E. RATHBUN.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED FEB. 21, 1908.

904,562.

Patented Nov. 24, 1908.

2 SHEETS—SHEET 1.

Fig. 1.

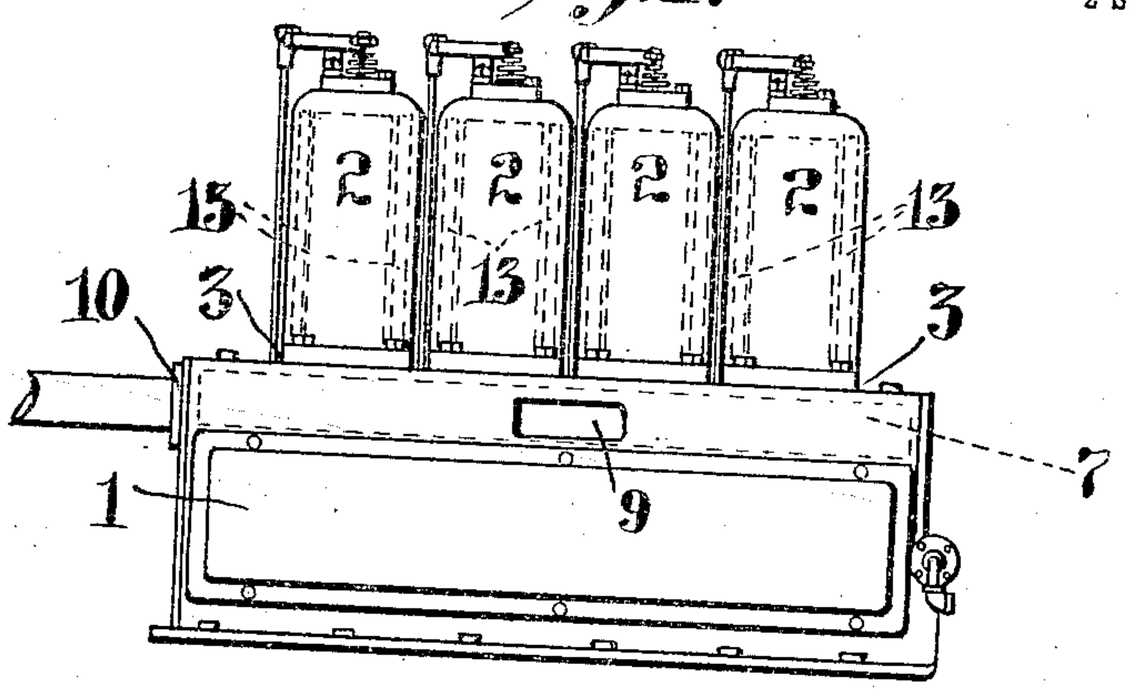


Fig. 2.

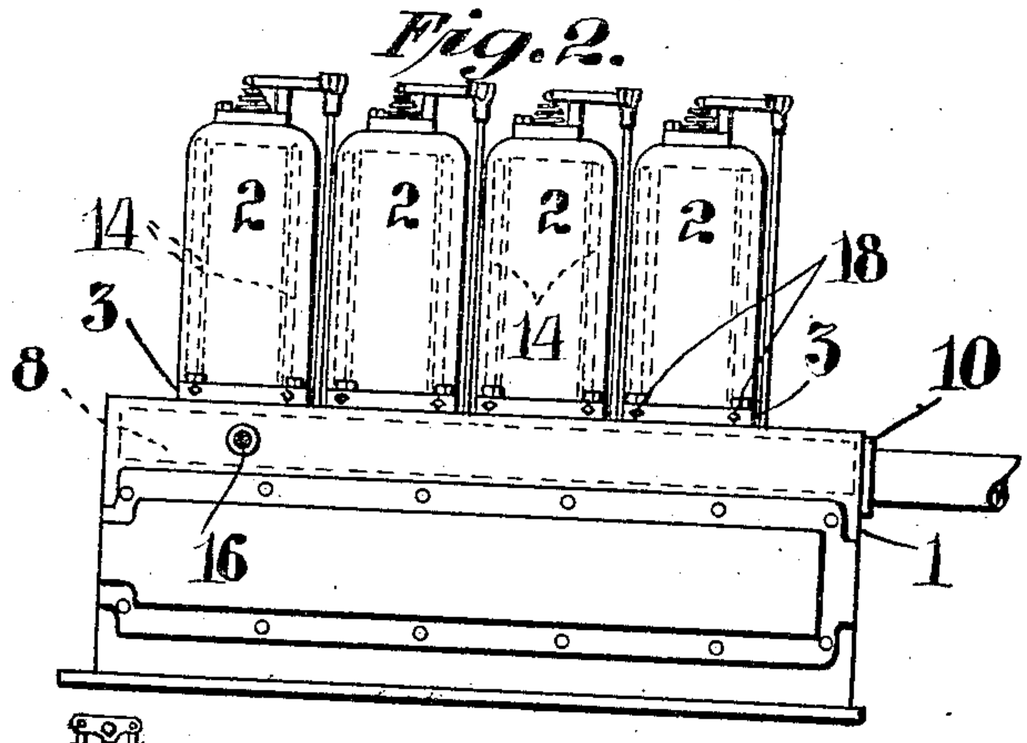


Fig. 3.

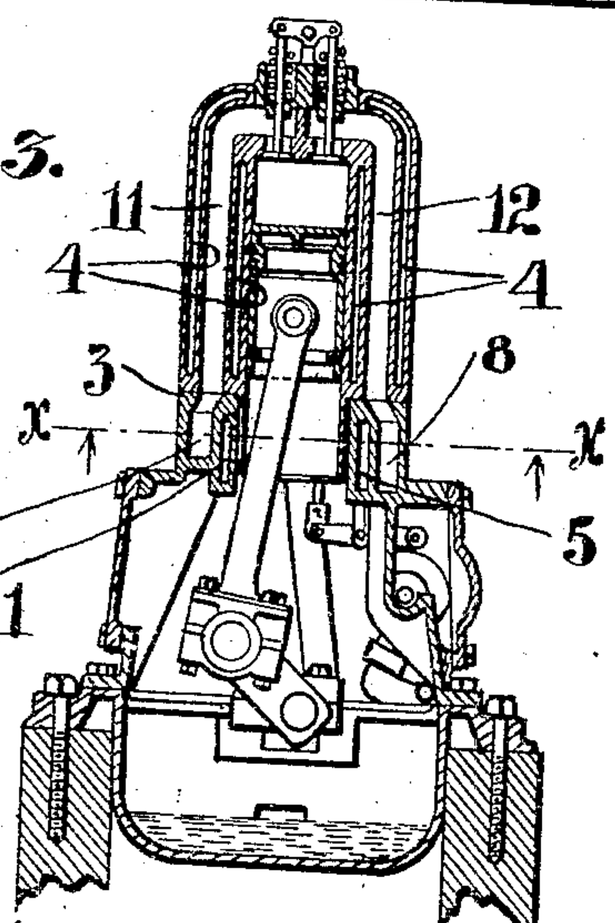
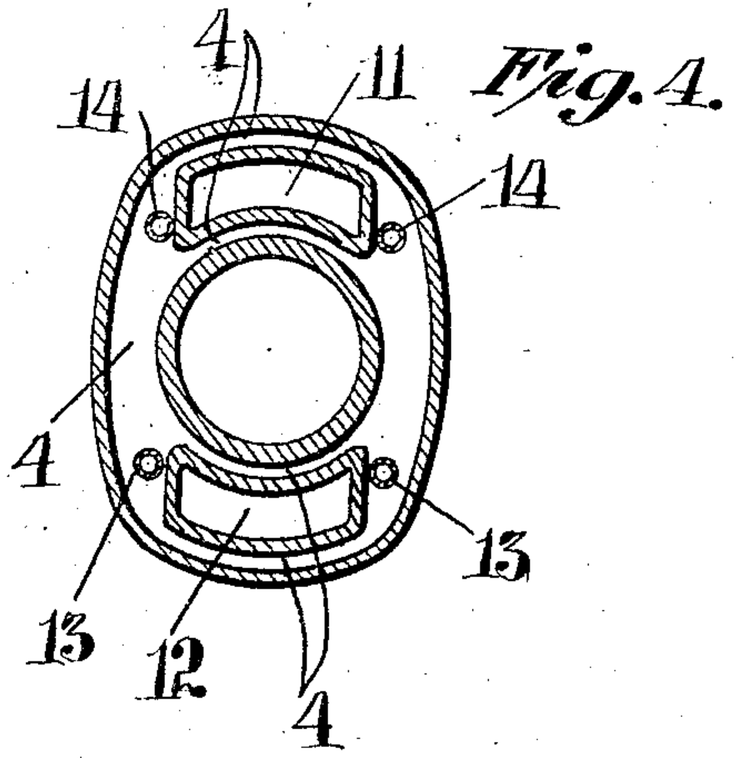


Fig. 4.



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2 SHEETS—SHEET 2.

Fig. 5.

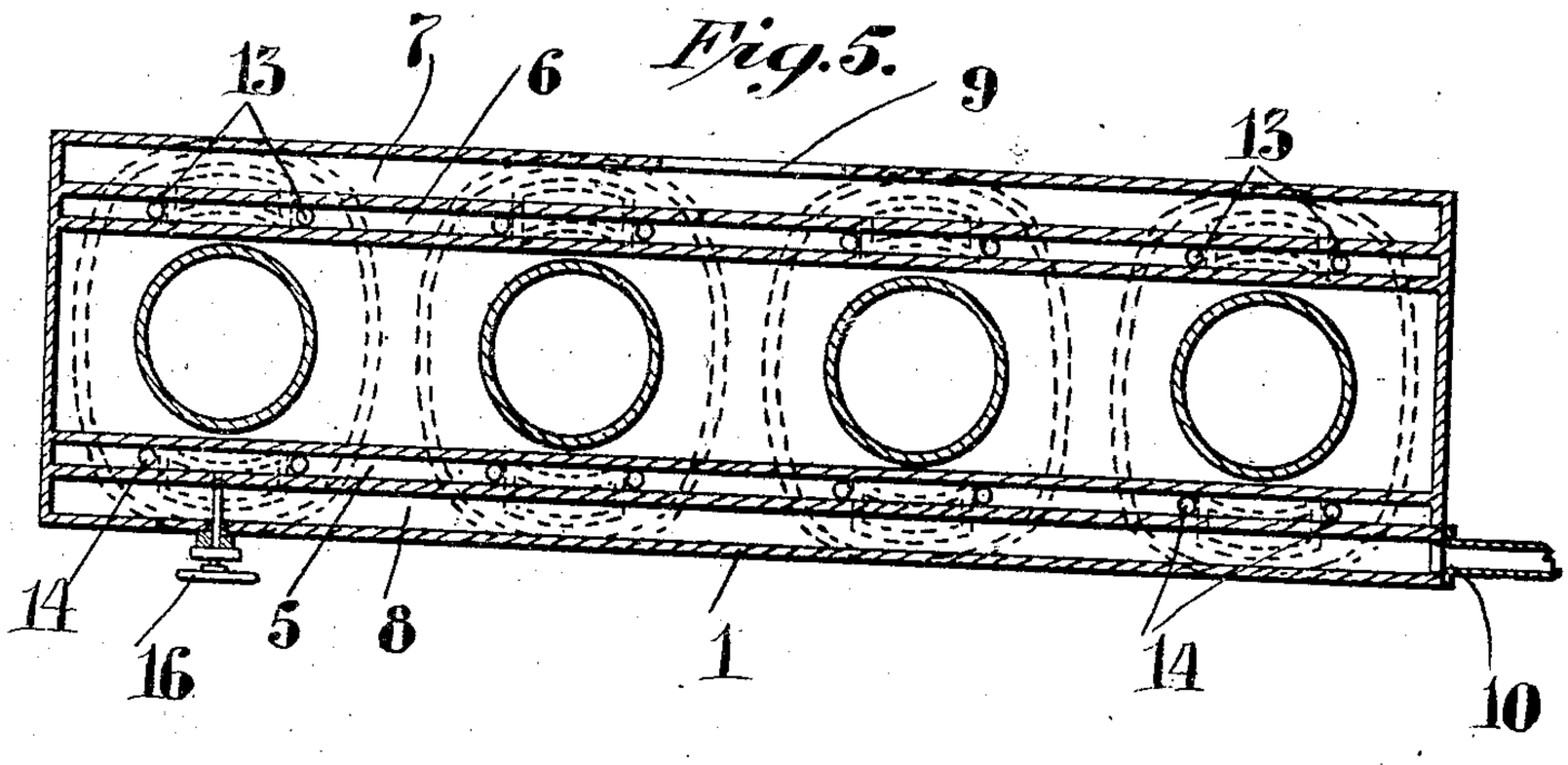


Fig. 6.

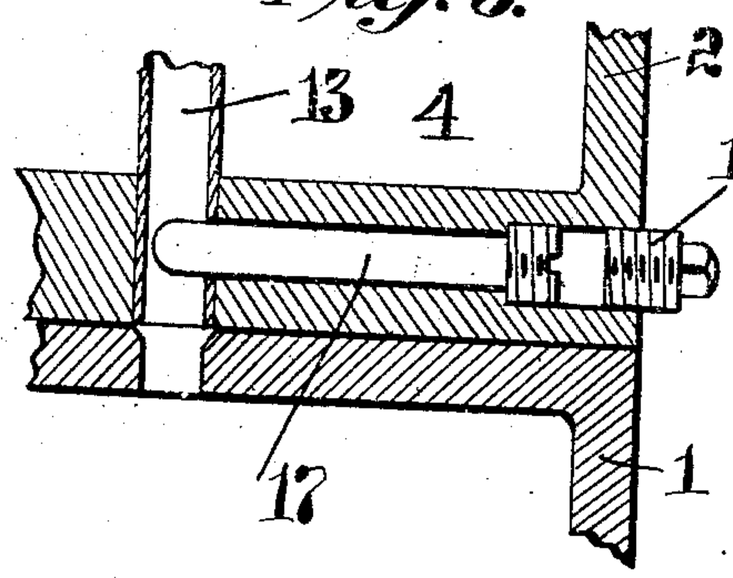
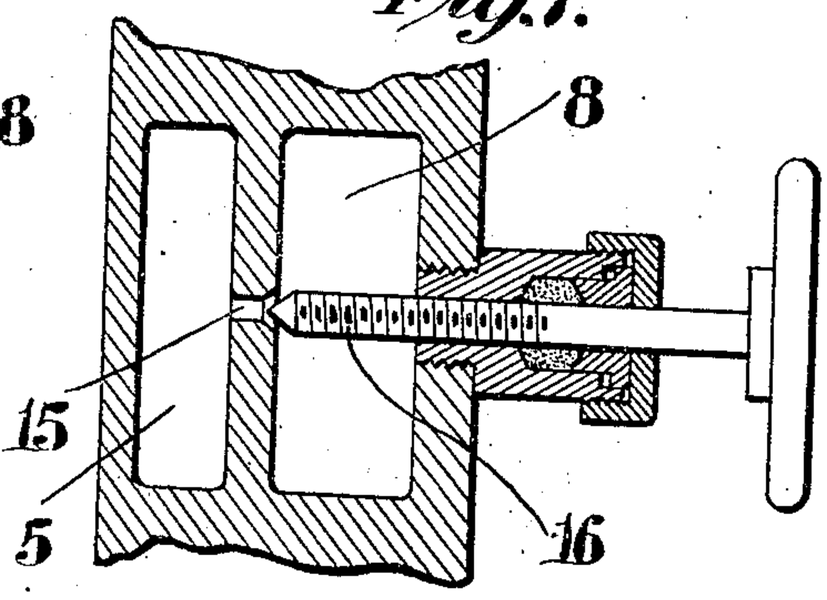


Fig. 7.



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UNITED STATES PATENT OFFICE.

EDWARD RATHBUN, OF TOLEDO, OHIO.

INTERNAL-COMBUSTION ENGINE.

No. 904,562. Specification of Letters Patent. Patented Nov. 24, 1908.

Application filed February 21, 1908. Serial No. 417,117.

To all whom it may concern:

Be it known that I, EDWARD RATHBUN, a citizen of the United States, residing at Toledo, in the county of Lucas and State of Ohio, have invented certain new and useful Improvements in Internal-Combustion Engines; and I do hereby declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to engines, and particularly to multi-cylinder explosion engines of the vertical type, and comprises means for avoiding the external pipes commonly provided for distributing the charge to the different cylinders and for collecting the exhaust gases from the different cylinders. These pipes, as usually arranged, cover the sides of the engines to a considerable extent, often interfering with access to the parts of the valve gear and making it difficult to make adjustments, on the exhaust side of the engine, without danger of being burned by contact with the hot exhaust piping; and such piping always gives the engine a confused, complicated appearance and adds considerably to cost of manufacture. Furthermore, it is frequently a matter of great difficulty to so design such external piping that all cylinders shall receive the same amount and character of charge, and shall all exhaust alike; and there is always danger of the external piping being bent, broken, deranged, or caused to leak.

To obviate these objections, according to my invention I provide a single housing or base or crank-case for a plurality of cylinders, the several cylinders being fitted thereto; and I provide in said housing, base or crank-case a single supply passage for all the cylinders, and a single exhaust passage for all the cylinders, said passages in the said housing having ports through which said passages are placed in connection with corresponding branch passages formed in the walls of the several cylinders. In this way I avoid the numerous pipe-branches commonly found on four-cycle explosion engines, avoid unequal distribution of the charges to different cylinders, make the valve gear readily accessible, greatly decrease cost of manufacture, and greatly simplify the engine in appearance.

In the accompanying drawings I illustrate an engine constructed in accordance with my invention. The engine shown is provided with four cylinders, but it will be apparent that this number may be greater or smaller, as preferred.

In said drawings: Figure 1 shows a side view of the engine—the side shown being the supply side; Fig. 2 shows a similar elevation of the exhaust side of the engine; Fig. 3 shows a central vertical section through one of the cylinders and the housing; Fig. 4 shows a transverse section of one of the cylinders; and Fig. 5 shows a horizontal section through the housing on line X—X of Fig. 3. Figs. 6 and 7 are sectional detail views.

In said drawings, 1 designates the housing (also commonly termed base or crank-case, in the art; the term housing being hereafter used herein to designate this part); and 2, 2 designate the several cylinders. In the construction shown and preferred, these cylinders are separate from each other and from the housing, but are carefully fitted thereto, at joints 3. The engine is provided, as usual, with pistons, crank-shaft, connecting rods, valves and valve gear, etc.; but these parts it is not necessary to discuss. Each cylinder is provided with a cored-out water jacket 4, and the housing is provided with cored-out longitudinal water-passages, 5 and 6, for supplying and carrying off, respectively, the cooling water, these passages 5 and 6 communicating with the jackets 4. In the said housing is a cored-out supply passage, 7, extending lengthwise on one side of the engine; and on the opposite side of the housing there is a corresponding exhaust passage, 8. There being but one housing for all the cylinders, the engine therefore requires but one supply connection, at 9, (communicating with passage 7). In the walls of each cylinder are cored-out supply and exhaust passages, 11 and 12 respectively, which communicate respectively with passages 7 and 8 in the housing, through ports or apertures in the meeting faces of the cylinders and housing. As shown in Fig. 3 particularly, the supply and exhaust passages are surrounded by the jackets; which has the effect of warming the entering charge somewhat (something highly desirable when the fuel is gasolene of high vaporization temperature or kerosene) and of making the engine perform substantially

uniformly notwithstanding variation of atmospheric temperature, and also of cooling the exhaust, so preventing overheating of the exhaust pipe. To still further cool the exhaust, I provide (see particularly Fig. 7) a duct 15 connecting water passage 5 and exhaust passage 8, and a valve 16 by which the flow of water through this duct into the exhaust passage may be regulated.

Since the finishing of the meeting faces of the cylinders and housing is an operation that must be performed in any case when the cylinders are separable from the housing, and since this operation is all that is required for making the joints between the cylinder fuel supply, exhaust, and water passages, and the corresponding passages of the housing, the forming of these passages for the cylinders in the walls of the cylinders themselves greatly decreases cost of manufacture; for the elaborate branched pipes for supply and exhaust, commonly required, and which require careful fitting to the cylinders, are no longer needed. Furthermore, since the connections of the several cylinders to the supply and exhaust passages 7 and 8 are of the same size and character, the performance of the several cylinders is substantially identical. And as above stated, and as appears from the drawings, the placing of these passages inside the walls of the housing and cylinders leaves the engine cylinders unobstructed by outside piping, making the valve gear readily accessible, and giving the engine the uncomplicated appearance characteristic of many two-cycle engines.

Since the supply water passage 5 is alongside the exhaust passage 8, the inner surface of this portion of the housing is prevented from being heated by the exhaust gases to such extent as to cause carbonization of lubricating oil splashed against this surface. The water passages 5 and 6 also tend to prevent overheating of the depending lower ends of the cylinders.

The water supply passage, 5, is connected to the several jackets by means of pipes 13 extending up through the jackets to near the tops thereof. The jackets are connected to the passage 6 for carrying off the water by similar pipes 14. The water being supplied to and taken from the jackets near their tops, efficient circulation of the water through the jackets is insured, and dead spaces in which circulation is inactive are avoided. To regulate the flow to the different jackets (which is sometimes desirable; for example, when the engine is set on an incline) I provide (see Fig. 6) valve screws 17 arranged to project across the pipes 13 to a greater or less extent as desired, so regulating the flow into these pipes. Screw plugs 18 cover over the ends of these valve screws. These valve-screws are located at the bases of the cylinders, as indicated in Fig. 2, and by removing the plugs 18 the valve screws may be adjusted as desired.

What I claim is:—

1. An internal combustion engine including in combination a housing and a plurality of cylinders mounted side by side thereon, said housing having formed in it a common supply passage for the cylinders and a common exhaust passage for the cylinders, both said passages extending lengthwise of the housing, said cylinders each having a supply passage and an exhaust passage formed in its walls, connected to the supply and exhaust passages of the housing, respectively, and extending substantially to the top of the cylinder.

2. An internal combustion engine including in combination a housing and a plurality of separate cylinders separable from and mounted side by side on said housing, the latter having formed in it a common supply passage for the cylinders and a common exhaust passage for the cylinders, both said passages extending lengthwise of the housing, said cylinders each having a supply passage and an exhaust passage formed in its walls, extending substantially to the top of the cylinder, said cylinder and housing having in their meeting faces ports connecting the said passages of the cylinder and housing.

3. An internal combustion engine including in combination a housing and a plurality of cylinders mounted thereon, said cylinders having water jackets, the housing having formed in it passages for the supply and carrying off of cooling water extending lengthwise of the housing past said cylinders, the jackets communicating in parallel with said passages.

4. An internal combustion engine including in combination a housing and a plurality of cylinders mounted thereon, said housing having formed in it passages for the supply and carrying off of cooling water, said cylinders having jackets and pipes within their external outlines extending from the water supply passage and water discharge passage of the housing to near the tops of said jackets, and connecting said jackets with the passages in the housing for supplying and carrying off the cooling water.

5. An internal combustion engine including in combination a housing and a plurality of cylinders mounted thereon, said housing having formed in it a common supply passage for the cylinders and a common exhaust passage for the cylinders, said cylinders each having a jacket and supply and exhaust passages substantially surrounded by the jacket, extending to substantially the top of the cylinder, and connected with the corresponding passages in the housing.

6. An internal combustion engine including in combination a housing and a plurality of cylinders mounted thereon, said housing having formed in it a common fuel supply passage and a common exhaust passage for the cylinders, and having also formed in it a common water-supply passage and a common water-discharge passage, said passages all extending longitudinally of the housing, said cylinders each having a jacket and having supply and exhaust passages extending substantially to the top of the cylinder, substantially surrounded by the jacket, and connected to the corresponding fuel supply and exhaust passages in the housing, the said jackets connected to the water-supply and water-discharge passages of the housing.

7. An internal combustion engine including a cylinder, a housing forming a base therefor and having in it parallel exhaust and water passages, and valved means connecting said passages.

8. An internal combustion engine including a cylinder, and a crank case housing forming a base for said cylinder and having in its walls exhaust and water passages, the latter between the exhaust passage and the inner surface of the housing and serving to prevent overheating of such inner surface.

9. A cylinder for an internal combustion engine including a jacket, and pipes within the external outlines of the jacket extending from the lower part of the cylinder to near the top of the jacket, and serving to supply and carry off cooling water.

10. An internal combustion engine including a crank case housing and a jacketed cylinder for which said housing forms a base, one end face of said cylinder seated on said base, said cylinder and base separable from each other but having their meeting faces proximated to form a joint, said housing having fuel supply and exhaust passages and water passages, said cylinder having corresponding passages, the passages of the cylinder and housing being in communication through ports in the meeting faces.

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

EDWARD RATHBUN.

Witnesses:
H. M. MARBLE,
FRANK E. RAFFMAN.