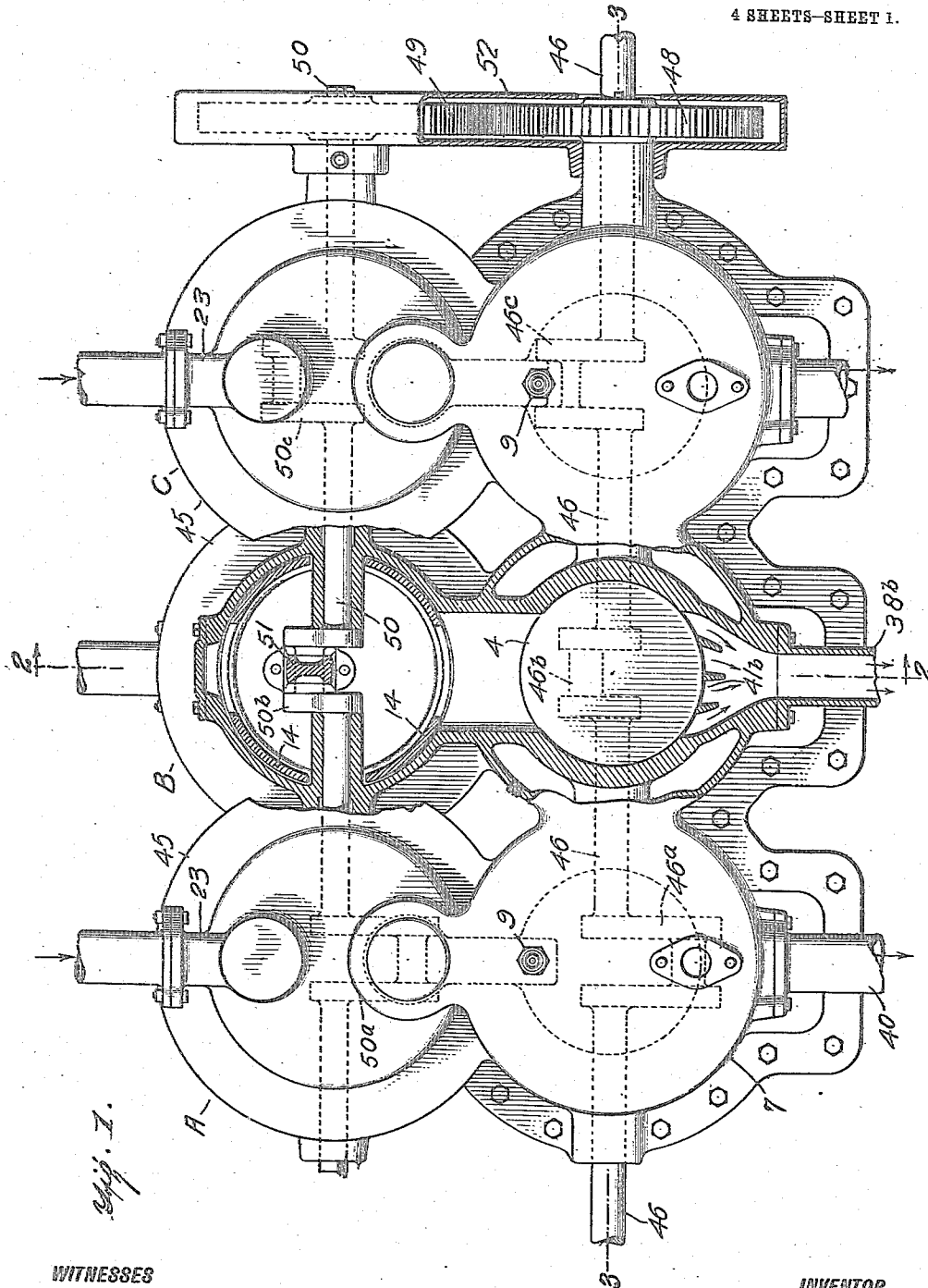


T. I. A. TOMASINI.
INTERNAL COMBUSTION ENGINE.
APPLICATION FILED FEB. 10, 1914.

1,128,917.

Patented Feb. 16, 1915.

4 SHEETS—SHEET 1.



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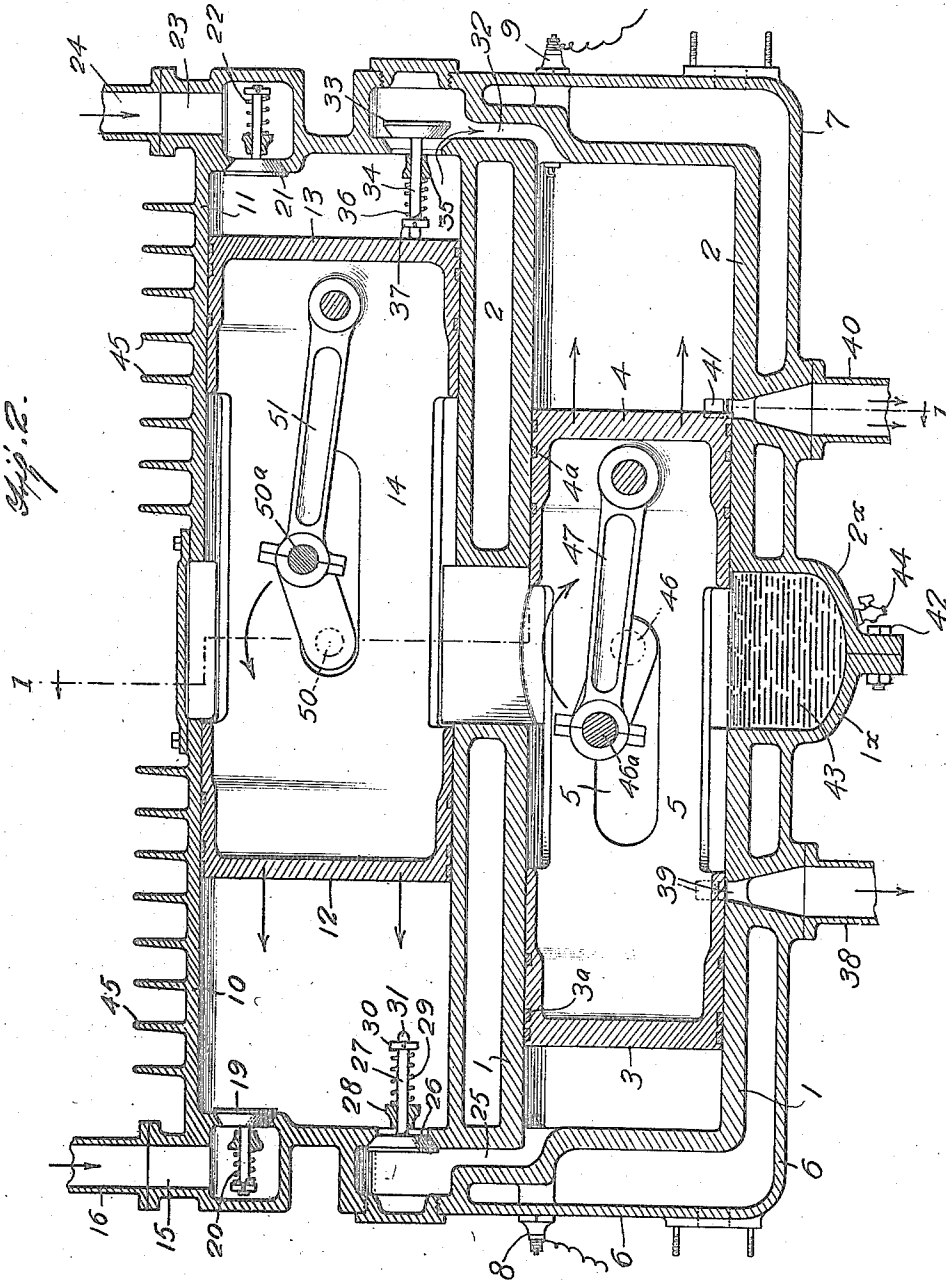
ATTORNEYS

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4 SHEETS—SHEET 2.



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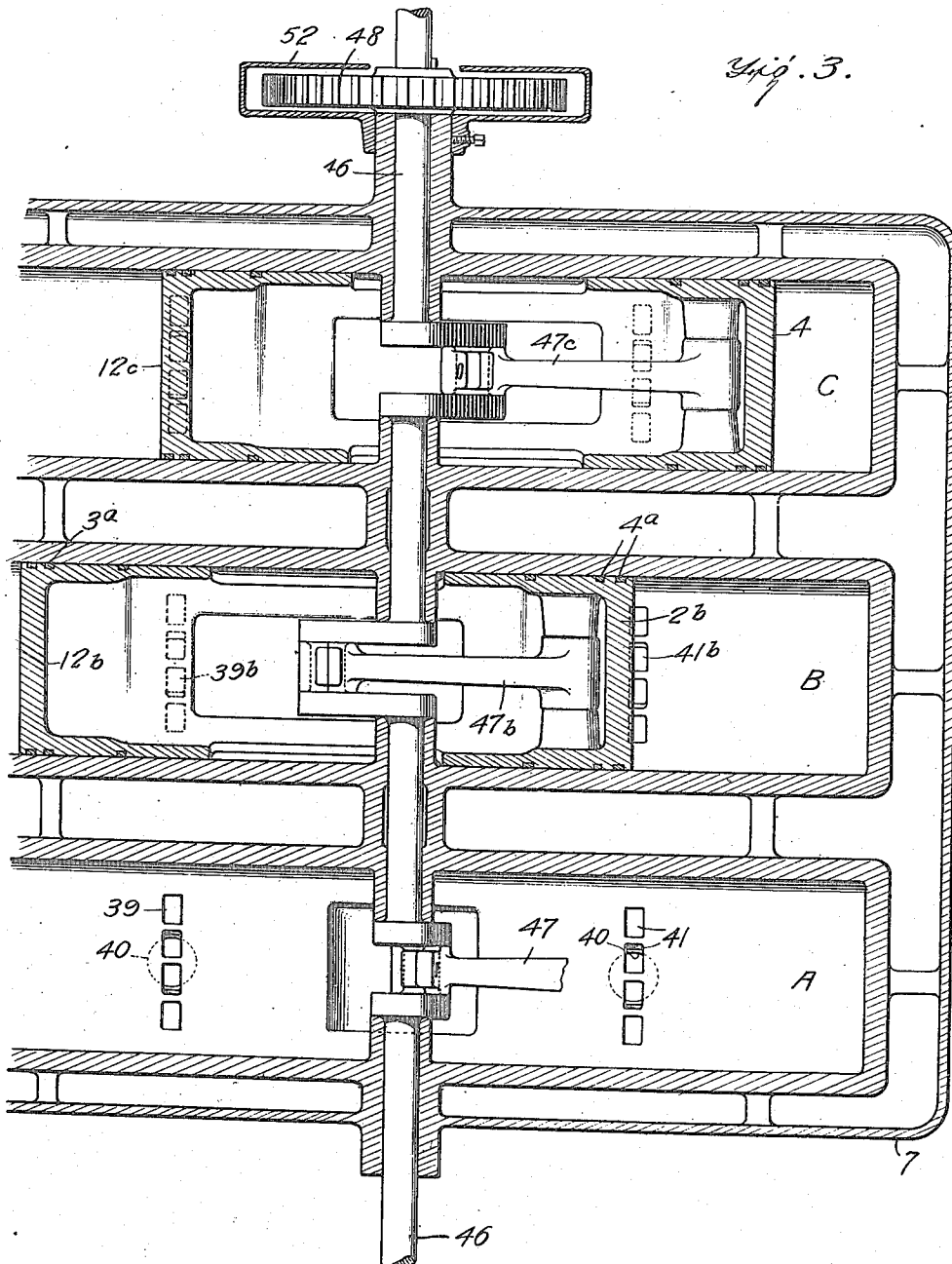
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4 SHEETS—SHEET 3.



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4 SHEETS-SHEET 4.

Fig. 4.

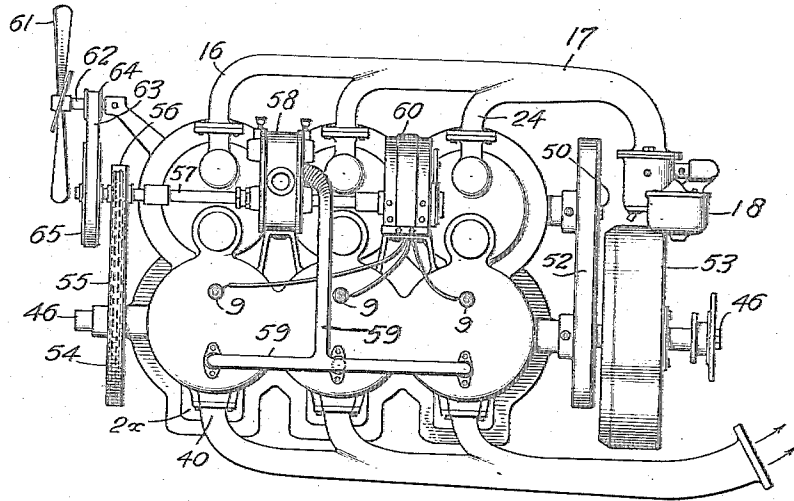


Fig. 5.

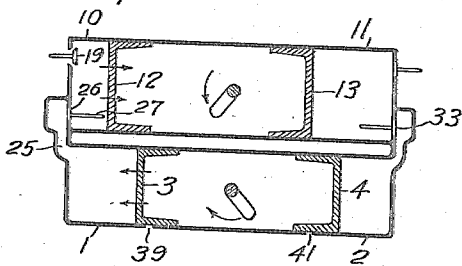


Fig. 6.

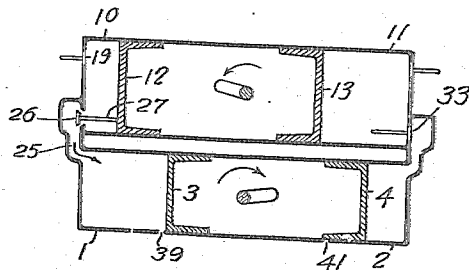
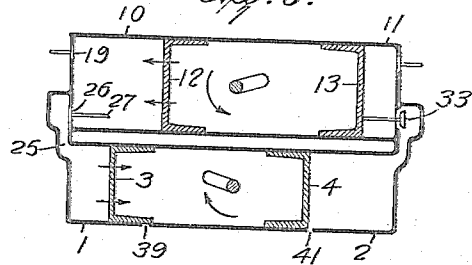
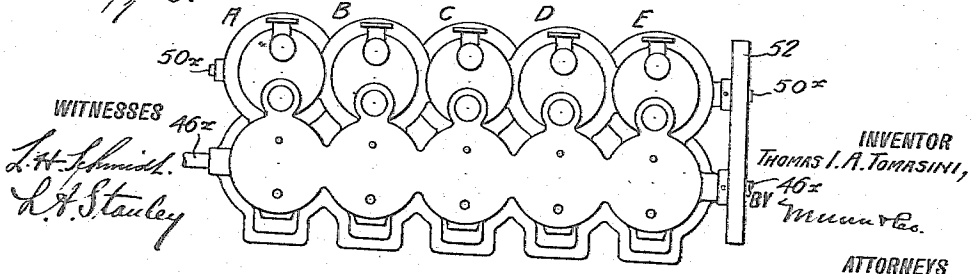


Fig. 7.

Fig. 8.



UNITED STATES PATENT OFFICE.

THOMAS ISIDORE ALBERT TOMASINI, OF SAN FRANCISCO, CALIFORNIA.

INTERNAL-COMBUSTION ENGINE.

1,128,917.

Specification of Letters Patent.

Patented Feb. 16, 1915.

Application filed February 10, 1914. Serial No. 817,784.

To all whom it may concern:

Be it known that I, THOMAS ISIDORE ALBERT TOMASINI, a citizen of the United States, and a resident of San Francisco, in the county of San Francisco and State of California, have made certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

My invention relates to improvements in internal combustion engines, and it consists in the combinations, constructions and arrangements herein described and claimed.

An object of my invention is to provide a device which has a plurality of cylinders, and in which the explosions take place in regular succession.

A further object of my invention is to provide a novel form of device in which there is an auxiliary compression cylinder for each explosion cylinder, the compression cylinder not only acting to compress the charge preparatory to firing the same, but also acting as a compression means for the efficient scavenging of the cylinder after the explosion has taken place.

Other objects and advantages will appear in the following specification and the novel features of the device will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawings forming part of this application in which—

Figure 1 shows an end view of an engine constructed according to my invention, certain parts being in section, Fig. 2 is a section along the line 2—2 of Fig. 1 looking in the direction of the arrows, Fig. 3 is a section along the line 3—3 of Fig. 1, Fig. 4 is a view of an automobile engine constructed according to my invention, Figs. 5, 6 and 7 are diagrammatical views showing the operation of the pistons, and Fig. 8 is a modified form showing a ten-cylinder engine.

In carrying out my invention I provide a plurality of opposed cylinders. A pair of opposed cylinders is shown in Fig. 2 at 1 and 2 respectively. Within the cylinder 1 is a piston 3, while a similar piston 4 is disposed in the cylinder 2. These cylinders are provided with the usual packing rings 3^a and 4^a respectively and are connected together by means of arms 5, so as to move in unison. The cylinder 1 is provided with a water jacket 6, while the cylinder 2 is

provided with a similar water jacket 7. A spark plug 8 extends through the walls of the cylinder 1, while a similar spark plug 9 extends through the walls of the cylinder 2.

Disposed adjacent to the cylinders 1 and 2, preferably above them, are the cylinders 10 and 11. These cylinders are provided with pistons 12 and 13 respectively which are rigidly connected together by means of the connecting members 14 so as to move in unison. The cylinder 10 has an inlet port 15 which communicates by means of a pipe 16 with the intake manifold 17, leading from the carbureter 18 (see Fig. 4). The inlet 15 is controlled by an inlet valve 19, which is normally held by a spring 20 in a closed position. The cylinder 11 has an intake valve 21 similar to the valve 19 in the cylinder 10, and which is held in a normally closed position by means of a spring 22. The valve 21 controls an inlet port 23, which communicates by means of a pipe 24 with the manifold 17.

Between the ends of the cylinders 1 and 10 is a passage 25 which is controlled by a valve 26. This valve has a valve stem 27 which passes through a guide member 28 against which one end of a spring 29 bears, the other end of the spring bearing against a collar 30 on the valve stem. The end of the valve stem is designed to be engaged by the piston 12 in its movement. A similar arrangement is provided for the cylinder 2 and includes the passage 32, valve 33, valve stem 34, guide 35, spring 36, and collar 37.

The cylinder 1 is provided with an exit pipe 38 which communicates with a series of exhaust ports 39 adapted to be covered and uncovered by the movement of the piston 3. The cylinder 2 has a similar exhaust pipe 40 and exhaust ports 41 similar to the ports 39, which are arranged to be covered and uncovered by the movement of the piston 4.

As will be seen from Fig. 2 the frames of the cylinders are extended, as shown at 1^x and 2^x, and are secured together at their central portions by means of bolts 42. These extensions 1^x and 2^x are curved downwardly to form an oil chamber 43, which is provided with a drain cock 44. As stated before, the working cylinders 1 and 2 are water jacketed, while the cylinders 10 and 11 may be provided with radiating projections 45. It will be understood that these

projections may be dispensed with in certain cases, or similar projections may be added to the cylinders 1 and 2 without departing from the spirit of the invention.

5 The arrangement of cylinders shown in Fig. 2 may be duplicated to provide various sets of cylinders such as those shown at A, B and C in Fig. 1, each consisting of two upper opposed cylinders, two lower opposed
10 cylinders, as shown in Fig. 2. The lower working cylinders have a common drive shaft 46 having U-shaped crank portions 46^a, 46^b and 46^c arranged about the axis of the shaft at 120° apart. The crank arms
15 are connected by means of a pitman such as that shown at 47 in Fig. 2 with one of the pistons such as that shown at 4 in Fig. 2. From this it will be understood that any movement of the piston 4 will tend to turn
20 the crank shaft 46. The shaft 46 bears a gear 48 which is arranged to mesh with a gear 49 on a crank shaft 50, which has U-shaped crank portions 50^a, 50^b and 50^c also connected by pitmen 51 with the pistons
25 such as that shown at 13 in Fig. 2, these crank portions 50^a, 50^b and 50^c also being at 120° apart with respect to the axis of the shaft 50. It will be understood, of course, that where a larger number of cyl-
30 inders is used the crank portions 46^a, 46^b, 46^c, etc., would be disposed about the axis of their respective shafts at such intervals as to cause the working cylinders to be fired in succession, so as to give a uniform move-
35 ment to the crank shaft. The crank portions 50^a, 50^b, 50^c, etc., of the upper tier of cylinders would be arranged accordingly. In the present instance I have shown three sets of lower working cylinders, and there-
40 fore the angles between the crank portions of the adjacent sets are 120° apart as stated.

From the foregoing description of the various parts of the device the operation thereof may be readily understood.

45 In Figs. 5, 6 and 7 I have shown diagrammatically the positions of the pistons in one of the sets of cylinders during various stages of the operation of the engine and since the other cylinders are precisely alike the description of the one set will be sufficient.
50 The engine is cranked in the usual manner and the piston 12 in the cylinder 10 is moving in the direction shown by the arrows. The valve 26 is closed by the spring 29 (see
55 Fig. 2). The valve 19 is opened since the piston 12 is now sucking in a charge through the port. On the return stroke of the piston 12, as shown in Fig. 6 both valves 19 and 26 will be closed and the charge will
60 be compressed in the cylinder 10. Now when the piston 12 engages the valve stem 27 of the valve 26 it will force the latter valve open and the compressed charge will rush through the passage 25 and into the cylin-
65 der 1, driving before it the exhaust gases in

the cylinder 1, so as to thoroughly scavenge the cylinder. Immediately thereafter the piston 3 of the cylinder 1 covers the exhaust port 39 and tends to compress the charge in the cylinder 1. The movement of the piston 3 at this point in the compression is shown in Fig. 5. The charge in the cylinder 1 is now exploded and the piston 3 is driven forward in the direction shown in Fig. 6. As soon as the piston 3 uncovers the exhaust
70 port 39 the piston 12 in the cylinder 10 has reached the position to open the valve 26 so as to scavenge the cylinder. It will be apparent from the diagrammatical showing in Figs. 5, 6 and 7 that the pistons 13 and 4
75 in the cylinders 11 and 2 respectively are working in opposite phases from the pistons 12 and 3 in the cylinders 10 and 1 respectively. Thus in Fig. 5, the piston 13 is compressing the charge in the cylinder 11,
80 while the piston 4 is being driven forward by the explosion stroke. In Fig. 6 the valve 33 is opened to permit the charge in the cylinder 11 to scavenge the cylinder 2 through the outlet port 41, while in Fig. 7
85 the piston 4 is just at the point where the explosion stroke is about to take place, while the piston 13 is about to compress the gas in the cylinder 11. The arrangement thus described provides an exceedingly efficient en-
90 gine, since the cylinders are rapidly scavenged and are therefore full of a clean mixture when explosion takes place. It will be noted that the return of the working pistons 3 and 4, so as to compress the gas, is effected not merely by the revolution of the fly wheel, but by the direct force of the explosion stroke on the opposite piston, since it is rigidly connected with the opposite piston.
95 The opening of the inlet valves 26 and 33 is accomplished positively by the contact of the pistons 12 and 13 with their valve stems so that there is no danger of these valves ever sticking.

100 In order to provide for the efficient lubrication of the device I arrange the oil well 43, so that the crank portions 46^a, 46^b, etc., will dip down into the oil at each revolution. The oil thus thoroughly lubricates the crank and is thrown by the latter on the walls of
105 the cylinders, so as to provide constant lubrication for the latter. In order to protect the gears 48 and 49 I provide a casing 52, as shown in Fig. 1.

110 The engine or motor which forms the subject of the present invention is designed to be used for various purposes such as for automobiles, motor boats, and for general use where internal combustion engines are desirable. In Fig. 4 I have shown an automotile engine. In this figure the main drive shaft 46 is provided with a fly wheel 53 at one end, and with a power transmitting device such as a pulley 54, and belt 55 at the
115 other end. The belt 55 is designed to run 130

over a pulley 56 on a shaft 57. The latter is connected with a rotary member of a pump 58 which maintains the circulation of water in the jackets by means of pipes 5 such as those shown at 59. The shaft 57 also drives the armature of a magnetó 60 to which the spark plugs are connected, as shown. A fan 61 is disposed on a stub shaft 62 and is driven by means of a belt 63 which passes over a pulley 64 on the stub shaft and over a drive wheel 65 on the shaft 57.

In Fig. 8 I have shown a series of five sets of cylinders such as the set shown in Fig. 2. These five sets I have designated A, B, C, D and E. The crank shaft 46* is, of course, connected with the pistons of the cylinders so that the lower set of ten cylinders are fired successively, thereby giving the crank shaft a substantially uniform motion. The crank shaft 46* drives the crank shaft 50* by means of gears closed in a casing 52* in a similar manner as the gearing shown in connection with Fig. 1. It is obvious that a greater or less number of sets of cylinders may be used than those shown without departing from the spirit and scope of the invention.

I claim:—

1. In an internal combustion engine, a working cylinder provided with an exhaust port and having a piston arranged to cover and uncover the exhaust port, a compression cylinder associated with said working cylinder and having a piston and an inlet port, a passage connecting said compression cylinder with said working cylinder, a valve for controlling said passage adapted to be positively operated by the engagement of the piston of the compression cylinder when the piston in the working cylinder has cleared the exhaust port, the return stroke of the piston in the working cylinder serving to compress the charge in the working cylinder, and means for exploding the compressed charge.

2. In an internal combustion engine, a compression cylinder, a piston therefor, an inlet port for said compression cylinder, a

valve for said port, a working cylinder, a piston therefor, an exhaust port arranged to be covered and uncovered by the movement of the piston in the working cylinder with said compression cylinder, an outlet valve for permitting the discharge of compressed gas from said compression chamber into said working chamber when the exhaust port in the working cylinder is open, said valve being positively operated by the movement of the piston in the compression cylinder, the return stroke of the piston in the working cylinder serving to compress the gas in the working cylinder, and means for exploding the gas.

3. In an internal combustion engine, a compression cylinder, a piston therefor, an inlet port for said compression cylinder, a spring-pressed valve for normally closing said inlet port and adapted to open automatically when the pressure is lowered within the compression cylinder, a working cylinder, a piston therefor, a passage connecting said compression cylinder with said working cylinder, a valve for controlling said passage, said valve being normally closed and adapted to be opened by the engagement of the piston in the compression cylinder with the valve stem, and an exhaust port in said working cylinder adapted to be covered and uncovered by the movement of the piston of the working cylinder, the movements of the pistons in the compression cylinder and the working cylinder being such that when the piston of the compression cylinder has opened the valve controlling the connecting passage between the cylinders, the piston in the working cylinder has cleared the exhaust port, thereby permitting the charge from the compression cylinder to scavenge the working cylinder, said charge being subsequently compressed by the movement of the piston in said working cylinder.

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Witnesses:

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