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C. F. KETTERING
INTERNAL COMBUSTION ENGINE

Filed Oct. 15, 1920

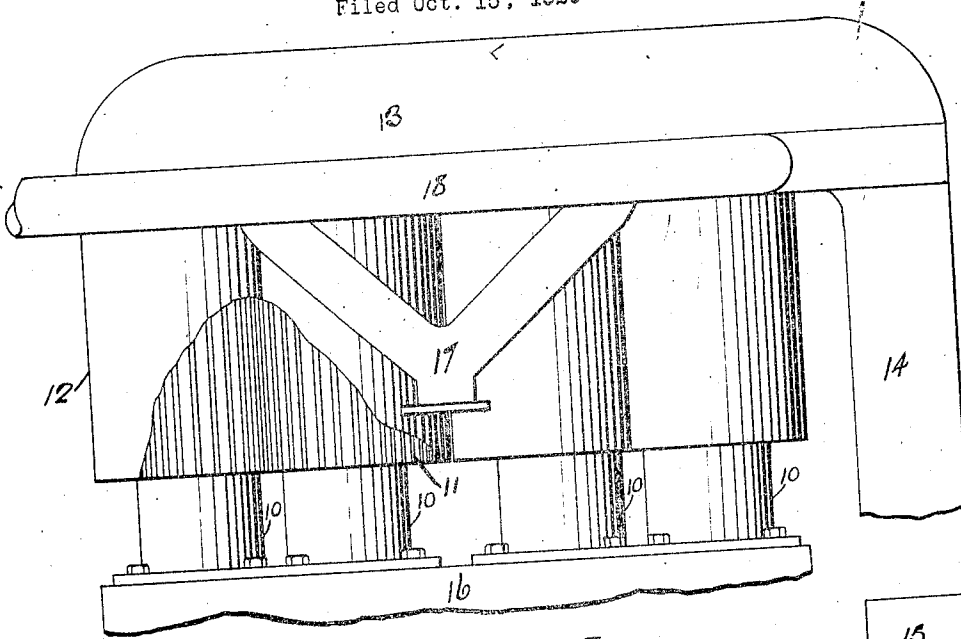


Fig. 1.

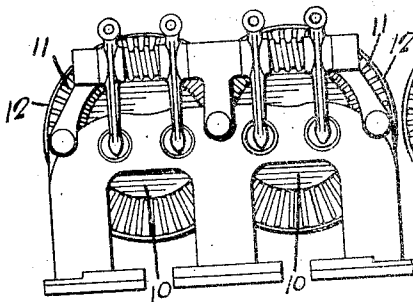


Fig. 2.

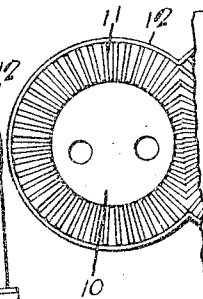


Fig. 3.

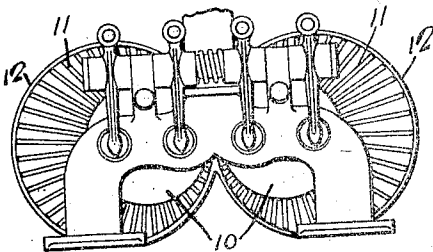


Fig. 4.

WITNESSES

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INTERNAL-COMBUSTION ENGINE

Application filed October 15, 1920. Serial No. 417,035.

To all whom it may concern:

Be it known that I, CHARLES F. KETTERING, a citizen of the United States of America, residing at Dayton, county of Montgomery, and State of Ohio, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a full, clear, and exact description.

The present invention relates to internal-combustion engines and in its preferred form which is chosen for the purpose of description relates to engines of the air-cooled type.

In application, Serial No. 392,646, filed June 29, 1920, by the applicant on engine cylinders and in application Serial No. 514,014, filed November 9, 1921, which is a continuation thereof, there has been described a cylinder for internal-combustion engines of the air-cooled type and the present invention, in its preferred form relates to engines involving this form of cylinder and to improvements therein.

In the former application there is described a cylinder of ferrous metal having attached thereto in effective thermal contact therewith, cooling elements of metal having a substantially greater heat conductivity than the metal of the cylinder proper. Such cooling elements are described as preferably of sheet copper folded and attached to the cylinder in such manner as to form longitudinal fins each being of flattened tubular form with one edge of the tube attached to the cylinder.

It has now been found that, in the preparation of such cylinders, it is sufficient to attach these cooling elements to the cylinder in such fashion as to have a considerable area of the cooling elements only upon that side of the cylinder which is adjacent to the exhaust valve. The side of the cylinder adjacent to the intake valve need have but little if any cooling means as the incoming comparatively cool gases exert considerable cooling effect upon this portion of the cylinder and head.

It will be very readily seen that the invention which is described herein will result in a very great cheapening and lightening of the complete engine, the doing away with the cooling elements upon one side of each cylinder permitting placing two cylinders in close proximity to form a pair, thus

decreasing the length of the complete engine and consequently the weight.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing wherein preferred embodiments of the present invention are clearly shown.

In the drawings:

Fig. 1 is a conventional representation of a four cylinder air-cooled engine, showing the relative positions of the two cylinders forming a pair and of the two pairs.

Fig. 2 is a plan view of the two of the cylinders of Fig. 1 with the draft tube removed.

Fig. 3 is a plan view of the other two cylinders of Fig. 1, with part of the draft tube shown in place and having removed from one of the cylinders the superstructure and exhaust and intake pipes.

Fig. 4 is a view similar to Fig. 2 of a modification thereof.

In Fig. 1 the engine is represented as being a four cylinder air-cooled engine provided with cylinders 10 carrying cooling fins 11 preferably of the form described in the applications above referred to and surrounded by draft sleeves 12 which latter communicate with a draft tube 13 leading to a blower attached to the continuation 14 of the draft tube. The blower casing is represented in Fig. 3 by the numeral 15.

The engine is also provided with the usual crank case 16, intake manifold 17 and exhaust manifold 18.

In one form of the invention, as will be readily seen in Figs. 1, 2 and 3 the fins are attached to the cylinders concentric therewith and have a portion of the set of fins on one side of the cylinder removed upon a line which is substantially tangent to the outer wall of the cylinder, this line being perpendicular to the diameter of the cylinder which is parallel to a line through the two valve ports. The other member of the pair of cylinders is made in the same fashion and the two are thereupon placed together with the sides from which the fins have been removed, adjacent each other.

In the form of cylinder shown in Fig. 4, the fins are attached to the cylinders in eccentric relation thereto so that the shorter fins occupy the same position upon the cylinder as is occupied by those fins, as described

in connection with Figs. 1, 2 and 3, which have been cut off.

An advantage derived from the disposal of the fins in the manner just described lies in the fact that a lower maximum temperature in the cylinder is obtained than when the fins are concentric, if the same amount of fin metal is used. Conversely, the same maximum temperature may be obtained with less fin metal.

In producing a pair of cylinders such as is represented in the drawings, these are made separately and may have the exhaust and intake pipes subsequently attached thereto or the casting for the cylinder may include the exhaust pipe and one-half of the intake pipe. After the fins have been applied to such a cylinder as has been last mentioned, two such cylinders may be placed together to form a pair and welded at the base and at the intake. This attachment of the two cylinders to form a pair is, however, not a part of the present application, but is described more in detail and claimed in copending application, Serial No. 417,125, filed October 15, 1920, in the name of Charles F. Kettering.

While the invention has been described as applied specifically to cylinders produced in the manner described in the first mentioned copending application, it is not to be considered that the invention is limited to such forms of cylinders as it is applicable to any form of internal-combustion engine cylinder and will be so claimed.

While the form of cylinders herein shown and described, constitute preferred embodiments of the invention, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What I claim is as follows:

1. An internal combustion engine including a cylinder having cooling elements attached thereto and having its intake and exhaust spaced apart, the said elements increasing in area from a minimum upon that portion adjacent to the intake of the cylinder to a maximum upon that portion adjacent to the exhaust thereof.
2. An internal-combustion engine comprising a plurality of cylinders, each cylinder having cooling elements which vary in area to correspond with the variations in the heating about the periphery of the cylinder walls.
3. A cylinder for internal combustion engines having substantially radial longitudinal fins or cooling elements, the line of the outer edges of the fins being substantially circular and eccentrically placed with respect to the cylinder.

In testimony whereof I hereto affix my signature.

CHARLES F. KETTERING.

Witnesses:

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ALVINA C. LEHMAN.