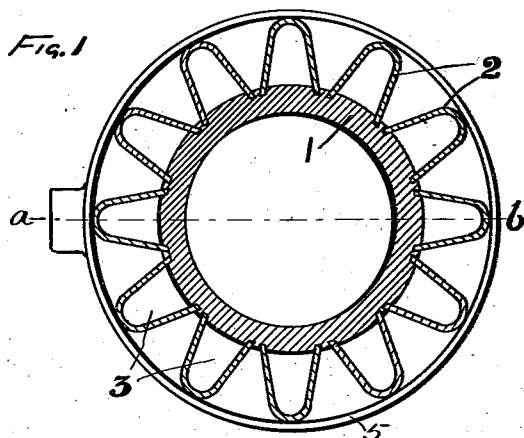
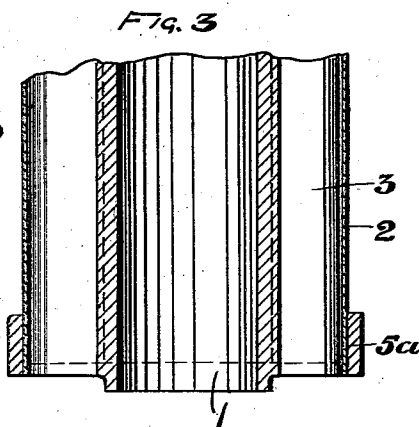
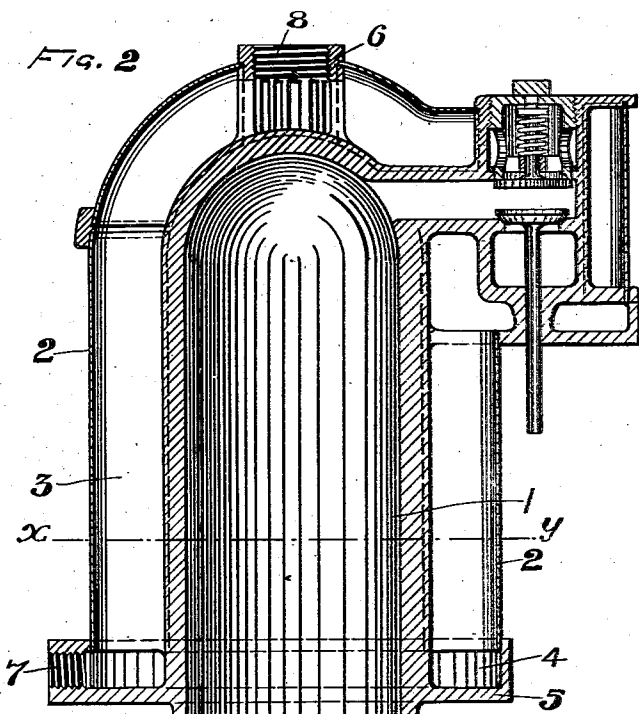
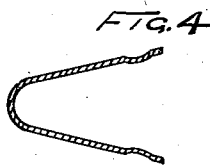


D. REID.
MOTOR CYLINDER.
APPLICATION FILED JAN. 4, 1904.

927,075.

Patented July 6, 1909.

2 SHEETS—SHEET 1.



WITNESSES

Roy Burkholder
Ralph H. Robertson

INVENTOR

David Reid
By *Roy Stewart Lehr*
Atty

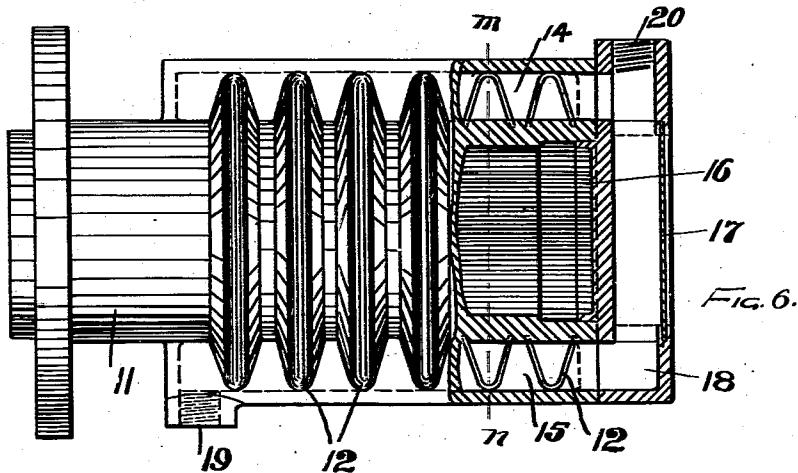
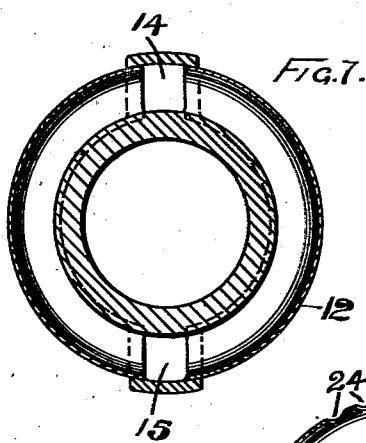
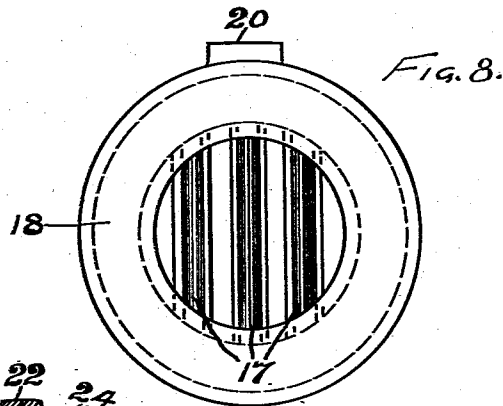
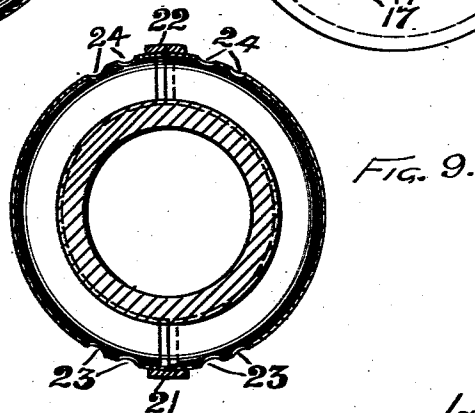
D. REID.
MOTOR CYLINDER.

APPLICATION FILED JAN. 4, 1904.

Patented July 6, 1909.

2 SHEETS—SHEET 2.

927,075.



WITNESSES

Ray Burkholder
Ralph H. Robertson

INVENTOR

David Reid
By Ray Stewart Gehr
Atty

UNITED STATES PATENT OFFICE.

DAVID REID, OF ITHACA, NEW YORK.

MOTOR-CYLINDER.

No. 927,075.

Specification of Letters Patent.

Patented July 6, 1909.

Application filed January 4, 1904. Serial No. 187,612.

To all whom it may concern:

Be it known that I, DAVID REID, a subject of the King of Great Britain, residing at Ithaca, in the county of Tompkins and State of New York, have invented a new and useful Motor-Cylinder, of which the following is a specification.

My invention relates to improvements in the cylinders of internal combustion motors, and has for its object the production of a cylinder that can be effectively cooled with either air or water, and that can be manufactured at a low cost. These objects are attained in the construction illustrated in the accompanying drawings, in which—

Figure 1 is a horizontal section on the line $x-y$ through the body of the cylinder shown in Fig. 2; Fig. 2 is a sectional elevation of the cylinder, the section being taken on the line $a-b$ in Fig. 1; Fig. 3 is a fragmentary view in sectional elevation of a slightly modified form of cylinder; Figs. 4 and 5 are sectional views showing modified forms of one of the structural elements; Fig. 6 is a side elevation, partly in section, of a horizontally arranged cylinder embodying my invention; Fig. 7 is a vertical section taken on the line $m-n$ in Fig. 6; Fig. 8 is an elevation of the head of the cylinder shown in Fig. 6; and Fig. 9 is a vertical section through the body of a horizontally arranged cylinder adapted for air cooling only.

Referring in detail to the construction illustrated in Figs. 1 and 2, the cylinder wall 1 of cast metal is provided exteriorly with hollow sheet metal ribs 2, which are formed from metal strips bent in the manner indicated in Fig. 1. The wall and ribs are united by being cast together in one integral structure. A series of passages 3 is thus formed between the inner surfaces of the ribs and the exterior surface of the cylinder wall. Each of these passages opens at one end into the annular chamber 4 formed within the collar 5, and at its opposite end into the chambered boss 6. Ports 7 and 8 open into the chamber 4 and the interior of the chambered boss 6 respectively.

In operation the ports 7 and 8 may either stand open to the atmosphere, or may be connected with piping through which the cooling medium, either air or water, flows or is positively forced. In the first case, a steady stream of cool air is drawn in at the lower opening, follows the annular chamber 4 around the cylinder, enters the hollow ribs,

risers to the head of the cylinder and, finally, passes out through the hollow boss 6. A strong, equally distributed circulation of air is thus maintained on all sides of the cylinder. In the second case, if air is the cooling medium, one of the two openings 7 and 8 is to be connected with means for positively forcing or drawing the air through the passages surrounding the cylinder. This arrangement, of course, produces a greater cooling effect than that first mentioned, in which reliance is placed on convection circulation alone. When water is used as the cooling medium the openings 7 and 8 are connected in the same manner as the common water jacketed cylinder with the piping of a cooling circuit through which the water flows by convection or, by suitable means, is forced to circulate. With the construction described several cylinders, with proper pipe connections, can be cooled with a single blower or circulating pump.

It will be observed that practically the entire outer surface of the cylinder wall and both the inner and outer surfaces of the ribs are exposed to a cooling medium and that a direct and unbroken path of metal is provided to conduct the heat from the cylinder wall to every part of the rib surfaces. I prefer to construct the ribs of copper on account of the high conductivity of this metal, but other metals, steel for example, can be used. In the construction shown in Fig. 2 the ribs are made in two sections to facilitate the operation of casting. By casting the cylinder wall and the ribs together, a perfect contact is secured between the metal of the cylinder wall and that of the ribs and the resulting integral structure is a highly efficient heat conductor.

Previous to my invention numerous attempts have been made to cast plane copper ribs in one with the cylinder wall, but none of them, to my knowledge, have been practically successful. That is to say, it has been found impossible to obtain satisfactory results even when the casting was done under the most favorable conditions that can be attained in practical work. The failure is due to the fact that the sand of the mold can not carry off the heat from the ribs rapidly enough to prevent over heating of the copper, and when such over heating occurs the copper in contact with the molten iron "boils" and is more or less broken up, also gas is given off and occluded in the iron thus pro-

ducing blowholes which render the iron unsafe for any such purpose as an engine cylinder. I have overcome this radical difficulty by devising the hollow rib which I substitute for the plane rib or fin. In setting up the mold for my cylinder the hollow ribs are cored but the cores are made to only partially fill the chambers within the ribs, thus leaving a large passage or vent within each rib. When the molten iron is poured the gases and vapors formed pass freely through these vents and rapidly carry off from the ribs the heat transmitted to them from the iron. This removal of heat is so rapid that injurious overheating of the copper is prevented, so that the embedded part of the rib retains its form and the casting obtained is free of blowholes while, at the same time, the union of copper and iron is such as to produce a perfectly tight joint.

It will now be understood that I have produced a motor cylinder that can be cooled with either air or water, the cooling in either case being highly effective. Further, the advantages of a thoroughly effective forced air cooling are secured with the smallest possible number of structural elements, and this fact, together with the method of manufacture, makes it possible to produce the cylinder at a comparatively low cost. When air cooling only is to be used, I prefer the construction shown in Fig. 3. Here the passages 3 open at their lower ends directly to the atmosphere, the collar 5^a, which is used in place of the chambered collar 5, performing a purely structural function.

The application of my invention to a horizontally arranged cylinder is illustrated in Figs. 6, 7, 8 and 9. In this case the hollow sheet metal ribs 12 are arranged circumferentially upon the surface of the cylinder wall 11. In the construction shown in Figs. 6 and 7 each rib section opens at one end into a longitudinal chamber 14 on the upper side of the cylinder and at its opposite end into a similarly arranged chamber 15 on the lower side of the cylinder. The cylinder head 16 is provided with hollow, transverse ribs 17 which open at either end into the annular chamber 18 which in turn communicates with the longitudinal chambers 14 and 15. Openings 19 and 20 are provided for the inlet and outlet of the cooling medium. If the opening 19 is used as the inlet, the cooling medium, air or water, as the case may be, upon entering moves along the chamber 15 from which it is distributed over the surface of the cylinder wall, a part rising through the hollow ribs 12 on the side walls of the cylinder and entering the chamber 14 which leads directly to the outlet 20, while the remainder rises through the annular chamber 18 and the hollow ribs 17 across the cylinder head to the outlet. As in the case of the vertically arranged cylinder, any suitable means may

be used to force the cooling medium through the passages surrounding the cylinder wall.

In Fig. 9 is shown a horizontal cylinder as constructed when air cooling with natural circulation only is to be used. In this case the rib sections have their ends embedded in solid, longitudinal flanges 21, 22. The air enters the ribs through perforations 23 at the lower side of the cylinder and, rising around the cylinder, passes out through perforations 24 at its upper side. I may prefer to form the hollow, heat radiating ribs with bent or corrugated sides as indicated in Fig. 4 forming longitudinal securing edges or flanges. The corrugations perform a useful function during the process of casting, and also increase the heat radiating capacity of the ribs. Also, instead of forming the ribs from sheet metal, closed tubes, either plain or corrugated, may be used. In Fig. 5, I show such corrugated form of tubular rib having corrugations 25, forming longitudinal edges or flanges for securing in the cylinder wall by casting.

What I claim as my invention is—

1. In a motor cylinder, the combination of the cylinder wall, a plurality of hollow wrought metal radiating ribs secured to said wall by casting and projecting from the surface thereof, a centrally disposed boss on the head of the cylinder, an annular chamber surrounding the opposite end of the cylinder, said boss and annular chamber being each provided with a port for the passage of a cooling medium, and the interior of each hollow rib being in communication at one end with the interior of said boss and at the other end with said annular chamber.

2. The combination of a cast metal cylinder, with a plurality of exterior hollow wrought metal ribs, each having edges secured in the exterior wall of said cylinder by casting, a cooling-medium inlet-duct in closed communication with the interiors of all of said ribs, and a cooling-medium outlet-duct in closed communication with all of said ribs, substantially as described.

3. In a motor cylinder, the combination of a cast metal cylinder wall at its opposite end portions formed with cooling-medium passages and ports to the exterior thereof, and a plurality of hollow wrought metal radiating ribs having longitudinal securing edges and arranged at the exterior of said wall and forming cooling-medium passages along the same in communication with said chambers, each rib being intimately united to said wall and secured thereon by the casting, substantially as described.

4. In a motor cylinder, the combination of the cylinder wall, a plurality of hollow wrought metal radiating ribs secured to said wall by casting and projecting from the surface thereof, a centrally disposed boss on the head of the cylinder, said boss being provided

with a port for the passage of a cooling medium, and the interior of each hollow rib being in communication with the interior of said boss.

5. In a motor cylinder, the combination of the cylinder wall, a plurality of hollow wrought metal radiating ribs projecting from the surface of said wall and intimately united thereto by having longitudinal portions cast therein, an annular chamber at one end of the cylinder provided with a port for the passage of a cooling medium, the interior of each hollow rib being in communication with said annular chamber.

6. In a motor cylinder, the combination of a cast metal cylinder wall provided with a cooling-medium inlet chamber at one end thereof, having an inlet port, and at the opposite end thereof provided with a cooling-medium outlet chamber having an outlet port, and a plurality of hollow wrought metal radiating ribs intimately united to said wall by casting and forming cooling-medium passages at the exterior surface of said wall each in communication with said chambers, substantially as described.

7. In a motor cylinder, the combination of the cast metal cylinder wall with a plurality of hollow copper radiating ribs projecting from and forming cooling-medium passages along the exterior of said wall, and secured thereto and united intimately therewith by having portions cast in said wall.

8. A motor cylinder comprising a cast metal exterior wall, and series of hollow wrought-metal radiating ribs arranged at the exterior of said wall and each having a pair of longitudinal spaced securing edges inti-

mately embedded in and united to said wall by casting, whereby said ribs are secured to said wall and form cooling-medium passages along the exterior of said wall. 40

9. The combination with a cylinder wall of cast metal of hollow exterior radiating ribs of wrought metal projecting from the surface of said wall, the chambers within said ribs having inlets and outlets for the passage of a cooling medium, and said wall and longitudinal corrugated portions of each rib being cast together in one integral structure. 45 50

10. The combination with a cylinder wall of cast metal of hollow exterior radiating ribs of copper projecting from the surface of said wall, the chambers within said ribs having inlets and outlets for the passage of a cooling medium, and said wall and spaced longitudinal portions of each rib being cast together in one integral structure. 55

11. A heat radiating rib for and adapted to be united to a motor cylinder by casting, consisting of a wrought metal tube formed with a longitudinal corrugation adapted to be cast in the cylinder wall. 60

12. The combination with a cast metal cylinder wall of hollow exterior radiating ribs projecting from the exterior of said wall and united thereto by casting, each rib being formed by a tube having longitudinal corrugations cast in said wall. 65

In testimony whereof I affix my signature in presence of two subscribing witnesses. 70

DAVID REID.

Witnesses:

S. E. BANKS,
B. T. COOK.