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PISTON RING

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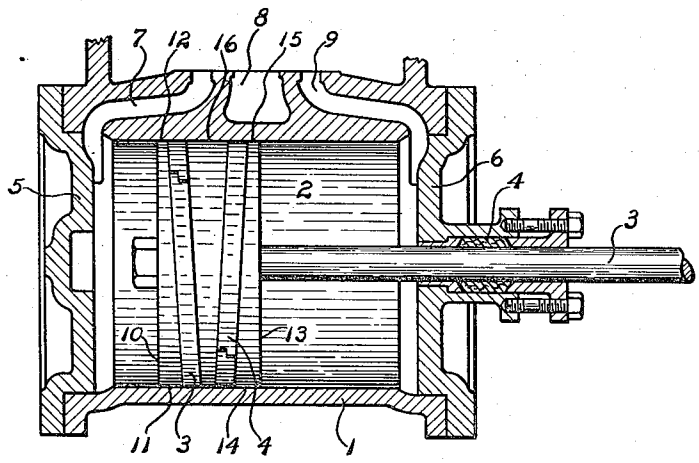


Fig. 1

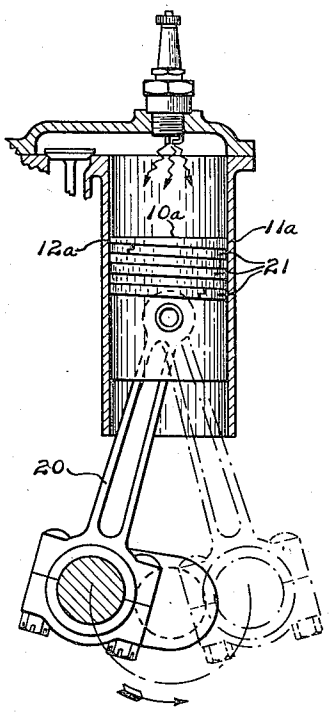


Fig. 2

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PISTON RING

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2 Claims. (Cl. 309—5)

The present invention relates to reciprocating engines and more particularly to pistons of such engines.

In reciprocating engines, where the cylinder is arranged horizontally as for example in the case of locomotives, it has been found that when the cylinder and piston are of large size, the wear of the cylinder or cylinder bushing in contact with the lower side of the piston, and of the piston itself, becomes excessive on account of the heavy weight of the piston. Suggestions have been made in the past for taking some of the weight off the lower part of the cylinder wall as for example by means of a rod extending through the cylinder head opposite the usual piston rod and equipped with a bearing block reciprocating on a guide arranged under it. This, however, complicates the construction considerably and is objectionable from other points of view.

The object of the present invention is to obviate the excessive wear by new and relatively simple means. The invention also has application to single acting vertically placed cylinders, especially in internal combustion engines.

The invention will be described in connection with the accompanying drawing, in which Fig. 1 shows a vertical section of a horizontal cylinder such as is used on a locomotive, with a piston to which my invention is applied; and Fig. 2 shows the invention applied to the piston of a vertically placed cylinder of an internal combustion engine.

Referring first to Fig. 1, the cylinder is indicated at 1, the piston at 2 and the piston rod at 3. This piston rod extends through the usual stuffing box 4. 5 and 6 are the two usual cylinder heads. The cylinder may be equipped with the usual bushing if desired. The usual passages for the admission and exhaust of steam by means of the distribution valve are shown at 7, 8, and 9, the valve itself not appearing in the drawing.

My invention relates specifically to the piston. The rings 3 and 4 are in accordance with the invention, inclined to the axis of the piston rod 3 and piston 2. The inclination of the ring 3 is in such direction that the distance from the face 10 is greatest at the lowest part 11 of the piston and least at the uppermost part 12. The inclination of the ring 4 on the other hand is in the opposite direction so that the distance of the ring from the face 13 is greatest at the lowest part 14 of the piston and least at the uppermost part 15. As a result, the upward thrust exerted by the live steam will take the weight of the piston, or a material part of such weight, off the bottom of the cylinder. This is due to the fact that the steam on whichever side is open to live steam pressure, will penetrate between the piston and the cylinder up to the ring, and there will be an unbalanced upward thrust as more surface is exposed to the upward pressure than to downward pressure. The amount of unbalanced upward thrust can be fairly accurately calculated or predetermined in any case by giving the proper slant to the rings.

On the exhaust side the difference in upward and downward thrust is of no particular moment as the exhaust pressure is too low to make this difference amount to anything. Whatever unbalanced pressure there is on this end will also be in the right direction.

It will be understood that the rings themselves will have to have the same inclination between their axis and the planes through their two edges as the grooves in the piston have to the axis of the piston. In practice there is no difficulty in fabricating rings of this kind.

The wedge shaped central portion 16 of the piston has a larger upper area subjected to downward pressure than its lower area subjected to upward pressure but the pressure on the cylindrical surface of this wedge-shaped piece is due to only such steam as has leaked by the ring and is therefore relatively small and negligible.

In an internal combustion engine of the type shown in Fig. 2 there is, during the explosion stroke, a decided lateral thrust of the piston against the cylinder wall. In the figure, for instance, assuming the crank pin to revolve in the direction indicated by the arrow, there will during the explosion stroke and while the connecting rod is on the left side as shown at 20 be a considerable thrust against the right side of the cylinder. To compensate for this the rings 21—21 are placed at an angle to the axis of the piston so that the area between the piston end 10*a* and the first ring is wider at the right side, as indicated at 11*a* than it is at the left side, as indicated at 12*a*. The thrust toward the right is therefore in part at least compensated by the gas pressure on the right portion of the area of the piston between its end and the first ring.

During the other three strokes of the cycle it is unnecessary to compensate for any lateral thrusts as such lateral thrust is relatively small and negligible.

Other applications of this inventive idea will readily suggest themselves as well as variations of the forms described.

What I claim is:

1. In apparatus comprising a cylinder and a piston reciprocably arranged therein and to have

one end exposed to pressure fluid and operating under conditions such that there is a tendency for the piston to press with greater force against one side of the cylinder than against the other, the combination with such piston of a ring arranged in a groove in the cylindrical surface of the piston and in a plane so inclined to the axis of the piston that it is farther from the end of the piston at the side which tends to press with greater force against the cylinder wall, the ring substantially preventing pressure fluid from flowing past it.

2. In a horizontal cylinder, a piston reciprocably arranged therein and exposed alternately on its two sides to pressure fluid, the piston having two grooves in its cylindrical surface inclined in opposite directions with respect to the axis of the piston and so that they are spaced apart farthest at the top side of the piston, and rings in said grooves, the ring toward the pressure fluid side in each case preventing any substantial amounts of pressure fluid from passing the ring, whereby the unbalanced upward force of the pressure fluid on the part of the cylindrical surface between the end of the piston toward the pressure fluid and the ring next to such end tends to lift the piston.

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