it is vibrated and held by a hand-screw, W′, which works through a ball in a socket in the end of the lever O^2, and through a nut in the end of the lever W, and in this manner the two vibrate together to a certain extent; but one end of the lever W is turned down, as shown in the drawings, and is set over to one side of the lifting-lever O^2, so that the curved

end will be over the arm that works the exhaust-valve; consequently, when it is desired for the inlet-valve to be held open to the full stroke the hand-screw is turned until the lever W is raised to the position shown in the dotted lines, and thereby depresses the opposite end until it comes in contact with the crank-arm of the exhaust, so that when it reverses it will lift the inlet-valve instead of by its own lever O^2 and its own eccentric, which works much faster and may be arranged to cut-off at half-stroke or less. As soon as the engine has fairly started, then the hand-screw is reversed gradually until the inlet-valve is operated by its own lever and eccentric, as already explained.

Such a combination of the parts constitutes the chief element of improvement in this invention, as it permits an engine of any size to be easily started after lighting the fire, by turning the crank up to depress the piston to its lowest point and letting it remain on its centers; then by charging the heater with the hand-pump until the gage indicates a working-pressure in the heater, when a slight turn of the crank will start the engine, and, if the valves are set to give the air-pressure its full stroke, the engine will continue to run as before, as no vacuum will be produced in the cylinder, and no pressure to resist the proper action of the working-valves.

The valves in the air-pump are shown in an enlarged form in Figs. 2, 3, and 4, the inlet-valve being shown at Figs. 2 and 3, and the check-valves at Fig. 4; but they are substantially the same in both, being puppet valves, as at x, faced with a leather facing, as at x^1, to work against a raised seat, as at x^2, or the seat may be flat, if desired.

The valve is provided with a stem, as at x^3, and passes through a guide, as at x^4, and is held to its seat by a spiral spring, as at x^5; but the check-valves are inclosed in a case made of two parts, y and y^1, which forms a chamber for the valve.

To prevent leakage, the stem is surrounded with the packing, as at y^3, and around the stem and within the lower part of the case y^1 there is a raised seat, as at z, upon the upper end of which, at z', is a cushion of leather or other elastic substance that receives the valve in its open position, and thereby prevents the metallic noise produced in their action.

The upper portion of this case, as at y, is screwed into the bed-plate over the cold-air passage B, as shown at Fig. 1; and in this manner the entire space may be covered with such valves, so that very little motion is required of them, and all metallic contact to produce noise is prevented.

Having thus described the several parts, I desire to claim—

1. In a caloric-engine, a cut-off mechanism, whereby an increase of pressure is produced in the fire-box greater than is due to the initial expansion of the air.

2. The combination, in a caloric-engine, of two eccentrics, and valve-gear, with the inlet and exhaust valves, whereby the pressure in the working-cylinder is increased beyond the initial pressure of the air-pump.

3. The combination, in a caloric-engine, of the two eccentrics, with the valve-gear, inlet and exhaust valves, and graduating-screw, or its equivalent, as described, for the purposes set forth.

4. The combination of the relief tube and valve with the fuel-chamber and heater of a caloric-engine, substantially as described, and for the purposes set forth.

5. The cold-air channel B, connecting the supply-pump with the heater, when provided with a gate at one end for opening the channel, substantially as described.

6. The combination of an auxiliary pump with the cold-air channel and heater of a caloric-engine, to assist in starting the engine, as described.

7. The cylinder mounted on studs between it and the bed-plate, to permit of the expansion of the parts without injury to the same, substantially as described.

FELIX BROWN.

Attest:
JOHN W. RIPLEY,
FRANK MCLAUGHLIN.