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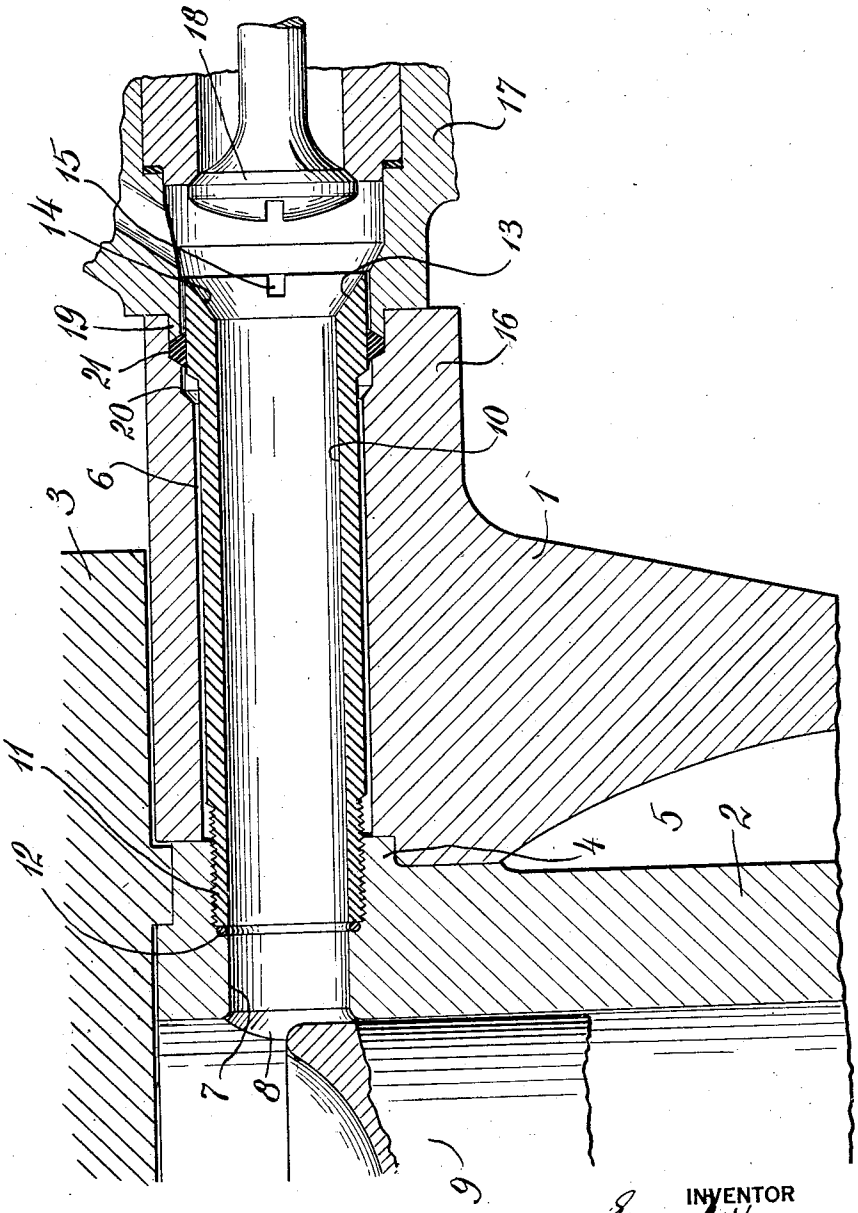

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CYLINDER CONSTRUCTION FOR INTERNAL-COMBUSTION ENGINES.

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This invention relates to internal combustion engines of the Diesel or other types and has to do more particularly with the construction of the cylinders of such engines. The invention has especial utility in Diesel engines and that adaptation of it will be described, though it is to be understood that the invention is capable of use in other internal combustion engines, of which the Diesel is only one of several well-known types.

In Diesel engine operation, it has long been the practice to start the engine by means of compressed air or other gases introduced into the cylinder through a valve, tube or other connection disposed in the cylinder head. Similarly, relief valves have been customarily provided to relieve excessive pressure in the cylinder, such valves being ordinarily disposed in the cylinder head. As the cylinder head also carries the inlet, exhaust and fuel valves in usual practice, the additional starting air valve and pressure relief valve placed on the head make the latter difficult to design and furthermore the distribution of the metal in the head is such that it is difficult to cool it evenly. Accordingly, strains are set up in the metal when the engine is working which are likely to result in cracking and the consequence is that frequent replacement has heretofore been necessary. The cylinder heads of these engines as now constructed, therefore, are difficult to design, construct and maintain in satisfactory condition.

The object of the present invention is to provide an engine construction in which these difficulties are overcome, more specifically, by providing a connection in the wall of the cylinder for the introduction of the starting fluid or for the relief of excessive pressure. By the use of a connection so disposed, the cylinder head design is greatly simplified, and its construction facilitated, as well as its life increased.

The invention is intended for use in engines in which a separate cylinder liner is used, not a part of the cylinder jacket, and it involves the formation of a bore through the cylinder jacket communicating with an opening through the liner into the cylinder just below the cylinder head and at such a point that it will not be covered by the piston at the end of its upstroke. Within the bore in the jacket is a tube threaded into the opening in the liner, and having its outer end free. The tube is packed at both ends by appropriate means, and at the outer end the packing may be held in place by the valve body fastened to the water jacket casting. The tube is thus free to expand or contract, is so mounted that no leakage around it can occur, and is properly placed so that it is in communication with the interior of the cylinder at all times.

For a better understanding of the invention reference will be made to the accompanying drawing, in which the single figure is a vertical sectional view through the cylinder wall and the connection.

In the drawing, the engine cylinder jacket 1 is shown as being provided with a liner 2 forced into the cylinder jacket and held in place by the cylinder head 3 overlying the flange 4 of the liner which enters a peripheral recess formed in the upper end of the jacket casting. The jacket and liner are spaced as at 5 to provide a chamber for the cooling medium.

In the jacket near the top thereof is formed a bore 6 communicating with an aperture 7 through the liner, the inner end of the aperture preferably being flared as indicated at 8 and lying sufficiently close to the lower face of the cylinder head so that the aperture is not covered by the piston 9 in its upstroke. Within the bore 6 is a tube 10 of any suitable material, which is threaded at its inner end as at 11 into the wall of the aperture 7 in the liner. A packing ring 12 lies between the end of the tube and the liner and prevents leakage of air or water at this point.

The tube 10 is of somewhat less diameter than the bore 6 so that lateral expansion of the tube and the bore is permitted. The outer end 13 of the tube is free. This end is preferably internally flared as shown at 14, and a transverse slot 15 is provided in the end of the tube to receive a tool for the insertion or removal of the tube.

Secured rigidly to the end of the extension 16 of the jacket in which the bore 6 is formed is the valve body 17 in which is the valve 18 controlling the flow through the tube and operated by the usual devices. This valve body has a tubular extension 19 entering the enlargement 20 at the end of the bore and acting as a gland for a packing ring 21. With this construction, the end of the

tube is free so that longitudinal expansion and contraction is permitted while leakage around the tube within the bore 6 is prevented.

It will be seen that with this construction access to the interior of the cylinder for the introduction of air for starting or for the relief of excessive pressure is afforded, but the air or pressure relief connection is disposed in the cylinder wall instead of in the head. The connection is entirely effective for the purposes intended and at the same time, the construction of the head is greatly simplified and difficulties in design, construction, and maintenance are overcome. A head of much greater strength and durability may accordingly be used without altering the operation of the engine in any way.

I claim:

1. In an internal combustion engine, the combination of a cylinder jacket, a liner therein, a head closing one end of the jacket, a piston movable within the jacket in contact with the liner, a passage through the jacket and liner opening into the interior of the latter at a point beyond the limit of travel of the piston toward the head, and a tube fixed in the liner and extending through the passage.

2. In an internal combustion engine, the combination of a cylinder jacket, a liner therein, a head closing one end of the jacket, a piston movable within the jacket in contact with the liner, an opening through the liner at a point beyond the limit of travel of the piston toward the head, a bore through the jacket in communication with the opening, and a tube projecting into the opening and extending through the bore.

3. In an internal combustion engine, the combination of a cylinder jacket, a liner therein, a head closing one end of the jacket, a piston movable within the jacket in contact with the liner, a passage through the jacket and liner opening into the interior of the latter at a point beyond the limit of travel of the piston toward the head, and a valve for controlling flow through the passage.

4. In an internal combustion engine, the combination of a cylinder jacket, a liner therein, a head closing one end of the jacket, a piston movable within the jacket in contact with the liner, a passage through the jacket and liner opening into the interior of the latter at a point beyond the limit of travel of the piston toward the head, and a tube in the passage in communication with the opening and spaced from the wall of that part of the passage through the jacket.

5. In an internal combustion engine, the combination of a cylinder jacket, a liner therein, a head closing one end of the jacket, a piston movable within the jacket in contact with the liner, an opening through the liner at a point beyond the limit of travel of the piston toward the head, a passage through the jacket and a tube mounted in the liner in communication with the opening and extending into the passage so as to provide a space for radial and axial expansion therein.

6. In an internal combustion engine, the combination of a cylinder jacket, a liner therein, a head closing one end of the jacket, a piston movable within the jacket in contact with the liner, an opening through the liner at a point beyond the limit of travel of the piston toward the head, a passage through the jacket, a tube threaded into the liner in the wall of the opening and extending into the passage free of the walls thereof.

7. In an internal combustion engine, the combination of a cylinder jacket, a liner therein, a head closing one end of the jacket, a piston movable within the jacket in contact with the liner, an opening through the liner at a point beyond the limit of travel of the piston toward the head, a passage through the jacket, a tube mounted in the liner in communication with the opening and extending into the passage, and packing at either end of the tube to prevent leakage between the latter and the inner wall of the passage.

8. In an internal combustion engine, the combination of a cylinder jacket, a liner therein, a head closing one end of the jacket, a piston movable within the jacket in contact with the liner, a passage through the jacket and liner opening into the interior of the latter, a valve body secured to the jacket and in communication with the end of the passage, and a valve in the body for controlling flow through the passage.

9. In an internal combustion engine, the combination of a cylinder jacket, a liner therein, a head closing one end of the jacket, a piston movable within the jacket in contact with the liner, an opening through the liner, a passage through the jacket in communication with the opening, a tube mounted at one end in the opening and extending into the passage, a valve body secured to the jacket in communication with the passage, a valve in the body for controlling flow through the passage, and packing between the free end of the tube and the inner wall of the passage held in place by the valve body.

In testimony whereof I affix my signature.

ERNEST NIBBS.