No. 618,638. Patented Jan. 31, 1899.

E. BRILLIÉ.

EXPLOSIVE MOTOR.

(Application filed Jan. 8, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 2.

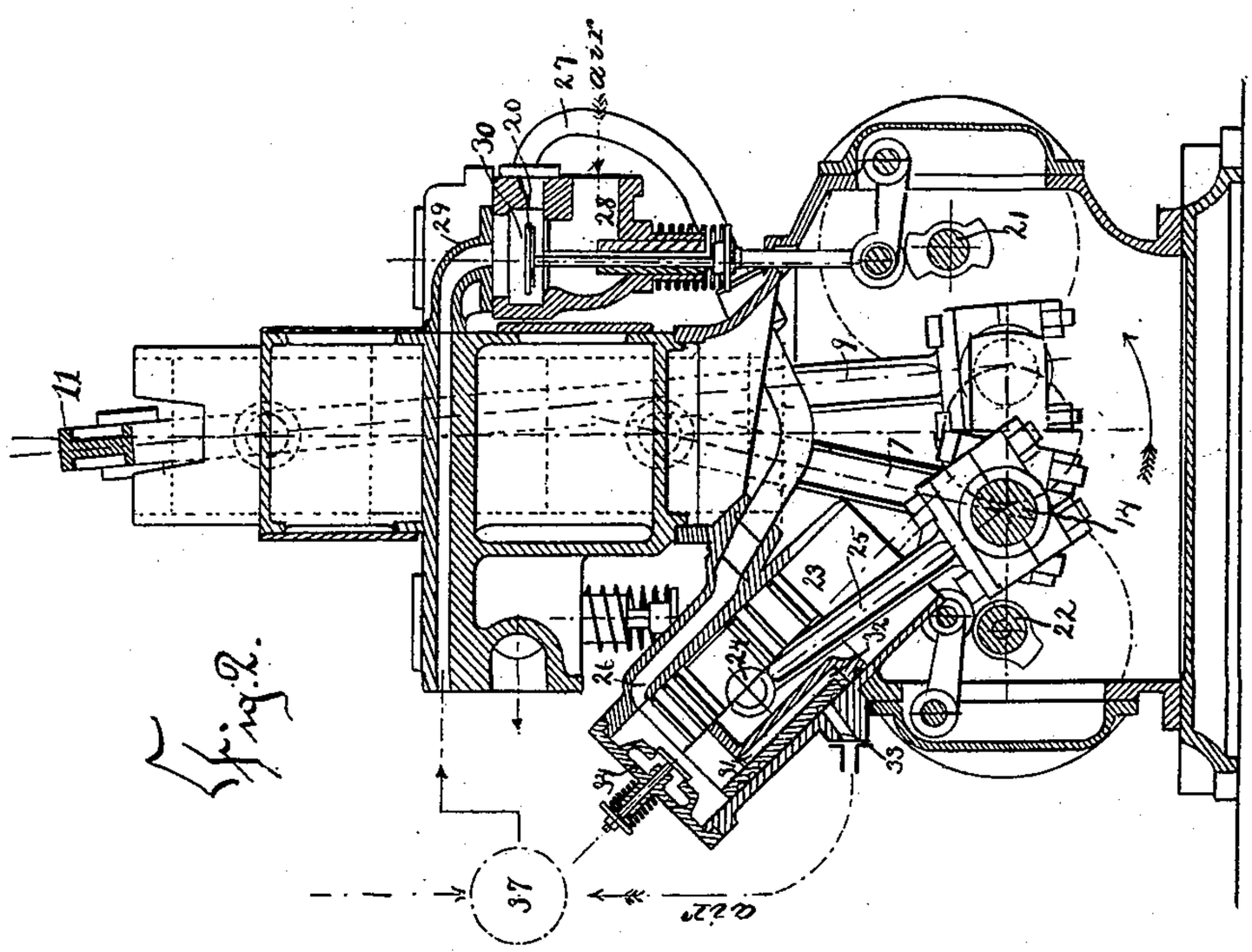
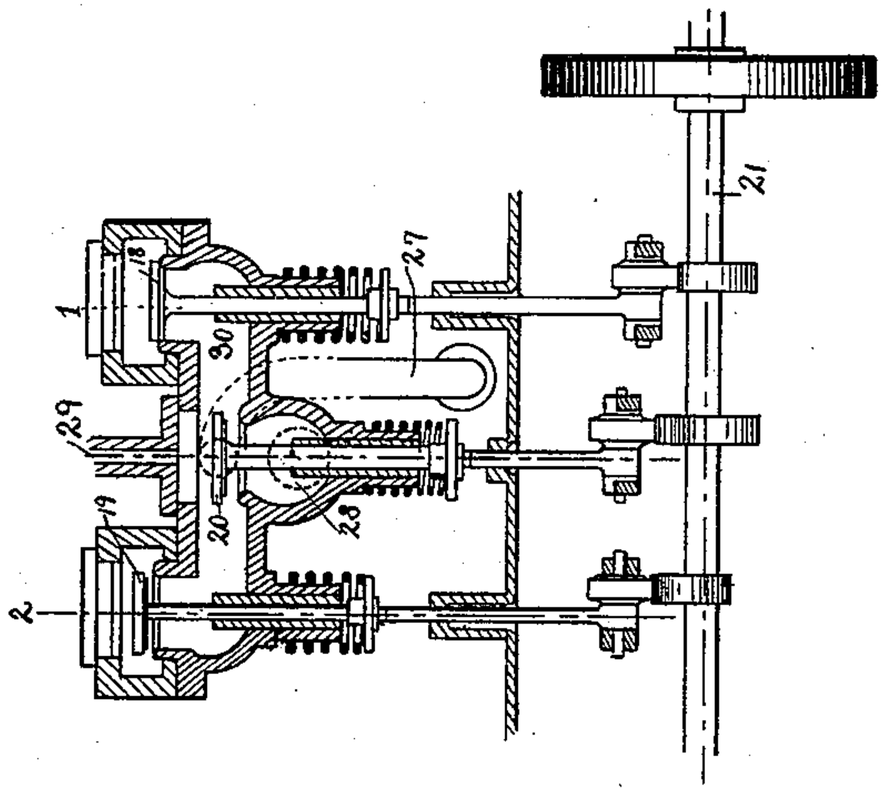


Fig. 1.



WITNESSES

W. H. Hill

J. A. O'Richmond.

INVENTOR

Eugene Brillié

by G. Dittmar

Attorney

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Fig. 4

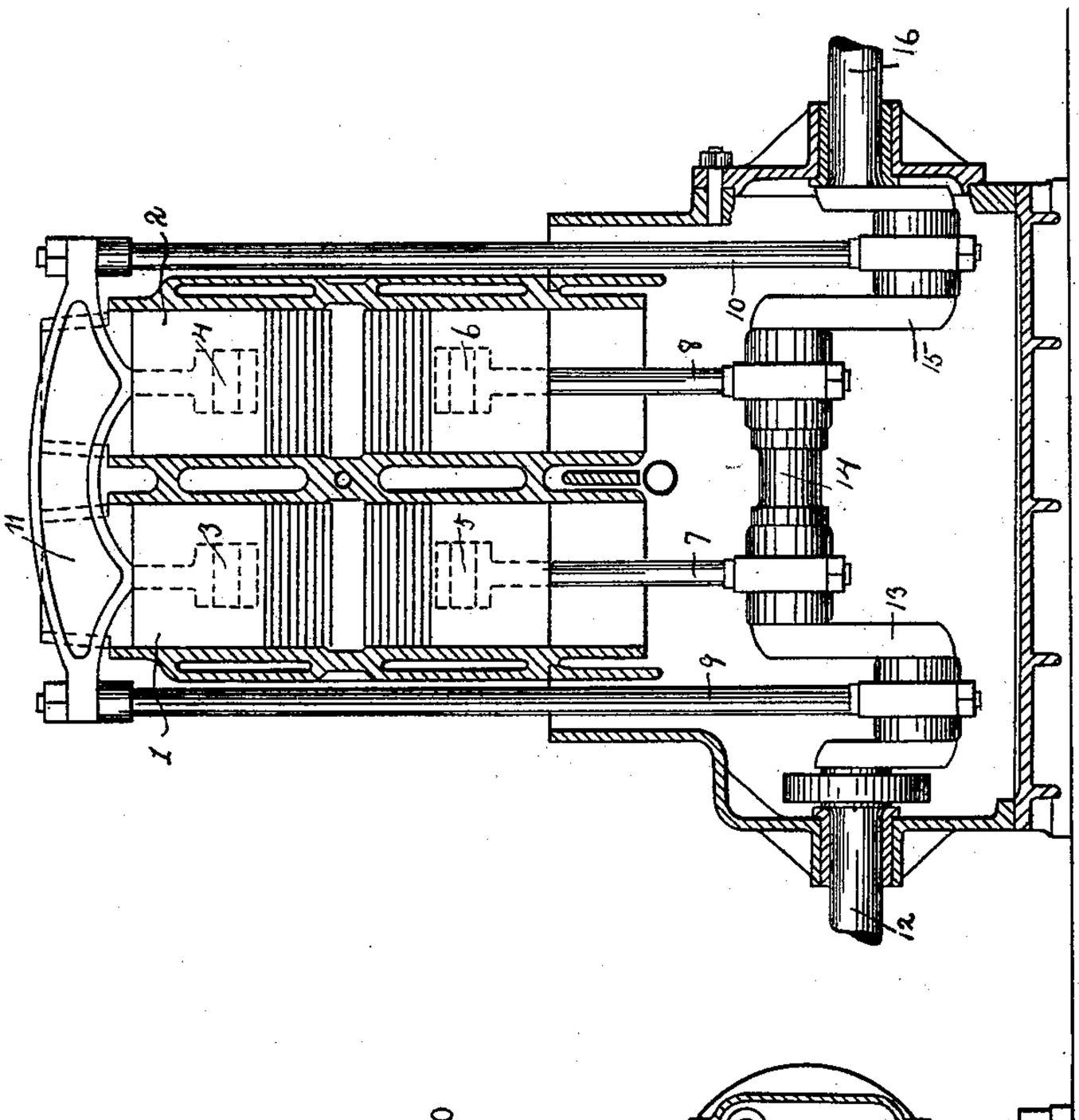
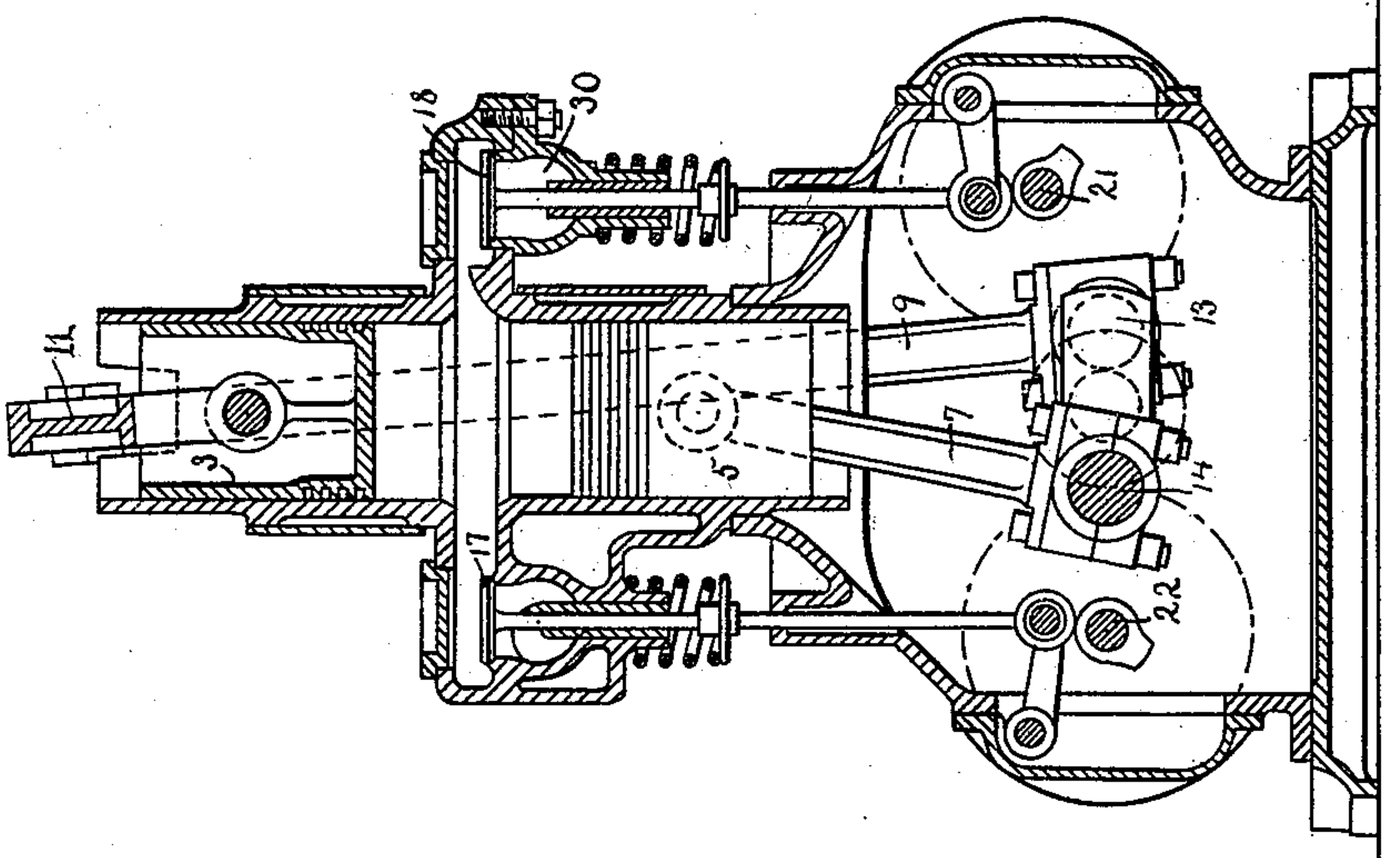


Fig. 3



WITNESSES

A. L. Donohoe.

Robert Voss

INVENTOR

Eugene Brillié

by G. Dittmar.

Attorney

UNITED STATES PATENT OFFICE.

EUGÈNE BRILLIÉ, OF PARIS, FRANCE.

EXPLOSIVE-MOTOR.

SPECIFICATION forming part of Letters Patent No. 618,638, dated January 31, 1899.

Application filed January 8, 1898. Serial No. 666,119. (No model.)

To all whom it may concern:

Be it known that I, EUGÈNE BRILLIÉ, a citizen of the French Republic, residing at Paris, France, have invented certain new and useful Improvements in Explosive-Motors, (for which I have received a patent in France, No. 267,818, dated June 12, 1897;) and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in explosive-engines of the four-phase system wherein two cylinders coöperate in such a way that a motive impulse is obtained at each revolution.

The improvements embody, first, the disposition of the means serving to prevent the perturbations resultant from the inertia of the masses in motion, and, second, the use of a pump which at each revolution displaces or shifts alternately the gases in the neutral spaces in one and the other cylinder after each exhaust and which determines at a given moment the injection of air intended to effect the pulverization of the liquid fuel (coal-oil, gasolene, &c.) in case the engine is fed by such.

In the accompanying drawings, Figure 1 is a section through the aspirating-valves which are operated by an auxiliary shaft. Fig. 2 is a section through the middle of the air-pump. Fig. 3 is a section through the middle of one of the cylinders; and Fig. 4 is a section through the middle of both cylinders, showing the motor-shaft in side elevation.

In said figures the cylinders are designated by the numerals 1 and 2.

3 5 and 4 6 are the pistons, which travel in pairs in opposite directions to each other. Two of these pistons, 5 and 6, are connected to the main shaft 12 13 14 15 16 by means of pitmen 7 8, which act upon the crank 14, and the two others, 3 and 4, are connected by pitmen 9 and 10 to cranks 13 and 15, opposite the crank 14, or at an angle of one hundred and eighty degrees thereto, said pitmen 9 and 10 being united by a transverse bar 11.

17 is the exhaust-valve of cylinder 1, Fig. 3. 18 is the aspirating-valve of said cylinder, Figs. 1 and 3, and 19 is the aspirating-valve of cylinder 2, Fig. 1. The two valves 18 and 19 aspirate air into a chamber 30, Figs. 1 and 2, which communicates by means of a valve 20 with an air-pipe 28. Said air-chamber communicates also, first, with a conduit 29, through which the gas or other explosive mixtures are admitted, and, second, with a conduit 27, which communicates through a port 26 with the air-pump 23.

All of the valves are operated by cams keyed on the two shafts 21 and 22, which revolve at half the speed of the main shaft. The compression cylinder or pump 23, Fig. 2, is inclined at an angle of forty-five degrees, more or less, to the cylinders 1 and 2. Its piston 24 is moved by a pitman 25, which is connected to the middle part of the crank 14 of the main shaft. (Omitted in Figs. 3 and 4 for the sake of clearness.)

The compression-cylinder is connected, first, through port 26 with conduit 27, as already stated, said port being adapted to close at a predetermined period when the piston 24 is moved; second, by means of the opening 33 with the conduit 31 32 in the piston 24; said port registering at a given moment with said conduit and being connected by a suitable pipe to a coal-oil pulverizer, as indicated in Fig. 2 by dotted lines, and, third, with an aspirating-valve 34.

Having described its principal parts, I shall now explain the operation of the engine. When the main shaft rotates, the pistons 3 and 4 move in an opposite direction to the pistons 5 and 6 whether receding from or approaching the same. The throw of the crank 14 is made greater than that of the cranks 13 and 15, so that the pistons 5 and 6 travel with a greater speed than the pistons 3 and 4. It results therefrom that the inertia of the mass of said pistons 5 and 6 and their pitmen 7 and 8 being smaller than the mass of the pistons 3 and 4 pitmen 9 and 10 and transverse bar 11 will easily compensate the inertia of the latter, and thus the engine is equilibrated. The explosions alternate in each cylinder in such a manner that a motive impulse is effected at each revolution.

The working phases are the following:

	Stroke of pistons.	Cylinder 1.	Cylinder 2.
First revolution	Divergent	Aspiration	Explosion and expansion.
	Convergent.	Compression	Exhaust.
Second revolution	Divergent	Explosion and expansion.	Aspiration.
	Convergent.	Exhaust	Compression.

At each revolution of the main shaft in the direction of the arrow, Fig. 2, the piston 24 will drive a certain quantity of air into the chamber 30. Simultaneously the valve 20 closes and cuts off communication with the outer atmosphere. At this moment exhaust commences in one or the other cylinder. Under the action of a cam on shaft 21 one of the valves 18 or 19 (the one corresponding with the cylinder under exhaust) will be lifted and will allow the air furnished by the pump to pass through, which drives before it through the exhaust-valve the gases accumulated between the pistons. At the end of the stroke of the pistons, when they are convergent or nearing each other—that is to say, at the end of the exhaust—the piston 24 in continuing its stroke closes the conduit 26, and the air is then compressed in the pump. This air at a predetermined moment escapes through conduit 32, when the latter registers with opening 33, so that the air is in part discharged into a pulverizer 37, from which the liquid is forced through conduit 29 into the chamber 30 at the moment when one of the cylinders 1 or 2 commences its aspirating period. At this moment the valve 20 opens and the outer atmospheric air entering through opening 28 is passed into the cylinder mixed with carbureted air. The aspiration of the pump 23 at first draws in air through valve 34 and then aspirates the same through the conduits 26 and 27.

The port 33 may be dispensed with when a liquid fuel is not used—for instance, when gas is employed as the explosive element. In this instance the conduits 31 32 and valve 34 would also be superfluous. In this case the piston 24, having closed the port 26, compresses air in the pump-cylinder, which serves at the back stroke to restore the power consumed by said compression.

Having now described my invention, I claim—

1. In an explosive-engine such as described the combination of a main shaft, two cylinders, the pistons therein, working in pairs in opposite directions to each other and imparting motion to the main shaft through suitable intermediate mechanism, means for supplying an explosive mixture to the cylinders at predetermined intervals, and a compression-cylinder operated by said main shaft and adapted to displace alternately the gases in one and the other cylinder, substantially as described.

2. A four-phase explosive-engine embodying in its organization two cylinders, the pistons 3, 5, 4, 6 working therein, a main shaft, its crank 14 with counter-cranks 13 and 15, at an angle of one hundred and eighty degrees thereto, pitmen 7 and 8 connecting crank 14 with pistons 5, 6, a transverse bar 11 in operative conjunction with pistons 3, 4, and pitmen 9, 10 connecting said bar with cranks 13, 15, in combination with means for supplying an explosive mixture to the cylinders at predetermined intervals, a compression-cylinder deriving motion from the main shaft through suitable intermediate means and adapted to displace the gases in said cylinders alternately and consecutively, and aspirating-valves for said cylinders, substantially as and for the purpose specified.

3. A four-phase explosive-engine embodying in its organization a main shaft, two cylinders, their pistons working in pairs and imparting successive motive impulses to said shaft through suitable intermediate mechanism, and means for supplying an explosive mixture to said cylinders, in combination with a compression-cylinder operated by said main shaft and adapted to displace the gases in said cylinders alternately and consecutively, an auxiliary shaft and a series of aspirating-valves operated thereby and communicating with the compression-cylinder and with the engine-cylinders, substantially as specified.

4. A four-phase explosive-engine embodying in its organization, a main shaft, two cylinders, their pistons working in pairs and imparting successive motive impulses to said shaft through suitable intermediate mechanism, and means for supplying an explosive mixture to said cylinders, in combination with a compression-cylinder operated by said main shaft and adapted at each compression to displace the gases in said cylinders, alternately and consecutively, auxiliary shafts, cams mounted thereon, and independently-operated aspirating-valves with their pistons extending downwardly and provided with a link or arm pivoted to a stationary part of the engine and adapted to be periodically struck by said cams, substantially as described and for the purpose set forth.

5. A four-phase explosive-engine embodying in its organization, a main shaft, two parallel cylinders, their pistons working in pairs and imparting separate and successive motive impulses to said shaft through suitable intermediate mechanism, and means for supplying an explosive mixture to said cylinders, in combination with a compression-cylinder operated by said main shaft and adapted at each compression to displace the gases in said cylinders, alternately and consecutively, auxiliary shafts, cams mounted thereon, an air-chamber, independently-operated aspirating-valves adapted to aspirate air therein, a conduit connecting said air-chamber with the compression-cylinder, and a pulverizer in communication with said air-chamber, said valves having their pistons extended down-

wardly and provided with a link or arm pivoted to a stationary part of the engine and adapted to be periodically struck by said cams, substantially as described and for the purpose set forth.

6. A four-phase explosive-engine embodying in its organization, a main shaft, two parallel cylinders, their pistons working in pairs and imparting separate and successive motive impulses to said shaft through suitable intermediate mechanism, and means for supplying an explosive mixture to said cylinders, in combination with a compression-cylinder, operated by said main shaft and adapted, at each compression, to displace the gases in said cylinders, alternately and consecutively, auxiliary shafts, adapted to rotate at half the speed of the main shaft, cams mounted thereon at different angles to each other, an air-chamber, independently-operating aspirating-valves adapted to aspirate air therein, a conduit connecting said air-chamber with the compression-cylinder, and a pulverizer in communication with said air-chamber, said valves having their pistons extended downwardly and provided with a link or arm pivoted to a stationary part of the engine and adapted to be periodically struck by said cams, substantially as described and for the purpose set forth.

7. A four-phase explosive-engine embodying in its organization, a main shaft, two parallel cylinders, their pistons working in pairs and at different speeds and imparting separate and successive motive impulses to said shaft through suitable intermediate mechanism adapted to compensate said difference in speed, and means for supplying an explosive mixture to said cylinders, in combination with a compression-cylinder, operated by said main shaft and adapted at each compression, to displace the gases in said cylinders, alternately and consecutively, auxiliary shafts adapted to rotate at half the speed of the main shaft, cams mounted thereon at different angles to each other, an air-chamber, independently-operated aspirating-valves adapted to aspirate air therein, a conduit connecting said air-chamber with the compression-cylinder, and a pulverizer in communication with said air-chamber, said valves having their pistons extended downwardly and provided with a link or arm pivoted to a stationary part of the engine and adapted to be periodically struck by said cams, substantially as described and for the purpose set forth.

8. A four-phase explosive-engine embodying in its organization, a main shaft, two parallel cylinders, their pistons working in pairs and at different speeds and imparting separate and successive motive impulses to said shaft through suitable intermediate mechanism adapted to compensate said difference in speed, and means for supplying an explosive mixture to said cylinders, in combination with a compression-cylinder, a pulverizer communicating therewith at periodic intervals, an air-chamber, conduits connecting said air-chamber with the pulverizer and with the compression-cylinder, auxiliary shafts, adapted to rotate at half the speed of the main shaft, cams mounted thereon at different angles to each other, and independently-operated aspirating-valves, adapted to aspirate air into said air-chamber and having their pistons extended downwardly and provided with a link or arm pivoted to a stationary part of the engine and adapted to be periodically struck by said cams, substantially as described and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

EUGÈNE BRILLIÉ.

Witnesses:
GUSTAVE GOBRON,
EDWARD P. MACLEAN.