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F. B. STEARNS
ENGINE CYLINDER LINER
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2,049,631

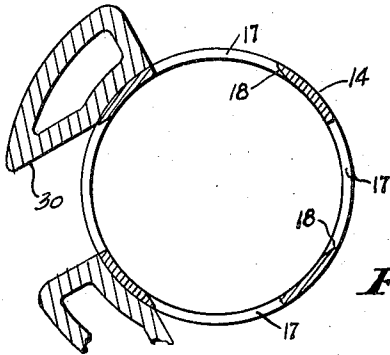


Fig. 4.

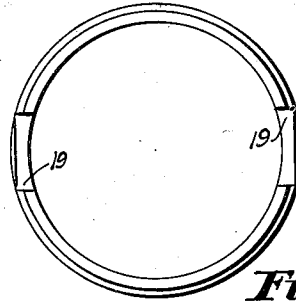


Fig. 3.

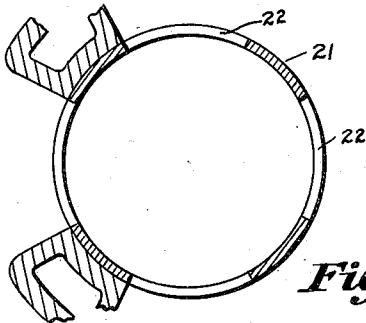


Fig. 5.

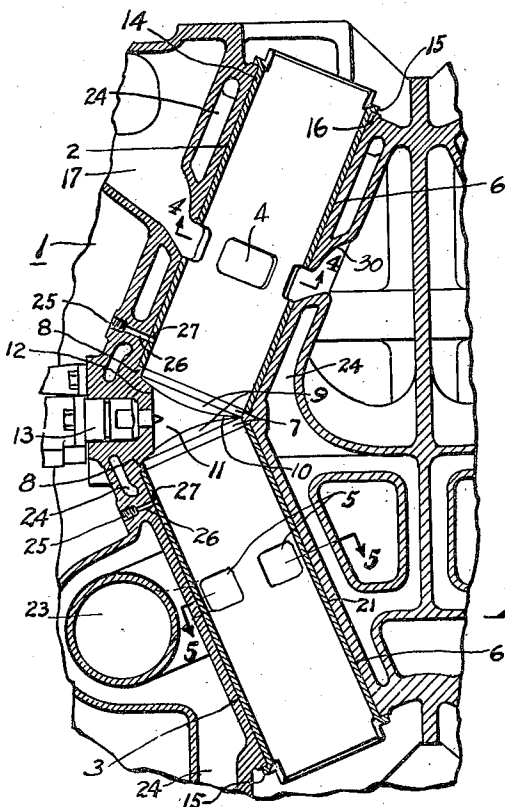


Fig. 1.

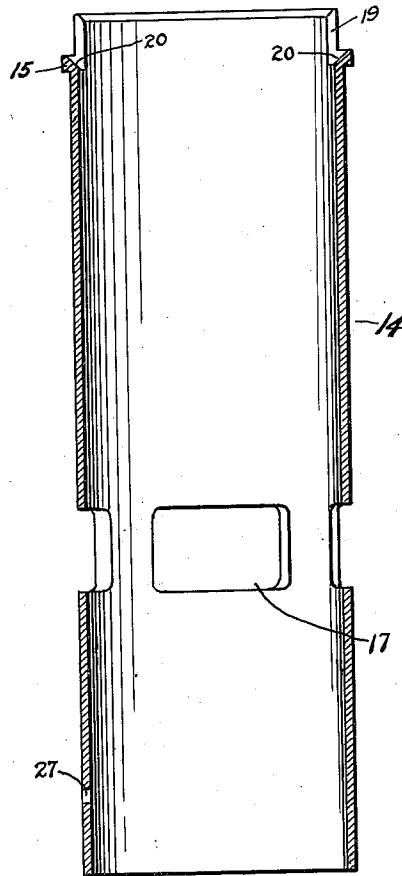


Fig. 2.

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ENGINE CYLINDER LINER

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2 Claims. (Cl. 123—53)

This invention relates to improvements in engine cylinders, and more particularly to the construction of internal combustion engine cylinders.

5 It has been found desirable to provide liners in engine cylinders for various reasons. Wear may be compensated for by merely removing a liner and inserting a new one rather than by refinishing the cylinder walls. Initially the cylinder walls of the engine block need not be subjected to a fine finishing and hardening operation, and it is relatively easier and more economical to properly harden and finish the liner rather than the cylinder walls.

15 In an engine cylinder wherein the intake and exhaust ports are in the cylinder walls, it is relatively easy to properly shape a liner having apertures aligned with the said ports to present a minimum frictional resistance to the ingress and egress of air or gas.

20 Difficulty has been encountered heretofore, due to the problem of providing a liner having the same coefficient of expansion as the cylinder block; consequently, excessive stresses have developed at the high temperatures encountered.

25 It is therefore an object of my invention to provide an engine cylinder adapted to have a liner removably inserted therein which has substantially the same coefficient of expansion as the cylinder block.

30 Another object of my invention is to provide an engine cylinder having a liner removably inserted therein, whereby a minimum of machining of the cylinder walls is required.

35 Another object of my invention is to provide an engine cylinder having intake and exhaust ports in the walls thereof and a removable liner or liners therein provided with aligned ports whereby a minimum of frictional resistance will be offered to the ingress and egress of gas.

40 Another object of my invention is to provide a liner for engine cylinders which may be easily inserted and removed from the engine block and which will remain in fixed position when inserted therein.

45 Another object of my invention is to provide a liner for engine cylinders which has a relatively low coefficient of friction.

50 Another object of my invention is to provide a liner for engine cylinders which has a relatively hardened surface.

55 These and other objects of my invention will become more apparent from a consideration of the drawing constituting a part hereof and in

which like reference characters refer to like parts.

Referring to the drawing:

Fig. 1 is a fragmentary medial sectional view of an engine cylinder embodying my invention; 5

Fig. 2 is a longitudinal sectional view of a cylinder liner which I may employ;

Fig. 3 is a plan view of the cylinder liner shown in Fig. 2;

Fig. 4 is a transverse sectional view taken 10 along the lines 4—4 of Fig. 1;

Fig. 5 is a transverse sectional view taken along the lines 5—5 of Fig. 1.

Referring to the drawing, the cylinder generally indicated at 1 comprises an upper section 2 15 and a lower section 3, the upper section being provided with intake ports 4, and the lower section being provided with the exhaust ports 5. The cylinder 1 is generally V-shaped with the apex of the V being disposed laterally and the upper section 2 and the lower section 3 thereof diverging respectively upwardly and downwardly therefrom at an angle dependent upon the relative positioning of the engine crank shaft (not shown) and the cylinder, thus forming a 20 continuous V-shaped open-ended cylinder.

The upper section 2 and the lower section 3 of the cylinder 1 comprise each a cylindrical bored portion 6, a coaxial reduced bored portion 7 forming therebetween a circular shoulder 8 30 and a coaxially bored convex portion 9 conforming to the crown of the piston. The convex portions 9 merge as indicated at 10 and the cross-sectional area of a combustion chamber 11 formed therebetween, thence progressively increases to the opposite wall 12 of the cylinder. The wall 12 forms one side of the chamber 11 and is relatively thick and projects into the cylinder to provide a suitable mounting for an injection nozzle 13 adapted to supply fuel to 40 the cylinder.

A liner 14 is preferably press-fitted into the upper section 2, the downwardly extending end thereof abutting shoulder 8 and a radially extending flange 15 engaging a suitably machined face 16 at the upper end of the section 2. 45 The liner is preferably composed of a metal having the same coefficient of expansion as the metal of the cylinder block so that there will be substantially no stresses developed therebetween due to variations in temperature.

A relatively large air chamber 17 substantially encloses the upper section 2 of the cylinder and is joined to the intake ports 4 in the section walls by ducts 30 which extend generally down- 55

wardly from the chamber and are disposed generally tangentially of the section walls. Thus air which is supplied to the cylinder through ports 4 will have a cyclonic and longitudinal impetus in the direction of the combustion chamber 11 imparted thereto.

The liner 14 is provided with ports 17 aligned with and complementary to the ports 4 of the cylinder. One side of the port 17 is inwardly flared as indicated at 18 so as to complete the generally tangential curve of the port 4 and thereby cause a cyclonic action to be imparted to incoming air with a minimum of frictional resistance.

The liners 14 are provided with generally rectangular slots 19, the bottom portions of which are inwardly flaring as indicated at 20, and provide lateral clearance for the usual connecting rod as the piston is reciprocated. A liner 21 is preferably press-fitted within the lower section 3 of cylinder 1 and is generally similar to liner 14 with the exception of exhaust ports 22, which are aligned with exhaust ports 5 of section 3. As illustrated in Fig. 5 the ports 22 have the edges extending radially rather than one edge extending tangentially of the liner wall as the ports 17 illustrated in Fig. 4. The ports 5 communicate with an exhaust manifold 23 which encircles section 3.

A suitable water jacket generally indicated at 24 surrounds the major portion of the upper and lower cylinder sections to ensure that the cylinder will be properly cooled.

Lubrication of the cylinder is preferably of the forced feed type and a threaded aperture 25 is therefor provided in the cylinder walls adapted to engage a lubricant supply line and has leading therefrom aligned apertures 26 and 27 in the cylinder wall and liners 14 and 21 respectively. Reciprocating movement of the piston (not shown), in the liner together with the lubricant pressure provides an effective means of lubricating the pistons.

Upon insertion of opposed pistons (not shown) which sealingly engage the cylinder walls, the cylinder becomes a closed cylinder except for the intake and exhaust ports and the injection of a nozzle.

The liners 14 and 21 preferably extend a sufficient distance beyond a terminal point of the piston stroke to ensure that the piston at all times will be completely within the liner and preventing any abrasive action between the liner ends and the piston, and also preventing any tendency of binding or mis-alignment therebetween. As previously pointed out, it is desirable that the liners have substantially the same

coefficient of expansion as the cylinder walls and for this reason liners composed of nickel alloy and a cylinder block of aluminum are preferably used.

The use of liners has various advantages as already pointed out such as being relatively inexpensive and easy to machine and properly harden as compared to a cylinder block, and wear is compensated for merely by removing and inserting a new liner. It is obviously desirable that relatively little friction be created between a piston and the cylinder walls, and for this reason metals offering relatively little resistance to movement therebetween are employed. The use of a liner permits a metal having a relatively high coefficient of friction to be employed for the cylinder block and a metal having a relatively low coefficient of friction to be utilized in lining the cylinder walls, thus effecting economy of construction and operation without sacrificing any advantages.

Although I have described embodiments of my invention, I contemplate that numerous and extensive departures may be made therefrom without departing from the spirit and scope of my invention or the appended claims.

Having thus described my invention, what I claim is:—

1. In an internal combustion engine construction, a pair of cylinders communicating at their inner ends with a common combustion chamber, a cylinder liner telescoped into each cylinder from the outer end thereof, the walls of the combustion chamber intermediate the cylinders having annular shoulders overlapping and sealing the inner ends of the liners substantially to prevent application of explosion pressure to the inner ends of the liners in the direction to expel the liners from the cylinders.

2. In an internal combustion engine construction a pair of cylinders communicating at their inner ends with a common combustion chamber, a cylinder liner telescoped into each cylinder from the outer end thereof by press-fitting it therein, the walls of the combustion chamber intermediate said cylinders having annular shoulders overlapping and sealing the inner ends of the liners substantially to prevent application of explosion pressure to the inner ends of the liners in the direction to expel the liners from the cylinders, the liners being secured in the cylinders solely by the friction of the press-fit thereof, and the liners and cylinders being formed from metal having substantially the same coefficient of expansion to prevent loosening of the liners upon changes of temperature.

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