May 2, 1933. C. W. PURKEY 1,906,765

PISTON

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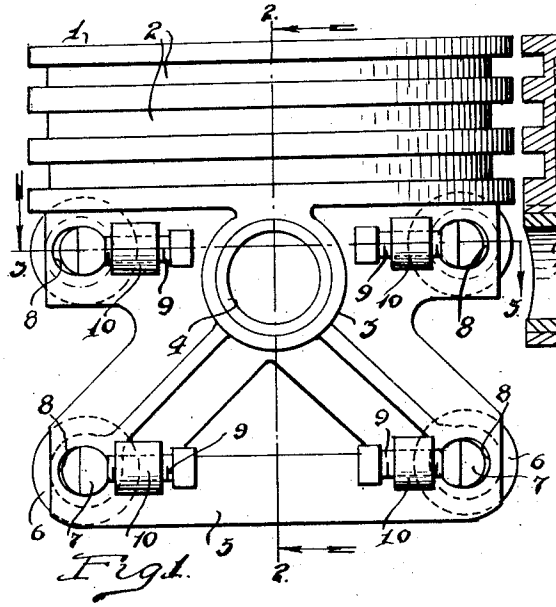


Fig. 1.

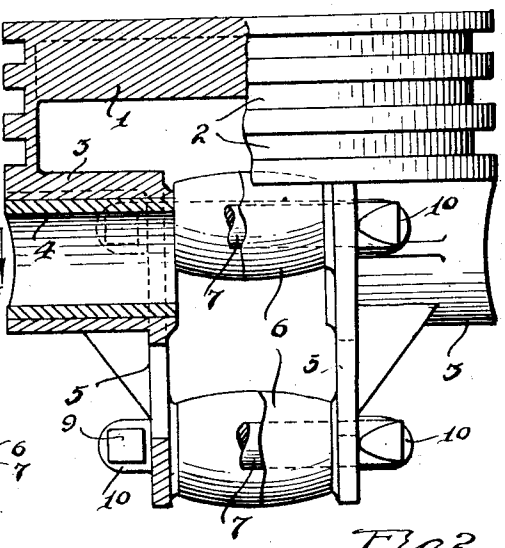


Fig. 2.

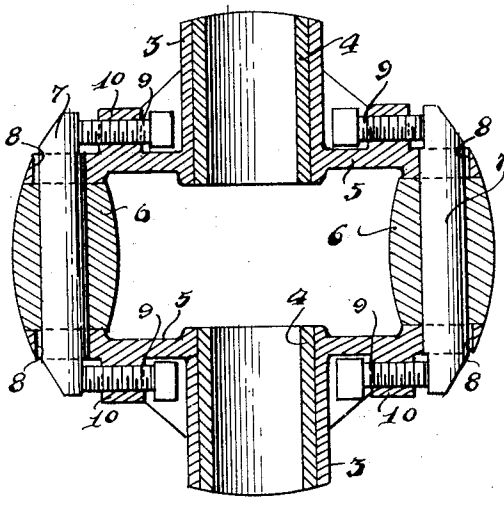


Fig. 3.

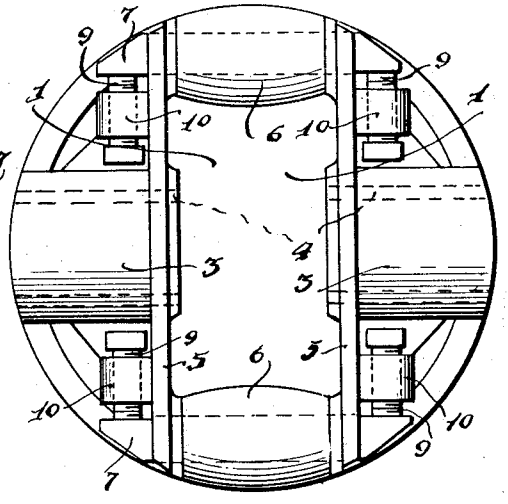


Fig. 4.

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Fig. 5.

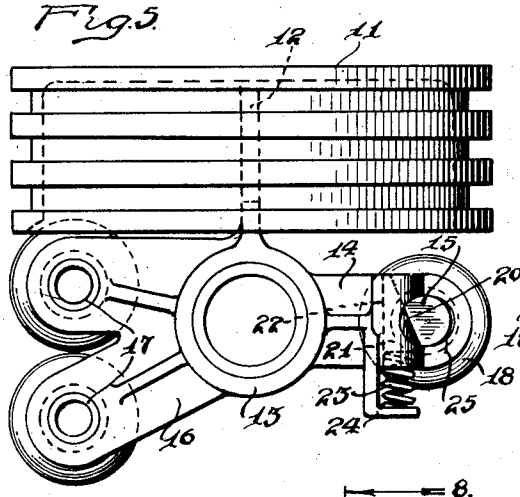
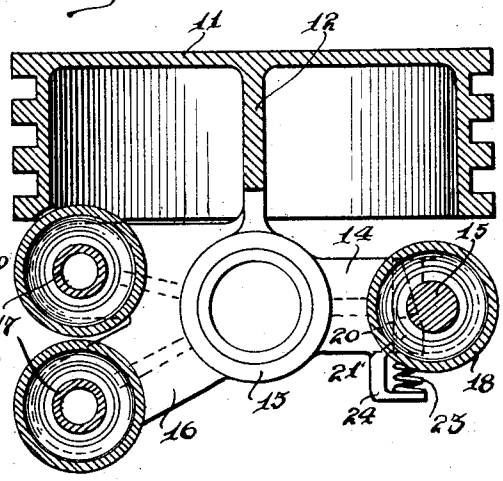


Fig. 7.



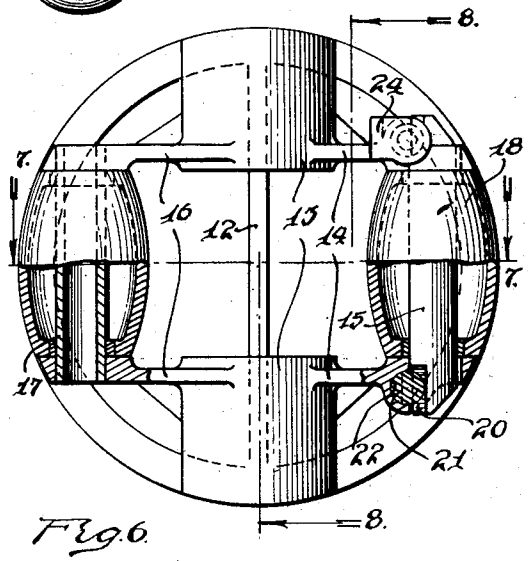
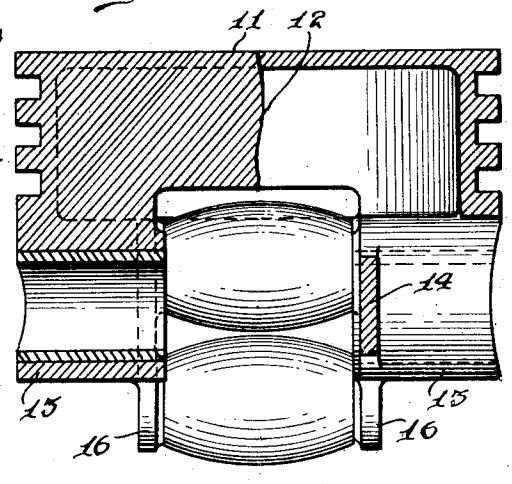


Fig. 6.

Fig. 8.



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UNITED STATES PATENT OFFICE

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PISTON

Application filed November 19, 1930. Serial No. 496,671.

This invention relates to pistons, and particularly to pistons carrying rollers for engagement with a cylinder wherein the piston reciprocates.

An object of the invention is to reduce the weight of a piston and minimize the friction incident to its use, by replacing the usual skirt member of the piston by a pair of spaced brackets projecting from the under face of the head, jointly mounting a plurality of cylinder-engaging rollers parallel to the wrist pin axis of the piston, and at opposite sides of its longitudinal axis.

Another object is to utilize the wrist pin bearings to reinforce the connection between said brackets and the piston head.

A further object is to employ two pairs of the described rollers, spacing the rollers of each pair longitudinally of the piston and positioning said pairs at opposite sides of the longitudinal axis of the piston.

Still another object is to associate with said rollers an adjustment means to initially establish a proper working relation between the rollers in a cylinder wall and to permit compensation for wear of said rollers.

These and various other objects the invention attains by the construction hereinafter described, and illustrated in the accompanying drawings, wherein:

Fig. 1 is a view in side elevation of the improved piston.

Fig. 2 is another side elevational view, partially in section on the line 2—2 of Fig. 1.

Fig. 3 is a cross sectional view of the piston taken on the line 3—3 of Fig. 1.

Fig. 4 is a bottom view of the piston.

Fig. 5 is a view in side elevation of an alternative form of the invention.

Fig. 6 is a bottom view of the same partly in section.

Fig. 7 is a vertical sectional view taken upon the line 7—7 of Fig. 6.

Fig. 8 is a vertical section taken upon the line 8—8 of Fig. 6.

Referring now more particularly to these views and describing first the construction shown in Figs. 1 to 4, inclusive, the reference character 1 designates a piston head having usual ring grooves 2. Formed integrally with said head, just below the latter, is a pair of wrist pin bearings 3, suitably spaced apart at opposite sides of the longitudinal axis of the piston, and substantially flush at their outer ends with peripheral face of said head. A suitable bushing 4 may be inserted in each bearing, as is common practice.

Integral with and downwardly extending from the under face of the head is a pair of brackets 5, which are further preferably integral with the inner ends of the bearings 3 and thus reinforced by the latter. Said brackets are relatively thin in the direction of the axis of said bearings, while extending transversely to said axis substantially across the under face of the piston head.

Between the brackets 5 are mounted two pairs of rollers 6, each gradually reduced from its center to its ends to substantially conform to the peripheral arc of the head. Each of said rollers is journaled on a pin 7 terminally mounted in slots 8 in said brackets, said slots being elongated slightly transversely to said pins. Thus said pins with rollers journaled thereon are afforded a slight play to and from the longitudinal axis of the piston. The brackets 5 have an extent longitudinally of the piston substantially equal to that of a piston skirt in present practice, whereby it is made possible to space the rollers 6 of each pair longitudinally of the piston, the upper roller of each pair being between the head and wrist pin axis, and the lower rollers being considerably below said axis.

The outer end portions of each pin 7 have a lateral face thereof planed for engagement by the end of a set screw 9 threaded in a lug 10 integrally outstanding from the adjacent bracket 5, said set screws being adapted to shift said pins from the longitudinal axis of the piston to establish proper engagement of the rollers 6 with the wall of a cylinder in which the piston reciprocates. Also, said set screws permit such adjustment of the rollers as may at times be requisite to compensate for wear.

Describing now the alternative construction illustrated by Figs. 5 to 8, inclusive, a hollow cylindrical piston head 11, having the usual ring grooves, is reinforced by a dia-

metrical rib 12. Integrally carried by said rib just below the head is a pair of wrist pin bearings 13, suitably spaced longitudinally of said rib to accommodate a connecting rod therebetween.

Formed integrally with the inner ends of the bearings 13, at one side thereof, is a pair of bracket arms 14 terminally jointly mounting a pin 15 parallel to the axis of said bearings, and from the other side of the latter, at their inner ends, a pair of double bracket arms 16 integrally project, mounting a pair of pins 17 parallel to the pin 15 and spaced longitudinally of the piston. The pins 15 and 17 journal rollers 18 fitted between the arms 14 and between the arms 16, tangentially to the extended cylindrical surface of the head 11, and preferably cored out to reduce their weight. The pins 17 are suitably fixed in the brackets 16 as by rivets 19.

The pin 15 has its end portions laterally planed, as indicated at 20, and these portions are engaged by acutely beveled ends of wedge members 21 set into vertical bores 22 of the arms 14, the said members being urged upwardly by coiled springs 23. The latter, at their lower ends, seat upon depending L-shaped extensions 24 of the arms 14. Thus the wedge members 21, under upward urge of the springs 23, exert a constant outward effort upon the pin 15, to maintain proper contact of the roller 18 with a cylinder wall (not shown), and the openings 25 of the arms 14 receiving the pin 15 are slightly elongated transversely of said pin, to afford the latter a slight play for taking up wear.

In the use of said piston, in either of its forms, engagement of the rollers 6 or 18 with a cylinder wall (not shown) prevents any oscillation of the piston about its wrist pin axis, thereby avoiding resultant slap and leakage past the head. Said rollers, furthermore, since they may turn freely as the piston reciprocates, greatly reduce the friction between the piston and the cylinder wall as compared to the cylindrical skirts now commonly employed.

A further advantage of the described construction is the reduction of weight achieved by the substitution of bracket members and rollers for an ordinary piston skirt.

A still further advantage lies in the possibility of employing a light metal, as aluminum, to form the entire piston, without undue resulting diametrical thermal expansion.

The last described form of the invention so locates the two adjacent rollers thereof as to engage the cylinder wall primarily during the power stroke of the piston, the single roller engaging said wall during the return stroke. Thus, the invention in this form takes into consideration the fact that the lateral thrust during the power stroke considerably exceeds the lateral thrust incident to the compression and scavenging strokes.

Elimination of one of the rollers in the last described construction directly reduces weight and expense, and further indirectly reduces weight by reduction in size of the roller-mounting brackets

While it is apparent that the illustrated embodiments of my invention are well calculated to adequately fulfill the objects and advantages primarily stated, it is to be understood that the invention is susceptible to variation, modification and change within the spirit and scope of the subjoined claims.

What I claim is:

1. A piston comprising a cylindrical head, a pair of spaced brackets projecting from the under face of the head, one at each side of the longitudinal axis of the head, a pair of rollers journaled upon and between said brackets at opposite sides of said axis, and positioned to roll upon the cylinder in which said piston operates, and a pair of wrist pin bearings integrally connecting said brackets to said head, and outwardly extending from said brackets, said bearings establishing an axis parallel to that of said rollers.

2. A piston comprising a cylindrical head, a support projecting from the under face of said head, a pair of wrist-pin bearings spaced at opposite sides of the piston axis and integrally connecting said head and support, and two pairs of rollers journaled in said support each parallel to the wrist pin axis and positioned to roll upon the cylinder in which said piston operates, the rollers of each pair being diametrically opposed, the axes of said pairs being at opposite sides of the transverse plane of the piston determined by the axis of the wrist pin bearings.

3. A piston comprising a head, a pair of wrist pin bearings carried by and below said head, bracket members projecting from said bearings, paired at opposite sides thereof, a pair of rollers carried by one pair of said bracket members having their axes aligned longitudinally of the piston, and a single roller carried by the other pair of bracket members, all of said rollers having their axes substantially parallel.

4. A piston comprising a cylindrical head, a supporting structure carried by said head therebeneath, a pair of rollers journaled in said supporting structure, and positioned to roll upon the cylinder in which said piston operates and at one side of the piston axis, and a single roller journaled in said supporting structure, tangentially to said cylinder, at the other side of said axis.

5. A piston comprising a cylindrical head, a supporting structure carried by said head therebeneath, a roller journaled in said structure, and positioned to roll upon the cylinder in which said piston operates, and means carried by said structure automatically compensating for wear of said roller.

6. A piston comprising a cylindrical head,

a supporting structure carried by said head therebeneath, a roller journaled in said structure, and positioned to roll upon the cylinder in which said piston operates, and means resiliently urging said roller outwardly to compensate for wear.

7. A piston comprising a cylindrical head, a supporting structure carried by said head therebeneath, a pin mounted in said supporting structure, a roller journaled on said pin, and positioned to roll upon the cylinder in which said piston operates, a pair of wedge members slidable in said supporting structure substantially longitudinally of the cylinder and engaging the ends of said pin, and means for exerting pressure on said wedge members, whereby said pin is deflected outwardly to compensate for wear of said roller.

8. A piston comprising a cylindrical head, a roller-carrying structure rigidly projecting from the under face of said head, a pair of rollers journaled in said structure at opposite sides of the longitudinal axis of the piston and positioned to roll upon the cylinder in which said piston operates, a pair of spaced wrist-pin bearings formed integral with said structure and establishing an axis parallel to those of said rollers, and means for individually adjusting said rollers away from each other.

9. A piston comprising a cylindrical head, a roller-carrying structure rigidly projecting from the under face of said head, a pair of rollers journaled in said structure at opposite sides of the longitudinal axis of the piston and positioned to roll upon the cylinder in which said piston operates, a pair of spaced wrist-pin bearings formed integral with said structure and establishing an axis parallel to those of said rollers, a pin journaling each of said rollers and terminally mounted in said structure, and means upon said structure engaging the ends of each pin for adjusting said rollers together with their pins away from each other.

10. A piston comprising a cylindrical head, a roller-carrying structure rigidly projecting from the under face of said head, a pair of rollers journaled in said structure at opposite sides of the longitudinal axis of the piston and positioned to roll upon the cylinder in which said piston operates, a pair of spaced wrist-pin bearings formed integral with said structure and establishing an axis parallel to those of said rollers, a pin journaling each of said rollers, and terminally mounted in said structure, lugs outwardly projecting from said structure, and set screws threaded in said lugs and bearing on the ends of said pins to adjust said pins and rollers away from each other.

In testimony whereof I sign this specification.

CARL W. PURKEY.