E. CHAPMAN.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED OCT. 2, 1907.

936,409. Patented Oct. 12, 1909.

2 SHEETS—SHEET 1.

FIG. 2.

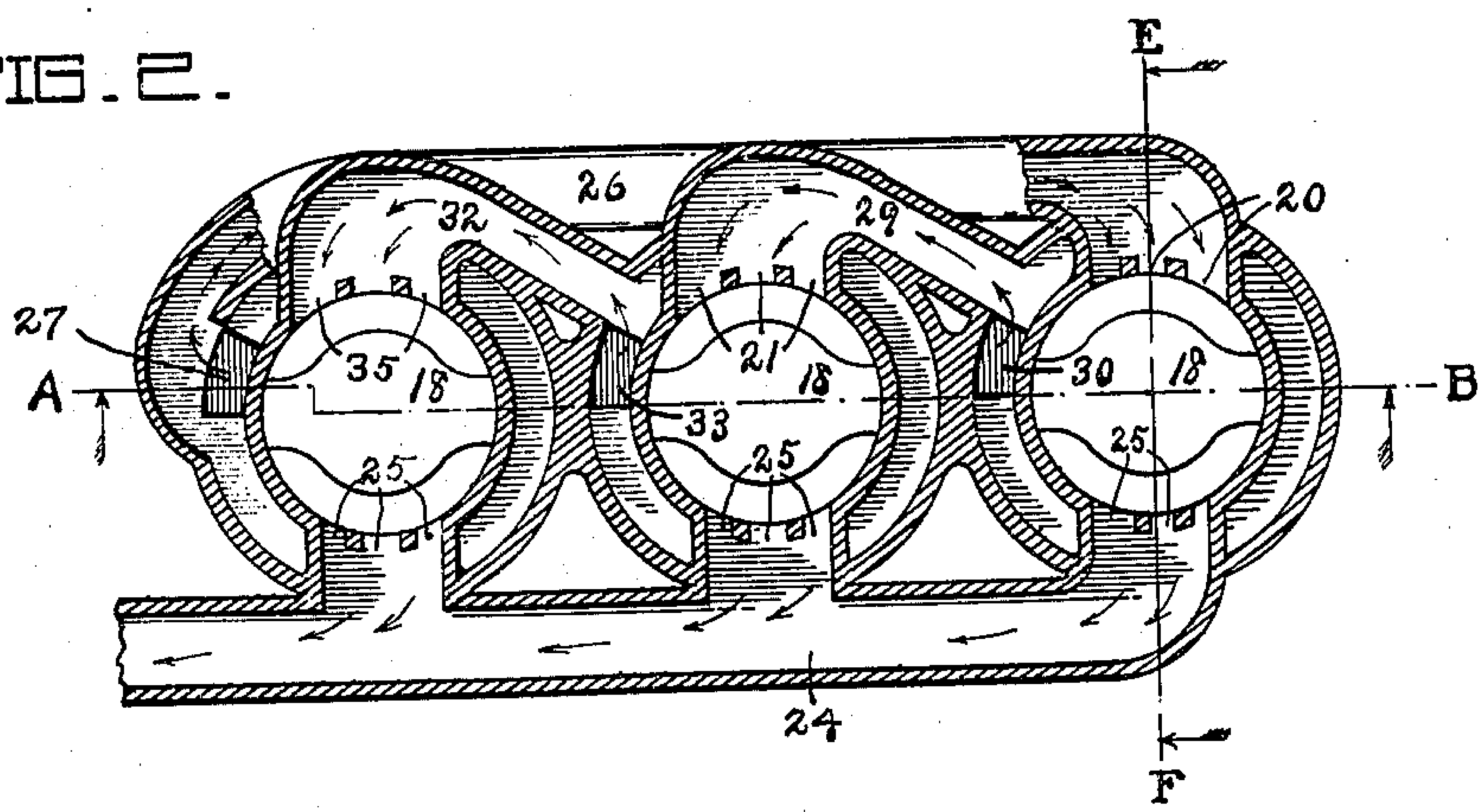
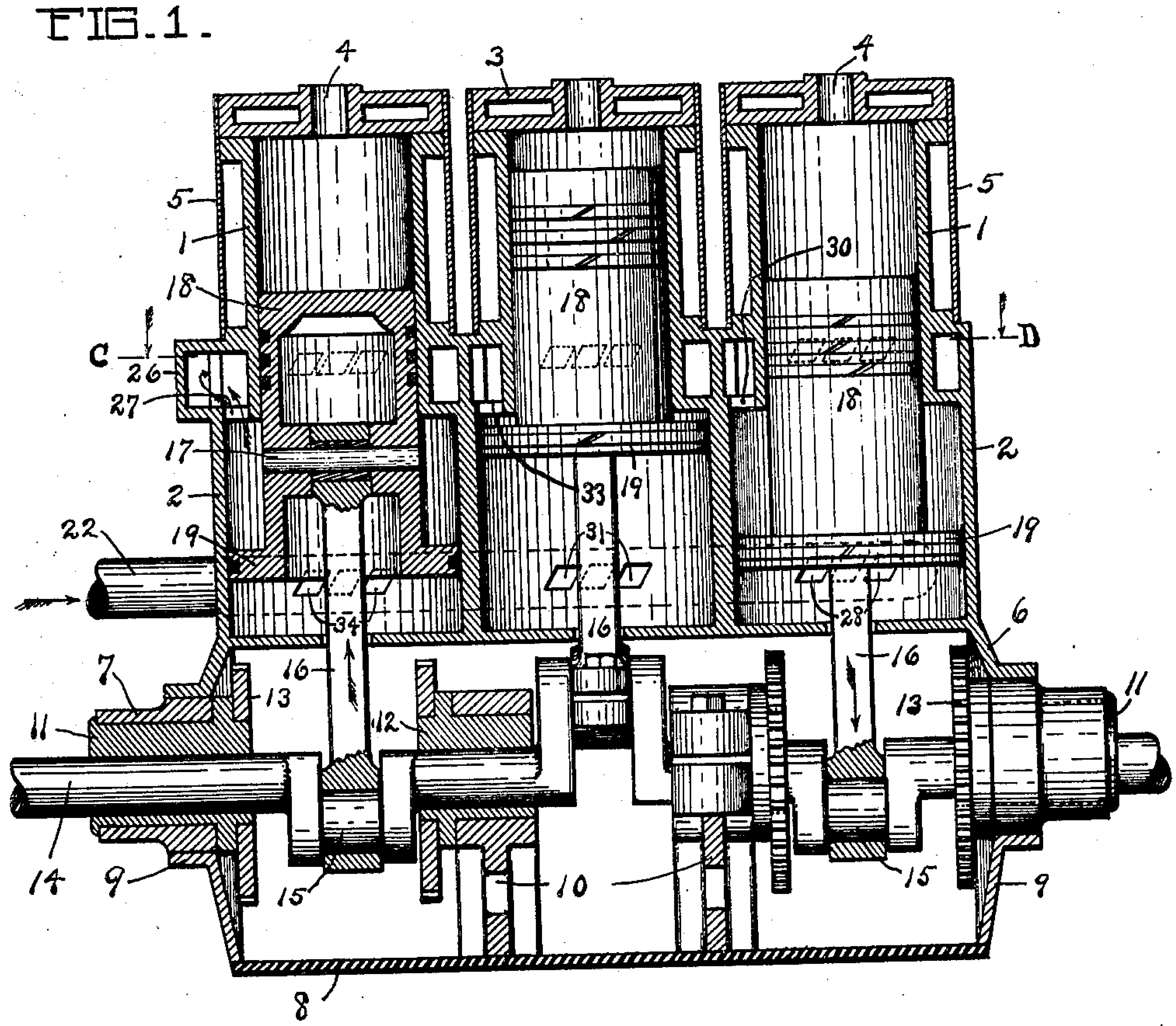


FIG. 1.



Witnesses:

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Inventor

E. Chapman.

By his Attorney

Edward N. Pagelsen.

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2 SHEETS—SHEET 2.

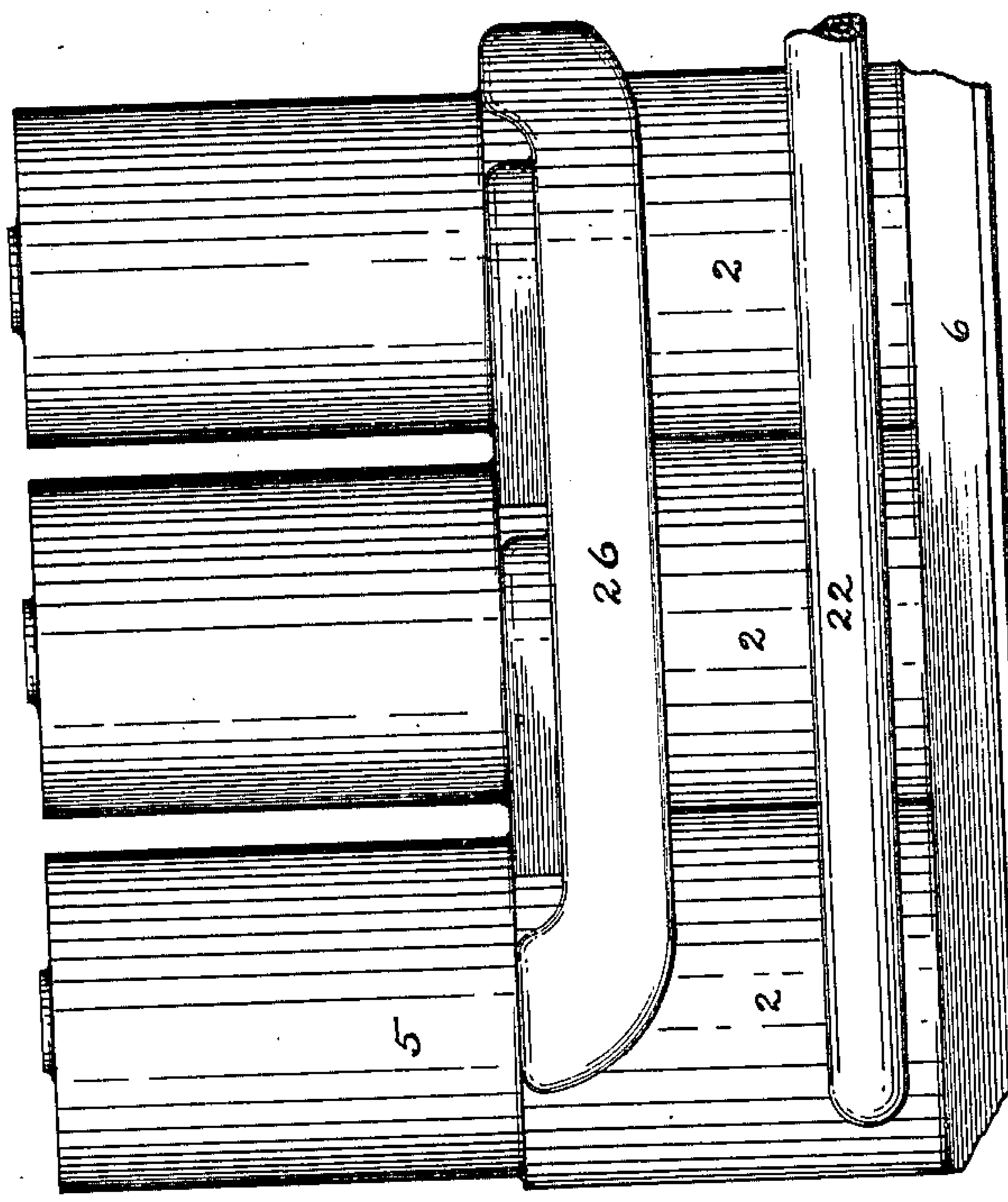

FIG. 4.

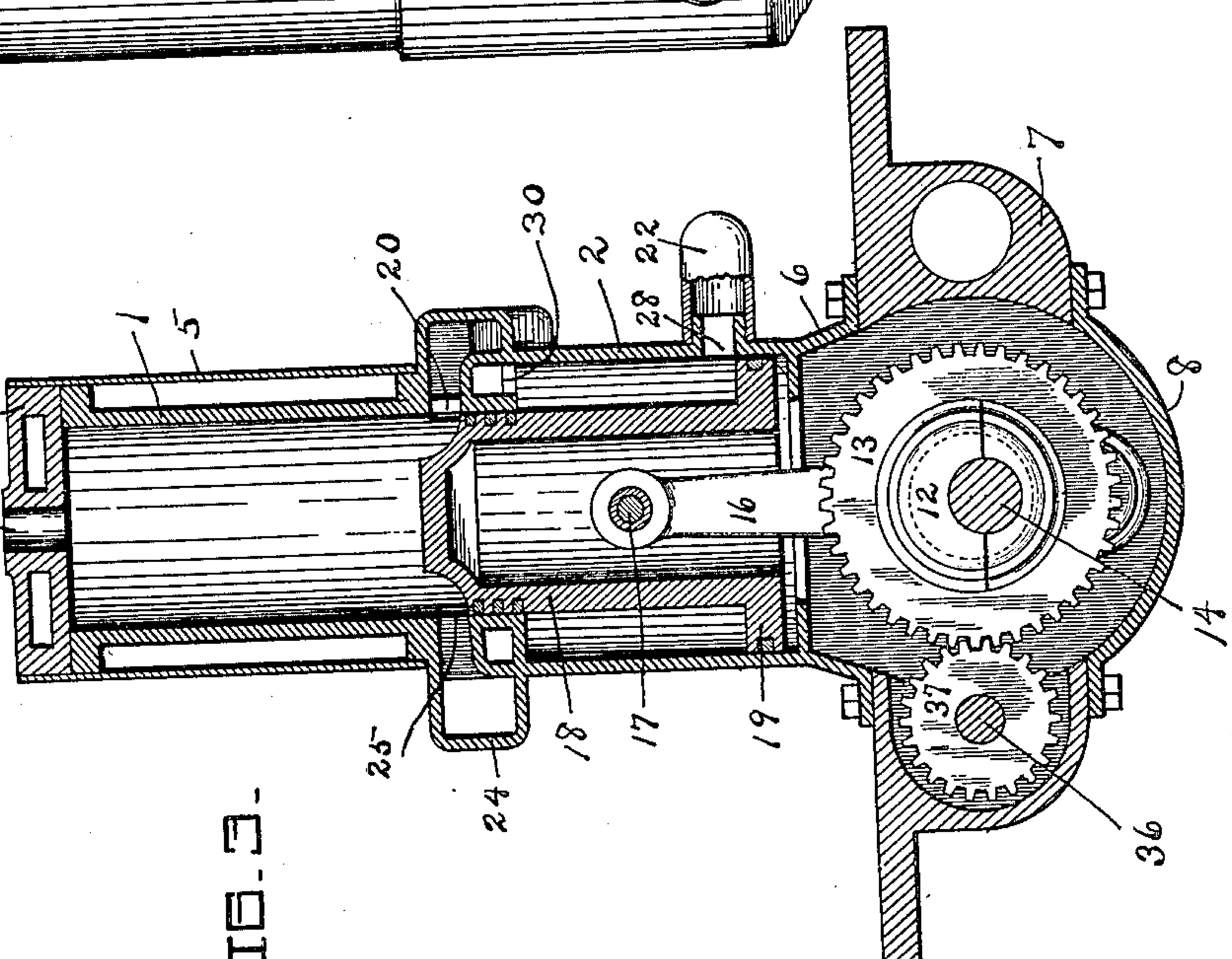

FIG. 3.

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UNITED STATES PATENT OFFICE.

ELLSWORTH CHAPMAN, OF PONTIAC, MICHIGAN.

INTERNAL-COMBUSTION ENGINE.

936,409. Specification of Letters Patent. Patented Oct. 12, 1909.

Application filed October 2, 1907. Serial No. 395,474.

To all whom it may concern:

Be it known that I, ELLSWORTH CHAPMAN, a citizen of the United States, and a resident of Pontiac, in the county of Oakland and State of Michigan, have invented a new and useful Internal-Combustion Engine, of which the following is a specification.

This invention relates to two-cycle internal combustion engines, and the object of my improvements is, to provide an engine of this kind that shall have no springs or valves, and one in which the charge shall always be compressed to the same density.

My invention consists in a two-cycle explosive engine, with cylinders either singly or in series, so constructed that the distance between the cylinder head and the center line of the crank shall be adjustable.

My invention further consists in a novel two cycle engine so constructed that the position of the shaft with reference to the cylinder shall determine the amount of the explosive charge.

I attain this object and embody the invention in the construction illustrated in the accompanying drawings, in which—

Figure 1 is a vertical cross section on the line A—B of Fig. 2. Fig. 2 is a longitudinal cross section of the cylinders on the line C—D of Fig. 1. Fig. 3 is a transverse vertical section on the line E—F of Fig. 2. Fig. 4 is an elevation of the cylinders, looking at them from the upper side of Fig. 2.

Similar reference characters refer to like parts throughout the several views.

In two cycle engines, the charge is compressed before being admitted into the explosion cylinder and the rush of such admission forces out the burned gases of the previous explosion. In the present construction means are shown for compressing charges for each of several cylinders independently and for compressing the exact amount of explosive mixture desired. The amount of vapor which is admitted to the explosion cylinder is determined by the relative positions of the crank shaft and the explosion cylinder.

In the drawings, the cylinders and their supporting flanges are shown attached to an engine bed. The cylinders are formed in two parts, the upper cylinder 1 which is the explosion cylinder, and the lower cylinder 2 which is the compression cylinder. All the cylinders may be cast as one piece or separately as desired. The cylinder heads 3 are provided with openings 4, to receive the spark plugs, and the usual water passages. Jackets 5 form circulating chambers around the explosion cylinders. Flanges 6 connect to the bed 7 of the engine. An apron 8 is secured to the lower side of the bed and prevents waste of lubricating and fuel oils. The ends 9 and cross bars 10 of the bed form bearings for the eccentric sleeves 11 and 12. These sleeves are split, and on them are secured the gears 13. These sleeves form the bearing for the crank shaft 14, which shaft is provided with crank pins 15. Connecting rods 16 are pivoted on the crank pins and on the wrist pins 17 of the pistons. The pistons have the parts 18 to fit the explosion cylinders and the parts 19 to fit the compression cylinders. The compression cylinders are formed with ports 28, 31, and 34 which connect with the pipe 22 which extends to the carbureter. Formed on or secured to the engine just above the compression cylinders is an exhaust pipe 24 which connects to the explosion cylinders through ports 25. Conducting pipes between the compression chamber cylinder of one engine and the explosion cylinder of another are also formed on or secured to the cylinder casting. These pipes are three in number in the drawings and are shown in Fig. 2. The conductor 26 extends from port 27 at the top of the left hand compression cylinder to the port 20 of the right hand explosion chamber. The conductor 29 extends from the port 30 at the top of the right hand compression cylinder to the intake ports 21 of the middle explosion cylinder, and the conductor 32 extends from the port 33 at the top of the middle compression cylinder to the intake ports 35 of the left hand explosion cylinder. The size of these ports will be determined by the explosive mixture and by the speed the engine is to run. Journaled in the bed is a shaft 36 having a gear 37 secured to it for each gear 13 on the eccentric sleeves 11 and 12. It will be seen that upon turning this shaft 36 all the sleeves 11 and 12 will also turn and the distance between the cylinder heads 3 and the crank shaft 14 may thereby be regulated. The upper ends of the pistons are cut out, as shown in Fig. 3, in order to deflect the explosion charge upward and to permit the escape of the burned gases through the exhaust ports.

When the parts are in normal position, the engines will draw full charge into the compression chambers, and as the crank pins are so positioned that the pin of the left hand engine, Figs. 1 and 2, is 120 degrees in advance of the pin of the right hand engine, the compression piston 19 of the left hand cylinder will have completed its compression and the maximum pressure will have traveled to the intake port 20 before this port of the right hand cylinder 1 is opened. The result will be that the compressed explosive mixture will rush in and displace the burned gases. Having the cranks separated 120 degrees always gives full compression in the conducting pipes 26, 29 and 32 at the opening at the intake ports, permitting the blast of explosive mixture to flow up against the cylinder head before spreading, resulting in a more complete cleaning out of the burned gases. The amount of explosive vapor, taken into the cylinders, depends largely upon the size of the intake ports. If the eccentric sleeves 11 and 12 are turned from the positions shown, the distance between the center line of the crank shaft and the ports will be lessened. This will result in the intake ports of both compression and explosion cylinders being opened both a less amount and for a less period of time. The amount of vapor that passes into the compression and explosion cylinders will therefore be reduced. At the same time the distance betwen the crank shaft and the ports is reduced, the distance between the crank shaft and the cylinder heads will also be reduced. As the length of the reciprocating parts remains constant, the dimensions of the explosion chambers at the upper end of the explosion cylinders will vary with the size of the ports and the quantity of the explosive mixture. The result is, that the density of the explosive mixture will remain practically constant at the time of explosion, resulting in an economical use of the fuel which is not possible with a delayed spark or with slight compression owing to throttling the intake.

Having now explained my improvement, what I claim as my invention and desire to secure by Letters Patent is:—

1. In an internal combustion engine, the combination of a compression cylinder, an explosion cylinder, each of said cylinders having intake ports, a frame to support said cylinders, a crank shaft mounted in said frame, pistons adapted to reciprocate within said cylinders, connections between crank shaft and pistons, and means for controlling the distance between said crank shaft and intake ports whereby the admission of the explosive fluid into said cylinders may be controlled by said pistons.

2. In an explosion engine, the combination of a frame, a series of eccentric sleeves rotatably mounted in said frame, means for revolving said sleeves, a crank shaft journaled in said sleeves and provided with a number of cranks evenly spaced, a series of compression cylinders mounted on said frame, a series of explosion cylinders adjacent to said compression cylinders said cylinders having intake and exhaust ports, and pistons connected to said cranks, the admission of explosive gases to said cylinders being controlled by the position of said crank shaft through said pistons.

3. The combination with a cylinder having an inlet port and a piston adapted to open and close said port, of means for adjusting the cylinder and piston, one relative to the other to vary the amount of charge admitted to the cylinder through the inlet port.

4. An internal combustion engine comprising a cylinder having an inlet port, a piston adapted to cover and uncover the port, and means for adjusting the piston relative to the inlet port to vary the amount of charge admitted to the cylinder through the port.

5. An internal combustion engine comprising a cylinder having an inlet port, a piston in the cylinder adapted to close and open the port, a crank shaft, means connecting the piston and crank shaft, and means for adjusting the crank shaft and piston relative to the inlet port to vary the amount of charge admitted to the cylinder.

6. An internal combustion engine comprising a cylinder having an inlet port, a piston in the cylinder, adapted to control the port, a crank shaft, means connecting the piston and crank shaft, rotatable members in which the crank shaft is eccentrically journaled, and means for rotating the members through the arc of a circle to vary the relation of the piston and inlet port.

7. An internal combustion engine comprising a cylinder having an inlet port, a piston in the cylinder adapted to control the port, a crank shaft, means connecting the piston and crank shaft, journals through which the crank shaft extends, rotatable members received in the journals, means for preventing endwise movement of the rotatable members, the crank shaft eccentrically journaled in the members, and means for rotating the members to vary the relation of the piston and inlet port.

8. An internal combustion engine comprising a cylinder having an inlet port, a piston in the cylinder, adapted to control the port, a crank shaft, means connecting the piston and crank shaft, split sleeves rotatably mounted in the engine, in which sleeves the crank shaft is eccentrically journaled, and means for rotating the split sleeves in the arc of a circle to vary the relation between the piston and the inlet port.

9. An internal combustion engine comprising a cylinder having an inlet port, a

piston controlling the port, and means for adjusting the piston and cylinder one relative to the other, to vary the speed of the engine.

10. A two-cycle engine comprising a cylinder having an inlet port therein, a piston adapted to cover and uncover the inlet port, a crank shaft with which the piston is connected, rotatable bearings in which the shaft is eccentrically journaled, and means for rotating the bearings.

In testimony whereof, I have signed this specification in the presence of two subscribing witnesses.

ELLSWORTH CHAPMAN.

Witnesses:

ELIZABETH M. BROWN,
EDWARD N. PAGELSEN.