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PISTON STRUCTURE FOR UNIFLOW STEAM ENGINES

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This invention relates to an improvement in uniflow steam engines and more particularly to a novel means for floatably supporting the piston in the cylinder of such an engine.

In engines of this character it has been the practice to employ a floating piston, that is, one that does not bear against the cylinder wall, steam being prevented from passing the piston by one or more piston rings located in each end of the piston. Such a floating piston is suspended on a piston rod which also floats through its packing and heretofore has been supported at one end by the main crosshead and at its other end by a slidable support or so-called tail crosshead.

The present invention proposes to avoid the necessity of projecting both ends of the piston rod through the heads of the cylinder, the piston rod extending through one end only of the cylinder for connection with the main crosshead. To accomplish this and yet still float the piston and the piston rod in the cylinder and in the stuffing box provided on one of the cylinder heads the present invention proposes to combine a slidable support or crosshead with the piston itself, this slidable support being interposed between the spaced heads of the piston and riding on the lower portion of the cylinder wall.

Another object of the invention is to provide an engine of this character which is simple and durable in its construction, reliable and efficient in operation and easy and comparatively inexpensive to manufacture and maintain.

Other objects and advantages reside in certain novel features of the construction, arrangement and combination of parts which will be hereinafter more fully described and particularly pointed out in the appended claims, reference being had to the accompanying drawing forming a part of this specification, and in which:

Figure 1 is a fragmentary view in central vertical longitudinal section showing an engine embodying the present invention, parts being shown in elevation for the sake of illustration;

Figure 2 is a view in section taken on line 2—2 of Figure 1, parts being broken away for the sake of illustration;

Figure 3 is a detail view in top plan illustrating the face plate for the sliding shoe of the piston support; and

Figure 4 is a diagrammatic view illustrating the type of engine with which the present invention is employed.

Referring to the drawing the numeral 5 designates the cylinder of a uniflow steam engine. A piston rod 6 is reciprocable in the cylinder 5 and floats or slides freely through a stuffing box 7 provided in one of the end heads 8 of the cylinder. The outer end of the piston rod is connected and supported on the main crosshead 9.

A piston designated generally at 10 is assembled with the inner end of the piston rod and includes spaced piston heads designated at 11 and 12. The piston heads are of identical construction although oppositely arranged and each has a hub portion 13 suitably secured to the piston rod, a disk-like body portion 14 integral with the hub portion 13 and a peripheral skirt 15 integral to the outer portion of the body portion 14.

The peripheral surfaces 16 of the skirts 15 are spaced slightly from the cylinder wall. Steam is prevented from passing the piston heads by means of piston rings 17 fitted in annular grooves 18 provided in the skirts 15 of the piston heads. The hollow space 19 of each piston head is closed off by a cover plate 19', the edges of which may be welded to the hub and skirt of the piston head.

A supporting slide for the piston designated generally at 20 is located in between the piston heads 11 and 12. This slide comprises a cast iron shoe designated at 21, formed at its ends with vee-shaped cradles 22 and 23 in which the piston rod 6 rests. The underface of the body of the shoe 20 is flat as will be understood from a comparison of Figures 1 and 2, and to this flat underface of the shoe a facing plate designated at 24 is applied. The upper surface of the facing plate 24 is also flat to have flush engagement with the undersurface of the shoe, but the lower surface of this facing plate is transversely curved so as to conform to the contour of the lower portion of the cylinder wall. Preferably this facing plate is constituted of leaded bronze.

The central portion of the body portion of the shoe is formed with a circular recess 25 and into this recess a correspondingly formed upwardly extending boss 26 of the facing plate fits. The facing plate, its boss 26 and the body portion of the shoe are provided with aligned bolt holes to accommodate a bolt 27 to which a nut 28 is applied to secure the parts assembled although leaving the facing plate free to adapt itself to riding contact with the lower portion of the cylinder wall.

The ends of the shoe 21 are formed with seats 29 which bear against the inner surfaces of the piston heads so that as the piston is reciprocated the supporting slide is constrained to movement therewith.

For the purpose of preventing angular disposition of the piston heads, the supporting slides are provided with a pair of wedges 30 and 31 pivotally hinged to the crankcase, as shown in Figures 1 and 2, and adapted to engage the wedges with the ends of the piston heads, the upper portion of the wedge 30 engaging the heads in the direction of sliding, and the lower portion of the wedge 31 engaging the heads in the direction of unidirectional reciprocation and adapted to facilitate substantially complete travel of the piston.
placement of the supporting slide its cradles are provided with longitudinally aligned openings so through which a holding or retaining rod extends. The end portions of this rod extend through openings provided therefor in the piston head, and its extremities are riveted over into counterbored provided in the ends of the openings.

The supporting slide is dimensioned and proportioned to support or sustain the inner end of the piston rod throughout its stroke and do this in such manner as to maintain this piston rod properly centered. In other words, the inner end of the piston rod is precluded from sagging under the influence of the weight of the piston so that the piston floats in the cylinder in the manner illustrated in Figure 1. The piston rod likewise floats through its stuffing box in the end head of the cylinder.

With the construction of this character it is unnecessary to provide a tail crosshead or to extend the piston rod through both ends of the cylinder. The construction of the engine is thus simplified and yet the piston and its piston rod are floated in the cylinder and in the stuffing box respectively.

While I have shown and described one construction in which the invention may be advantageously embodied, it is to be understood that the construction shown has been selected merely for the purpose of illustration or example and that various changes in the material size, shape and arrangement of the parts may be made without departing from the spirit of the invention or the scope of the subjoined claims.

The invention comprises:

1. An engine of the character described comprising a cylinder, a piston rod reciprocable in said cylinder, a piston on said rod having spaced piston heads fixed thereto, the peripheral surfaces of said piston heads being slightly spaced from the wall of said cylinder, piston rings carried by said heads and having steam tight engagement with the wall of said cylinder, and a supporting slide for the piston positioned in between said heads and riding on the lower portion of the wall of the cylinder and comprising a shoe having cradles in which the piston rod rests and a head engaging against the lower portion of the cylinder wall.

2. An engine of the character described comprising a cylinder, a piston rod reciprocable in said cylinder, a piston on said rod having spaced piston heads fixed thereto, the peripheral surfaces of said piston heads being slightly spaced from the wall of the cylinder, piston rings carried by said heads and having steam tight engagement with the wall of said cylinder, and a supporting slide for the piston positioned in between said heads and riding on the lower portion of the wall of the cylinder, and comprising a cast iron shoe having cradles in which said piston rod rests and a head facing for the shoe and contacting the cylinder wall.

3. An engine of the character described comprising a cylinder, a piston rod reciprocable in said cylinder, a piston on said rod having spaced piston heads fixed thereto, the peripheral surfaces of said piston heads being slightly spaced from the wall of the cylinder, piston rings carried by said heads and having steam tight engagement with the wall of said cylinder, and a supporting slide for the piston positioned in between said heads and riding on the lower portion of the wall of the cylinder, and comprising a shoe in supporting relation to the piston rod and a facing for the shoe floatably engaged therewith.

4. A cylinder reciprocably and a piston rod having spaced piston heads fixed thereto, the peripheral surfaces of said piston heads being slightly spaced from the wall of the cylinder, piston rings carried by said heads and having steam tight engagement with the wall of said cylinder, and a supporting slide for the piston positioned in between said heads and riding on the lower portion of the wall of the cylinder, and comprising a shoe having cradles in which the piston rod rests and a head engaging against the lower portion of the cylinder wall.
main crosshead connected to and supporting the outer end of the piston rod, and a supporting slide riding on the lower portion of the wall of the cylinder, constrained to reciprocate with the piston and having supporting engagement with the inner end of the piston rod whereby the piston as well as the piston rod is floated in the cylinder and in the stuffing box respectively by virtue of the combined supporting action of said slide and said main crosshead.

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