W. FROEHLICH.

TWO-STROKE CYCLE INTERNAL COMBUSTION MOTOR.

APPLICATION FILED JAN. 26, 1915.

1,168,877.

Patented Jan. 18, 1916.

2 SHEETS—SHEET 1.

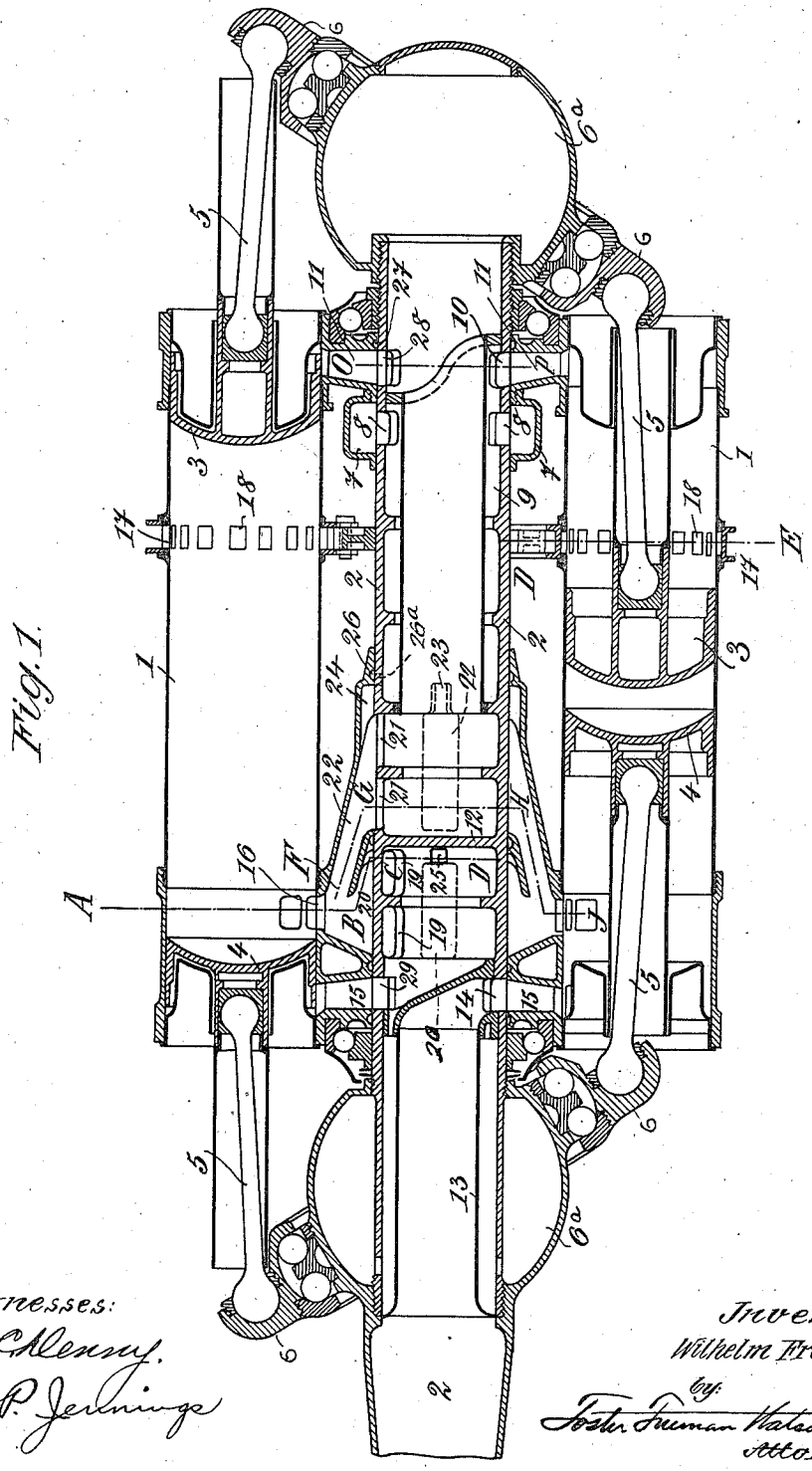


Fig. 1.

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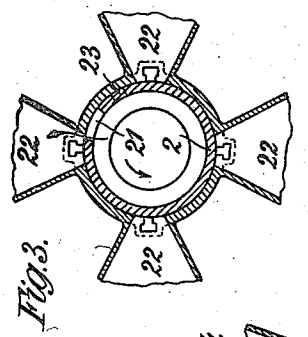


Fig. 3.

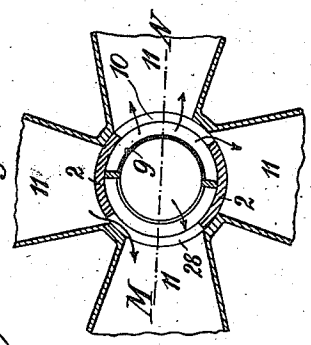


Fig. 4.

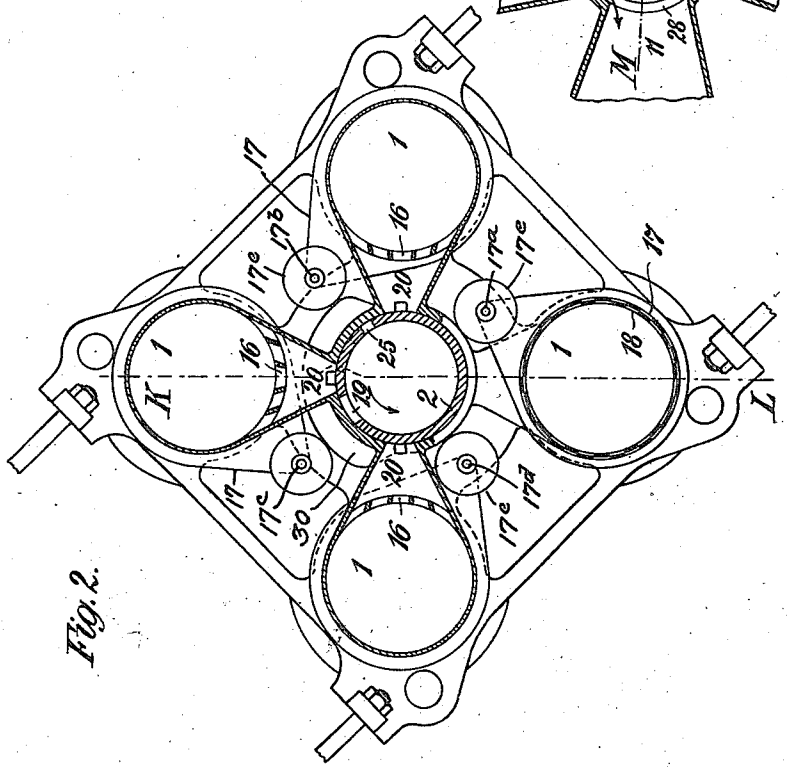


Fig. 2.

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UNITED STATES PATENT OFFICE.

WILHELM FROEHLICH, OF WANNSEE, NEAR BERLIN, GERMANY.

TWO-STROKE-CYCLE INTERNAL-COMBUSTION MOTOR.

1,168,877. Specification of Letters Patent. Patented Jan. 18, 1916.

Application filed January 26, 1915. Serial No. 4,558.

To all whom it may concern:

Be it known that I, WILHELM FROEHLICH, a subject of the King of Prussia, residing at 11 Tristanstrasse, Wannsee, near Berlin, Germany, have invented certain new and useful Improvements in Two-Stroke-Cycle Internal-Combustion Motors, of which the following is a specification.

My invention relates to internal combustion motors working in a two-stroke cycle, and more especially to the type of motors with a number of cylinders arranged parallel to each other around a hollow central shaft.

According to my invention the hollow shaft serves as an intermediate receptacle for the scavenging air and for the gas and air mixture. It further serves as a distributing valve for the admission of the scavenging air and the mixture to the cylinders and for governing the feed pumps drawing in and compressing the air and the mixture. The shaft therefor directly governs the suction and compression channels of the air and mixture pumps and the admission channels as well as, by aid of cams and annular valves, the exhaust channels of the cylinders.

The drawings affixed to this specification show the preferred form of a motor according to my invention.

Figure 1 is a vertical longitudinal section on the line K—L (Fig. 2), the points, where the scavenging air and mixture pumps are connected to the hollow central shaft, being shown in a horizontal section on line M—N (Fig. 4). Fig. 2 is a section on the line A—B—C—D—E (Fig. 1), Fig. 3 is a section on the line F—G—H—J (Fig. 1), Fig. 4 is a section on the line O—P (Fig. 1).

1 are four cylinders rigidly fastened to the engine bed and surrounding the rotatable central shaft 2. Two pistons 3 and 4 in each cylinder working in opposite directions are operatively connected by rods 5 with so-called reeling rings 6 mounted on spherical bodies 6^a connected with the central shaft so as to impart to said bodies and to the shaft connected with them a movement of rotation.

In the position shown in Fig. 1 the explosive mixture inlet 7 surrounding the shaft 2 is connected by a port 8 in the hollow shaft 2 with an annular chamber (suction chamber) 9 provided in said shaft. Chamber 9 is connected with the channel 11 of the casing leading to the lower cylinder 1, by the port 10 which coincides with channel 11. The piston 3 of the lower cylinder having completed its return stroke from the right to the left has drawn mixture into the cylinder. At the same time the piston 3 in the upper cylinder has pressed the mixture drawn in at a former phase through channel 11 and port 28 into the interior of shaft 2, the part at the right of the partition 12 of said shaft serving as an intermediate receptacle for the gas and air mixture. In the position shown in the drawing piston 4 of the lower cylinder having completed its stroke from the left to the right has drawn in air through the open left-hand end and through the central tube 13 and port 14 of shaft 2. At the same time piston 4 of the upper cylinder in moving from right to left has pressed the air drawn in at a former phase through channel 15 and port 29 into the chamber provided at the left of the partition 12 in the shaft, this chamber extending across the annular chamber surrounding tube 13 into the spherical body carrying the left-hand reeling ring 6.

The chamber at the right of the partition 12 of the shaft having thus been filled with gas and air mixture and the left-hand chamber with compressed air, the admission of scavenging air and gas and air mixture into the motor will take place in the following manner: When at the end of the expansion of the gases ignited between the pistons 3 and 4 of the upper cylinder the piston 4 uncovers inlet 16, a cam 30 on shaft 2 having caused the annular valve 17 governing the exhaust to open the exhaust ports 18, the ports 19 arranged in the wall of the left-hand chamber coincide with corresponding ports in the fixed casing surrounding the shaft. As shown in the drawings the valve 17 for each cylinder is in the form of a band encircling the cylinder between suitable guides, and passing about a shaft 17^a, 17^b, 17^c or 17^d on the casing or frame of the engine, said shafts being provided with rollers 17^e which extend into the path of the cam 30. As the shaft 2 revolves the valve rollers will be moved outward, effecting a movement of the band 17 sufficient to open the ports 18, each of said valves being returned to its closed position as the cam passes from engagement with the corresponding roller. The compressed air stored within the hollow shaft now passes through ports 19, channel 20 and inlets 16 into the

upper cylinder and displaces the burnt gases causing them to escape through the ports 18. When the piston 4 of the upper cylinder has reached the final position represented in the drawing, the ports 21 provided in the wall of the right hand chamber in the shaft come in front of the casing channel 22 and the compressed mixture contained within the shaft entering the cylinder through channel 22 and inlet 16 displaces the scavenging air and fills the cylinder, whereupon the exhaust ports 18 are closed by the annular valve 17 governed by cam 30 on shaft 2. The admission of gas and air mixture is continued until piston 4 has closed the inlets 16, whereupon a port 23 in the wall of the shaft 2 which surrounds the suction chamber coincides with a port 24 connected with the mixture admission channel 22, and a port 25 in the wall of the shaft 2 which surrounds the compressed air chamber coincides with a port connected with the scavenging air admission channel 20. While piston 4 closes the inlet 16 of the cylinder, compressed air is admitted into channel 20 and the mixture still present in the channel 22 is forced into the suction chamber 9 of the shaft. Therefore the reopening of the inlet 16 by the short piston 4 cannot cause any losses of mixture, the mixture having been forced out of the channel 22 and this channel as well as the channel 20 containing nothing but air.

In the joints between the shaft and the walls of the compressed mixture chambers of the casing surrounding it an annular groove 26 is provided, said groove being connected by a narrow opening 26^a with the suction chamber 9 of the shaft. This arrangement serves for preventing a loss of mixture in case that the joints between the shaft and the casing should become loose, the compressed mixture being pressed first of all into the annular groove 26 and being drawn from it through the opening into the suction chamber 9. A similar annular groove provided at 27 is similarly connected with the suction chamber.

I claim:—

1. In a two-stroke cycle motor, the combination of a hollow shaft, a plurality of cylinders arranged around said shaft, pistons within the cylinders, means connected with the pistons for rotating the shaft, separate intermediate storage chambers and suction chambers for scavenging air and for a mixture of gas and air within the shaft, passages for conducting scavenging air, and said mixture from the shaft to the cylinders, means for introducing mixture into a cylinder and means for immediately thereafter connecting said suction chamber for the mixture with the mixture passage.

2. In a two-stroke cycle motor, the combination of a hollow shaft, a plurality of cylinders arranged around said shaft, pistons within the cylinders, means connected with the pistons for rotating the shaft, separate intermediate storage chambers and suction chambers for scavenging air and for a mixture of air and gas within said shaft, passages for conducting scavenging air, and said mixture from the shaft to the cylinders, means for introducing the mixture into a cylinder, means for immediately thereafter connecting said mixture suction chamber with the mixture channel, and means for simultaneously connecting the mixture channel with the intermediate storage chamber for scavenging air.

3. In a two-stroke cycle internal combustion motor, the combination of a hollow shaft, a plurality of cylinders arranged around the shaft, pistons within the cylinders, means connected with the pistons for rotating the shaft, separate intermediate storage chambers and suction chambers for scavenging air and for a mixture of gas and air arranged within the shaft, a casing surrounding the shaft, passages in said casing for conducting scavenging air, and a mixture of gas and air from the shaft to the cylinders, compressed mixture chambers in the fixed casing surrounding the shaft, annular grooves in the joints between the walls of the last said chambers and the shaft, and a connection between said grooves and the suction chamber within the shaft.

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

WILHELM FROEHLICH.

Witnesses:
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