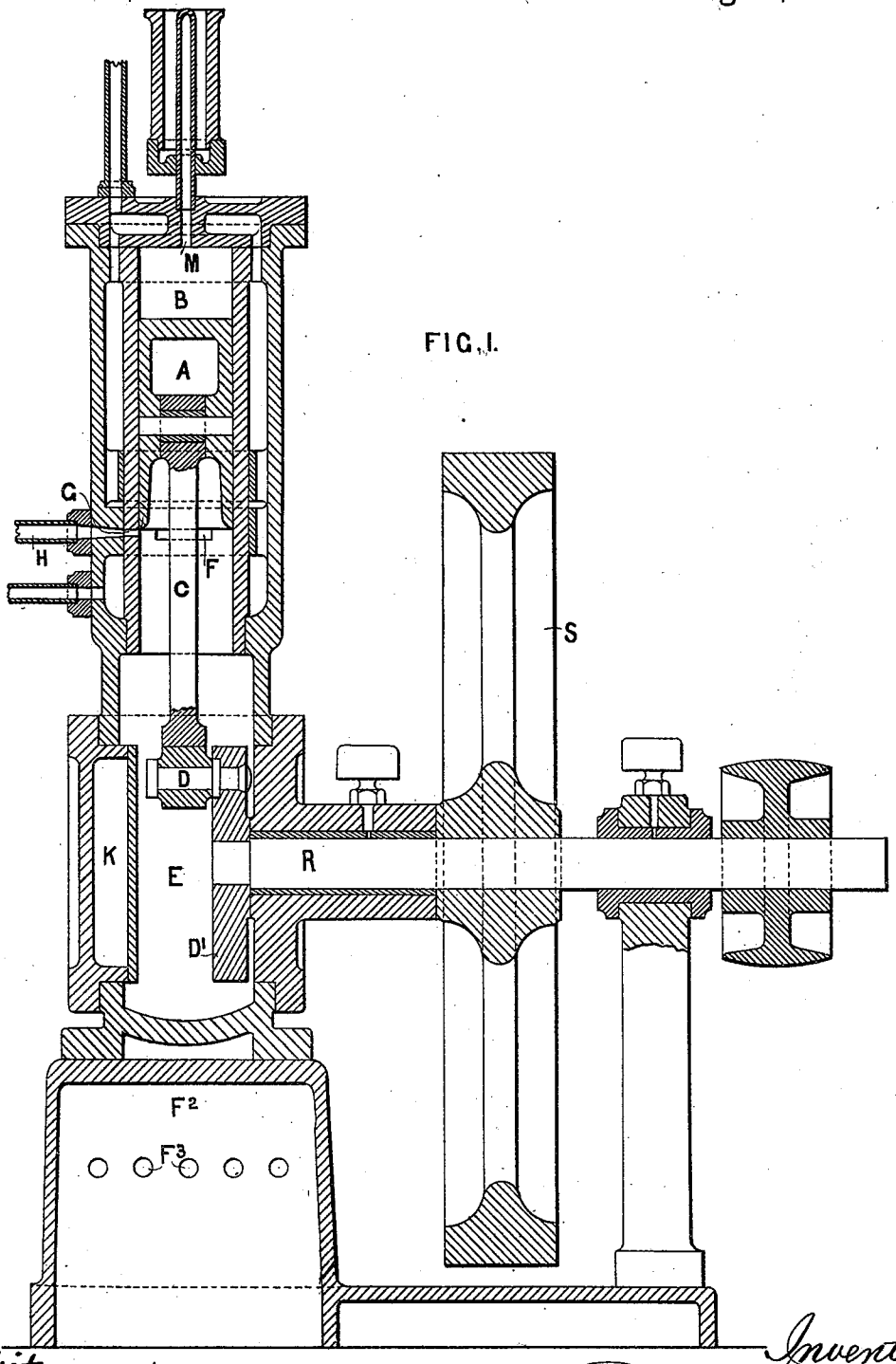
(No Model.) 2 Sheets—Sheet 1.

F. W. C. COCK.

GAS ENGINE.

No. 544,210. Patented Aug. 6, 1895.

FIG. 1.



Witnesses:-
H. K. Boulter
P. G. Northrup

Inventor
Frederick W. C. Cock
By Wm. C. Boulter Attorney

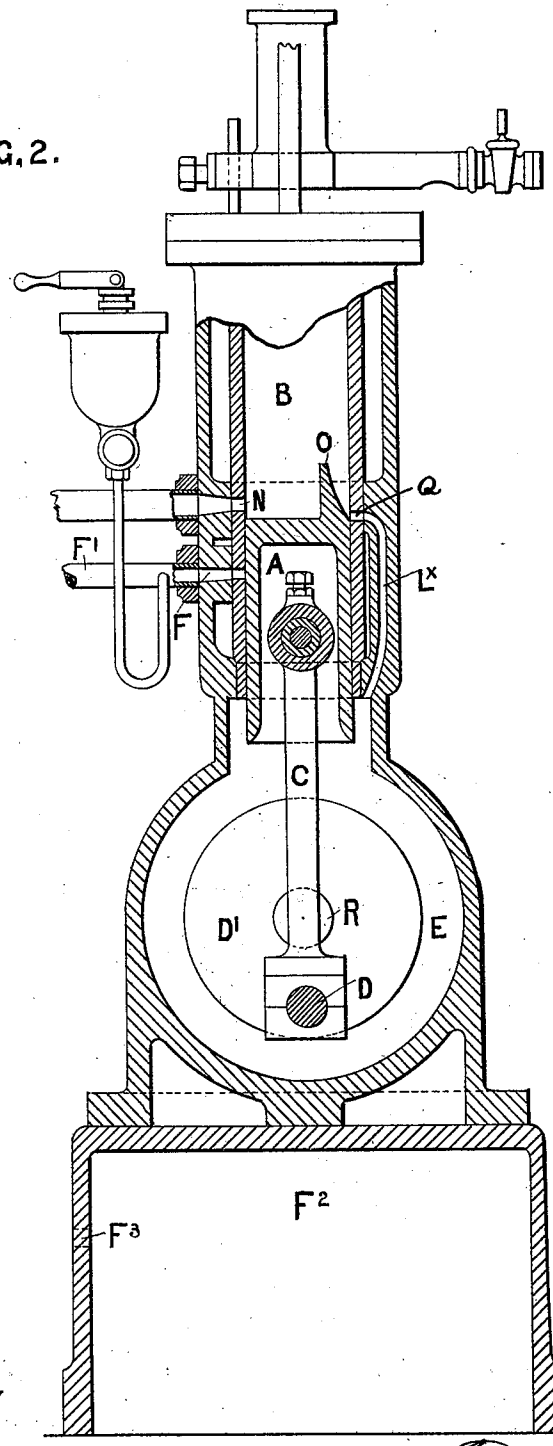
(No Model.) 2 Sheets—Sheet 2.

F. W. C. COCK.

GAS ENGINE.

No. 544,210. Patented Aug. 6, 1895.

FIG. 2.



Witnesses:
W. K. Boulter
H. S. Northup

Inventor:-
Frederick W. C. Cock
By Wm. E. Boulter
Attorney.

UNITED STATES PATENT OFFICE.

FREDERIC WILLIAM CASWELL COCK, OF ERITH, ASSIGNOR TO JOSEPH DAY, OF BATH, ENGLAND.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 544,210, dated August 6, 1895.

Application filed March 10, 1894. Serial No. 503,189. (No model.) Patented in England October 15, 1892, No. 18,513.

To all whom it may concern:

Be it known that I, FREDERIC WILLIAM CASWELL COCK, a subject of the Queen of Great Britain, residing at Erith, in the county of Kent, England, have invented a new and useful Improvement in Gas-Engines, (for which I have obtained a patent in Great Britain, No. 18,513, bearing date October 15, 1892,) of which the following is a specification.

This invention has reference to that class of gas-engine in which the crank works in a closed chamber or casing (the explosive mixture being slightly compressed in this chamber) and in which an impulse is obtained at each revolution, or an engine in which the piston during its forward stroke compresses the charge within the cylinder at the forward end corresponding to the aforesaid closed chamber or casing. In my improved engine the inlet port or ports is or are placed in the cylinder and in such a position and made of such a form that it or they shall be covered by the piston throughout the entire revolution of the crank-shaft, except for an extremely brief period when the piston is close to the end of its return stroke. By this arrangement the piston itself forms the covering-valve for this inlet-port or these inlet-ports and defines the period and duration of the admission, thus insuring that a more uniform charge shall be admitted and that the volume shall be more positively determined than was possible by the provisions made for that purpose in the before-mentioned specification.

In order that this invention may be more readily understood, certain drawings illustrative thereof are appended hereto, in which—

Figure 1 is a sectional elevation with the piston or plunger at the top of its stroke, assuming the engine to be vertical; and Fig. 2 is an end elevation, partly in section, with the piston at the bottom of its stroke.

In the drawings, the admission of gas and air is shown as through two separate ports, the air being admitted by the port F, while the gas is admitted by the port G. These ports, it will be seen, are of considerable width, but of little depth, so that the duration of their opening will be brief, as they will be closed except when the piston is at or near the extreme of its return stroke. The flow of the gas and [or] air or of the explosive mixture may be controlled by any suitable device.

In the case of a horizontal engine the gas and [or] air or the explosive mixture pass or passes into that end of the cylinder which corresponds to the chamber E of the example shown in the appended drawings of this application.

The following is a description of the mode of working this invention: Assuming the piston A to be at the top, as shown in Fig. 1, it will be seen that the air and gas ports are uncovered, and are now in free communication with the chamber E, in which, at this time, a partially-vacuous condition exists, and the air and gas rush in to satisfy this vacuous condition. At this moment, also, the explosive mixture is in a compressed state above the piston and is driven into the igniting-tube M, shown as placed in the top cover of the cylinder, which ignites it in the usual manner, producing the downward or "power" stroke. Almost immediately after the commencement of this downward stroke the gas and air ports are closed by the descent of the piston, which then begins to slightly compress the gas and air mixture, which has been drawn into the chamber E below it. By the time that the piston has completed its downward stroke, as shown in Fig. 2, it has uncovered the outlet-port N, thus allowing the products of combustion to escape, and it has also uncovered the upper mouth Q of the passage $L^{\times}$ forming the communication between the chamber E and the upper side of the piston. The products of combustion have, as regards the bulk of them, escaped through the exhaust by reason of their pressure above that of the external atmosphere, and as soon as this escape has lowered that pressure to the condition prevailing in the chamber E the mixture passes up the passage $L^{\times}$ into the upper part of the cylinder, coming in contact with the shield or deflector O, which is carried on the top of the piston. This shield or deflector prevents the passage of the mixture across the top of the piston and out by the outlet-port, and compels it to rise to the top of the cylinder, passing away from the exhaust-port, thus enabling it to sweep round and chase before it

the small portion of the products of combustion remaining in the cylinder. By this time the piston has so far advanced in its upward stroke as to cover the mouth of the exhaust Q of the passage $L^{\times}$. During the ascent of the piston, it will be seen that the before-mentioned partially-vacuous condition in the chamber E below it is produced. The cylinder is shown water-jacketed in the usual well-known manner.

An inverted vertical engine only has been shown in the drawings, and the mode of working has been described in reference thereto; but it will be obvious that the engine may be vertical with the crank-shaft above or may be placed horizontally or at any intermediate angle.

Propositions have been put forward for making gas-engines wherein the ports have been opened and closed by the movement of the piston itself, (although I am not aware that any of them have come into commercial use.) I do not therefore claim the construction of such gas-engines generally; but

What I do claim as my invention, and desire to secure by Letters Patent, is—

1. In a gas engine, the combination of a cylinder and a piston therein, the cylinder being divided by the piston into a combustion chamber and a compression chamber, and a passage connecting the two chambers, the said passage being opened and closed by the piston, with air and gas inlet ports opening into the compression chamber, the said ports being covered and uncovered by the piston itself, substantially as set forth.

2. In a gas engine, the combination of a cylinder, a compression chamber at one end thereof, a piston adapted to reciprocate within the cylinder and to compress the explosive mixture in the compression chamber during its downward or outward stroke, a port or passage leading from the compression chamber into the cylinder, its lower end being adapted to remain constantly open and its opposite end adapted to be closed by the piston from near the beginning of its inward stroke until said piston has nearly reached the limit of its outward stroke and to be opened when the piston is completing its outward stroke, air and gas inlet ports leading into the cylinder and adapted to be closed by the piston from near the beginning of its inward stroke until near the completion of its return or outward stroke, and an exhaust port communicating with the cylinder and adapted to be closed by the piston from near the beginning of its inward stroke until near the end of its return or outward stroke and to be opened while said piston is terminating its outward stroke and during a portion of its inward stroke, all substantially as described, for the purpose specified.

FREDERIC WILLIAM CASWELL COCK.

Witnesses:
C. A. JENSEN,
T. F. BARNES.