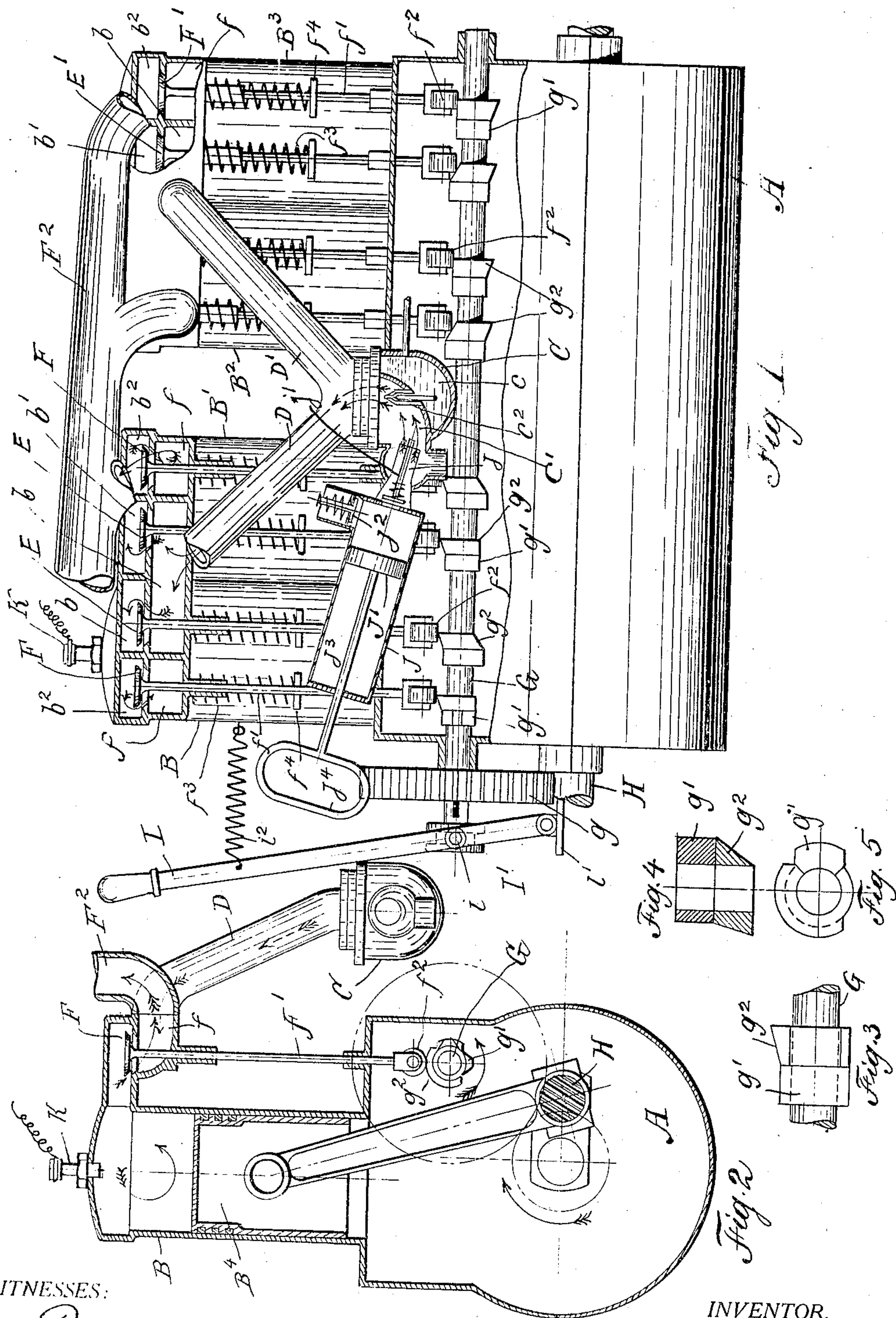


J. ZAGORA.
STARTING DEVICE FOR EXPLOSIVE ENGINES.
APPLICATION FILED MAR. 7, 1908.

920,515.

Patented May 4, 1909.



WITNESSES:
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STARTING DEVICE FOR EXPLOSIVE-ENGINES

No. 920,515.

Specification of Letters Patent.

Patented May 4, 1909.

Application filed March 7, 1908. Serial No. 419,657.

To all whom it may concern:

Be it known that I, JOSEPH ZAGORA, a citizen of the United States, and residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Starting Devices for Explosive-Engines, of which the following is a complete specification.

This invention relates to improvements in starting devices for explosive engines and more particularly to a starting device of that class adapted to deliver the initial charge of the explosive mixture to the cylinder independently of the piston action:

One of the objects of this invention is to provide a device particularly adapted for use with explosive engines for motor vehicles and by means of which the engine may be started without necessitating the operator leaving his seat.

It is a further object of the invention to provide a device by means of which the intake and exhaust valves of the cylinder or cylinders which it is desired to charge may be manually opened during the priming operation and then closed to confine the mixture in the cylinder ready for the spark.

Another object of the invention is to provide a device by means of which air may be forced through the carbureter of a gasoline or oil engine, or past the gas inlet of a gas engine, and convey the explosive fluid to the cylinder while the engine piston is at rest.

On the drawings: Figure 1 is a sectional, side elevation of an explosive engine provided with a starting device embodying my invention. Fig. 2 is a vertical, transverse section of the same. Fig. 3 is a fragmentary side elevation of the valve shaft and pair of the valve operating cams. Fig. 4 is a longitudinal section of the cams. Fig. 5 is an end elevation of the cam.

As shown in said drawings: A indicates the crank case and B, B', B² and B³ the cylinders of a multiple cylinder explosive engine, though the starting device is equally adaptable for use with a single cylinder engine if preferred. Supported adjacent the engine in any preferred manner is the carbureter C, which may be of any preferred construction, and is provided with an oil chamber and an air chamber indicated by c and c' respectively. An oil or vapor outlet c² opens from the oil chamber into the air chamber and above the same are pipes D and D' opening

from the air chamber to the intake chambers b of said cylinders. Controlling the passages from the intake chambers b to the inlet ports b'—b' of said cylinders are the valves E and E', and controlling the outlet ports b² of said cylinders are the exhaust valves F and F' which open into the exhaust chambers f. Leading from said exhaust chambers f is the exhaust pipe F² adapted to carry off the products of combustion in the usual manner. Said valves E, E', F and F' are provided with valve stems f' which extend downwardly into the crank case A and are provided on their lower ends with rollers f². A coiled spring f³, which acts normally to hold the valves in closed position, is carried on each stem and engages at one end against the intake or exhaust chamber, as the case may be, and at its lower end engages against a cross pin f⁴ carried on the stem. A valve actuating shaft G is journaled in suitable bearings in said crank case and is provided on one end with a gear g which is splined thereon to permit the shaft to be moved longitudinally in its bearings. Said shaft G is driven from the crank shaft H by means of a gear, not shown, adapted to mesh with the gear g. On said shaft G are a plurality of cams g' adapted when the shaft is in operative position to engage the rollers f² and as the shaft is rotated to operate the valves. Adjacent each cam g' is a cam g² adapted, when the shaft is moved longitudinally, to open the valves of those cylinders in which the pistons are in power and compression positions, and for this purpose, where a multiple cylinder engine is used, said cams g² are so arranged with respect to the cams g' that when the pistons in two of the cylinders, as for instance B and B', are stopped in power and compression positions their valves will be opened by the longitudinal movement of the shaft, and when the pistons in the other cylinders are in exhaust and suction positions respectively their valves will be closed, as shown more clearly in Fig. 1. Any preferred means may be employed to move said shaft longitudinally when it is desired to start the engine, but as shown, a lever I is pivoted on a suitable support i' adjacent the engine, and is provided with a pin i which engages in a grooved pulley I' on the end of said shaft and acts to move the shaft longitudinally when the lever is operated, and a spring i², engaged to the lever and to the cyl-

inder B, acts to normally hold the shaft at the inner limit of its movement, with the cams g' in engagement with the rollers f^2 .

Any preferred means may be employed to force a mixture of air and explosive fluid under pressure into the cylinders which are to receive the charge, but as shown an air pump J is supported adjacent the carbureter and is provided with an outlet j projecting into the air chamber c' . An outlet valve j' controls said outlet and an inlet valve j^2 admits air to the pump. The piston J' is provided with a rod j^3 having a handle j^4 at its outer end in easy access to the operator.

The operation is as follows: When it is desired to start the engine the valve shaft is moved longitudinally to bring the cams g^2 beneath the rollers f^2 , thereby opening the valves of the cylinders whose pistons are in power and compression positions and closing the valves of the remaining cylinders. The pump is then operated thereby forcing a mixture of air and the explosive fluid into the open cylinders and forcing out any products of combustion that may have remained therein. When a sufficient charge has been placed in the cylinders the valve shaft is returned to operative position thereby closing said valves and the charge is ignited by any desired means, as by the manual operation of the sparking device K.

Obviously the device may be used with gas engines also and many details of construction may be varied without departing from the principles of my invention.

I claim as my invention:

1. In a device of the class described the combination with a plurality of cylinders each provided with an inlet and an exhaust port, of a carbureter having an air chamber therein, pipes leading from said air chamber to said inlet ports, a valve for each port, a

valve stem on each valve, a longitudinally movable, rotative shaft adjacent said stems, cams thereon adapted to normally operate said valves when the shaft is rotated, other cams on said shaft adapted when the shaft is moved longitudinally to open a part of said valves and close the remaining valves, means for moving said shaft longitudinally, and means adapted to force air into said air chamber and carry explosive mixture into the ports when held open by said cams.

2. In a device of the class described the combination with a crank case of a plurality of cylinders thereon, a piston in each cylinder, an inlet and an exhaust port for each cylinder, a valve for each port, a stem on each valve extending into said case, a roller on each stem, a rotative shaft journaled in said case adjacent said rollers, cams on said shaft adapted to engage said rollers and operate said valves in succession when the shaft is rotated, a cam adjacent each of the aforesaid cams, each arranged to open or close one of said valves when the shaft is idle, means adapted to adjust the shaft longitudinally and bring said last named cams into or out of operation with said rollers, a carbureter having an air chamber therein, pipes connecting said air chamber with the inlet ports, a gas inlet into said air chamber and means adapted to force an air blast past said inlet and carry explosive mixture to said inlet ports when said last named cams are in operative position.

In witness whereof I have hereunto subscribed my name in the presence of two witnesses.

JOSEPH ZAGORA.

Witnesses:

ROBT. KLOTZ,
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