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AIR-COOLED CYLINDER

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This invention relates to an improvement in heat dissipating means for the cooling of internal combustion engine cylinders and the like, and more particularly cylinders which comprise a liner and shell of different metals.

In air cooled engines, such as for motorcycles and aircraft, the outside shells of the cylinders are frequently made of aluminum or one of its alloys in order to obtain light weight and because such metals possess very satisfactory heat dissipating qualities, while the liner or inside shell of such cylinders is usually a ferrous product for wearing purposes. Heretofore, various constructions of such cylinders assembled from two such separate and different materials have been attempted and no thoroughly satisfactory product has yet been attained. The present improvement aims at overcoming the difficulties which have been encountered in such structures.

A cylinder of two piece construction wherein the shell is of one metal and the liner of another should provide for the easy flow of heat from the interior to the exterior of the cylinder, and one of the chief difficulties heretofore met with is in securing good conduction of heat across the joint or contacting surfaces between the inner and outer members of the cylinder. Abutting contact between the metal surfaces even under high pressure does not provide a high degree of efficiency for heat flow and when, as is often the case, the metals have a different coefficient of expansion, an air gap occurring between the surfaces will become more efficient as an insulator for heat than as a conductor therefor.

In order to secure low thermal resistance between the liner and the shell, we have found it desirable to provide a relatively narrow space, substantially cylindrical, between the two members and to fill this space with a liquid substance such as an easily fusible metal or a salt of low melting but sufficiently high boiling point to remain liquid under all conditions of operation. No provision is made for any intended circulation of the filler within its space, which in depth is made as small as is practicable and yet provide room for the different expansion of the liner and shell. A liquid filler furnishes a more intimate contact with the surfaces of the cylinder members for the efficient conduction of heat than would a solid filler. The latter, even if in itself an excellent heat conductor, would not be so satisfactory since, due to the different expansion of such a solid filler material and the two cylinder members, fissures or voids would form to considerably impair the thermal conduction.

In the drawings which show a preferred embodiment of our invention:

Fig. 1 shows in cross-section an improved cylinder construction according to this invention;

Fig. 2 is a horizontal section on line 2—2 of Fig. 1; and

Fig. 3 is a fragmentary enlarged view in section of the shoulder abutting joint between the liner and shell.

Referring to the drawings in detail, in Fig. 1 H and C indicate the head end and the crank end of the cylinder, respectively. 1 is the liner which may be of iron, steel or kindred product, 3 is the shell having cooling ribs 4 and usually of lighter material, such as aluminum or the like, than the liner, and 2 is a relatively narrow cylindrical space left between the liner and shell adapted to be filled up to the level 11 with a liquid filler. It will be understood that the space 2 will extend entirely around the cylinder and axially substantially the full length of the cylinder. But this space 2 is much narrower than the usual water jacket space of water cooled cylinders. It need only be wide enough to insure a clearance between the two surfaces of the liner and shell, which will be bridged by the liquid filler.

The liner and the shell of the cylinder are subjected to different temperatures and they have besides different expansion coefficients. This is usually taken care of by a flexible joint between the two members at one of their ends. For mechanical and other reasons, this flexible joint is preferably located