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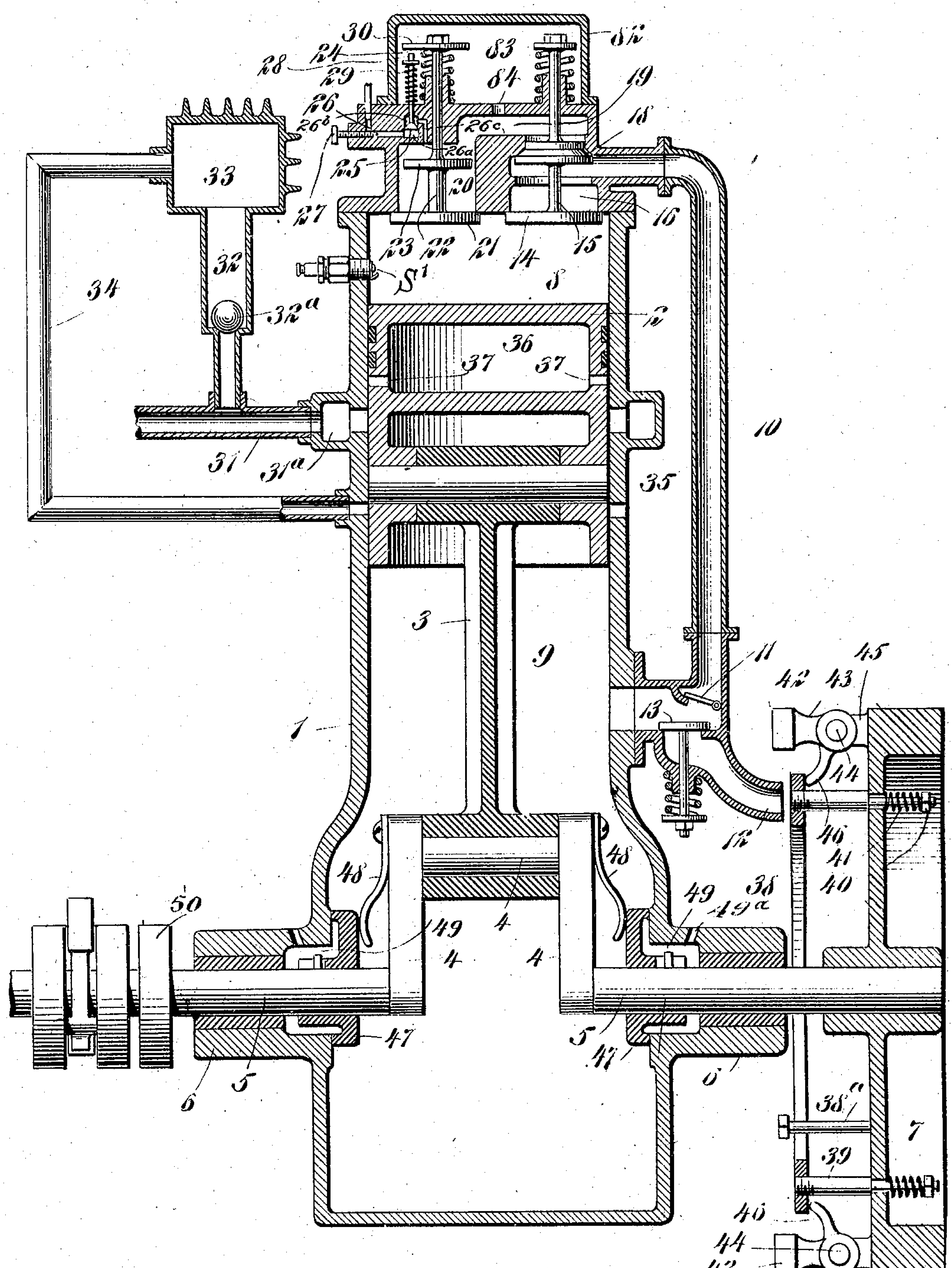
P. METZLER.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED SEPT. 5, 1906.



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PAUL METZLER, OF JERSEY CITY, NEW JERSEY, ASSIGNOR OF ONE-HALF TO JULIUS MINCK, OF BROOKLYN, NEW YORK.

INTERNAL-COMBUSTION ENGINE.

No. 855,115. Specification of Letters Patent. Patented May 28, 1907.

Application filed September 5, 1906. Serial No. 333,371.

To all whom it may concern:

Be it known that I, PAUL METZLER, a subject of the Emperor of Germany, and a resident of Jersey City, Hudson county, State of New Jersey, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

My invention relates to internal combustion engines, and has for its object to improve the construction of engines of this description.

My invention will be fully described hereinafter and the features of novelty will be pointed out in the appended claims.

Reference is to be had to the accompanying drawing which shows a central sectional view of my improved engine.

1 is the cylinder of the engine in which the piston 2 travels up and down, said piston 2 being connected by a rod 3 with a crank 4 of the shaft 5. The shaft 5 is journaled in suitable bearings 6 secured to or forming part of the cylinder 1 and carries the fly wheel 7. The cylinder 1 is divided into two chambers 8 and 9 by the piston 2 which chambers are connected with each other by means of a pipe 10 in which is located a flap valve 11 the purpose of which will be described hereinafter.

12 is an air inlet which communicates with the chamber 9, which inlet is normally closed by a spring pressed valve 13. A valve 14 carried by a stem 15 normally closes the opening 16 which communicates with the pipe 10. A second valve 18 is secured to the stem 15 and normally prevents communication between the pipe 10 and the passage 19 which leads to a small chamber 20 leading to the chamber 8 of the cylinder 1. The chamber 20 is closed by the valve 21 which is carried by a stem 22, to which stem is also fastened the disk 23, which disk is slightly smaller in diameter than the chamber 20. A spring 24 serves to keep the valve 21 in its normal position.

25 is the valve which controls the gasolene or fuel inlet 26, the size of which inlet may be regulated by the needle valve 27. The passage 26 leads to a chamber 26^a in which the valve 25 is located. As the said valve is opened the gasolene passes from the chamber 26^a to the small chamber 26^b and through the passage 26^c to the combustion chamber. It is then impossible for the pressure of the gasolene to open said valve 25 all such pressure having a tendency to close said valve. The valve 25 is mounted on a stem 28, surrounded by a spring 29 which keeps said valve 25 in its closed position. The upper end of the stem 28 engages a projection 30 on the stem 22, which projection also serves as an abutment for one end of the spring 24.

31 is the exhaust pipe which extends to the atmosphere and which is connected by means of a pipe 32 with a cooling chamber 33. A pipe 34 connects this cooling chamber 33 with the interior of the cylinder 1 the object of which will be more clearly brought out hereinafter. 35 is an opening in the cylinder wall extending to the outer air and located diametrically opposite to the point where the pipe 34 enters the cylinder 1. The piston 2 is provided with a chamber 36 which has diametrically opposite openings 37 in the walls thereof.

In order to regulate the amount of air which enters the chamber 9, through the air inlet 12, the fly wheel 7 is provided with a flat ring 38 mounted on rods 39 which extend through the fly wheel and are screw threaded to receive nuts 40. Springs 41 surround said rods and have one end bearing against the fly wheel and the other end abutting against the nuts 40. 42 are weights secured to arms 43 which are pivoted at 44, to lugs 45 on the fly wheel. The arms 43 are provided with projections 46 which extend adjacent to the ring 38. 38^a are stops to limit the movement of the ring 38.

47 are disks, preferably made elliptical in form and secured to the shaft 5 so as to turn therewith, yet being capable of sliding on said shaft. The disks 47 are pressed against the walls of the lower chamber 9 by means of flat springs 48, secured to the cranks 4 and also by the pressure in the chamber 9.

49 are oil wells provided with inlets 49^a; thus when oil is passed into the wells 49 it covers the surface of the chamber walls which are engaged by the disks 47 as said disks are rotated. A tight joint is thus secured at these points and leakage is prevented, the said disks moving lengthwise of the shaft as they wear. The elliptical shape of the chamber 49 will cause the oil to rise and fall thus insuring good lubrication.

50 indicates a means for producing a spark at the igniter S^1. 82 is a hood secured to the

upper portion of the cylinder 1, thus forming a chamber 83 which communicates with the passage 19 by means of an opening 84.

In operation an electric spark is produced in the usual way in the chamber 8 which ignites the mixture of gasolene and air contained in said chamber and causes said mixture to explode. This explosion drives the piston 2 downward; as soon as the upper edge of said piston passes the openings 31[a] the exhaust escapes through the pipe 31. Almost instantly atmospheric pressure is attained in the chamber 8, and as the downward stroke of the piston has compressed the air in the chamber 9, and in the pipe 10, the valve 14 will be opened by the pressure of the air, which pure air will enter the chamber 8 and expel the exhaust gases from said chamber. After the valve 14 has been pressed down far enough to completely open the valve 18, which is mounted on the same stem with valve 14, pure air air will rush into the passage 19 and will open the valve 21. This will at the same time open the gasolene valve 25 and allow gasolene to enter the chamber 20. Owing to the fact that there is very little space between the disk 23 and the walls of the chamber 20, the air rushes by this disk with a high velocity and carries with it the gasolene, the rushing in of the air resulting in a perfect mixture of air and gasolene. It is advisable to have pure air enter the chamber 8 first to drive out the remaining exhaust gases as if a mixture of gasolene and air were immediately introduced into said chamber 8 said mixture would be liable to become ignited by the burning exhaust, causing a premature explosion. As the piston travels in the upward direction, the valves 14 and 21 will be closed as soon as the openings 31[a] are covered by the piston and compression of the mixture takes place in the chamber 8. When the crank 4 reaches its upper position the compressed mixture is again ignited and the operation just described is repeated. During the upward stroke of the piston 2 pure air is sucked through the inlet 12, the suction opening the valve 13, and into the chamber 9. This pure air is compressed on the downward stroke and driven into chamber 8, as described above. As soon as the piston has reached its lowest point and starts upward again the valve 11 is closed by suction and no air in the pipe 10, which air might still be under pressure, can be sucked into chamber 9 from said pipe.

The regulation of the amount of air which enters the chamber 9, is effected as follows: As the shaft 5 is rotated and with it the fly wheel 7, the centrifugal force will cause the weights 42 to fly outward and swing the arms 43 on their pivot, if the speed should exceed a certain limit. This causes the projections 46 to move the ring 38 toward the air inlet 12 so that only a small amount of air can enter the chamber 9. On the next downward stroke the pressure of the air in the chamber 9 and the pipe 10 will not be great enough to open the valve 18 so that only a small amount of pure air enters chamber 8 and no explosion occurs. A throttling action is thus obtained and the speed of the engine is reduced. With this construction no gasolene is wasted as would be the case if this throttling did not take place. It is to be understood that the ring 38 never contacts with the inlet 12, in other words said inlet is never completely closed, a stop 38[a] being provided to limit the movement of the ring 38, so that there can be no friction between the ring 38 and the inlet 12 as the ring 38 rotates. As the exhaust gases rush into the pipe 31 some part of said gases will raise the check valve 32[a] and pass through the pipe 32 into the cooling chamber 33 where said gases will be cooled. As said gases escape under pressure there will be some pressure in said chamber 33, so that as soon as the opening 37 registers with the opening of the pipe 34, the cooled exhaust gases will rush into the chamber 36 and out through the opposite opening 37 and through the opening 35 into the outer air. The piston is thus effectually cooled at each stroke. In order to prevent the pressure of the air in the passage 19 and the chamber 20 from forcing gasolene along by the stem 28 of the valve 25, I provide the hood 82 which forms the chamber 83 and connect said chamber with the passage 19 by means of the opening 84. With this arrangement the pressure on both sides of the valve 25 is equalized and no leakage is possible.

Various modifications may be made without departing from the nature of my invention as defined in the claims.

I claim:

1. In an internal combustion engine, a cylinder having two inlet ports and an exhaust port, a piston arranged to reciprocate in said cylinder, an inlet for compressed air connected with one of the inlet ports of the cylinder, a passage leading from said compressed air inlet to the other inlet port of the cylinder, a fuel inlet connected with said passage, a valve controlling the connection of the compressed air inlet with said passage, another valve connected with the first-named valve and controlling the air inlet port of the cylinder, so that air will first enter the cylinder and then also the said passage, and another inlet valve controlling the connection of said passage with the cylinder.

2. In an internal combustion engine, a cylinder having two inlet ports and an exhaust port, a piston arranged to reciprocate in said cylinder, an inlet for compressed air connected with one of the inlet ports of the cylinder, a passage leading from said compressed air inlet to the other inlet port of the cylinder, a fuel inlet connected with said passage, a

valve controlling the connection of the compressed air inlet with said passage, another valve connected with the first-named valve and controlling the air inlet port of the cylinder, so that air will first enter the cylinder and then also the said passage, another inlet valve controlling the connection of said passage with the cylinder, and a fuel inlet valve controlled by the second-named inlet valve, controlling the admission of fuel to said passage.

3. In an internal combustion engine, a cylinder provided with two inlet ports and an exhaust port, a passage connecting the two inlet ports, a valve controlling said passage, and two inlet valves controlling the cylinder inlets, one of said inlet valves being connected with the valve controlling said passage, an inlet for compressed air leading to the engine between the two connected valves, and a fuel inlet leading to said connecting passage, so that air will first enter the cylinder through one of its inlets and will then pass through the said passage and mix with fuel before entering the other inlet of the cylinder.

4. In an internal combustion engine, a cylinder having two inlet ports and an exhaust port, a valved connection between the two inlet ports and means for first injecting air through one of the inlet ports and then injecting a mixture of air and fuel through the other inlet port.

5. In an internal combustion engine, a cylinder having two inlet ports and an exhaust port, a passage connecting the two inlet ports, a valve controlling the admission of compressed air to said passage, another valve connected with the first-named valve and controlling the direct admission of compressed air to the cylinder, a third valve controlling the connection of said passage with the cylinder, a fuel inlet valve controlled by said third valve to govern the admission of fuel to the said passage, and a cap forming a chamber communicating with said passage and inclosing the stems of the valves entirely, so as to equalize the pressure and prevent the escape of fuel along the valve stems.

6. In an internal combustion engine, a cylinder having two inlet ports and an exhaust port, a passage connecting the two inlet ports, a valve controlling said passage, another valve connected with the first-named valve and controlling one of the cylinder inlets, a compressed air supply leading to the engine between said valves, another valve closing the second cylinder inlet, means for supplying fuel to said passage, and a cap forming a chamber in communication with said passage and inclosing the valve stems entirely to prevent the escape of fuel along the stems.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

PAUL METZLER.

Witnesses:
ALEXANDER J. CLINCHY,
GEO. BRIGHTON.