No. 745,422. PATENTED DEC. 1, 1903.

C. R. DAELLENBACH.

EXPLOSIVE ENGINE.

APPLICATION FILED SEPT. 29, 1902.

NO MODEL.

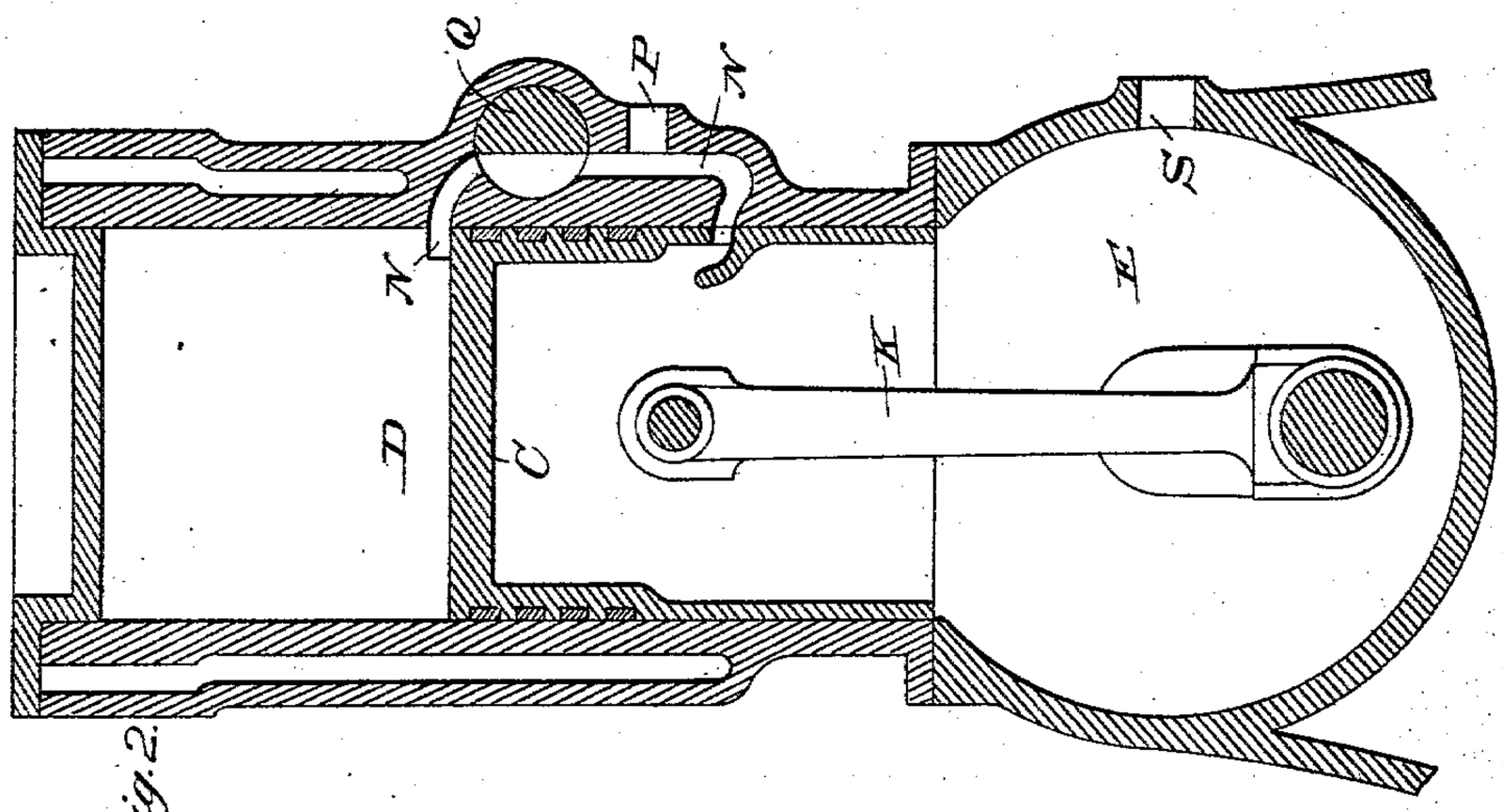

Fig. 2.

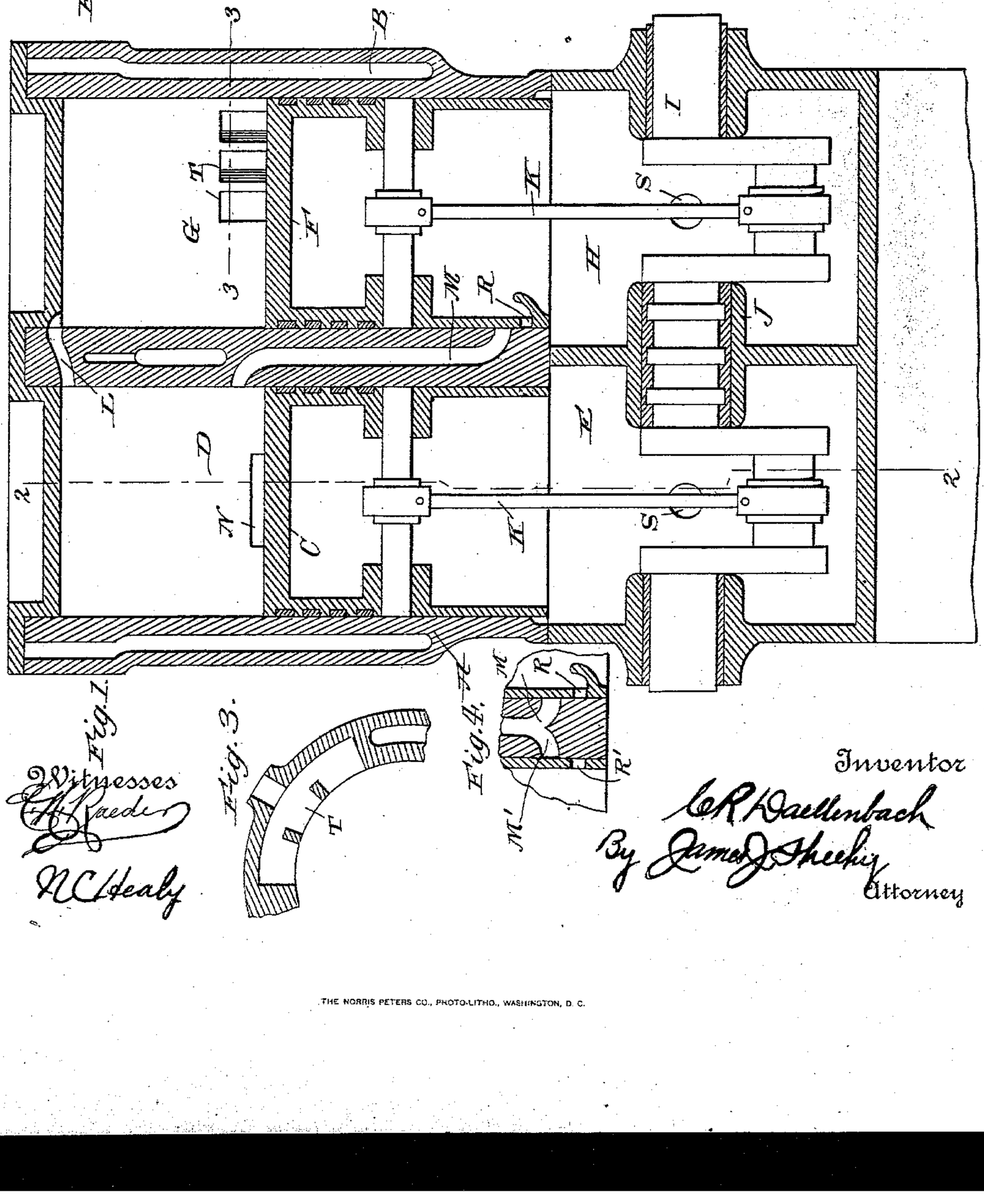

Fig. 1.

Fig. 3.

Fig. 4.

Witnesses
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No. 745,422. Patented December 1, 1903.

UNITED STATES PATENT OFFICE.

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EXPLOSIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 745,422, dated December 1, 1903.

Application filed September 29, 1902. Serial No. 125,341. (No model.)

To all whom it may concern:

Be it known that I, CHARLES R. DAELLENBACH, a citizen of the United States, residing at Parkgate, in the county of Lawrence and State of Pennsylvania, have invented new and useful Improvements in Explosive-Engines, of which the following is a specification.

My invention relates to improvements in explosive-engines, and has for its general object to provide a plural-cylinder explosive-engine which is reliable in operation and is calculated to develop great power in proportion to the amount of fuel consumed.

The invention will be fully understood from the following description and claims when taken in conjunction with the accompanying drawings, in which—

Figure 1 is a vertical section of a plural-cylinder engine constituting one embodiment of my invention; Fig. 2, a section taken at right angles to Fig. 1 and in the plane indicated by the broken line 2 2 of said figure; Fig. 3, a detailed section taken in the plane indicated by the broken line 3 3 of Fig. 1, and Fig. 4 a detailed section of a modification.

Similar letters of reference designate corresponding parts in Figs. 1 to 3 of the drawings.

The illustrated embodiment of my invention comprises two cylinders A B, arranged side by side. The cylinder A is divided by a piston C into chambers D and E, and the cylinder B by a piston F into chambers G and H. The pistons are connected so as to move in concert or synchronously, preferably through the medium of a crank-shaft I, journaled in the cylinders and also in a sleeve J, interposed between the same, and pitmen K, interposed between the cranks of the shaft and the pistons.

Interposed between and connecting the chambers D G, which are the explosion or expansion chambers of the engine, is a passage L, the end of which adjacent to the chamber G is preferably disposed downwardly, as shown, in order to cause explosive mixture to take a downward course in said chamber as it is discharged from the passage. A passage M is also interposed between the chamber D of the cylinder A and the chamber H of cylinder B, while in communication with the said chamber D is a passage N, Fig. 2, designed to supply the same with fuel or explosive mixture under pressure. This latter passage may lead from any suitable source of supply without involving a departure from the scope of my invention. I prefer, however, to interpose it between the chambers E and D and provide it with a port P, designed to be connected with a source of gas or gasolene supply. I also prefer to provide it with a suitable regulating-valve Q, located at a point intermediate of the port P and the chamber D.

The end of the passage M which communicates with the chamber H of cylinder B is controlled by the piston F, while the end of the said passage which communicates with the chamber D of cylinder A is controlled by the piston C, as is also the fuel-supply passage N. The pistons C F are preferably hollow, as illustrated, and the latter is preferably, although not essentially, provided with a port R, designed to register with the lower end of the passage M.

The chambers E H of the cylinders A B are provided with ports S for the entry of air and the chamber G of the latter cylinder with one or more exhaust-ports T.

The operation of my improved engine is as follows: When the pistons C F are nearing the end of their outward stroke, communication is established between the passage M and the chambers H and D, and in consequence air compressed in the chamber H passes to the chamber D, with the result that the products of combustion of the previous explosion are forced from said chamber D through the passage L into the chamber G and from thence through the exhaust-ports T, which are then open. From this it follows that the engine is able to thoroughly clear itself of the products of combustion subsequent to each explosion, which is advantageous, since the capacity of the engine is increased and a certainty of the explosions taking place at the proper time is attained. When the pistons reach the end of their outward stroke, the passage M is closed to the chamber H and communication is established between the

passage N and the chambers E and D, with the result that the chambers D and G are supplied with fuel or explosive mixture under pressure. At this time the pistons C F move inwardly and communication between the passage N and chamber D, communication between the passage M and the chamber D, and communication between the ports T and the chamber G are closed in the order named, and the compression rapidly increases until the crank-pins reach the dead-center, when the explosive mixture will be ignited, the pistons forced outwardly, and the operation described repeated. The pistons operate on their inward strokes to draw air into the chambers E H through the ports S, which are preferably controlled by non-return valves, (not shown,) while on their outward stroke said pistons operate to compress the air in said chambers.

When it is not desired to depend on compression of the fuel to ignite the same, a hot tube, electric sparker, or other means may be employed for the purpose without involving a departure from the scope of my invention.

Incident to the operation of the engine it will be observed that precedent to each explosion the expansion-chambers are cleared of all spent gases or products of combustion and then filled with a pure explosive mixture, and subsequent to each explosion the gases are expanded to a greater extent than in other engines. The thorough clearing of the expansion-chambers of spent gases or products of combustion, as above described, is materially advantageous, because it precludes back or premature explosions and assures the expansion-chambers containing pure explosive mixture above at the time the explosion takes place, which contributes materially to the efficiency of the engine. It will also be observed that the two pistons offer a great amount of surface to the expanding gases at the moment of the explosion, with the result that a powerful movement is transmitted to the crank-shaft at the time when the pressure is maximum and the value of the expansion the greatest.

While I prefer to sweep the products of combustion from the chambers D G with a blast of compressed air from the chamber H, I desire it distinctly understood that a blast of compressed air or other fluid from any other source of supply may be used for the purpose without involving a departure from the scope of my invention.

The operation described in the foregoing is the operation of the construction shown in Figs. 1, 2, and 3 of the drawings.

When a branch passage M′ is provided between the lower end of the passage M and the chamber E and a port R′ is provided in the piston C, as shown in Fig. 4, the operation will be the same as that described, except that when the ports R R′ are registered with the branches at the lower end of the passage M and also when the pistons are above said branches the chambers E H will be in communication with each other. In virtue of this it will be observed that but one port S controlled by a non-return valve is necessary to supply both chambers E H with air. I prefer, however, when the branch M′ and port R′ are employed to employ both ports S and use some means to temporarily close the one connected to the chamber E. Then in the event of the non-return valve controlling the other port S becoming choked or disabled the port S connected to the chamber E may be opened to said chamber. I also desire it understood that I may when desired provide a valve or cut-off (not shown) in the branch M′ for controlling communication between the passage M and the chamber E.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination in an explosive-engine, of two cylinders, and pistons arranged therein, and connected together; one of the cylinders being divided by its piston into an expansion-chamber and a compression-chamber, and the other cylinder having an expansion-chamber between its head and piston, an exhaust-passage connected with the expansion-chamber of the last-mentioned cylinder, a passage connecting the two expansion-chambers, a passage intermediate of the expansion-chamber and compression-chamber of the first-mentioned cylinder, having a port for the admission of gas or gasolene, and a passage connected with the expansion-chamber of the first-mentioned cylinder for supplying said chamber with fluid-pressure.

2. The combination in an explosive-engine, of two cylinders, and pistons therein; the cylinders being divided by the pistons into expansion-chambers and compression-chambers, and the pistons being connected together so as to move in concert, a passage intermediate of the expansion-chamber and the compression-chamber of one cylinder, a port for supplying gas or gasolene to said passage, a passage intermediate of the expansion-chamber of said cylinder and the compression-chamber of the other cylinder, an exhaust-passage connected with the expansion-chamber of the latter cylinder, and a passage connecting the expansion-chambers of the two cylinders.

3. The combination in an explosive-engine, of two cylinders, and pistons therein; the cylinders being divided by the pistons into expansion-chambers and compression-chambers, and the pistons being connected together so as to move in concert, a passage intermediate of the expansion-chamber and the compression-chamber of one cylinder, and having its ends arranged to be overrun by the piston therein, a port for supplying gas or gasolene to said passage, a passage intermediate of the expansion-chamber of said cylinder and the compression-chamber of the other cylinder, and having its ends arranged to be

overrun by the pistons of the two cylinders, a passage intermediate of the expansion-chambers of the two cylinders, and an exhaust-passage connected with the expansion-chamber of the second-mentioned cylinder.

4. The combination in an explosive-engine, of two cylinders, and pistons therein; the cylinders being divided by the pistons into expansion-chambers and compression-chambers, the expansion-chambers being in communication, and one expansion-chamber being connected with the compression-chambers by separate passages controlled by the pistons, the said passages communicating directly with the expansion-chamber, a connection between the pistons whereby they are caused to move together, an exhaust-port leading directly from one expansion-chamber, one or more air-inlet ports, and a gas or gasolene inlet port communicating directly with one of the passages between the compression-chambers and one expansion-chamber.

5. The combination in an explosive-engine, of two cylinders, and pistons therein; the cylinders being divided by the pistons into expansion-chambers and compression-chambers, and the pistons being connected together so as to move synchronously or in concert, a passage intermediate of the expansion-chamber and the compression-chamber of one cylinder, means for supplying gas or gasolene to said passage, a passage connected with the expansion-chamber of said cylinder and also connected with the compression-chambers of both cylinders, an exhaust-passage connected with one expansion-chamber, a passage connecting the expansion-chambers of the two cylinders, and means for supplying air to one or both of the compression-chambers.

6. In an explosion-engine, the combination with two cylinders, provided with a passage connecting the clearance-spaces thereof, one of said cylinders being provided with a fuel-inlet port and the other with an exhaust-port, pistons in said cylinders, connected to move synchronously, and adapted to control said inlet and exhaust ports, of two auxiliary compression-chambers, a connection from the cylinder provided with said inlet-port, to one of said chambers, an independent connection from said cylinder to the other compression-chamber, and means for supplying air to said compression-chambers, substantially as described.

7. In an explosive-engine, the combination with two cylinders, provided with a passage connecting their clearance-spaces, one of said cylinders being provided with a fuel-inlet port and the other with an exhaust-port, of two auxiliary compressing-chambers, a connection from one of said chambers opening into the cylinder provided with the said inlet-port, a separate connection from the other compression-chamber opening into said cylinder, means for supplying air to said compression-chambers and pistons in said cylinders connected to move synchronously and adapted to control said inlet-port, the openings communicating with said connections, and said exhaust-port, substantially as described.

8. In an explosive-engine, the combination with two cylinders provided with a passage connecting their clearance-spaces, one cylinder being provided with a fuel-inlet port, and the other with an exhaust-port, a connection from the explosion-chamber of the cylinder provided with said inlet-port, to the other cylinder on rear side of the piston thereof, pistons in said cylinders connected to move synchronously and adapted to control said ports and the said connection, of two auxiliary compression-chambers, communicating with the said cylinders on the rear sides of the said pistons, a connection between the cylinder provided with the said inlet-port; and its respective compression-cylinder, and means for supplying air to both of said compression-chambers, substantially as described.

9. In an explosive-engine, the combination with two cylinders provided with a passage connecting their clearance-spaces, one cylinder being provided with a fuel-inlet port and the other with an exhaust-port, two auxiliary compression-chambers, each communicating with one of said cylinders on the rear side of the piston, a connection from one of said chambers to the explosion end of the cylinder provided with the fuel-inlet, a connection between the two cylinders, having an opening in the explosion end of the cylinder provided with the fuel-inlet port, and an opening in the rear end of the other cylinder, two pistons in said cylinders connected to move synchronously and adapted to control the said openings in said cylinders and said inlet and exhaust ports, and means for supplying air to said compressing-chambers, substantially as described.

10. In an explosive-engine, the combination with two cylinders provided with a passage connecting their clearance-spaces, one of said cylinders being provided with a fuel-inlet port and the other with an exhaust-port, an auxiliary compression-chamber for each cylinder formed on the rear side of the piston thereof, a connection between the cylinder provided with said inlet-port and one of said compression-chambers, a separate connection from said cylinder to the other of said compression-chambers, pistons in said cylinders connected to move synchronously and provided with ports adapted to register with openings in said cylinders forming part of said connections, said pistons being adapted to control by their movements said ports and connections, substantially as described.

11. In an explosive-engine, the combination with two cylinders provided with a passage connecting their clearance-spaces, one of said cylinders being provided with a fuel-inlet port and the other with an exhaust-port, an auxiliary compression-chamber for each cylinder formed on the rear side of the piston thereof,

a connection between the cylinder provided with said inlet-port and one of said compression-chambers, a separate connection from said cylinder to the other of said compression-chambers, pistons in said cylinders connected to move synchronously and provided with ports adapted to register with openings in said cylinders forming part of said connections, said pistons being adapted to control by their movements said ports and connections, and deflectors in said pistons adjacent to said ports, substantially as described.

12. In an explosive-engine, the combination with two cylinders provided with a passage connecting the clearance-spaces thereof, one of said cylinders being provided with a fuel-inlet port and with an auxiliary port having a lead over the inlet-port, the other cylinder being provided with an exhaust-port having a lead over the said auxiliary port an auxiliary compression-chamber for each cylinder, pistons in said cylinders separating the explosion-chambers thereof from their respective auxiliary compression-chambers, said pistons being connected to move synchronously, a connection between said inlet-port and one of said compression-chambers, a connection between said auxiliary port and the other compression-chamber and means for supplying air to said compression-chambers, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

CHARLES R. DAELLENBACH.

Witnesses:

T. E. TURPIN,

N. C. HEALY.