R. CARMICHAEL & W. SCHAIBLEY.

GAS ENGINE.

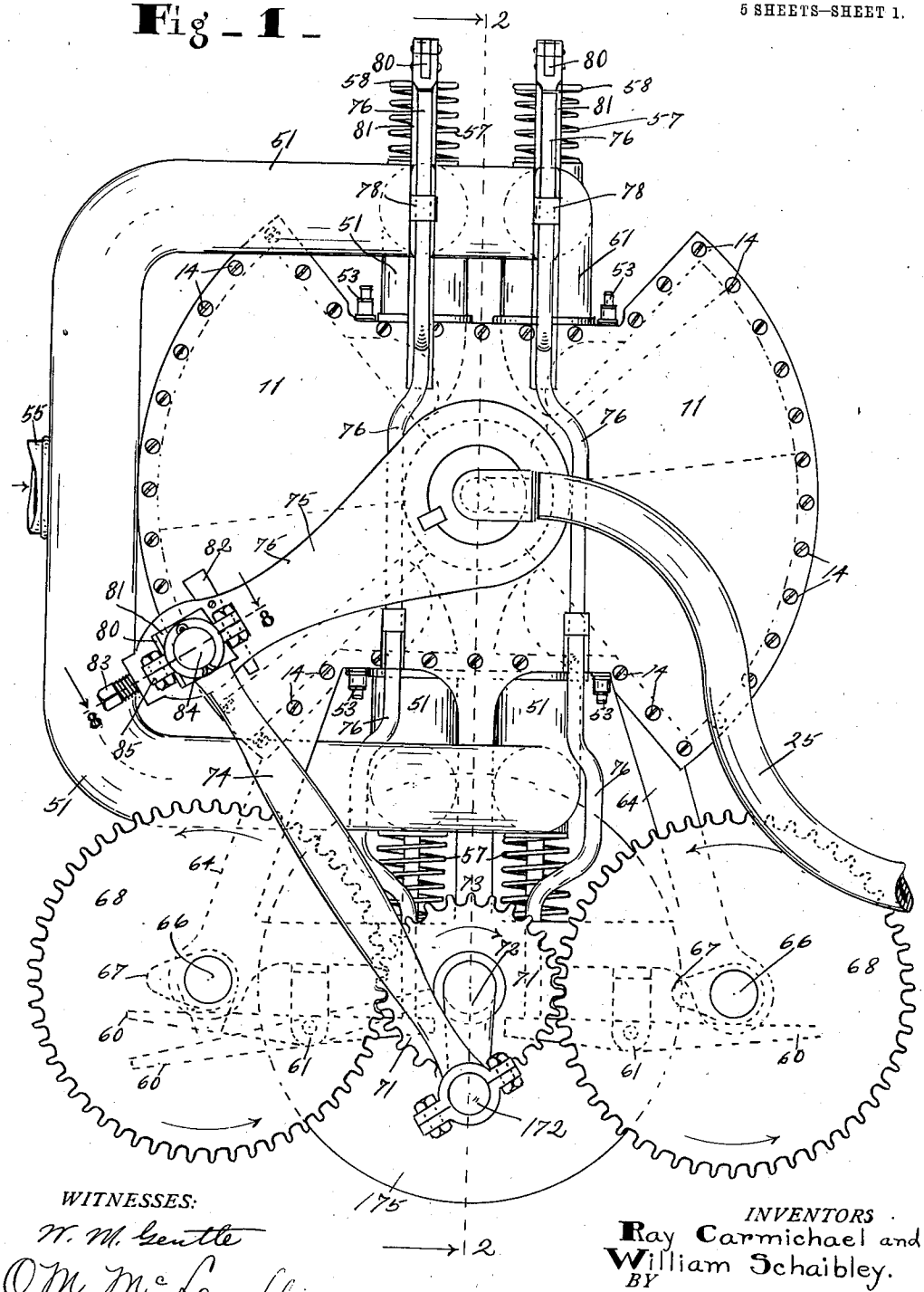
APPLICATION FILED AUG. 18, 1910.

1,010,583.

Patented Dec. 5, 1911.

5 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

W. M. Gentle

O. M. McLaughlin

INVENTORS.

Ray Carmichael and

William Schaibley.

BY

ATTORNEY.

R. CARMICHAEL & W. SCHAIBLEY.

GAS ENGINE.

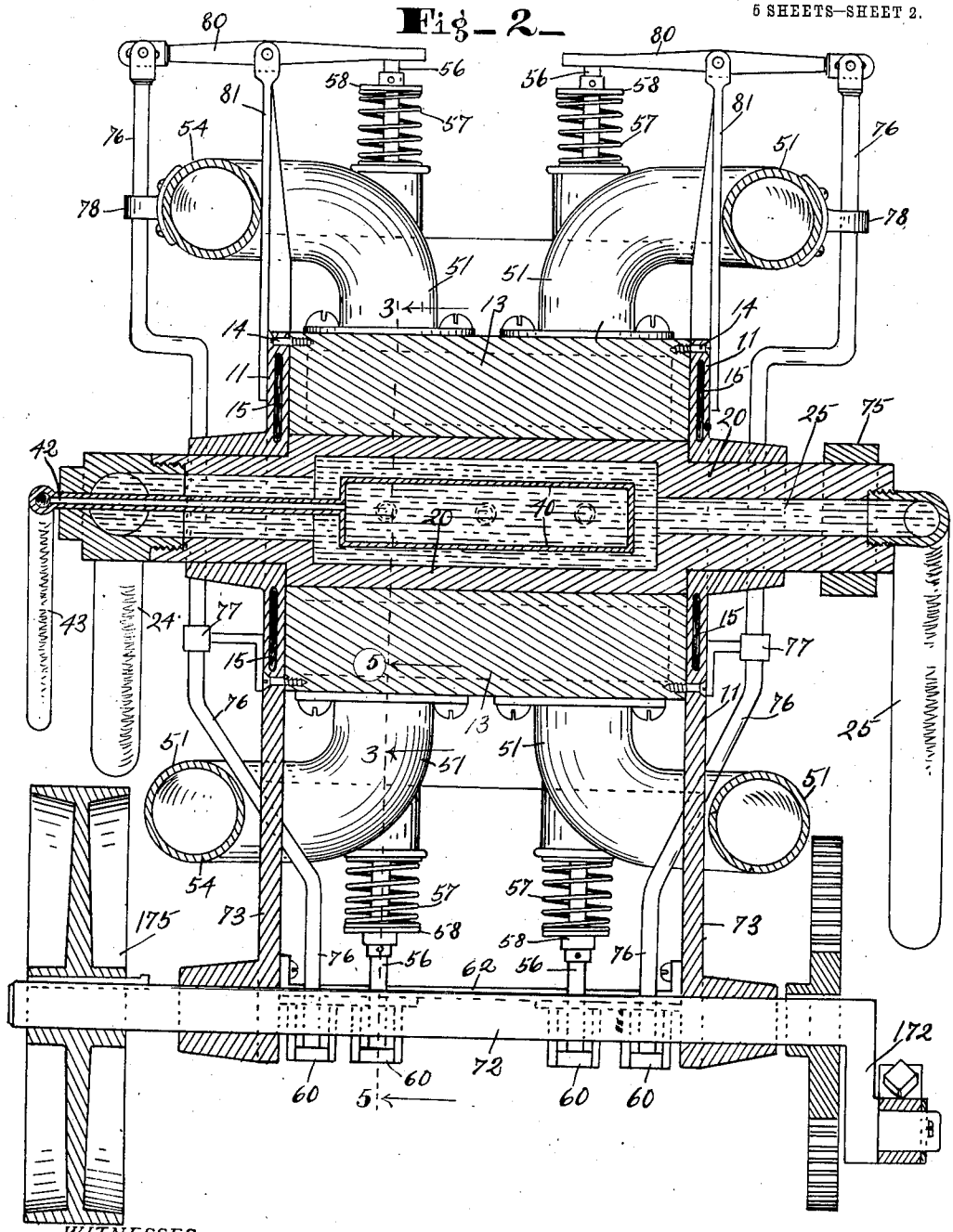
APPLICATION FILED AUG. 18, 1910.

1,010,583.

Patented Dec. 5, 1911.

5 SHEETS—SHEET 2.

Fig. 2.



WITNESSES:

W. M. Gentle.

O. M. McLaughlin

INVENTORS.

Ray Carmichael and
William Schaibley.

BY

V. Lockwood

ATTORNEY.

R. CARMICHAEL & W. SCHAIBLEY.

GAS ENGINE.

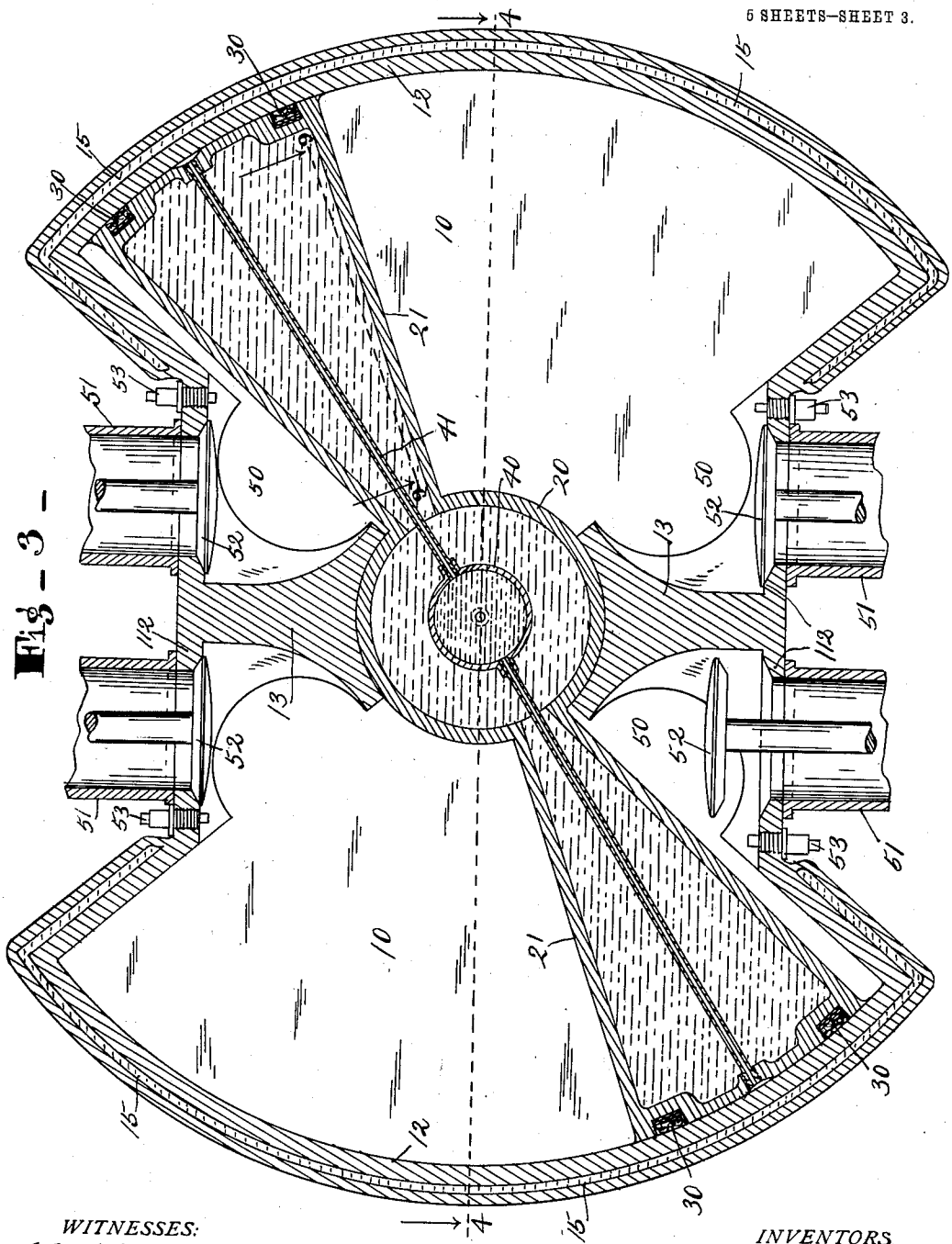
APPLICATION FILED AUG. 18, 1910.

1,010,583.

Patented Dec. 5, 1911.

5 SHEETS—SHEET 3.

Fig - 3 -



WITNESSES:

W. M. Gentle.

O. M. McLaughlin

INVENTORS.

Ray Carmichael and
William Schaibley.

BY

W. H. Lockwood

ATTORNEY.

R. CARMICHAEL & W. SCHAIBLEY.

GAS ENGINE.

APPLICATION FILED AUG. 18, 1910.

1,010,583.

Patented Dec. 5, 1911.

5 SHEETS—SHEET 4.

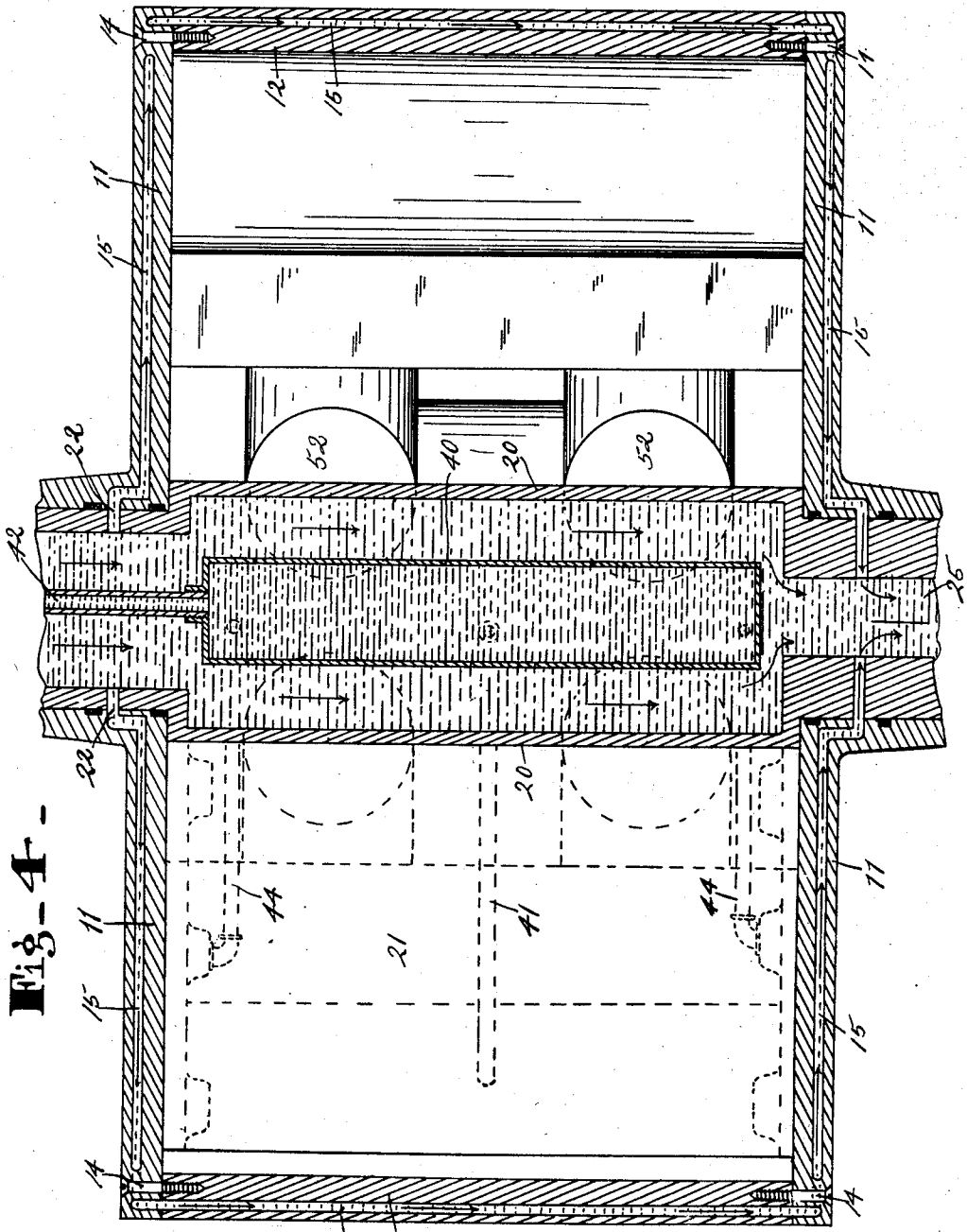


Fig-4-

WITNESSES:

W. M. Gentle.

O. M. McLaughlin

INVENTORS.

Ray Carmichael and William Schaibley.

BY

V. Hockwood

ATTORNEY.

R. CARMICHAEL & W. SCHAIBLEY.

GAS ENGINE.

APPLICATION FILED AUG. 18, 1910.

1,010,583.

Patented Dec. 5, 1911.

5 SHEETS—SHEET 5.

Fig. 5.

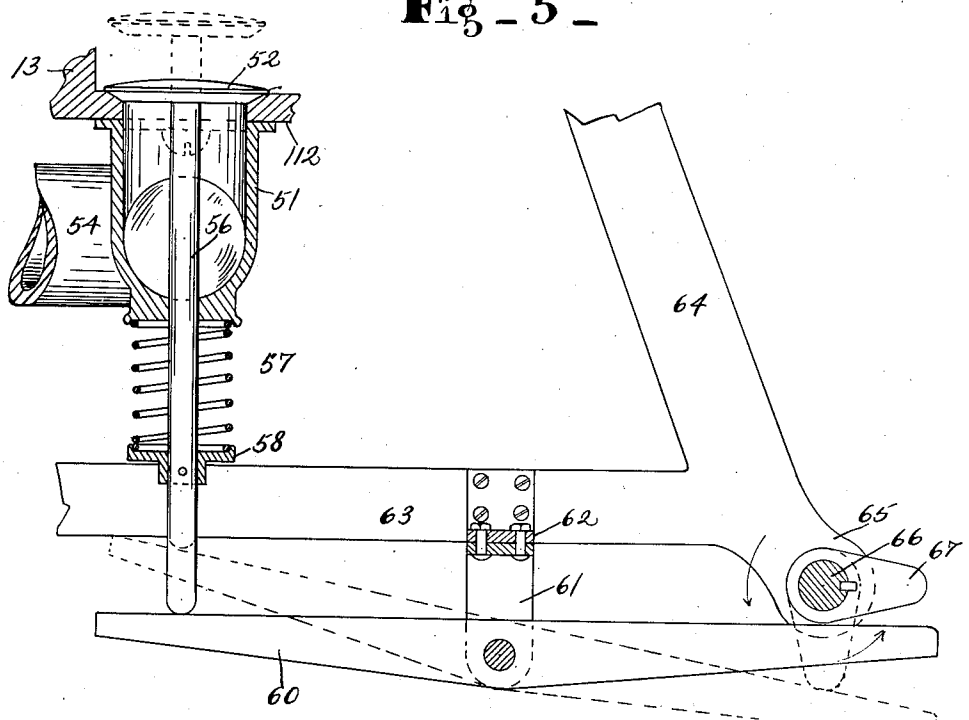


Fig. 6.

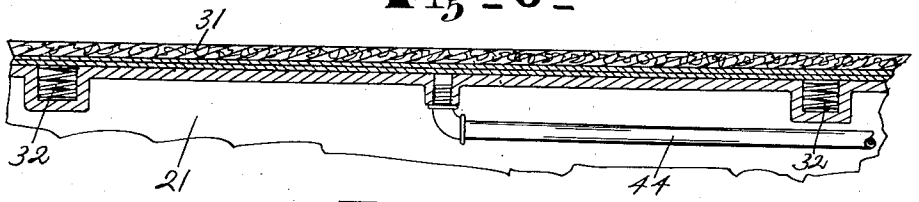


Fig. 7.

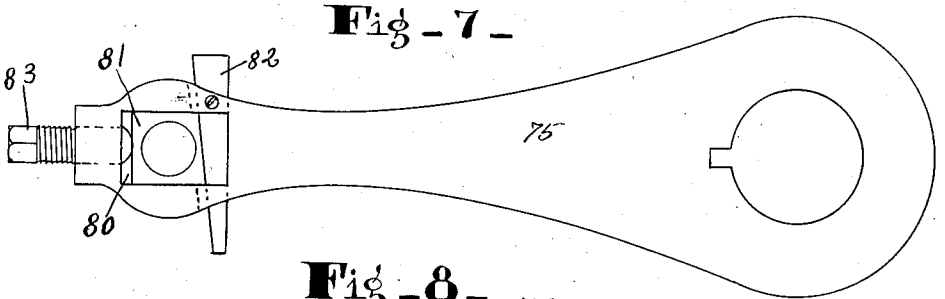
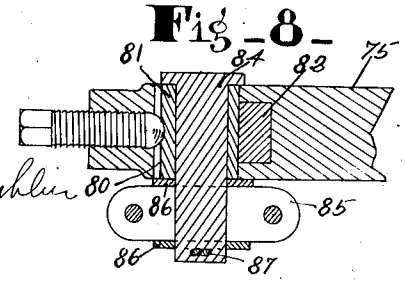


Fig. 8.



WITNESSES:

W. M. Gaulter

O. M. McLaughlin

INVENTORS.

Ray Carmichael and

William Schaibley.

BY

V. H. Lockwood

ATTORNEY.

UNITED STATES PATENT OFFICE.

RAY CARMICHAEL AND WILLIAM SCHAIBLEY, OF INDIANAPOLIS, INDIANA.

GAS-ENGINE.

1,010,583. Specification of Letters Patent. Patented Dec. 5, 1911.

Application filed August 18, 1910. Serial No. 577,768.

To all whom it may concern:

Be it known that we, RAY CARMICHAEL and WILLIAM SCHAIBLEY, of Indianapolis, county of Marion, and State of Indiana, have invented a certain useful Gas-Engine; and we do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings.

The object of this invention is to provide an improved form of internal combustion engine so as to greatly reduce the size in proportion to the power, or to increase the power in proportion to the size of the engine, and also to vastly improve the water-cooling and lubricating features of the engine.

The chief feature of the invention consists in providing fan-shaped explosion chambers associated one opposite the other, and providing oscillatory pistons operable therein, which are secured together or to an intermediate hollow shaft mounted on the partition between the chambers.

Means for causing the explosion are provided in the chambers on each side of each piston, and arranged to operate like a four-cylinder engine, and therefore, the pistons rock the hollow shaft and power is transmitted therefrom to the crank shaft or other driven means. The pistons and the shaft on which they are mounted are all hollow, so that the same may be filled with water at all times, and also ample lubrication may be provided by means located within the pistons lubricating the surfaces between the pistons and walls of the explosion chamber.

The device is self-contained and there is no chance for leakage of the mixture in the explosion chambers, and with a pair of pistons, as shown, when one is actuated, the other will compress the incoming charge, and with the connection between the crank shaft and the piston made as shown herein, the engine will never stop on center, and, therefore, can always be started with a spark.

The nature of the invention will be understood from the accompanying drawings and the following description and claims.

In the drawings, Figure 1 is an elevation of one end of the engine, some hidden parts being shown by dotted lines. Fig. 2 is a central vertical section on the line 2—2 of Fig. 1. Fig. 3 is a vertical transverse section of part of the device on the line 3—3 of Fig. 2, parts being broken away. Fig. 4 is a horizontal section on the line 4—4 of Fig. 3, parts being broken away. Fig. 5 is a vertical transverse section on the line 5—5 of Fig. 2, parts being broken away and the altered position of parts being shown by dotted lines. Fig. 6 is a section on the line 6—6 of Fig. 3, parts being broken away. Fig. 7 is a side elevation of the crank on the rock shaft on a large scale. Fig. 8 is a section on the line 8—8 of Fig. 1.

In detail, two explosion chambers 10 are provided by means of end walls 11 and segmental-shaped side walls 12, see Figs. 2 and 3. There is also an intermediate partition 13 and top and bottom walls 112. The two chambers 10 are located on opposite sides of a center which is concentric with the side walls 12 of said chambers, and the chambers are separated by a central partition or wall 13 which is integral with the side walls 12, and the end walls 11 are fastened to side walls 12 by screws 14. Water-jacket chambers 15 are provided in the walls of the explosion chambers.

The central part of the partition 13 is widened, as shown in Fig. 3, to provide a bearing for the tubular shaft 20 of the oscillatory pistons 21. There are two of these oscillatory pistons which extend like wings, sector-like, in opposite directions from the tubular shaft 20, and are hollow and in communication with the tubular shaft 20, so as to receive water or other cooling fluid. The water chamber in the oscillatory pistons and tubular shaft 20 is in communication with the water chambers 15 in the walls of the explosion chambers through the ports 22, see Fig. 4, and the water chambers 15 are in the end and side walls of the explosion chambers which are also in communication with each other, so that all of said water chambers are in communication with each other. Water is supplied to the tubular shaft 20 through the water supply tube 24, see Fig. 2, and it flows out of said chambers through the outlet tube 25, which leads from one end of the tubular shaft 20, see Fig. 4, and thence through the tube 25, see Fig. 2.

The pistons 21 oscillate in the explosion chambers and their ends are curved so as to snugly fit the curved inner surfaces of the walls 12 of the explosion chambers, and packing 30 is provided in the outer ends of the pistons to make a tight joint, so that gas, on the occasion of explosions, will not

pass from one side to the other of either of said pistons. There is also packing 31 on the sides of the pistons for making a tight joint between them and the end walls 11 of the explosion chambers, and that packing is forced outwardly against the walls of the explosion chambers by the springs 32, see Fig. 6. The two explosion chambers are not in communication with each other and explosions take place in each end of each chamber, and, therefore, on each side of each piston. The thickness of the pistons is indicated in Fig. 3, while the width is indicated in Fig. 4.

An oil tube 40 is located in the center of the tubular shaft 20 and from the oil pipes 41 extends through each piston to the wall 12 of the casing, so as to lubricate the engaging surfaces between said wall and piston, see Fig. 3. The oil is furnished to the tube 40, see Fig. 4, through the pipe 42 and the supply tube 43, see Fig. 3, and through the supply tube 43, see Fig. 2. As seen in Fig. 4, oil pipes 44 lead from each end of the oil tube 40 to the end walls of the pistons and end wall 11 of the explosion chambers for the purpose of lubricating them, as there is a tight fit at those points.

At each end of each explosion chamber a recess 50 is provided for receiving the fuel or mixed air and gas from gasolene through the intake pipes 51, the outlets of which are controlled by the valves 52. Beside said intake pipes 51 there are spark plugs 53 for igniting the fuel. The detail of the valve mechanism is found in Fig. 5. The four intake pipes 51 are supplied with one manifold fuel pipe 54, see Fig. 1, which leads from a single fuel supply pipe 55, which latter pipe leads from the carbureter, not shown. The valve stem 56 of each valve 52 extends through the intake pipe 51 and is held normally closed by the spiral spring 57 surrounding it, which bears against one end of the intake 51 and at the other end against the spring seat 58, which is pinned to the valve stem. The valve stem is opened by the locking lever 60 fulcrumed between its ends to a bracket 61 from the skeleton frame 61 on the plate 62 secured to the horizontal bars 63 of the skeleton frame at the ends of the machine. Said skeleton frame has also an inclined bar 64, and there is an extension 65 at the junction of the two bars 63 and 64, which carries the cam shaft 66 on which the cam 67 is mounted, adapted to engage and actuate one end of the lever 60 from the full line to the dotted line position shown in Fig. 5. The arrangement just described is for the operation of the lower valves 51, as appears in Figs. 1 and 2. The two shafts 66 are driven by gears 68 secured thereon and meshing with a pinion 71 on the crank shaft 72, which is mounted in two downwardly extending bars 73 from the end walls 11 of the casing, as seen in Fig. 2. The crank shaft is driven by the connecting rod 74 which extends from the rocker arm 75, which is secured on the tubular rock shaft 20, see Figs. 1 and 2. The oscillatory movement or throw of the crank 75 is equal to double the length from point to point of the crank 172 on the crank shaft 72, so that the latter crank revolves in the direction indicated by the arrow in Fig. 1. The crank shaft has a drive wheel 175.

The upper valves 52 are controlled by the levers 60, similar to that shown in Fig. 5, which operate long connecting rods 76 passing through guides 77 on the end walls 11 of the explosion chambers and guides 78 on the manifold pipe 54, see Fig. 2. At the upper ends the rods 76 are pivotally connected with rocking levers 80, which are pivoted between their ends on posts 81, which extend up from the end walls of the machine, and the free ends of the levers 80 are connected with the valve stems 56, and the remainder of the construction is the same as that shown in Fig. 5, except that it is inverted.

The foregoing valve controlled mechanism is arranged so that these valves will be operated in the same order as the valves of the four-cylinder gas engine of the usual type, and likewise, the ignition mechanism, which is not here shown in full, operates the spark plugs in the same order as the four-cylinder engine. In other words, when a charge enters one valve controlled port into the piston chamber, as, for instance, the upper left-hand valve of Fig. 3, said charge is compressed by the piston, and then explodes and drives the piston to the position shown in Fig. 3. During the compression of the charge which has entered through said left-hand valve, the charge has been entering through the right-hand valve, and when the charge through the left-hand valve has exploded, the piston compresses the charge on the other side, whereupon it explodes and drives the piston in the opposite direction. This process continues successively with the lower right-hand valve and then the lower left-hand valve, the charges entering past said valves in the order named, and, therefore, being compressed and exploded in the same order.

In the foregoing description of the mechanism it will be observed that we have two exploding chambers of peculiar shape, each fan-shaped in one section, and, therefore, the two together constitute only part of a cylinder. The pistons are oscillatory in said fan-shaped chambers, and exploding means is provided at each side of each chamber at each side of each piston. The pistons are secured on the oscillatory shaft from which power is transmitted by the rocker arm to what may be termed the crank shaft. The

actuation of one piston causes the compressing movement of the other, as well as creates the power to be transmitted by the pully, and this mechanism provides an extremely compact engine, in fact, almost as small as a one cylinder engine, and yet equivalent in operation to a four-cylinder engine of the ordinary type.

Another peculiarly advantageous feature is the means for water-cooling the piston as well as the explosion chambers. The pistons are full of water all the time as well as the tubular shaft on which they are mounted, and, therefore, the device is water-cooled both inside and out.

Another perculiarity is the means for lubricating the frictional surfaces of the pistons and exploding chambers through means located within the pistons and tubular shaft on which they are secured.

The rocker arm 75 is arranged with reference to the pistons 21 and is connected, as shown in Fig. 1, to the crank shaft by the connecting bar 74, so that when said pistons are at the limit of their oscillatory movement, the crank shaft will pass center and will be off center when the piston makes the slight return movement which it would necessarily make under the influence of the compressed charge so that the crank shaft would never be on center when the pistons stop. After stopping the engine there will be a compressed charge at one end of one of the explosion chambers so that generally the pistons would be returned to substantially a midway position in the explosion chamber, and at that time the connection with the crank shaft would still be off center so that all that would be necessary to start the engine would be an explosion charge from the battery or otherwise. Hence, this engine does not need to be cranked excepting after it has been standing idle a long time, as it will hold the charge much longer than the gas engine of the ordinary type.

The degree of compression of the charge may be regulated somewhat by an adjustable connection between the rocker arms 75 and the connecting bar 74. For this purpose the outer end of the rocker arm has a rectangular opening 80 in it for a bearing block 81 which has an oblique side bearing against a wedge 82 which is insertible in slots at a right angle to the rocker arm 75 adjacent the opening 80. This wedge adjusts the block 81 in one direction, and the set screw 83, which extends longitudinally of the rocker arm 75 when it is mounted in the end thereof, adjusts the block 81 in the opposite direction. A wrist pin 84 has bearings in the block 81 and is secured by the clamps 85 on the end of the connecting rod 74. By adjusting the block 81 toward or away from the axis of the rocker arm, the points of stoppage of the pistons at their limit of movement may be modified and thus the degree of compression of the charge modified.

86 are washers and 87 is a pin.

We claim as our invention:

1. An internal combustion engine including a fan-shaped explosion chamber, a rock shaft mounted in connection therewith, a piston extending radially from the rock shaft in said chamber with its outer surfaces in engagement with the walls of said chamber, means for causing explosions in said chamber, and means extending through said rock-shaft and piston for supplying lubrication to the engaging surfaces of said piston and the walls of the explosion chamber.

2. An internal combustion engine including a fan-shaped explosion chamber, a rock shaft mounted in connection therewith, a piston extending radially from the rock shaft in said chamber with its outer surfaces in engagement with the walls of said chamber, means for causing explosions in said chamber, an oil supply tube within said rock shaft, and tubes leading therefrom to the surfaces of said piston which engage the walls of said explosion chamber.

In witness whereof we have hereunto affixed our signatures in the presence of the witnesses herein named.

RAY CARMICHAEL.
WILLIAM SCHAIBLEY.

Witnesses:
G. H. BOINK,
O. M. MCLAUGHLIN.