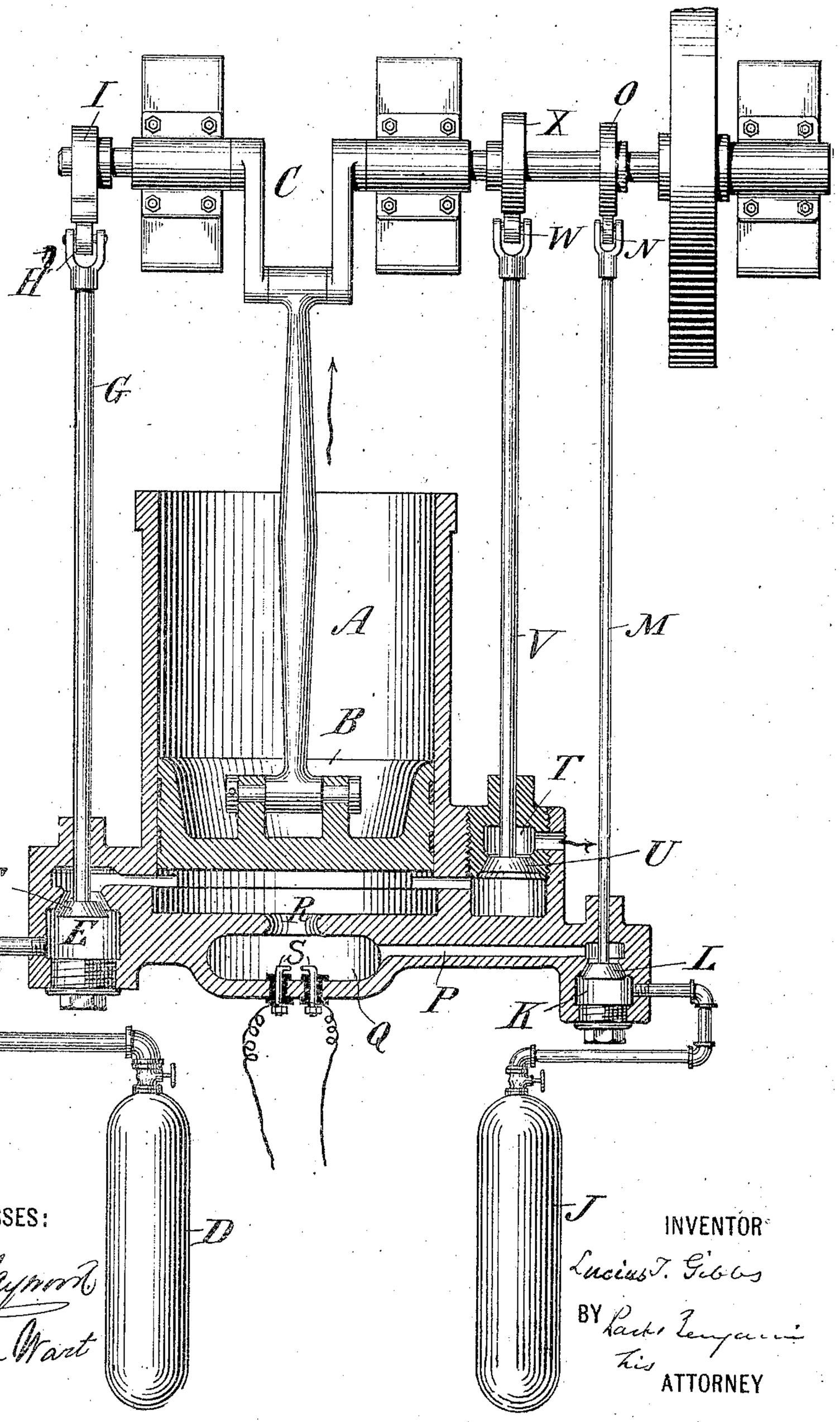
(No Model.)

L. T. GIBBS.

COMPRESSED AIR ENGINE.

No. 604,745. Patented May 31, 1898.



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LUCIUS T. GIBBS, OF NEW YORK, N. Y.

COMPRESSED-AIR ENGINE.

SPECIFICATION forming part of Letters Patent No. 604,745, dated May 31, 1898.

Application filed September 23, 1897. Serial No. 652,672. (No model.)

To all whom it may concern:

Be it known that I, LUCIUS T. GIBBS, of the city, county, and State of New York, have invented a new and useful Improvement in Compressed-Air Engines, of which the following is a specification.

My invention is a compressed-air engine in which the working energy is derived from compressed air which drives the piston over a part of the stroke and is subsequently cut off and allowed to expand, and gas is introduced under a pressure which may be superior to that of the original air. Hence the following definite cycle results: First, air is admitted at working pressure and after driving the piston over a portion of the stroke is cut off and then operates expansively. Second, gas is admitted at a pressure higher than that of the air existing in the cylinder at the time of its admission and before the air-pressure in the cylinder by expansion shall have fallen to that of the atmosphere. Hence said gas may be admitted either before or after the point of cut-off of the air, and the point of cut-off of the gas may be either prior to, coincident with, or subsequent to the point of air cut-off; but the gas and air are not admitted simultaneously. Third, after the gas has been admitted and after it has been cut off the mixture of air and gas is ignited. It will be observed from this cycle that the cylinder is not charged with air and gas both at atmospheric pressure, nor with air and gas both under compression and simultaneously admitted.

The accompanying drawing is a diagrammatic sectional representation of an engine or motor constructed and arranged in accordance with my invention.

A is the working cylinder, B the piston, and C the crank-shaft.

D is a source of air under pressure, such as a flask or reservoir in which air has previously been compressed by any suitable means. The reservoir D communicates with the valve-chest E, in which is seated a puppet-valve F, which is acted by the rod G. In the end of rod G is journaled a roller H, which is actuated upon by the cam I on shaft C. Said cam is constructed so as to open and close the valve F in accordance with the timing hereinafter explained.

J is a source of inflammable gas or vapor under pressure, such as a flask or reservoir in which the gas has previously been compressed by any suitable means. Reservoir J communicates with a valve-chest K, in which is seated a puppet-valve L, which is provided with a rod M, carrying at its end a roller N. Roller N is acted upon by the cam O on crank-shaft C, and said cam O is constructed to open and close the valve L in accordance with the timing hereinafter explained.

When the valve L is open, the gas or vapor can pass by a duct P to a chamber Q, which opens at R directly into cylinder A. In the chamber Q is an electric igniting device S, connected in circuit and operated to ignite the gas in said chamber at the proper time, also as hereinafter explained. Finally, communicating with cylinder A is a valve-chest T, in which is seated a puppet-valve U, which has a rod V, carrying at its end a roller W. Roller W is acted upon by cam X on shaft C, and said cam is constructed to open and close the valve L to permit or cut off exhaust from the cylinder A in accordance with the timing hereinafter explained.

The operation and timing of the engine, which is here single-acting, are as follows: Cam I opens the valve F to allow air under working pressure to flow from reservoir D behind the piston. The piston then begins its stroke. Cam O then opens the gas-valve L and allows the gas to enter chamber Q from the gas-reservoir J. In order that this may occur, it is obvious that the pressure of gas must exceed that of the air. A sufficient amount of such gas to heat the air after expansion will therefore, because the gas is at such high pressure, enter the chamber Q in a very brief time. Consequently the cam O may allow valve L to close and so cut off the gas before cam I allows valve E to close and so cut off the air. When, however, the valve E closes, then the air operates expansively, and at any time after this point of cut-off the circuit may be established through the igniting device S and the previously-admitted gas ignited, thus restoring the heat lost during expansion. On the return stroke the exhaust-valve U, which hitherto has been kept shut, is opened by its cam X and the expanded air escapes into the atmosphere.

It will be obvious from the foregoing that while it is essential that air alone shall enter the cylinder at working pressure and so start the piston it is not essential that the gas shall enter prior to the point of cut-off of the air. It may be admitted after the point of cut-off when the air is at any desired pressure not substantially that of the atmosphere. Hence it will further be apparent that there may be considerable latitude in gas-pressure, in moment of gas admission, and in the time during which said admission continues, the last, of course, depending upon the differential between the pressure in the cylinder and the pressure in the gas-reservoir. Obviously if the timing be such that the period of gas admission is subsequent to the period of air cut-off then so high a pressure in the gas-reservoir is not necessary as when the gas admission precedes the air cut-off, both periods of admission being equal in duration. On the other hand, if the gas be at pressure superior to that of the original air then the period of admission taking place after air cut-off may be shorter in duration than if occurring prior thereto.

The term "gas" as herein used means any inflammable vapor or any inflammable fluid in the form of spray or other comminuted condition.

I claim—

1. The combination of a motor, a source of air under working pressure, a source of gas or inflammable vapor under pressure, valves respectively controlling the admission of said air and said gas to said motor and an igniter; the said parts being so organized and timed that first air and then gas are independently admitted to the cylinder and an explosion or ignition then caused to occur subsequent to the cut-off of the working air, substantially as described.

2. The combination of a motor, a source of air under working pressure, a source of gas or inflammable vapor under pressure, a valve controlling the admission of air to the motor, a valve controlling the admission of gas to the motor and an igniter; the parts being so organized and timed that gas will be independently admitted into the cylinder when the air is at a certain pressure therein and subsequently ignited when said air is at a certain lower pressure, substantially as described.

3. The combination of a motor, a source of air under working pressure, a source of gas or inflammable vapor under pressure, a valve controlling the admission of air to the motor, a valve controlling the admission of gas to the motor and an igniter; the parts being so organized and timed that gas will be independently admitted into the cylinder before the point of cut-off of the air and ignited subsequent to said point of cut-off, substantially as described.

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