C. F. LEMBKE.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED FEB. 7, 1913.

1,108,916.

Patented Sept. 1, 1914.

3 SHEETS—SHEET 1.

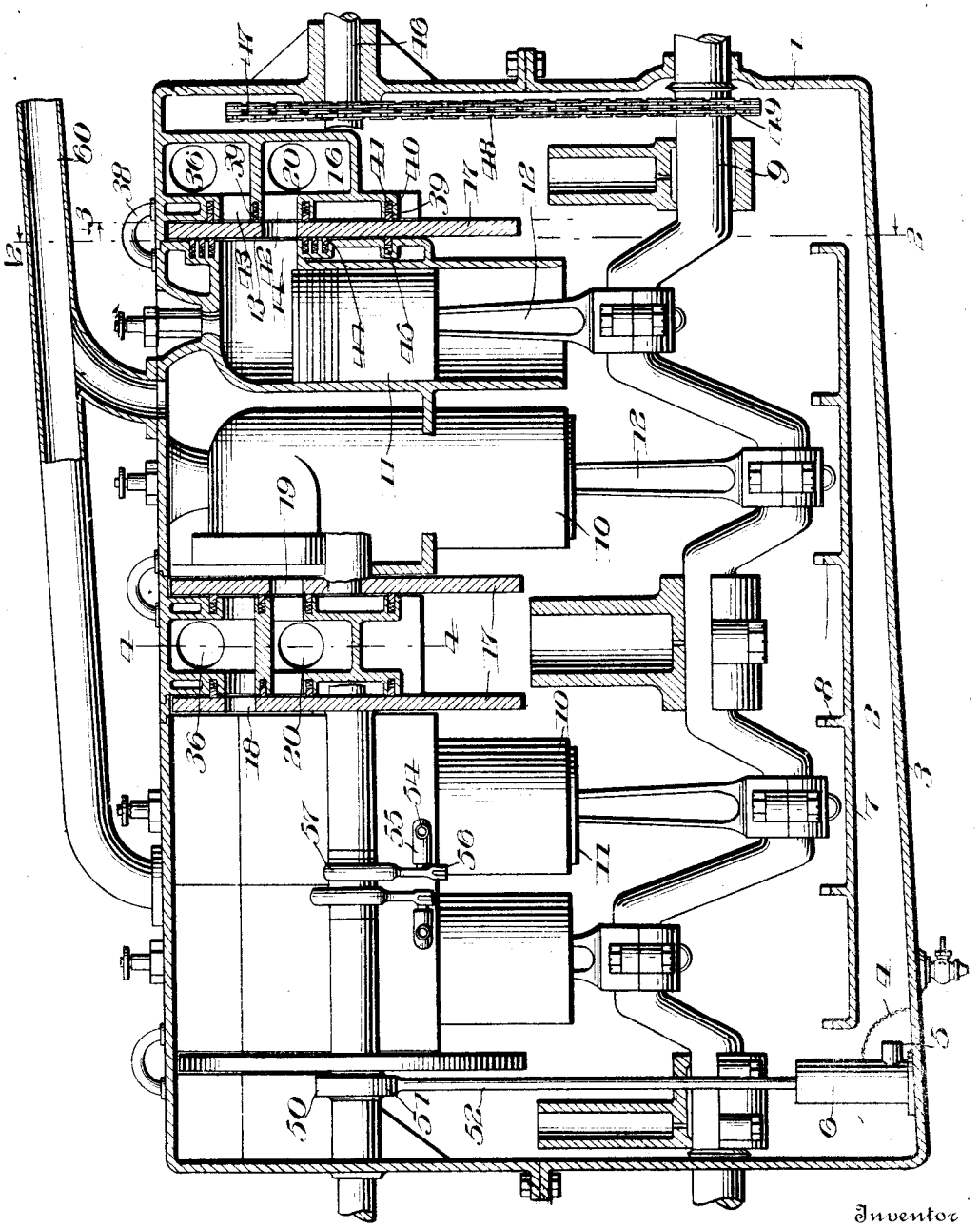


Fig. 1.

Witnesses

M. B. Shafer.

R. M. Smith.

Inventor

Charles F. Lembke

By Victor J. Evans

Attorney

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3 SHEETS—SHEET 2.

Fig. 2.

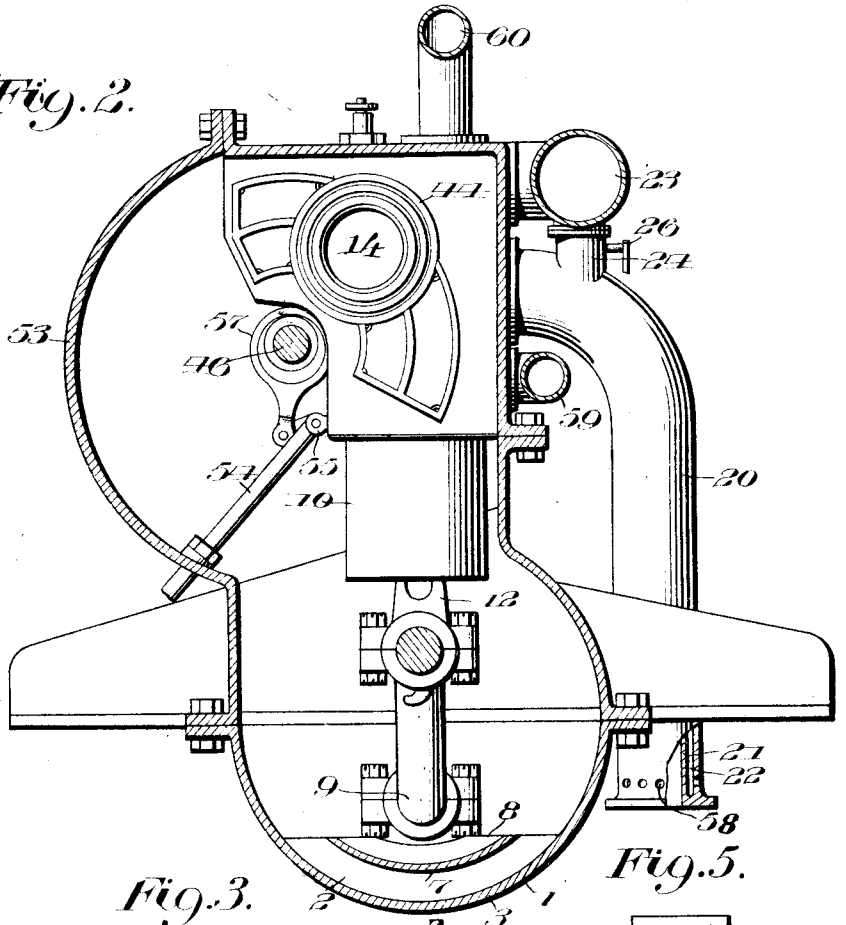


Fig. 3.

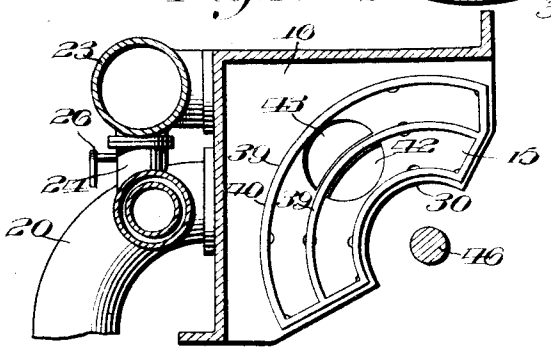
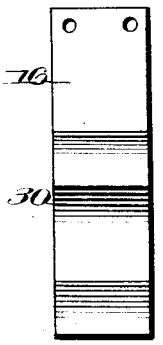


Fig. 5.



Inventor

Charles F. Lembke

Witnesses

M. B. Sleper

R. M. Smith.

By Victor J. Evans

Attorney

C. F. LEMBKE.

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3 SHEETS-SHEET 3.

Fig. 4.

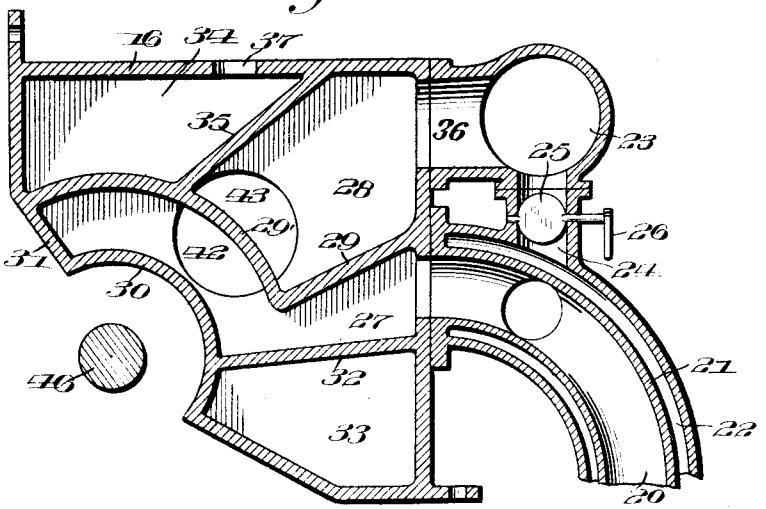


Fig. 6.

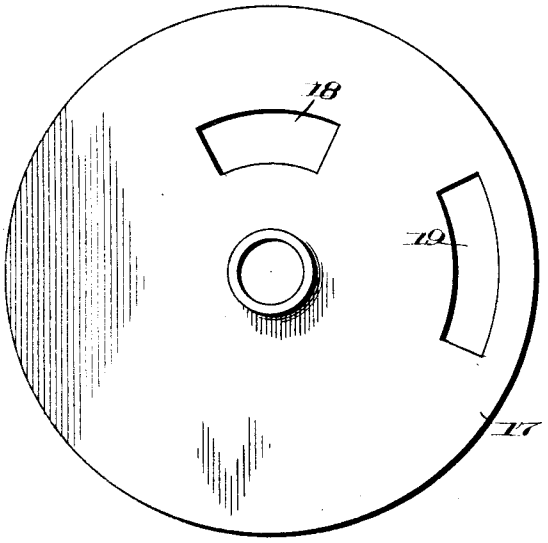
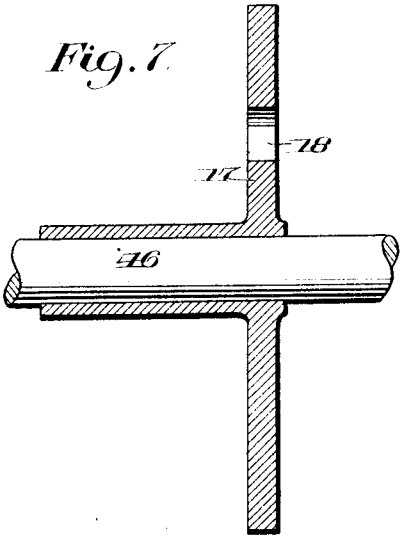


Fig. 7



Witnesses

M. B. Sleper

R. M. Smith.

Inventor

Charles F. Lembke

By Victor J. Evans

Attorney

UNITED STATES PATENT OFFICE.

CHARLES F. LEMBKE, OF VALPARAISO, INDIANA.

INTERNAL-COMBUSTION ENGINE.

1,108,916. Specification of Letters Patent. Patented Sept. 1, 1914.

Application filed February 7, 1913. Serial No. 746,899.

To all whom it may concern:

Be it known that I, CHARLES F. LEMBKE, a citizen of the United States, residing at Valparaiso, in the county of Porter and State of Indiana, have invented new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

This invention relates to internal combustion engines, the object in view being to provide a practically noiseless valve arrangement, which will do away entirely with the usual noisy puppet valves now in common use, the engine embodying, in connection with each cylinder thereof, a disk-shaped rotary valve which operates between a combined inlet and exhaust chest and the cylinder, so as to properly time the admission of explosive mixture to the combustion chamber of the cylinder and the exhaust of the burnt gases therefrom.

A further object of the invention is to provide means for obtaining a constant and close contact between the disk-shaped valve and the adjacently located abutting faces of the chest and cylinder to prevent leakage and consequent loss of power, the construction also providing for the rapid and accurate opening and closing of the exhaust and inlet ports.

A further object of the invention is to provide means for thoroughly scavenging the cylinders with fresh air immediately after each active or working stroke of the engine.

A further object of the invention is to provide a novel arrangement of jacket and controlling valve for heating the intake pipe or manifold with the exhaust or burnt gases leaving the cylinder.

With the above and other objects in view, the invention consists in the construction, combination and arrangement of parts, as will be hereinafter more fully described, illustrated in the accompanying drawings, and pointed out in the claims hereunto appended.

In the drawings: Figure 1 is a side elevation, partly in section, of a four-cylinder internal combustion motor, embodying the present invention. Fig. 2 is a vertical cross section through the same on the line 2—2 of Fig. 1, looking in the direction of the arrow. Fig. 3 is a partial vertical cross section taken on the line 3—3 of Fig. 1, looking in the direction of the arrow. Fig. 4 is a vertical cross section on the line 4—4 of Fig. 1. Fig. 5 is an inner edge view of the gas chest. Fig. 6 is a side elevation of one of the disk valves. Fig. 7 is a diametrical section through the valve, showing the valve shaft in elevation.

While I have illustrated the invention as associated with a four-cylinder engine of the four-cycle type, it will, of course, be understood, as the description proceeds, that the invention is applicable to an engine having any number of cylinders.

In the drawings, 1 designates the crank case of the engine which is shown as provided in the bottom thereof with an oil sump 2 having an inclined bottom floor 3, by which the oil is led by gravity toward one end of the crank case, where it passes through a screen 4 covering the inlet nozzle 5 of an oil pump 6 which is operated in the manner hereinafter set forth.

In the bottom of the crank case is arranged an oil pan 7 divided off by partitions 8 into separate compartments, into which the cranks are adapted to dip for supplying lubrication by the splash system to the cylinders and pistons.

9 designates the crank shaft, 10 the cylinders, 11 the pistons, and 12 the connecting rods, all of said parts being of the usual construction and arrangement.

In carrying out this invention, each of the cylinders 10 is provided at one side with a flat milled face 13, and a single relatively large combined intake and exhaust port 14 leading from the combustion space of the cylinder outwardly through the milled face thereof, as clearly shown in Fig. 1. Arranged just opposite the face 13 of the cylinder is the correspondingly flat and milled face 15 of a gas chest 16, while between the adjacent faces of the chest and cylinder is arranged a rotary disk valve 17 which is shown in detail in Figs. 6 and 7, wherein it will be seen that the valve is provided with an arcuate or segmental inlet port 18, and a somewhat longer exhaust port 19 which is also arcuate or segmental in shape. It will also be observed that while the ports 18 and 19 are concentric to the axis of the disk, the exhaust port 19 is located at a greater distance from the axis of the valve than the inlet port 18, but both of said ports 18 and 19 are within proper range to register with the combined inlet and exhaust port 14 of the cylinder, as clearly shown in Fig. 1. At this point, it may be noted that in a

four-cylinder engine, the gas chest which is situated in the center of the motor may be utilized to supply gas to and carry the same off from the adjacent inner cylinders, while a separate gas chest may be used for each of the end or outer cylinders, as indicated in Fig. 1. It will, therefore, be necessary to describe but one of said gas chests, and preferably a single one, such as is shown in section at the right hand end of Fig. 1, and also shown in side elevation in Fig. 3, and in vertical section in Fig. 4.

By reference to Figs. 2, 3 and 4, it will be observed that the gas chest 16 has associated therewith a gas intake pipe 20 which is jacketed or double-walled, as shown at 21, thereby leaving an intervening heating space 22 which is placed in communication with the exhaust pipe 23 by means of a connection 24 which is controlled by a butterfly valve 25 provided with a suitable operating handle 26, which enables the exhaust gas to be passed around the intake pipe for the purpose of heating the latter under certain conditions, such as in primarily starting the engine, particularly in cold weather.

The intake pipe 20 leads into a gas receiving chamber 27 within the gas chest, said chamber being divided off from the exhaust chamber 28 of the chest by means of an intervening web or partition 29, a portion 29′ of which extends concentrically to the axis of the rotary disk valve, as shown in Fig. 4. The remainder of the receiving chamber 27 is defined by the inner concentric wall 30, the inner end wall 31 of the chest, and a bottom partition 32, beneath which is a water jacket space 33, another water jacket space 34 being located above the exhaust chamber 28 and divided therefrom by a wall or partition 35.

36 designates a passage leading from the exhaust chamber 28 into the exhaust pipe or manifold 23. The chest is also provided in the top wall thereof with an opening 37 adapted to receive a pipe connection 38, by means of which communication is obtained between the water jacket of the cylinder and the water jacket of the gas chest, thus insuring the proper cooling of all parts of the engine.

Referring now to Fig. 3 of the drawings, it will be observed that in its milled face the gas chest 16 is provided with packing rings 39 which are concentric to the axis of the disk valve, the packing rings or segments 39 being received in grooves 40 in the face of the gas chest, and being normally pressed outwardly by means of springs 41 arranged behind the ring segments, whereby the latter are held in close gas tight contact with the adjacent face of the rotary disk valve 17. The side of the gas chest which abuts against the valve is also provided with an inlet port 42 and an exhaust port 43, and by reference to Figs. 3 and 4, it will be observed that these ports are of segmental form, and together form a circle of approximately the same diameter as the combined inlet and exhaust port 14 of the cylinder, as shown in Fig. 1.

The partition wall 29′ passes about centrally across the space occupied by the ports 42 and 43, and thereby divides said ports from each other, this being further carried out by the packing ring segment 39 which is contained in a groove in said partition wall 29′, as shown in Fig. 1. In a somewhat similar manner the milled face of the cylinder is provided with packing rings 44 arranged in concentric relation to each other and to the port 14, as shown in Fig. 2, the said rings being continuous or endless, and being arranged in grooves in the wall of the cylinder, and normally pressed outwardly by means of springs 45, so as to effect a gas-tight joint between the wall of the cylinder and the rotary disk valve 17. The rotary disk valve 17 is mounted fast on the valve shaft 46, or in the case of an engine embodying a plurality of cylinders, all of the disk valves are mounted fast on a common valve shaft, as shown in Fig. 1, said valve shaft being mounted in suitable bearings at one side of the center of the engine and being provided with a sprocket wheel 47, from which a driving chain 48 runs around another sprocket wheel 49 fast on the crank shaft 9, motion in this way being transmitted from the crank shaft to the valve shaft, so as to drive the last-named shaft at half the speed of the crank shaft, which is necessary in a four-cycle engine. Near its opposite end, the valve shaft 46 is provided with an eccentric 50, to the strap 51 of which is connected the rod 52 of the oil pump 6, hereinabove referred to. In this way, the oil pump is continuously operated at half the speed of the crank shaft, and serves as a means for causing the oil to circulate to the different parts of the engine, it being intended to pump the oil to the disk valves, in order to properly lubricate said valves where they come into contact with the chests and cylinders.

The disk valves are inclosed by a suitable casing 53, as shown in Fig. 2, the shaft 46 passing through and being journaled in said casing. Each cylinder, in the preferred embodiment of this invention is provided with an air inlet pipe 54, as shown in Fig. 2, said pipe extending through the casing 53 and receiving its supply of air from the outside thereof. At its inner end, the pipe 54 connects with its respective cylinder, and at a suitable point in said pipe is arranged a valve casing 55, the valve 56 of which is connected to an eccentric strap 57 actuated by an eccentric on the valve shaft 46, as shown in Fig. 1. The eccentrics are so re-

lated to the shaft and remainder of the motor that air is admitted through each connection 54 to its cylinder at the end of the power stroke, and before the exhaust stroke, said air entering the cylinder and thereby helping to cool the piston head, and also assisting in a thorough scavenging of the burnt gases which are swept entirely from the cylinder by the action of the air and the piston, thus leaving the combustion space perfectly clean for a fresh charge of explosive mixture.

58 designates a series of vents around the heating jacket 21 of the intake pipe, so as to provide for the escape of the gas after heating said pipe.

59 designates the inlet water pipe for admitting cooling water to the jackets, and 60 the return or outlet pipe leading from the water spaces of the jackets back to the radiator, not shown.

What is claimed is:

1. In an internal combustion motor, the combination of a cylinder, a piston, a crank shaft, a valve shaft parallel to and driven from the crank shaft, a gas chest arranged at one side of the cylinder, a rotary disk valve interposed and operating between and in contact at both sides with the cylinder and chest and provided with inlet and exhaust ports which are arranged at unequal distances from the axis of the valve and register with similar ports in the cylinder and chest, said valve being fast on and revolving with the valve shaft, and packing strips supported by the opposing faces of the cylinder and chest and lying in contact with the opposite faces of said disk valve.

2. In an internal combustion motor, the combination of a pair of cylinders, pistons working therein, a crank shaft, a valve shaft parallel to and driven from the crank shaft, a gas chest arranged between said cylinders, rotary disk valves interposed and operating between and in contact with the adjacent sides of said cylinders and chest and provided with inlet and exhaust ports which are arranged at unequal distances from the axis of the valve and register with similar ports in the cylinders and chest, said valve being fast on and revolving with the valve shaft.

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

CHARLES F. LEMBKE.

Witnesses:

NORMAN GREEN,

E. G. OSBORNE.