J. J. McINTYRE.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED FEB. 28, 1907.

920,167.

Patented May 4, 1909.

3 SHEETS—SHEET 1.

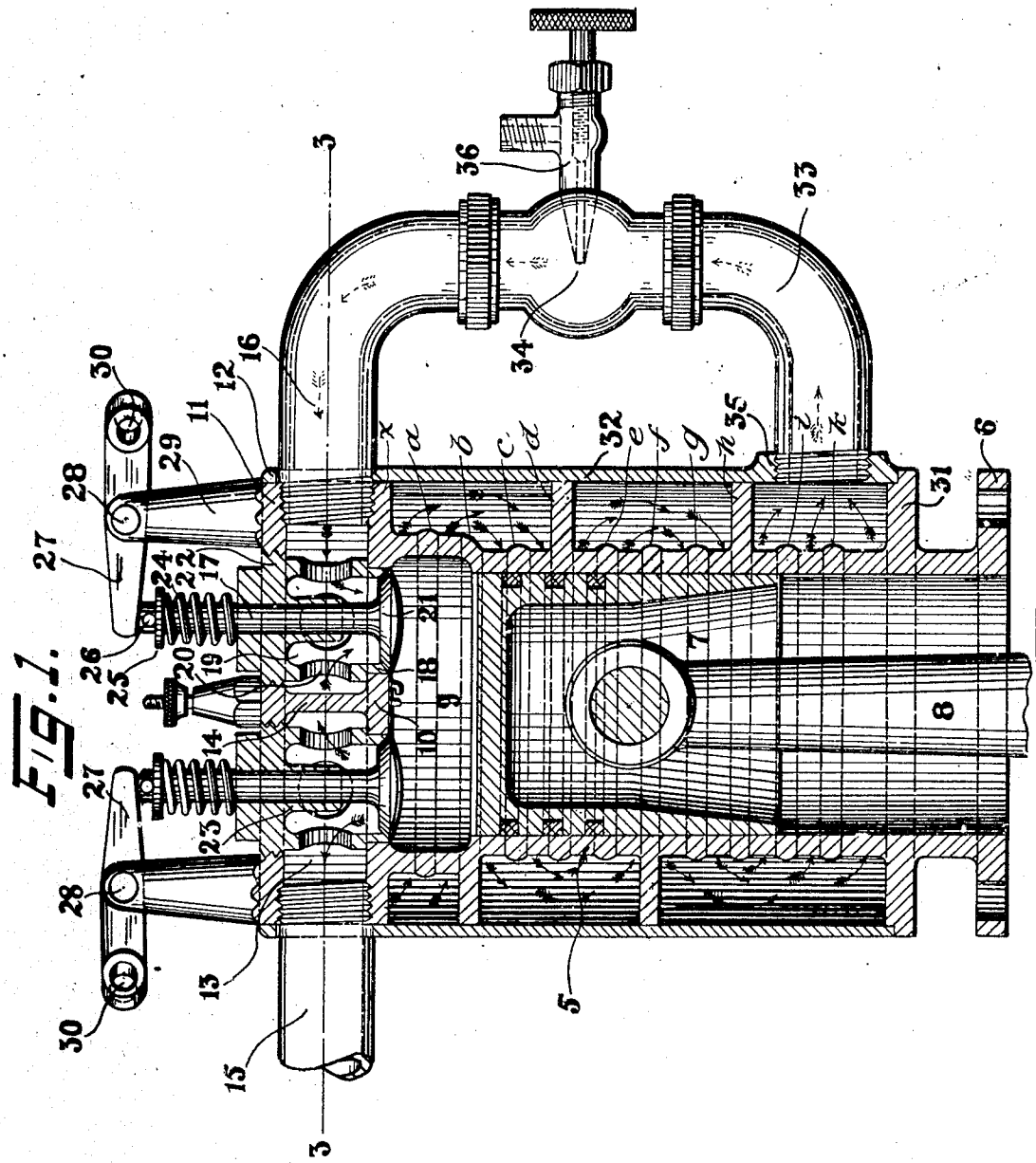



FIG. 1.

Witnesses

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3 SHEETS—SHEET 2.

Fig. 2.

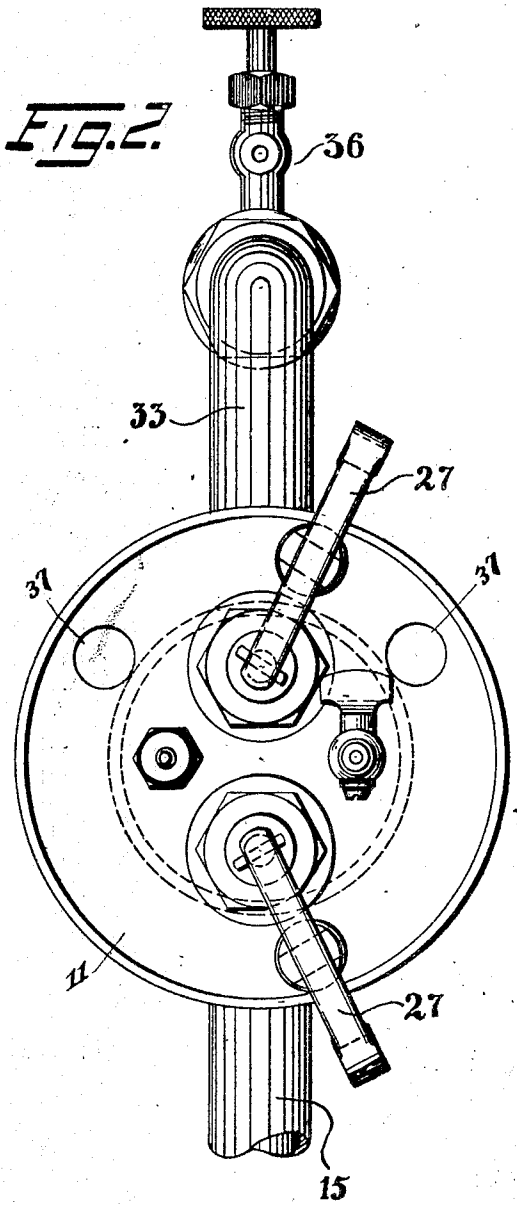
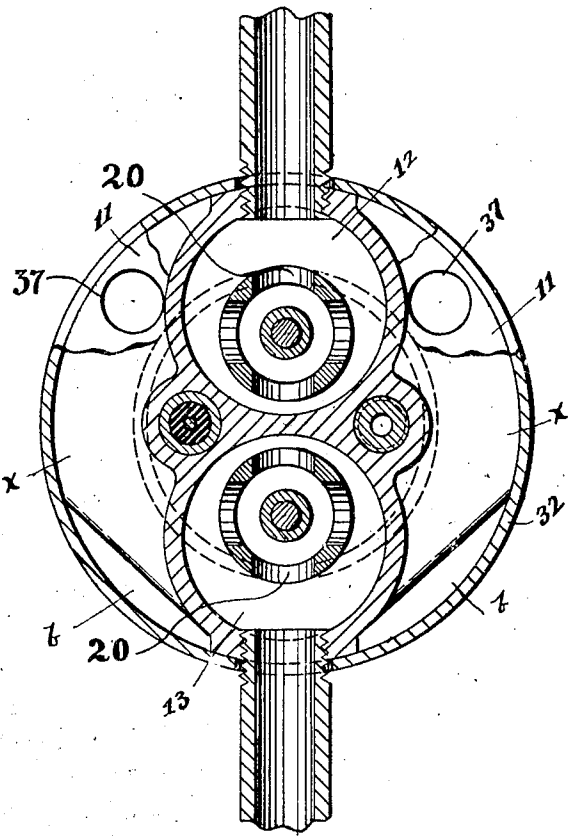



Fig. 3.




Witnesses

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3 SHEETS—SHEET 3.

Fig. 4.

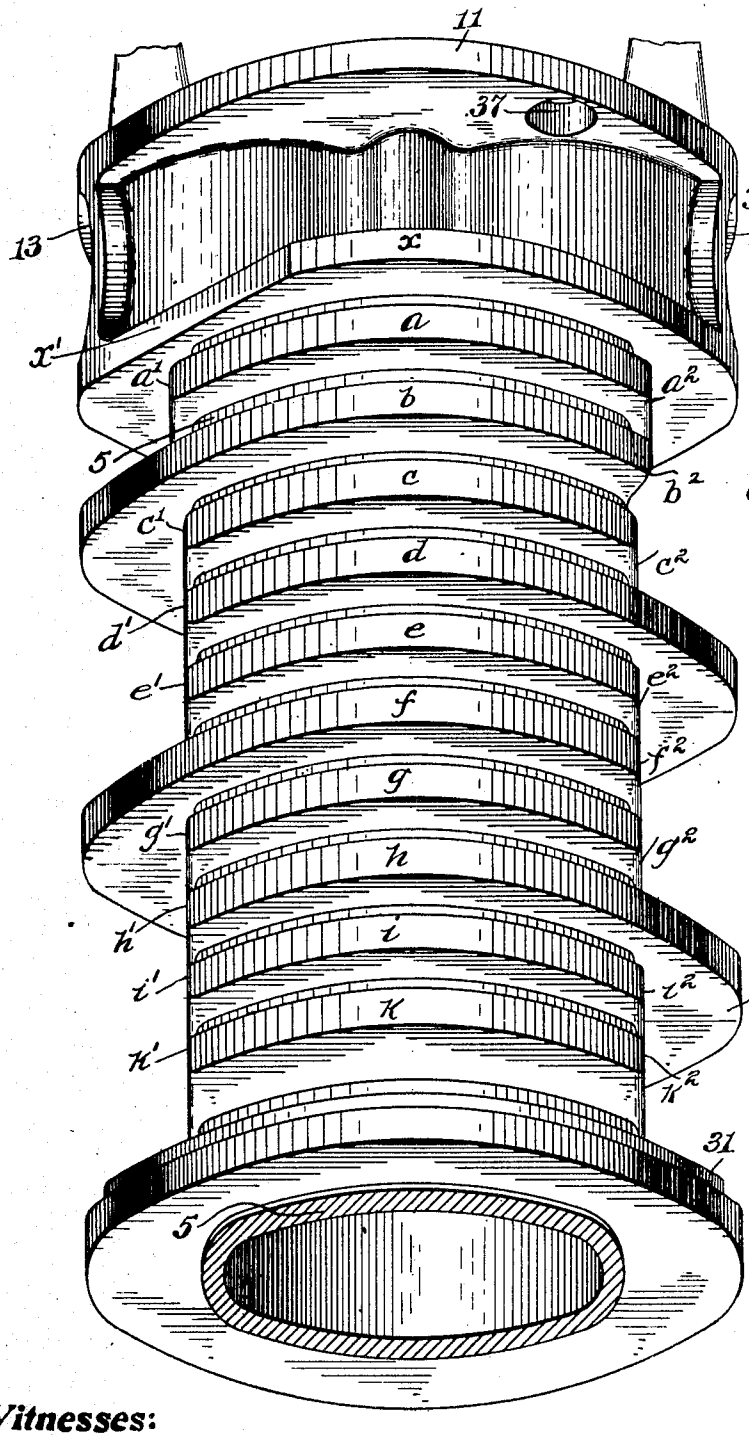



Fig. 5.

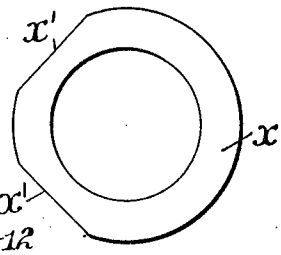



Fig. 6.

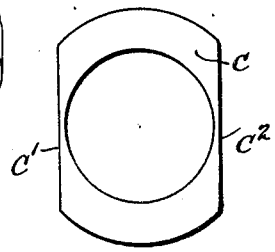



Fig. 7.

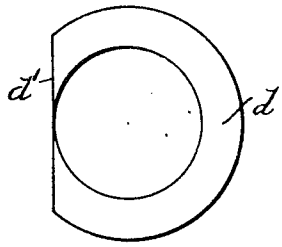
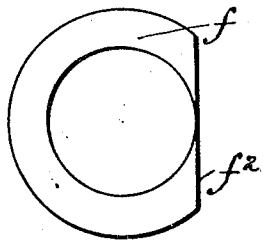



Fig. 8.




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# UNITED STATES PATENT OFFICE.

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## INTERNAL-COMBUSTION ENGINE.

No. 920,167. Specification of Letters Patent. Patented May 4, 1909.

Application filed February 28, 1907. Serial No. 359,928.

*To all whom it may concern:*

Be it known that I, JOHN J. McINTYRE, a citizen of the United States, residing in Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

This invention relates to internal combustion engines, and has for an object to provide means whereby the air drawn into the carbureter will traverse the radiation surfaces of the ignition chamber and the cylinder, cooling these upon its passage to the carbureter and arriving at the carbureter in a heated condition. The advantages are that not only does the air in such passage serve to cool the ignition chamber and the cylinder, but it will arrive at the mixing chamber of the carbureter in a heated condition, which will facilitate the gasification of the oil employed and will raise the temperature of this so that the charge of gaseous mixture delivered to the ignition chamber will be in a heated condition and thereby facilitate the more complete combustion of the charge.

In the form of my invention illustrated the air will be drawn in and pass across and between a number of radiation plates, which are so disposed relative to the cylinder and a surrounding casing that the air will pass back and forth as through a labyrinthian passage. The charge of fresh air in this manner will first be presented to the portion of the engine in which the explosion takes place and which is generally the most apt to become overheated, thereby insuring its being maintained at a sufficient temperature that the parts do not burn out.

The invention broadly contemplates the cooling of an internal combustion engine by the air drawn into the carbureter.

In the drawings accompanying and forming a part of this specification a form of my invention is illustrated wherein Figure 1 is a central vertical section of an engine equipped with a practical embodiment of a form of my improvement; the engine here illustrated is of the four cycle vertical type. Fig. 2 is a top plan view of the engine illustrated in Fig. 1. Fig. 3 is a view looking down on the engine and taken principally on a plane indicated by the dotted line 3—3 in Fig. 1 with the exception of certain parts which are shown in another plane, which plane will be apparent upon a comparison of the reference characters. Fig. 4 is a perspective view of the casting which constitutes the cylinder. Fig. 5 is a reduced plan view of the plate *x*. Fig. 6 is a reduced plan view of either plate *c*, *e*, *g*, *i*, or *k*. Fig. 7 is a reduced plan view of either plate *d* or *h*; and Fig. 8 is a reduced plan view of either plate *b* or *f*.

The engine cylinder is designated by the reference character 5 and is shown as intended for occupying a vertical position when in use, the cylinder is provided at its lower portion with a flange 6, which may be employed for bolting or otherwise securing the engine to its base. Within the cylinder is mounted a piston 7 having a pitman 8 connected to it. In Fig. 1 the piston is shown at the extreme of its upward stroke, which in practice will be the compression and scavenging strokes in a four cycle engine, which is the type here illustrated. Of course this invention is not limited to a four cycle engine; but for the purpose of convenience a four cycle engine is illustrated.

Above the piston is represented an ignition chamber 9, the walls of which are a continuation of the walls of the cylinder, although of somewhat larger radius in the present illustration. The end 10 of which chamber will be considered the cylinder head and above the cylinder head are provided the supply inlet and exhaust chambers, there being cast integral with the cylinder in the present instance a head 11 and there being between the inlet chamber 12 and the exhaust chamber 13 a partition 14. From the exhaust chamber 13 there is shown extending a conduit 15 leading to some exhaust, which in practice will generally be a muffler. This, of course, does not concern the present invention and is not illustrated. A conduit 16 leads into the inlet chamber from a carbureter, presently to be described. A valve and valve seat is provided for each of the chambers 12 and 13 for controlling the communication with the ignition chamber. The inlet comprises a valve body 22 which has a valve seat 18 facing downwardly into the ignition chamber. The walls 19 of the valve body are provided with a series of openings 20 for permitting the free passage of the gas. An upwardly closing valve 21 seats upon the seat 18 and is carried by a valve stem 17 guided in a flange 23 of the body portion. A suitable compression spring 24, held in place by a bur 25 and pin 26, is employed for holding the valve to its seat. The valve is shown as controlled

by means of a lever 27 pivoted at 28 to a post 29 and having means of attachment at 30 for some operative part of the mechanism. The valves in the present instance for the inlet and for the exhaust are illustrated as substantially similar and to prevent extending the description the same reference characters are applied to both.

The head or plate 11 projects beyond the sides of the cylinder and there is a flange 31 at the bottom portion of the cylinder, which also projects beyond the cylinder, and there is a casing 32 connected to such extending portions 11 and 31. The air conduit 33 which leads to the mixing chamber 34 of the carbureter enters the lower portion of the chamber formed between the casing 32 and the walls of the cylinder. The casing is shown as comparatively thin, but having an enlargement 35 for the engagement of the conduit 33. A hydrocarbon induction nozzle 36 is shown as entering the mixing chamber 34.

The top plate 11 is provided with a pair of normally open air inlets 37. The walls of the cylinder and the ignition chamber are provided with radiation plates, which in the present illustration are disposed in a horizontal plane. These radiation plates at most of their edges extend to the casing 32. The passages are not alternately arranged; but it will be seen that several of the plates at one side will be provided with passages, and then several at the other side, so that the stream of air passing in will not all pass over the same plates; otherwise the air will get too hot at the first part of its passage. A larger volume of air is passed over the engine as a whole by the construction illustrated than if all the air had to pass between each two plates. After the air arrives at the lower portion of the chamber between the casing 32 and the cylinder wall it will find entrance into the carbureter conduit 33 and will in its heated condition, after having reduced the temperature of the parts over which it is has passed, enter the mixing chamber 34, and owing to its high heat will form an explosive mixture with the oil delivered by the induction device 36; the mixture will then pass on through the conduit 16 to the inlet chamber 12, and thence, as required by the operation of the device, pass from the valve 21 into the ignition chamber.

The radiation plates and the open spaces which these plates leave are so disposed one relative to the others that the current of air will be divided into two streams, one of which will traverse one side of the cylinder and the other of which will traverse the other side of the cylinder, each stream passing back and forth from side to side several times in its passage from one end of the cylinder to the other and being sub-divided in its several passes from one side to the other. The two streams and the sub-divisions of these will come together at given intervals at each side of the cylinder but in the main, the streams will be divided and sub-divided as before referred to. Some of the radiation plates as for instance plates $a$, $c$, $e$, $g$, $i$ and $k$ are each provided with an opening at each side, which openings in Fig. 4 at the left side bear the reference character of the plate primed and at the right side with the exponent 2. The plates $x$, $d$ and $h$ are provided with openings at $x'$, $d'$, $h'$ at the left hand side only and the plates $b$ and $f$ are provided with openings $b^2$ and $f^2$ at the right hand side only. Air will enter the opening 37 in the plate 11 and pass around the outside of the chambers 12 and 13 between the plates 11 and $x$, which plate $x$ in the present instance is an outward continuation of the cylinder head 10. The air will pass through the opening $x'$ when its direction of flow will be reversed toward the other side of the cylinder, part of this stream passing between the plate $x$ and $a$ and part between the plate $a$ and $b$. That portion of the stream of air which has been caused to pass between the plates $x$ and $a$ will pass over the opening $a^2$ and $b^2$ and that portion of the air which passed over the opening $a'$ and between the plates $a$ and $b$ will pass over the opening $b^2$. The air will so pass on from side to side upon each side of the cylinder in sub-divided streams until it reaches the space at the right hand side between the plates $h$ and 31, when it will be conveyed to the mixing chamber 34 by means of the pipe 33. The air will then be very hot and will immediately gasify the oil supplied by the carbureter 36. The explosive mixture will then be conveyed by the pipe 16 into the inlet chamber 12.

The suction stroke of the piston will, when the valve 21 is open, draw the air through the conduit 16, the mixing chamber conduit 33, and the chamber between the casing 32 and the cylinder walls from the openings 37, which, as before stated, will normally be open. One advantage of having these air inlets normally open is that upon the explosion heating up the ignition chamber and the cylinder any rise in temperature of the air and its expansion will be followed by a discharge of the air through these openings, and upon suction taking place this discharged air will be substituted by other air, which will, of course, be cooler.

Having described my invention I claim:

1. In an internal combustion engine, the combination with a cylinder, of a carbureter, a conduit leading from the carbureter to the explosion chamber of the cylinder, radiation plates on the cylinder, a casing surrounding the plates and explosion chamber of the cylinder, some of said plates having passages at one side of said cylinder and some at the opposite side thereof, said plates being alter-

nately disposed, and some of the plates being located between the said plates having openings at both of the said sides of the cylinder, the radiation plates and casing constituting a labyrinthian air passage doubling upon itself several times about each side of the cylinder, an air inlet at one end of the casing, and a conduit connecting the other end of the casing with said carbureter.

2. In an internal combustion engine having a cylinder and an ignition chamber, the combination with a casing surrounding the ignition chamber and the cylinder and spaced away from the same, a series of radiation plates surrounding said chamber and cylinder and extending from the walls of these to the walls of the casing, some of said plates being provided with openings at one side only, those plates having openings at one side only being disposed between plates having openings at both sides, the plates having openings at one side only being so arranged that their openings are disposed alternately in register with the openings at the respective sides of the plates having openings at both sides, said casing having an air inlet at one end and an air outlet at the opposite end, a mixing chamber, a conduit connecting the outlet from said casing with the mixing chamber and connecting said mixing chamber with the ignition chamber.

3. In an internal combustion engine, the combination with a cylinder, of a carbureter, a conduit leading from the carbureter to the explosion chamber of the cylinder, a casing surrounding the cylinder and spaced away from the same, the space between the casing and cylinder having an air inlet opening at one end, means within said space for dividing the air into two streams, one traversing one side of the cylinder and the other traversing the other side, for causing each stream to pass back and forth several times across the side it traverses, and for sub-dividing each of said streams in its several passages from one side to the other, and a conduit connecting the other end of the space with the carbureter.

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