No. 748,233. PATENTED DEC. 29, 1903.

J. SWAN.

STEAM ENGINE PISTON.

APPLICATION FILED APR. 24, 1903.

NO MODEL.

Fig. 1.

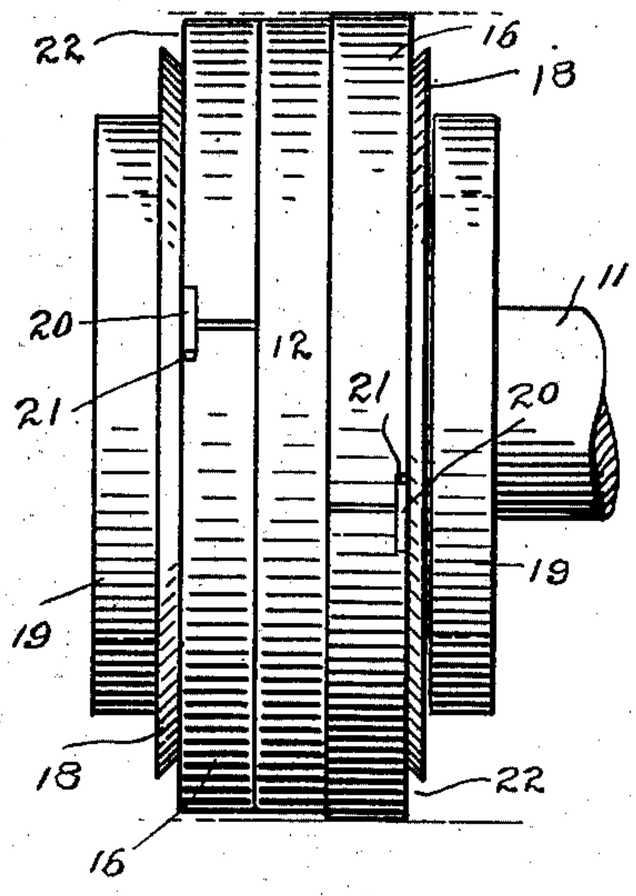


Fig. 2.

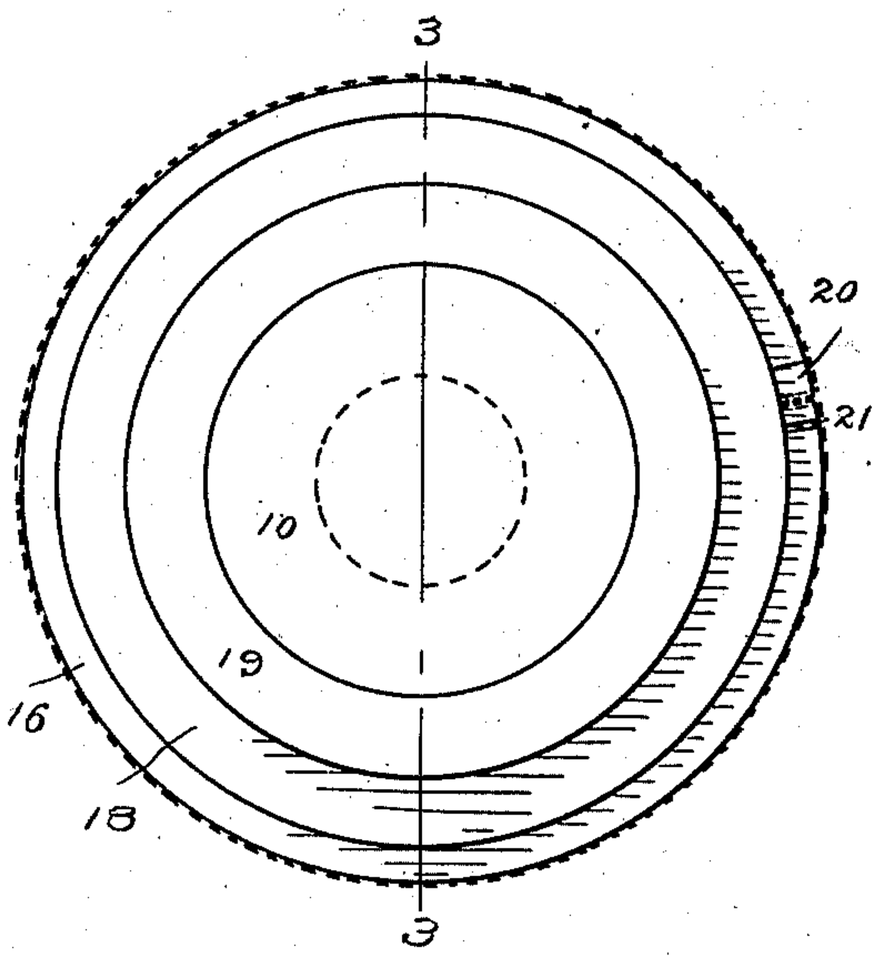


Fig. 3.

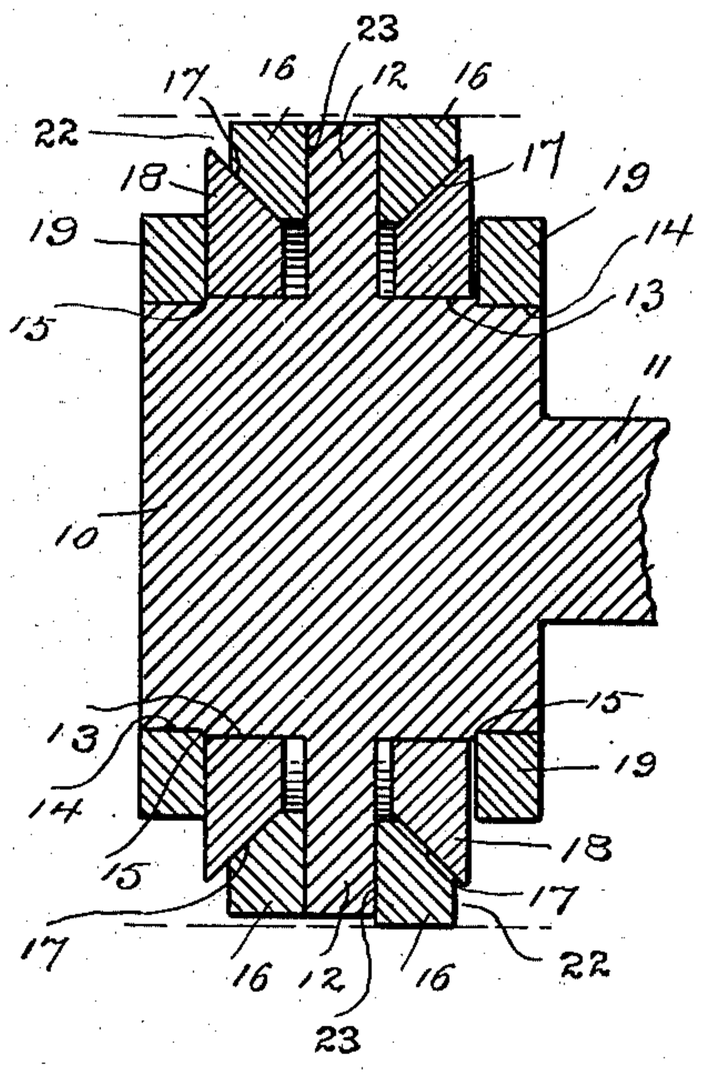
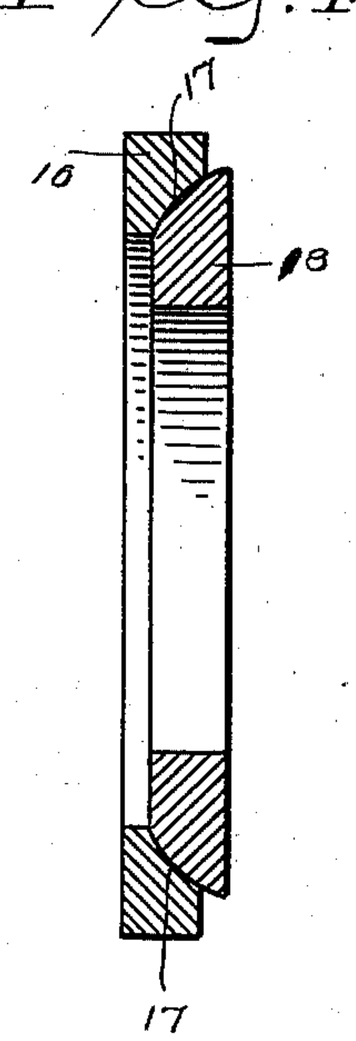


Fig. 4.



WITNESSES.

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No. 748,233. Patented December 29, 1903.

UNITED STATES PATENT OFFICE.

JAMES SWAN, OF SEYMOUR, CONNECTICUT.

STEAM-ENGINE PISTON.

SPECIFICATION forming part of Letters Patent No. 748,233, dated December 29, 1903.

Application filed April 24, 1903. Serial No. 154,050. (No model.)

To all whom it may concern:

Be it known that I, JAMES SWAN, a citizen of the United States, residing at Seymour, county of New Haven, State of Connecticut, have invented a new and useful Steam-Engine Piston, of which the following is a specification.

In reciprocating steam-engines as ordinarily constructed the entire peripheral surface of the piston is intended to engage the wall of the cylinder during the entire stroke in each direction.

It is one of the objects of this invention to produce a steam-engine piston which shall be adapted to all kinds of cylinders, old or new, and whether the surface is even or uneven, and which shall fit the cylinder tightly, but with as little friction as possible.

It is a further object of the invention to produce a steam-engine piston in which a portion of the peripheral surface shall be expanded by the steam, so as to engage the wall of the cylinder closely when the piston is moving in either direction.

It is a further object of the invention to produce a steam-engine piston the exhaust end of which—*i. e.*, the portion of whose peripheral surface is forward when moving in either direction—shall move freely in the cylinder and without friction and the receiving end of which—*i. e.*, the rear portion—shall engage the wall of the cylinder closely, and thereby prevent leakage of steam.

With these and other objects in view the invention consists in certain constructions and in certain parts, improvements, and combinations which will be hereinafter described and then specifically pointed out in the claims hereunto appended.

In the accompanying drawings, forming part of this specification, Figure 1 is a side elevation of my novel piston; Fig. 2, an end elevation thereof; Fig. 3, a section on the line 3 3 in Fig. 2, and Fig. 4 is a detail sectional view illustrating a slightly-modified form in which the engaging surfaces of the ring and disk are made respectively concave and convex instead of a right line.

10 denotes the body of my novel piston as a whole, and 11 the piston-rod. The body comprises a central disk which fits the cylinder closely, but without friction, and is specifically indicated by 12, and hubs 13 on opposite sides of the disk. The outer ends of the hubs are slightly reduced, as at 14, said reduced portions terminating in shoulders 15.

16 denotes contractile rings lying on opposite sides of the disk whose normal diameter—that is, when contracted—is approximately the same as the diameter of the disk. Upon the outer faces of the contractile rings are inclines 17, which are engaged by rings 18, which are adapted to slide on the hubs, said sliding rings being retained in position in any suitable manner, as by retaining-rings 19, which are rigidly secured to the reduced ends of the hubs and rest against the shoulders. The inner faces of the sliding rings are inclined to correspond with the inclines on the outer faces of the contractile rings. The angle of inclination of these engaging surfaces may of course be varied within reasonable limits, depending, of course, upon the steam-pressure to be used in the cylinder, the greater the pressure the greater of course may be the inclines upon the sliding rings, and vice versa.

The operation is as follows: In Fig. 3 I have indicated the wall of the cylinder by broken lines at top and bottom, but have for the sake of clearness exaggerated the distance between the periphery of disk 12 and the wall of the cylinder. In this figure the piston is moving toward the left, steam entering the cylinder at the right of the piston as it appears in this figure and exhausting at the left of the piston. When steam enters the right end of the cylinder, it acts upon the right sliding ring 18 and moves it forward slightly relative to the right retaining-ring, as clearly shown at the right in Fig. 3. The effect of this forward movement of the sliding ring through the engagement of its inclined surface with the incline upon the right contractile ring is to expand said contractile ring outward, as shown, causing it to engage the wall of the cylinder closely. The action of the steam upon the rings is of course the same whether the steam is working under boiler-pressure or expansively. During this movement of the piston toward the left the left ring of course remains at its normal or contracted position, as shown at the left in Fig. 3. As soon as the stroke toward the left is finished and the exhaust at the right end of

the cylinder commences the pressure against the right sliding ring is relieved and said ring instantly contracts to its normal position and moves the sliding ring backward on the hub to its normal position—that is, resting against the retaining-ring—the normal position of a contractile ring when contracted and the corresponding sliding ring being shown at the left in Fig. 3. As soon as steam enters the cylinder at the left end thereof it acts against the left sliding ring, moving it forward relatively to the corresponding retaining-ring, and through the engagement of the respective inclines upon the sliding ring and the contractile ring expands the left contractile ring outward and causes it to engage the wall of the cylinder closely, the position of an expanded contractile ring and of the corresponding sliding ring being shown at the right in Fig. 3. It will thus be seen that the rings act alternately and the action is the same when the piston is moved in either direction, the outer periphery of one ring only being in close contact with the wall of the cylinder, the body of the piston and the other contractile ring moving within the cylinder freely, and, furthermore, that as the operative contractile ring is expanded by pressure acting outward the outer periphery thereof will with reasonable limits conform to the irregularities in the wall of the cylinder, so that my novel piston when applied to an old and worn cylinder will prove very effective in preventing leakage of steam and will greatly increase the efficiency of the engine while reducing the cost of running it.

In order to give still greater adaptability of the contractile ring to irregularities in the wall of the cylinder, the inclines upon the contractile rings may be concave curves and the inclines upon the sliding rings corresponding convex curves, as shown in Fig. 4, or, if preferred, again the respective concavity and convexity of the contractile and sliding rings may be reversed from the form illustrated in Fig. 4. This being an obvious colorable variation of the forms illustrated is not thought to require specific illustration, it being wholly immaterial which of a corresponding pair of rings is made concave and which convex. When the concavo-convex form is used, it permits slightly-increased freedom of movement of the engaging surfaces of the corresponding rings over each other and gives the contractile ring increased adaptability to irregularities in the wall of the piston.

It will be noted that the diameter of both the retaining-rings and the sliding rings is less than the diameter of the contractile rings, so as to leave a space between the peripheries of said rings and the wall of the cylinder. These spaces, which I have indicated by 22, permit steam on the receiving side of the piston to press upon the outer face of the contractile ring and force said ring forward against the face of disk 12, as at 23 at the right in Fig. 3, and thereby prevent leakage of steam between the face of the disk and the inner face of the contractile ring. In order to prevent leakage of steam at the joints in the rings, I provide plates 20 at the joints, one end of each plate being recessed into the ring and rigidly secured thereto and the other end of the plate being free and lapping past the joint and lying in a recess 21 at the other end of the ring.

Having thus described my invention, I claim—

A piston for steam-engines consisting of a rigid body having a central disk with parallel side walls and hubs on opposite sides thereof, contractile rings on opposite sides of the disk which normally move freely within the cylinder and whose outer faces are provided with undercut inclined engaging surfaces, and sliding-rings upon the hubs having corresponding engaging surfaces, the contractile ring at the receiving end of the piston being expanded by pressure of steam upon the corresponding sliding ring, whereby the outer periphery of the contractile ring is caused to engage the cylinder closely.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES SWAN.

Witnesses:
A. M. WOOSTER,
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