No. 751,252. PATENTED FEB. 2, 1904.

J. BOOP.

PISTON.

APPLICATION FILED JUNE 15, 1903.

NO MODEL.

FIG. 1.

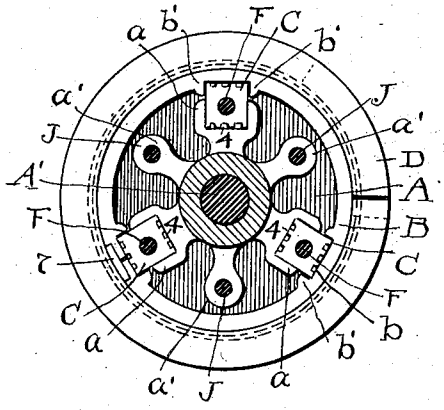


FIG. 2.

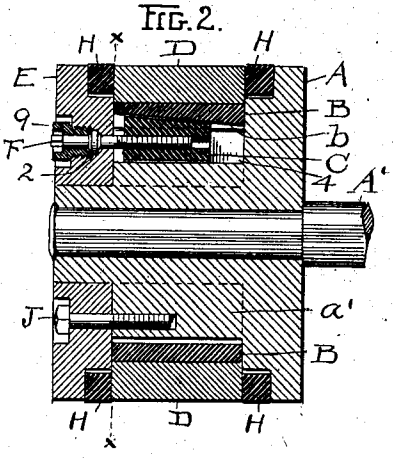


FIG. 3.

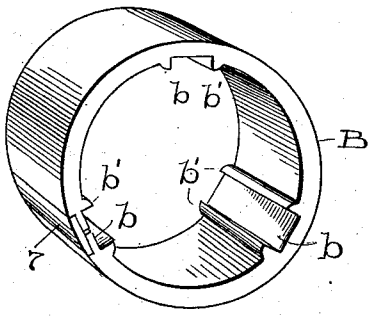
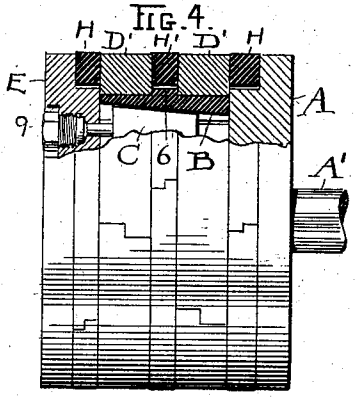


FIG. 4.



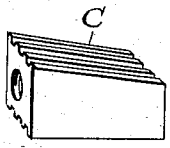


FIG. 7.

FIG. 5.

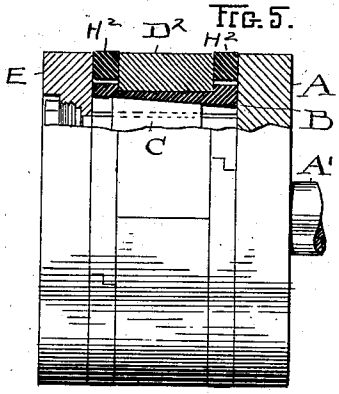
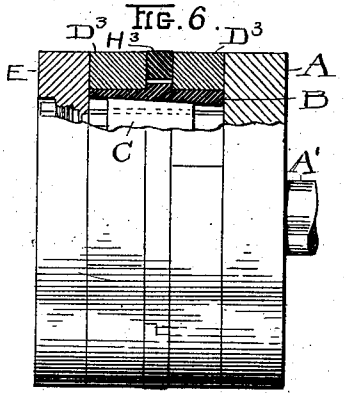


FIG. 6.



ATTEST.

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 751,252. Patented February 2, 1904.

UNITED STATES PATENT OFFICE.

JOHN BOOP, OF CLEVELAND, OHIO.

PISTON.

SPECIFICATION forming part of Letters Patent No. 751,252, dated February 2, 1904.

Application filed June 16, 1903. Serial No. 161,440. (No model.)

To all whom it may concern:

Be it known that I, JOHN BOOP, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Pistons; and I do declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in pistons; and the invention consists in a piston constructed and adapted to operate substantially as shown and described, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a cross-section of the piston on line *x x*, Fig. 2; and Fig. 2 is a central sectional elevation of one form of my improved piston on the axis thereof, front to rear. Fig. 3 is a perspective elevation of the expanding ring shown in Figs. 1 and 2, and Fig. 4 is a plain side elevation, partly in section, of a modified form of the piston. Figs. 5 and 6 are sectional elevations corresponding substantially to Fig. 2 and showing still further modifications, respectively, as hereinafter fully described. Fig. 7 is a perspective view of one of the several wedges for expanding the parts.

In the views thus shown I have illustrated several different constructions of piston, but which in practical effect and value are substantially alike, as will be seen in the particular description of said several forms in their order in this specification, and I might still further change and modify the said constructions and parts thereof and keep within the spirit and object of this invention.

Referring now to the piston and parts shown in Figs. 1, 2, and 3, A represents the piston-head, which is shown in this instance as grooved out in its body portion from the front to lighten the weight and is shown as having radial portions *a* and *a'*, respectively, constructed to use the different parts connected immediately therewith, as hereinafter described. The said piston-head has a bore centrally through the same for piston-rod A', which may be secured in any suitable way by upsetting the end of the said rod or by nut or otherwise. B is the expanding ring, which is located about the middle cored portion of the piston and spaced out of immediate engagement with the radial portions *a* by means of wedges or keys C, one of which is seen in detail, Fig. 7. Three such keys are shown in this instance, but I might use four or more, and said keys work on the inclined faces *b*, between guide-ribs *b'* on the interior of ring B, and in channels 4 in head A. Said channels or recesses have relatively deep walls, as shown. The wedges C are ribbed or corrugated lengthwise on their bearing-faces to relieve friction and promote their operation by means of screw-bolts F, which control the same. Said bolts extend through follower E from the outside, and suitable confining plugs 9 are threaded into the follower from the outside behind the collars 2 on said screw-bolts F, so as to hold the said bolts from longitudinal movement in their bearings while they are turned to operate said wedges. These bolts enter threaded bores centrally in or through wedges C and operate to drive or draw the wedges and expand the ring B more or less, as may be needed, and according to the wear upon wearing or bearing rings D about the periphery of said expanding ring. The ring D is a split ring in any event whether one or more be used; but only one is shown in Figs. 2 and 5, while two are shown in Figs. 4 and 6. It will be seen also that the bottom or face of channels or grooves 4 in the piston-head are parallel to the axis of the head, while the faces *b* of the expanding ring between ribs *b'* are inclined from the initial or front edge of said edge of said ring to the rear or opposite edge thereof, and the measure or degree of such inclination is relatively as seen in Fig. 2. Thus wedges or keys C are constructed and situated to take up all the wear that can come upon rings D, and the space within head A behind follower E affords them all requisite movement. In this connection I emphasize the material advantage of this construction and arrangement of parts, in which each wedge is independent of all others, because it enables me to localize the expansion of parts where it may be needed. Thus in a horizontally-disposed cylinder and

piston the wear upon the wearing-rings naturally will be greatest at the bottom, on which rests the weight of the piston. This being true I can by my independent or separate means of adjustment take up the wear at the bottom of the piston without affecting the position of the parts in other portions thereof, and this differentiates the invention very clearly from all structures in which the expanding ring and the wearing-rings are necessarily enlarged or expanded all around in like manner and degree when any expansion at all occurs, which is the old practice. The wedges C are purposely left somewhat free at or about ribs b' to accommodate the parts to this separate operation where expansion is needed.

H represents what are commonly known as "packing" or "snap" rings, being of springy metal and adapted to expand and hold a close bearing upon the surface of the cylinder by reason of their own inherent outward pressure. Hence they are constructed to be sprung into working position and naturally bear outward all around. In Fig. 2 I show piston-head A and follower E as having a right-angled annular recess next to wearing-ring D, in which I place the said packing or snap rings H, so that in this case said rings are not affected by any expansion of expanding ring D and where they serve also the practical purpose of packing-rings for the piston. Bolts J here and there fix follower disk or plate E rigidly but removably to or upon head A.

In Fig. 4 I show a modification in which the wearing-ring has a small annular rib 6, midway about which is placed a snap-ring H', and there are two wearing-rings D' instead of one and on either side of ring H'; otherwise the construction is the same as in Fig. 2.

In Fig. 5 I show a further modification in which there is a single wearing-ring D^2 and two snap-rings H^2 at the edges thereof and said parts arranged wholly about expanding ring B. In this case also ring D is let into an annular recess of slight depth in expanding ring B.

Still another modification of these arrangements and constructions of parts is seen in Fig. 6, in which there are two wearing or bearing rings D^3 and a single snap-ring H^3 between them and all encircling expanding ring B. In this also, as in all the others, a single set of wedges C serve all the purposes of expansion, and any particular wedge can be tightened more or less, as the piston may need.

The wearing-rings may be of any suitable material.

The bolts F might be arranged so as to pull upon the wedges C instead of push, and this idea is within my invention.

In operation the snap-rings bear uniformly and closely against the cylinder, while wearing-rings depend for their tightness upon expanding ring B and said ring B on wedges C.

In Fig. 3 I show the expanding ring as having a lap-joint on the line of its split or division and provide the same with an overlapping plate 7, set into recesses in the adjacent edges of the ring and flush with the outer surface of the ring to make the joint steam-tight.

The wearing ring or rings not being self-expansible they cannot in themselves take up wear and in all cases will wear loose sooner or later after any given and sufficient adjustment; hence the special importance of associating with such rings the self-expanding snap-rings, which in a very material sense serve as packing-rings also and keep the piston tight though the wearing-rings have begun to leak. It will also be seen that these bearing-rings are essentially a part of the piston and sustain its load and take the most trying place in its work and are not of the nature of packing-rings or other minor and mere sustaining features or parts.

With independent adjustable wedges to localize the expansion of the wearing-rings I can always center the piston-rod to work true in its bearings and glands and always have a tight packing fit at the wearing parts of the engine.

What I claim is—

1. The piston-head and the expansion-ring about the same having a plurality of inclined bearing-surfaces transversely in its inside and ribs at the sides of said surfaces, in combination with a wedge for each of said surfaces and a separate screw to operate each wedge, substantially as described.

2. The piston-head having a plurality of recesses radially disposed about the same running front to rear of the piston and having parallel walls at their sides, and an expanding ring having inclined bearing-surfaces opposite said recesses, in combination with wedges engaged between said recesses and bearing-surfaces, a separate screw-bolt for controlling each wedge and a follower-plate in which said bolts are engaged to be rotated, substantially as described.

3. The piston-head having a series of recesses disposed at equal distances about its middle portion and an expanding ring having walled inclined surfaces directly opposite said recesses, in combination with wedges engaged between said recesses and inclined surfaces and having threaded bores lengthwise thereof, a separate screw-bolt for each wedge having a collar between its ends, a follower-plate and means therein to engage said collar and prevent longitudinal movement of the bolt, substantially as described.

4. In pistons, a head and an expanding ring therein having a plurality of inclined flat bearing-surfaces internally from edge to edge, means to expand said ring at any one of said bearing-surfaces and a wearing-ring about said expanding ring, substantially as described.

5. The piston-head having a series of straight recesses about its middle portion with

parallel side walls and equidistant from the axis of said head, a wedge in each recess and means to actuate each wedge independently, in combination with an expanding ring about said wedges having inclined surfaces engaged thereby, a split wearing-ring about said wearing-ring and a snap-ring next to said wearing-ring, substantially as described.

6. The combination with the piston-head having radial arms, the outer ends of which are recessed, an expanding ring surrounding said radial arms, wedge-keys arranged in the recessed ends of said arms, a follower, bolts adapted to operate the wedge-keys, means carried by the follower adapted to prevent longitudinal movement of the bolts, and the packing rings surrounding the expanding ring, as specified.

7. The combination with a piston having radial arms, the ends of which are recessed, the beams of said recesses being longitudinally straight, the expanding ring surrounding the radial arms and provided with interior guiding-ribs, the inner face of the rings between the ribs being inclined, the wedge-keys arranged in the recesses and between the guiding-ribs, the packing-rings, the follower-plate, and bolts carried by the follower for operating the wedge-keys, as specified.

8. The combination with the piston having radial arms upon the forward faces thereof, the outer ends of said arms being recessed, the piston-ring having interior guiding-ribs, the inner face of the rings between the ribs being inclined, the wedge-keys, the wedge-faces being corrugated or grooved, packing-rings surrounding the expanding ring, the follower-plate, wedge-key bolts for moving the said wedge-keys, and means carried within the follower-plate for holding the key-bolts against longitudinal movement, as specified.

9. The combination with the piston having expansions upon the front face thereof, said expansions being recessed, the expanding rings having interior guiding-ribs, packing-rings surrounding the expanding ring, the follower-plate having threaded apertures, the wedge-keys arranged in the recesses and having threaded bores, the key-bolts passing through the follower-plate, the threaded ends of said bolts engaging the threaded bores of the wedge-keys, a collar arranged upon each bolt, and the plugs arranged in the follower-plate adapted to engage the collar and hold the bolt against longitudinal movement for the purpose specified.

In testimony whereof I sign this specification in the presence of two witnesses.

JOHN BOOP.

Witnesses:
R. B. MOSER,
R. ZBORINK.