

UNITED STATES PATENT OFFICE.

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ENGINE.

SPECIFICATION forming part of Letters Patent No. 699,995, dated May 13, 1902.

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To all whom it may concern:

Be it known that I, GEORGE E. WHITNEY, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Engines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention relates to engines, particularly of the type wherein is employed a reciprocating piston, the piston-rod of which is joined to a connecting-rod which actuates a usual crank. Engines of this type, particularly such as are used in exposed places—such, for instance, as when mounted upon and to operate an automobile—cause much annoyance by reason of the difficulty in lubricating the ordinary sliding cross-heads and guides and the rapidity with which the rubbing-surfaces thereof wear away in spite of most careful attention on the part of the operator. To overcome this trouble, attempts have been made to employ ball-bearing cross-heads, wherein the cross-head, for instance, is grooved longitudinally to receive a ball, which also travels in a corresponding groove in the stationary or fixed guide on the frame; but it has been found in practice that ball-bearing cross-heads produce frequent breakage of the piston-rod; because the ball in rolling from one to the other end of the cross-head as the latter reciprocates occupies a position directly opposite the wrist-pin at only one point in the entire length of stroke of the cross-head, said ball at other times being more or less out of position relative to said wrist-pin, either above or below it, according to the position of the cross-head. Thus at either end of its stroke the ball occupies a position at one end of the cross-head, and not until the cross-head has moved through one-half its distance from one to the other extreme position does the ball in its movement reach a position opposite the wrist-pin. Consequently during the entire first half of the movement in either direction of the cross-head, during a part of which time the side thrust upon the cross-head is almost at its maximum, the ball is offset from or to one

side of the wrist-pin. Consequently the entire side thrust upon the wrist-pin tends to skew the cross-head and break the piston-rod. To obviate this difficulty and to avail so far as possible of the advantages of a rolling contact between the cross-head and its guides, my present invention comprehends the use of a wheel mounted upon the end of a piston-rod and preferably mounted upon the wrist-pin itself and which is rolled back and forth by the reciprocations of the piston-rod, said wheel at its periphery rolling upon the stationary guide to preserve the alignment of the piston-rod. This insures always a point of contact between the cross-head and guide which is directly opposite the axis of the wrist-pin whatever be the position of the latter. Consequently there can be no tendency of the side thrust to break the piston-rod or any connected part, as is the case with a ball-bearing.

My invention will be best understood from a description of one embodiment thereof.

In the accompanying drawings, Figure 1 in side elevation illustrates a typical engine equipped with a wheel cross-head made in accordance with my invention; Fig. 2, a horizontal section on the dotted line 2 2 upon an enlarged scale; and Fig. 3, a vertical sectional detail through the cross-head and wrist-pin, showing the manner of attachment of the piston-rod to the cross-head and the means for taking up wear at the wrist-pin.

Referring to the drawings in the particular embodiment of my invention therein illustrated, A is the cylinder, and B B frame members secured thereto and carrying at their lower ends suitable bearings for a crank-shaft C, provided with a crank C', all of which are and may be of usual or desired construction. The usual piston-rod *a* is here shown as threaded at its end and screwed into the cross-head *b*, being held by a lock-nut *a'*. The cross-head is provided with a central aperture *b'* for the bearing-block *b²*, which, with the lower end wall of the cross-head, constitutes the cross-head bearing for the reception of the wrist-pin *c*. The end of the piston-rod is shown as resting against the bearing-block *b²* in order that any wear of the wrist-pin

bearing may be taken up by slackening the lock-nut a' and screwing the piston-rod inward to set said bearing-block against the wrist-pin.

5 The ends of the wrist-pin c are shown as extended beyond the cross-head at each side of the latter, such extended ends presenting conical portions c' c' , facing in the same direction, upon which are clamped the arms d' 10 of the bifurcated end of the connecting-rod d , which actuates the crank C' . Beyond these conical portions c' the extended ends of said wrist-pin are reduced at c^2 c^3 to receive the bushings c^4 , upon which are rotatably 15 mounted the guide-wheels c^5 . Nuts c^6 , threaded upon said reduced ends c^2 c^3 , serve to clamp the parts securely in position.

The bushings c^4 are preferably flanged outwardly at their inner ends to bear upon the 20 adjacent faces of the arms d' of the connecting-rod, and a straight bushing c^7 is interposed between the arms d' of the connecting-rod, so that the nut c^6 at the bottom of Fig. 2, if tightened, will act through the adjacent 25 bushing c^4 upon the connecting-rod arms d' and intervening bushing c^7 and draw the wrist-pin longitudinally through said connecting-rod to cause its conical portions c' c' to take up any slack between said conical 30 portions and the arms of the connecting-rod surrounding the same. This makes it possible at all times to obtain a tight fit between said connecting-rod and wrist-pin to cause the latter to move with and non-rotatably in said 35 connecting-rod and to turn freely in the cross-head bearing described.

One of the reduced ends of the wrist-pin—as, for instance, that marked c^3 —may be further extended to provide an operating connection for a usual pump. 40

The guide-wheels c^5 roll freely upon the fixed guides e e , suitably attached, as by bolts e' , to the frame members B B , said guides preferably having flanges or lips e^2 to take 45 any side thrust of said guide-wheels and to insure correct alinement of the reciprocating parts.

The guides e e are spaced one from the other a distance slightly exceeding the diameter of the wheels c^5 , so that when the engine 50 is running in one direction, with the guide-wheels rolling against one of the guides e , said wheels will clear the other of said guides, and when the direction of movement of the 55 engine is changed the guide-wheels will of course be caused to run in contact with the other guide e and clear the first-mentioned guide.

The rotative movement between the wrist-pin or its bushing and its guide-wheels c^5 is slight, never amounting to a full rotation of 60 said wheels, and as the bearings thereupon are in line with and virtually a part of the structure for the necessary bearing between

the wrist-pin and connecting-rod no additional difficulty is experienced in lubrication 65 and there is no appreciable additional wear or trouble from dust. In other words, since a bearing at the wrist-pin is necessary for the connecting-rod the addition of the guide- 70 wheels thereat, considering their slight rotative movement, is not an objection of consequence. On the other hand, a free rolling contact is obtained against the guides, which requires no lubricating, is always movable 75 with and opposite the wrist-pin to receive directly the side thrust thereupon, hence introduces no tendency to break the piston-rod, and is never loose or liable to fall, as are balls 80 when employed.

My invention is not limited to the particular embodiment thereof here shown and described as an illustration of my invention, as the same obviously is open to various modifications without departing from the spirit 85 and scope of the invention.

I claim—

1. An engine containing a piston-rod, a connecting-rod, a wrist-pin joining the two, a guide and a guide-wheel mounted on said 90 wrist-pin.

2. An engine containing a piston-rod, a connecting-rod, a guide-wheel connected with and moved by said piston-rod, and guides arranged at opposite sides of said guide-wheel. 95

3. An engine containing a piston-rod, a connecting-rod, a plurality of guide-wheels having coincident axes arranged at opposite sides the axis of said connecting-rod and connected therewith and movable thereby and 100 guides for said wheels.

4. An engine containing a piston-rod, its connecting-rod, a cylindrical-faced guide-wheel and a guide therefor, said guide and guide-wheel together presenting perpendicular 105 side guiding means to receive the side thrust of said wheel.

5. In an engine a connecting-rod having a forked end, a wrist-pin provided with conical portions firmly held therein, a cross-head in 110 which said wrist-pin turns, and a plurality of guide-wheels mounted on said wrist-pin and guides therefor.

6. In an engine having a wheel cross-head, a pair of wheels, a connecting-rod and a cross- 115 head arranged between said wheels, a wrist-pin extended through said cross-head, connecting-rod and wheels, with means outside said wheels and acting upon the parts between said wheels but not by means thereof, 120 to move said wrist-pin axially.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GEORGE E. WHITNEY.

Witnesses:

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E. P. NORMANDIN.