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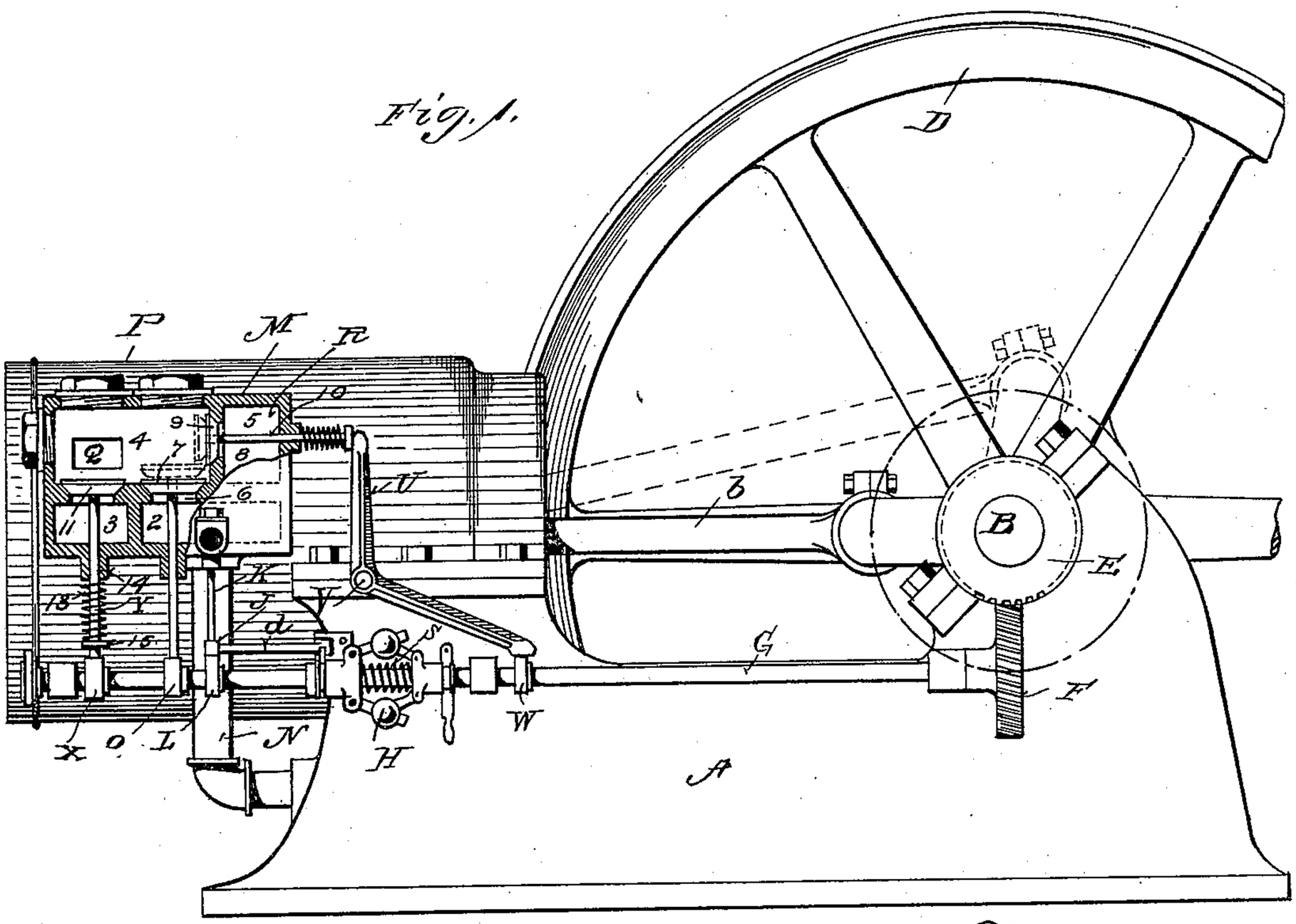
T. C. KENNEDY.

EXPLOSIVE ENGINE.

(Application filed Apr. 8, 1898.)

(No Model.)

Fig. 1.



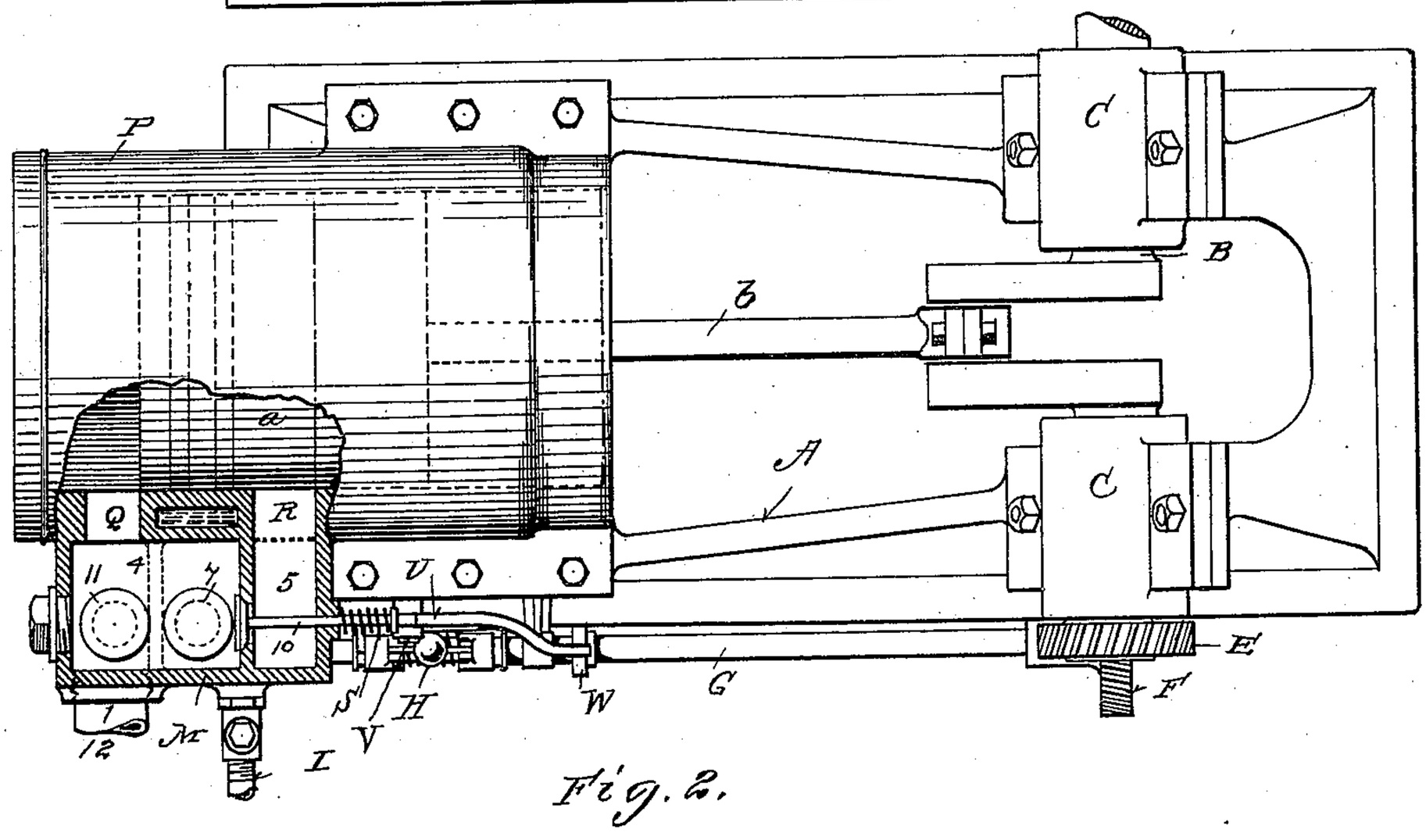


Fig. 2.

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EXPLOSIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 621,572, dated March 21, 1899.

Application filed April 8, 1898. Serial No. 676,871. (No model.)

To all whom it may concern:

Be it known that I, THOMAS C. KENNEDY, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Gas-Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to certain new and useful improvements in gas-engines.

My invention has reference to a particular construction of gas-engine chest whereby two explosive charges may be drawn from a common supply and completely separated from each other, such charges being adapted to be exploded at different times, the explosion of the second charge being regulated by the position of the piston within the cylinder, thus producing a plurality of working explosions one after the other as the piston travels outward on its working stroke.

My invention also relates to details of construction hereinafter appearing, and particularly pointed out in the claims.

In the accompanying drawings, on which like reference letters and numerals indicate corresponding parts, Figure 1 is a side elevation of a gas-engine embodying my invention with my improved chest partly in section, and Fig. 2 is a plan view with parts in section.

The letter A represents a suitable base, in which is mounted a crank-shaft B in suitable bearings C. Upon one end of the shaft B is keyed or otherwise secured a fly-wheel D and upon the other end is secured a driving gear-wheel E, meshing with a driven gear F, carried by a shaft G. Upon this shaft G is mounted a governor mechanism H. This governor mechanism is adapted to regulate the supply of gasolene or other volatile liquid supplied through the pipe I by means of a hit-and-miss device, such as shown at J, and which engages with the stem K of the valve in the pipe I when the speed of the engine is such that more gasolene is required. When the speed of the engine increases, the governor mechanism causes the hit-and-miss device to be thrown out of contact with the stem K, and consequently the stem will not be raised by a cam L, also mounted on the shaft G. Thus the supply of gasolene will be cut off. Thus far I have described no new features in the art of gas-engine construction.

Referring now to the construction of my improved chest, as shown at M, it will be seen that it is divided into four or more separate chambers 2, 3, 4, and 5. The chamber 2 constitutes a mixing-chamber for the mixing of the gasolene and air, the latter being conducted to said chamber through an air-pipe N. An orifice 6 communicates with the chamber 4, which I term the "primary" explosive-chamber, and is adapted to be opened and closed by a valve 7, operated by a suitable cam O, carried by the rotatable shaft G. When the valve 7 is raised by the cam O, the mixture of gasolene and air, which I term the "explosive" mixture passes into the primary explosive-chamber 4. From this chamber it passes into the cylinder P through the port Q and also into the chamber 5, which I term the "auxiliary" explosive-chamber through the orifice 8, which is opened and closed by the valve 9, as will presently appear. A port R connects said chamber 5 with the interior of the cylinder P for the purpose hereinafter appearing.

Referring now to the mechanism for operating the valve 9 at the proper time, it will be seen that a valve-stem 10 extends beyond the chest M and has mounted upon it a spring S, which normally acts to seat said valve. One arm of a bell-crank lever U engages with said stem and the other arm of said bell-crank lever engages with a cam W, carried by the shaft G, which acts to operate the bell-crank lever to cause it to open the valve 9 at the proper time. This bell-crank lever is pivoted on a stud V, carried by the engine-bed. When the valve 7 is opened, it will be understood that the valve 9 is also opened, and hence the explosive mixture passing from the chamber 2 into the chamber 4 will also enter the chamber 5. This occurs when the piston *a* is making its outstroke, and consequently the explosive mixture will also pass into the engine-cylinder through the ports Q and R. On the return stroke of the piston the valve 7 reseats, while the valve 9 remains open. Thus the explosive mixture in the chambers 4 and 5 and in the cylinder will be compressed a like or substantially a like amount. When it has received the proper

amount of compression, the valve 9 is seated by the spring S and an explosion is produced within the cylinder and chamber 4 by any suitable device, such as an ordinary electric igniter. (Not shown in the drawings.) This explosion forces the piston toward the other end of the cylinder, and as it opens the port R the compressed explosive mixture in the chamber 5 will be exploded by reason of its coming in contact with the highly-heated gases within the cylinder or by an electric spark, if desired, and another impulse will be given to the piston, which will still further augment the power of the engine. On the return stroke of the piston the products of combustion will be discharged through the exhaust-valve 11, which will be opened at the proper time by the cam X on the shaft G operating on the stem Y to unseat said valve. These products of combustion will pass into the chamber 3, which may be termed the "exhaust-chamber," and out through the discharge-pipe 12. During the remainder of the cycle of the engine this exhaust-valve is held seated by any suitable means, such as by a spring 13, which is interposed between the boss 14, extending from the chest M, and a collar 15, secured to the valve-stem Y.

The particular feature of my invention consists in dividing the chest into two divisions and in providing the valve-controlled opening between these two divisions and a port communicating with the interior of the engine-cylinder from each of said divisions or chambers, the valve acting to close the opening between said chambers before an explosion occurs in the primary chamber.

The piston *a*, it will be understood, is connected with the crank-axle B by an ordinary crank-rod *b* in the usual manner.

With my invention I am enabled to produce two explosive impulses on the piston as it moves outward on its working stroke without any danger of exploding the explosive mixture within the chambers 4 and 5 at the same time. In all engines of this character heretofore invented where more than one explosion was made to act on the piston during its working stroke the chambers containing the explosive mixture have been in communication with each other, and consequently an explosion in one chamber usually produced an explosion in the adjoining chamber simultaneous with it, which completely destroyed the effect sought to be obtained. I therefore wish to be understood as laying broad claim to a chest having more than one chamber for receiving the explosive mixture, each of which communicates through suitable ports with the interior of the engine-cylinder and which have communication with each other and are entirely cut off from each other at predetermined intervals.

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

1. In a gas-engine, the combination with an engine-cylinder, of a chest having a plurality of chambers located therein and a gas-admission valve communicating therewith, each of said chambers communicating with said engine-cylinder and with each other, and means for regulating the time of such communication of said chambers with each other.

2. In a gas-engine, the combination with an engine-cylinder, of a chest having a plurality of chambers located therein, said chambers each having a port communicating with the interior of said cylinder, a valve between said chambers, a rock-shaft connected with said valve at one end and with an operating-cam at its other end adapted to operate said valve whereby the communication between said chambers may be established and cut off, and means for admitting the explosive mixture to said chest.

3. In a gas-engine, the combination with an engine-cylinder, of a chest connected thereto, said chest having two chambers each of which communicates with said cylinder and with each other, a valve-stem having a valve located thereon, a bell-crank lever connected with said stem at one end and operated by a cam at its other end and adapted to unseat said valve whereby said chambers may communicate with each other, and a spring adapted to seat said valve whereby communication between said chambers is cut off, and means for admitting the explosive mixture to said chest.

4. In a gas-engine, the combination with an engine-cylinder, of a chest connected therewith, an inlet and an exhaust valve in said chest, a partition located therein and dividing said chest into two chambers, said partition having a hole or opening therein, a valve adapted to open and close the opening in said partition, each of said chambers having a port communicating with the interior of said cylinder.

5. In a gas-engine, the combination with an engine-cylinder, of a chest connected therewith and having a charge-admission-valve opening therein, said chest being divided by a partition to form two chambers therein, one of which chambers is in advance of the other, and each having a port or opening communicating with the interior of said cylinder, one of which ports is adapted to be opened and closed by the cylinder-piston, a valve between said chambers adapted to be opened when the explosive mixture is entering the chest and to be closed before an explosion takes place in each of said chambers whereby when an explosion occurs in one chamber it will not affect the explosive mixture in the other chamber until the latter's port, communicating with the cylinder is uncovered by the piston.

6. In a gas-engine, the combination with an engine-cylinder, a chest connected therewith, having a mixing-chamber, an exhaust-chamber and a primary and a secondary explosive-chamber located therein, a valve between said mixing-chamber and said primary explosive-

chamber, another valve adapted to open and close an opening between said primary explosive-chamber and said secondary explosive-chamber, means for closing the valve between said explosive-chambers before an explosion occurs in said primary explosive-chamber, said primary and secondary explosive-chambers each having a port communicating with said cylinder, the port in the secondary explosive-chamber adapted to be opened and closed by the piston as it reciprocates in said cylinder, and an exhaust-valve opening between the primary explosive-chamber and said exhaust-chamber and adapted to be operated to permit the exhaust products to pass into said exhaust-chamber, substantially as shown and described.

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

THOMAS C. KENNEDY.

Witnesses:
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