Nov. 24, 1942. A. KRUPP 2,303,082

WASHING MACHINE CYLINDER

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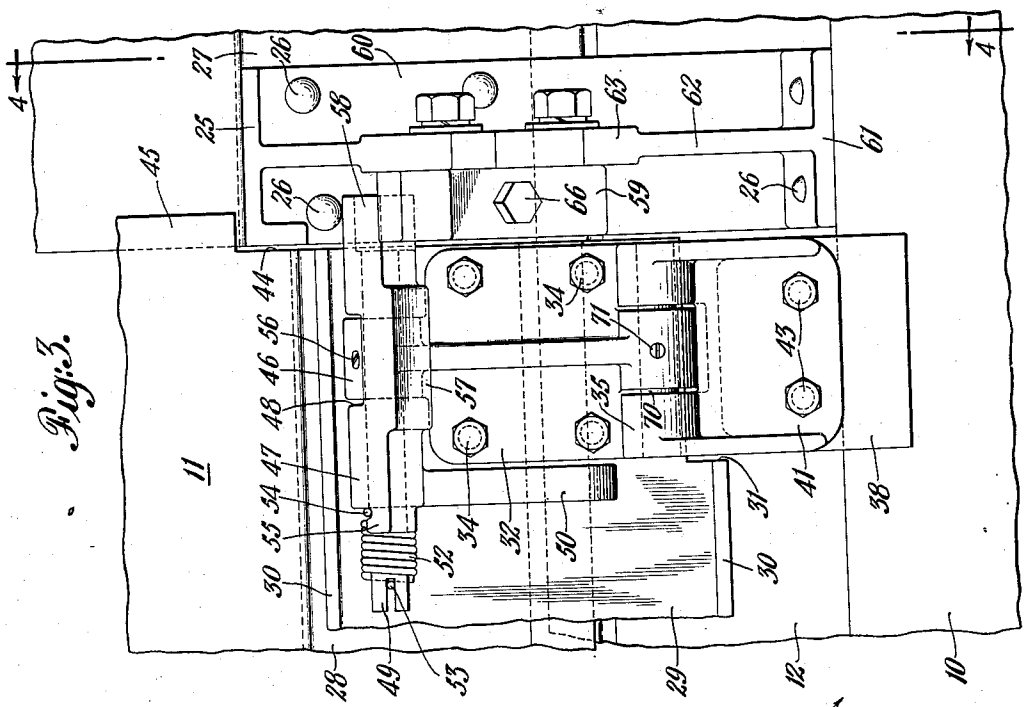


Fig. 3.

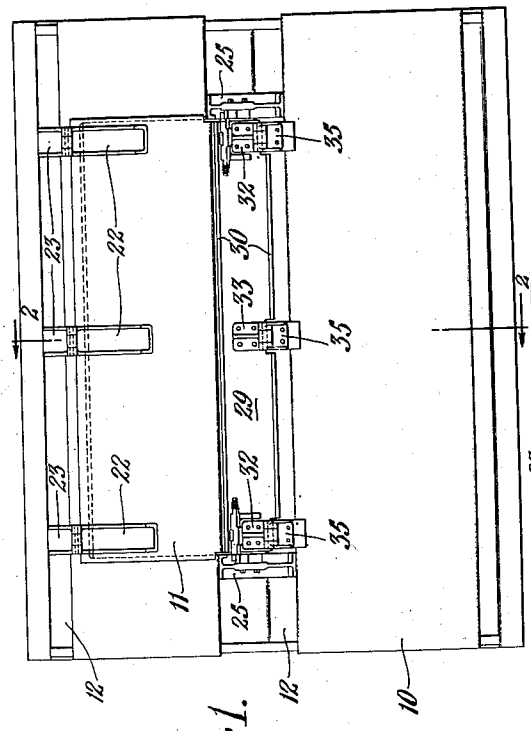


Fig. 1.

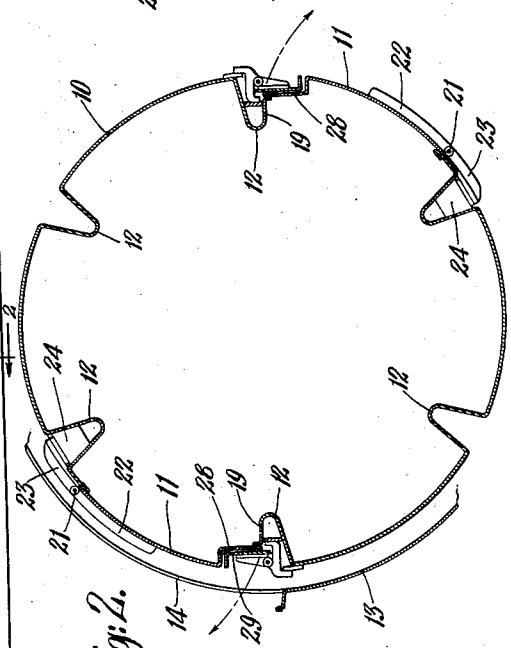


Fig. 2.

INVENTOR
ANTON KRUPP
BY
Donald W. Robertson
ATTORNEY

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Fig. 5.

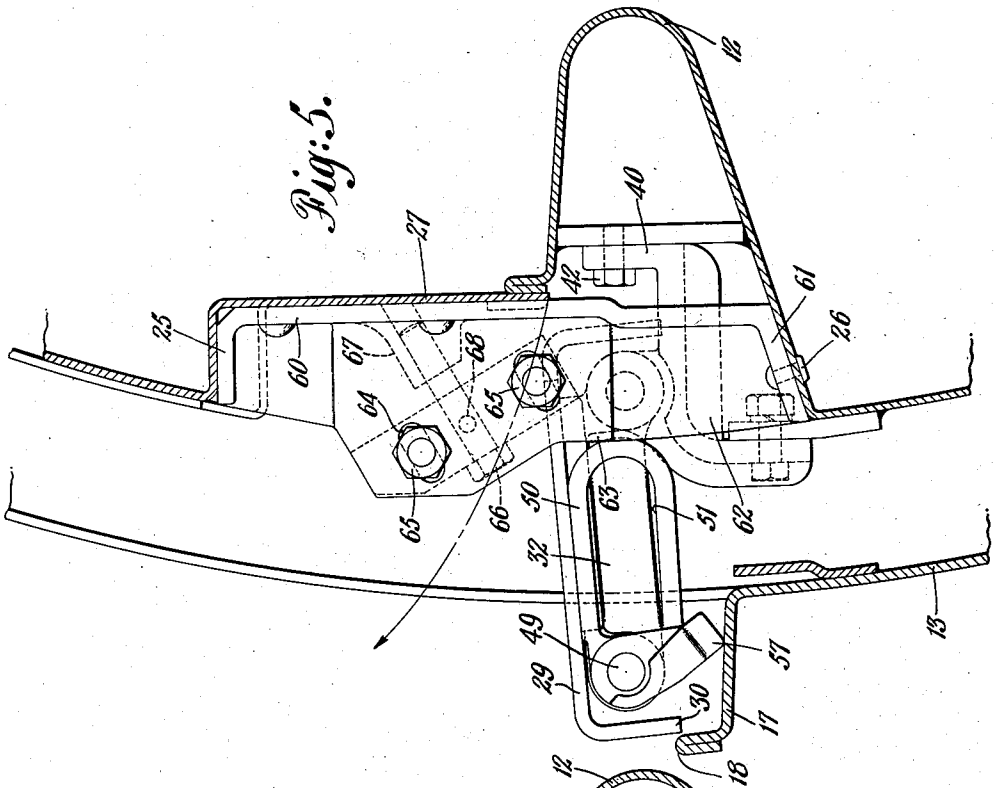
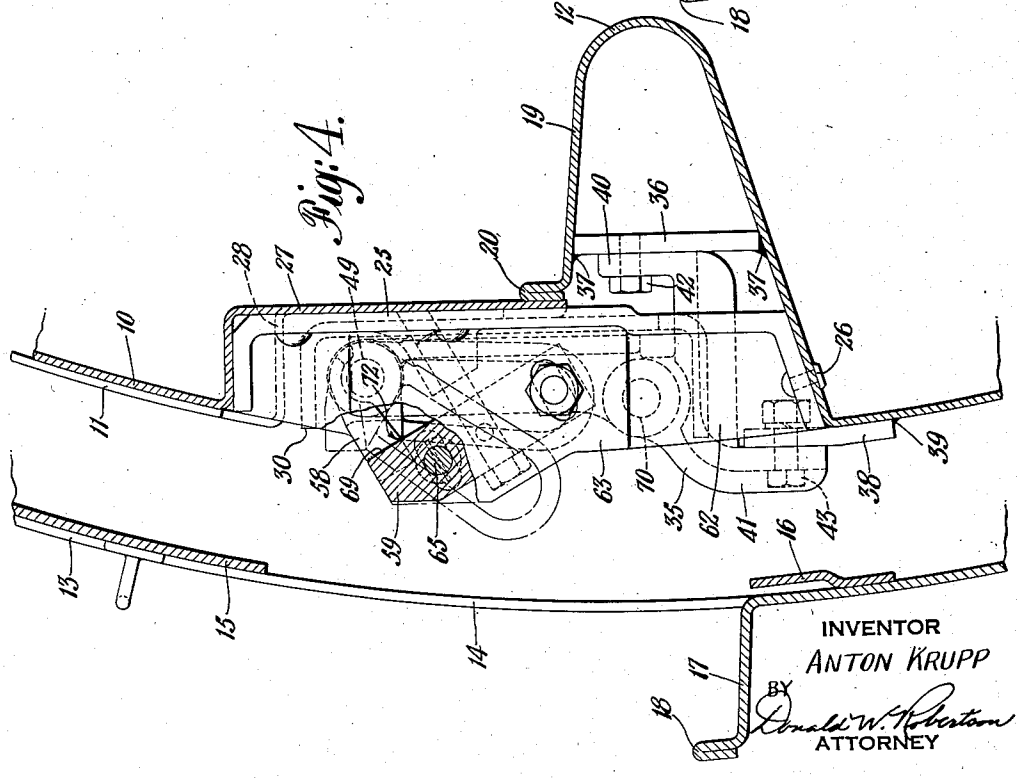


Fig. 4.



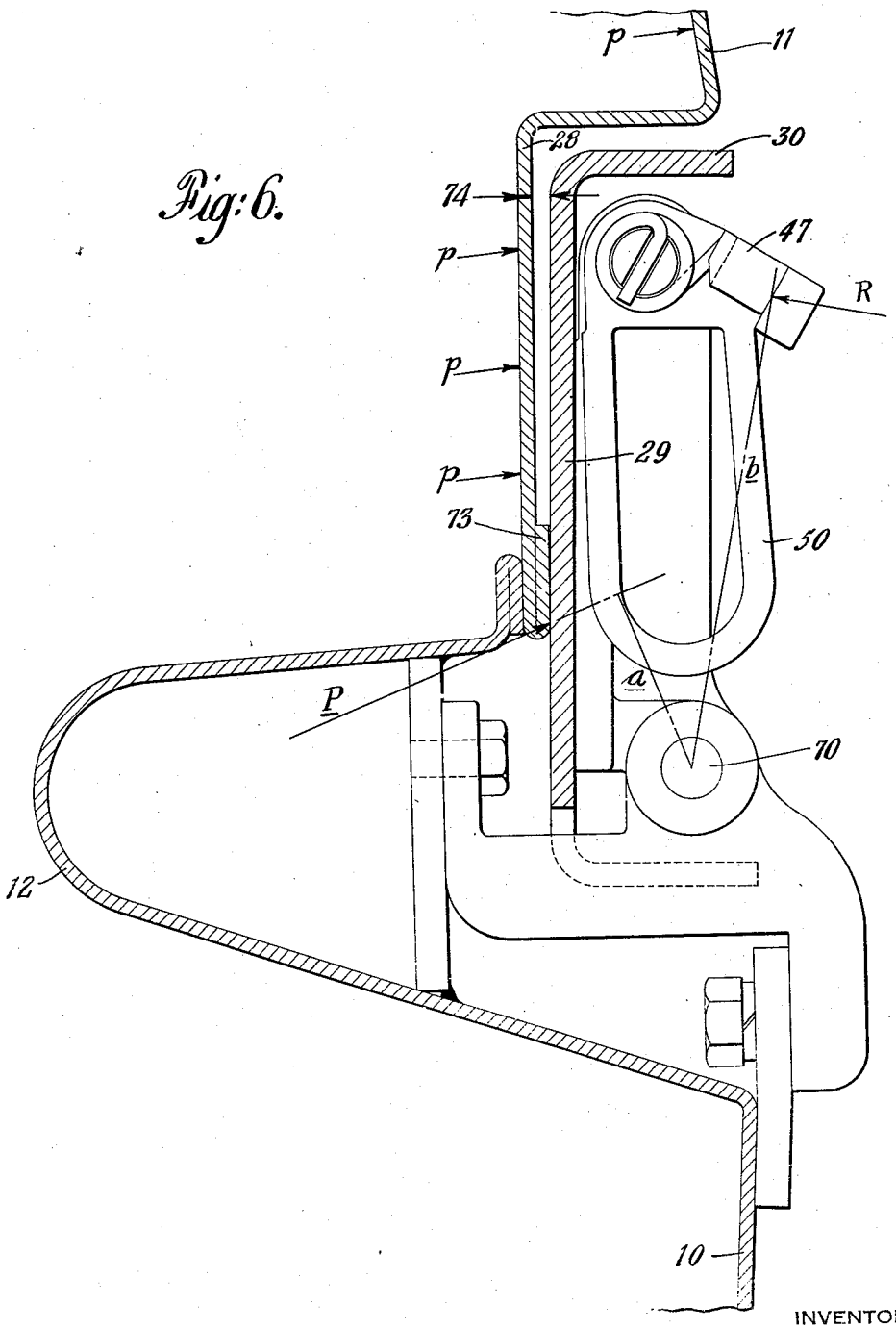
INVENTOR
ANTON KRUPP
BY
Donald W. Roberson
ATTORNEY

Nov. 24, 1942. A. KRUPP 2,303,082

WASHING MACHINE CYLINDER

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Fig: 6.



INVENTOR
ANTON KRUPP
BY
Donald W. Robertson
ATTORNEY

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WASHING MACHINE CYLINDER

Anton Krupp, Syracuse, N. Y., assignor to United States Hoffman Machinery Corporation, New York, N. Y., a corporation of Delaware

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9 Claims. (Cl. 220—55)

The invention relates to washing machine construction, and more particularly to door locking means for the cylinders of rotary washers. It finds special application to doors located in the sides of cylinders arranged for rotation about a horizontal axis.

Locking devices for the purpose indicated must be extremely rugged, especially in the case of large laundry and dry cleaning washers designed for use in wholesale cleaning plants. In washers of this type the load is imposed radially outwardly against the door, and tends to loosen the locks which, in turn, causes considerable wear of the latching bolts and other parts. This, in time, creates a condition which makes it impossible to maintain the door in tightly closed position, and the clothes may catch in the cracks between the door and sill, becoming torn or impeding proper cleaning action.

In order to minimize the effects of wear, and at the same time provide an unloading shelf between the cylinder door opening and the shell or casing within which the cylinder operates, washing machine cylinders have been provided heretofore with two-part doors so arranged that the lower door will function as an unloading shelf and also serve to lock the upper door when closed. For this purpose the lower door is made relatively narrow, and besides closing the lower part of the opening is arranged to engage projections on the upper door. This type of construction has the disadvantage, among others, that the load is imposed radially outwardly against both doors. That is, a portion of the load is carried directly by the lower door, and therefore must be resisted directly by the latch mechanism associated with the lower door. It is an object of my invention to provide a locking arrangement in which no direct load is applied to the latches or locking bolts.

Another object of the invention is to provide a door and lock construction which is less subject to wear than is the case with constructions heretofore known.

A further object is to provide a locking device which is readily adjustable to create an initially tight seal at the door sill, and to compensate for such small amount of wear as may be encountered during operation.

A further object is to provide a door mechanism which is of improved ruggedness, yet which is simple in construction and operation.

Other objects and advantages of my invention will appear as the description proceeds.

In accordance with my invention a single door is employed to close the entire opening in the cylinder wall. Instead of applying a latch or latches directly to this door, I apply latches to an intermediate member which will be designated herein as a latch stave. This stave is designed to function as a lever in such a way that outward forces tending to open the door are concentrated entirely on the short arm of the lever, whereas the latches associated with the stave operate against the long arm of the lever. Thus the entire load is carried through the lever and no direct load is carried by the latches. The manner in which this and other objects of my invention are achieved will now be described in connection with the preferred embodiment thereof shown in the drawings, of which

Fig. 1 is a side elevational view of a washer cylinder illustrating the general arrangement of my door and locking construction.

Fig. 2 is a transverse sectional view taken on the line 2—2 of Fig. 1.

Figs. 3, 4 and 5 are enlarged detail views of one of the locks, Fig. 3 being a side elevational view thereof, Fig. 4 a sectional view on the line 4—4 of Fig. 3, and Fig. 5 a view similar to Fig. 4 but with the latch stave in unloading position.

Fig. 6 is an enlarged transverse sectional view similar to Figs. 4 and 5 but looking in the opposite direction.

Referring to Figs. 1 and 2, I have illustrated a washer cylinder 10 which, in this case, has two loading or discharge openings closed by curved doors 11. The cylinder shown is constructed of metal, but, if desired, can be of wood stave construction or any other suitable form. The sides of the cylinder are pressed inwardly at intervals to form a series of ribs 12. The cylinder is mounted for rotation in a shell or casing 13 which has an opening 14 for loading and unloading the cylinder. A sliding door 15 (Fig. 4) may be provided to close the opening 14. A jam 16 fits around the edge of the door 15 when the latter is closed. At the lower edge of the opening 14 is provided a sill 17 terminating in an upturned flange 18 which may be doubled over, as shown, to provide a smooth upper edge which will not tear the clothes.

The side 19 of those ribs 12 which form the lower edges of the respective cylinder openings are cut back and flanged upwardly to provide sills 20 against which the free edges of the doors 11 abut. These sills, like the edge 18 of the sill 17 of the casing, may be doubled over to provide a smooth upper edge as shown in Fig. 4. Each

door 11 is hinged, as at 21 (Fig. 2) to the cylinder 10. As shown, the hinge members 22 are secured to the door, and the hinge butts 23 are secured to plates or brackets 24 welded to the inside of the rib 12. This construction is described purely by way of illustration, and it will be understood that the doors 11 may be attached to the cylinder in any convenient manner.

Latch keeper blocks 25 are welded, riveted, or otherwise secured to the outside of the cylinder 10 at either side of the door opening. As shown, the keeper blocks are riveted to the cylinder at 26, 26. Opposite this point the wall of the cylinder is inset, as at 27, so that the keeper blocks nest into the cylinder, projecting only slightly beyond its outer surface, and thus making it possible to maintain the walls of the cylinder 10 and casing 13 in close proximity. Similarly, the free edge of the door 11 is inset, as at 28, to receive the latch stave 29 and associated latching mechanism in such a way that these elements do not project substantially above the outer surface of the main body of the cylinder 10.

The latch stave 29 preferably is formed with marginal flanges 30 to reinforce it against bending stresses. The lower flange is cut away at 31 to receive the hinges 32, 33 for pivotally mounting the latch stave on the cylinder. The hinges 32, 33 are secured to the latch stave in any convenient manner, as by means of bolts 34, which are of the countersunk type so that there are no projections on the face of the latch stave. The hinge butts 35 are suitably secured to the cylinder 10. For this purpose I have shown a bridge or bolt plate 36 (Fig. 4) welded to the legs of the rib 12, as at 37, and a second bolt plate 38 welded to the outside of the cylinder 10 at 39, the bolt plates 36 and 38 providing a mounting for the hinge butt. The hinge butt is provided with two legs or attaching lugs 40 and 41 which are bolted or otherwise secured to the plates 36 and 38, respectively, as at 42, 43.

The hinges 32 and 33 are attached to the latch stave 29. The edges of the door 11 are offset at 44 (Fig. 3) to fit within the cylinder opening. Above the offset portion 44, the door 11 overlies the edges of this opening, as at 45. The hinges 32 are so constructed as to provide a base for the latch mechanism, and for this purpose are provided with lugs 46 at their upper ends. (In this respect the hinges 32 differ from the intermediate hinge 33.) The construction of each of the hinges 32 is the same, and the construction of each latch mechanism is the same except that one is right hand and the other left hand; therefore it will be sufficient to describe in detail only one of these mechanisms. Figs. 3, 4 and 5 illustrate the latch mechanism and associated hinge 32, 35 for the right hand end of the door 11.

The latch proper consists of a body portion 47 which is recessed at 48 to surround a lug 46 of the hinge 32. The lug 46 and body portion 47 of the latch are apertured to receive a latch pin 49, providing a pivotal connection between the latch and the hinge 32. At one end of the body portion 47 of the latch there is provided a handle 50 which preferably is arranged to one side of the body of the hinge 32 so that when the latch stave 29 is swung into the open position shown in Fig. 5, the handle can be brought directly against the stave 29. The handle 50 also preferably is made in the form of a loop, providing an opening 51 for the hand of the operator. A torsion spring 52 surrounds one end of the pin 49, one end of this spring being fixed against rotation with respect to the pin as by passing the free end of the spring through a slot in the pin as at 53, and the other end being fixed against rotation with respect to the latch body 47 as by having a free end 54 engage a recess in a lug 55 formed in the latch body. The spring 52 thus is arranged to urge the latch in a counterclockwise direction as viewed in Fig. 4 to hold the latch in locking position, and as viewed in Fig. 5 to hold the latch up against the side of the stave 29. The pin 49 is held against rotation with respect to the hinge 32 by a set-screw 56 having a threaded engagement with the lug 46. In order to strengthen the latch body 47, it is provided with a projection 57 which bridges the recess 48, compensating for the metal which is eliminated to provide for reception of the lug 46. The latch body 47 projects beyond the edge of the offset 44 in the door 11, as at 58. The projection 58 is arranged to engage a latch keeper 59 which is adjustably mounted on the latch keeper block 25 previously referred to. The point of engagement of the projection 58 with the keeper 59 lies within the surface of revolution generated by the edge of the door during its opening and closing movements.

The form of the latch keeper block 25 is best shown in Figs. 3 and 5. The base 60 of this block rests against the inset portion 27 of the cylinder wall to which it is secured in the manner previously described. The base 60 is provided with flanges at its two ends, the lower flange 61 being inclined so as to rest against one of the legs of the rib 12 to which it is secured by the rivet 26. The two end flanges of the latch keeper block are connected by a web 62 which preferably is formed integral therewith and also integral with the base 60 of the block. The central portion of this web 62 may be made thicker than the other portions as shown at 63. Thus when the block 25 is made as a casting, the thickened portion 63 of the web can be machined conveniently to provide a smooth surface for contact with the latch keeper 59 which, as will be described, is movable with respect thereto during adjustment. The central portion 63 of the web projects somewhat beyond the main body of the keeper block 25 in order to accommodate the keeper 59 and its adjusting means, and is provided with a pair of elongated apertures 64 to receive adjusting bolts 65 which pass therethrough and engage the keeper 59. This construction provides means for creating an initially tight seal at the door sill 20 and also compensates for such small amount of wear as may be encountered during operation of the latch. The position of the keeper 59 with respect to the keeper block 25 is regulated and/or locked by means of a bolt 66 which passes through the keeper and has a threaded engagement with a lug 67 which preferably is made integral with the base 60 and with the central portion 63 of the web of the keeper block. A set-screw 68 may be provided in the keeper 59 to lock the bolt 66 after the adjustment has been made. The elongated apertures 64 and the axis of the bolt 66 preferably are arranged normal to the latch-engaging surface 69 of the keeper, and the surface 69 lies in a plane which passes close to, but does not intersect, the axis of the hinge pin 70. Thus a small component of the force which tends to rotate the latch stave 29 around the pivot pin 70 tends to move the latch 47 in a clockwise direction. This small component of force is resisted

by the friction between the projection 58 and surface 69 of the keeper, and also by the counterclockwise force exerted by the torsion spring 52 which serves to maintain positive engagement of the keeper by the latch. However, in view of the disposition of the surface 69 in a plane which passes (as viewed in Fig. 4) to the right of the axis of the pivot pin 70—i. e., to the sill side of the hinge point of the latch stave—it becomes easier to disengage the latch when it is desired to open the cylinder door. It should also be observed that (as viewed in Fig. 4) no part of the projection 58 of the latch extends substantially below a plane which passes through the axis of the latch pin 49 and which is normal to the surface 69 of the keeper. Thus initial opening movement of the latch begins to swing the projection 58 away from the surface 69, simplifying the unlocking action. On the other hand, when the door is being locked, this permits the edge 72 of the latch to be brought first against the upper end of the surface 69 to initially engage the latch, after which further counterclockwise movement of the latch handle will serve to force the parts into tightly locked position, closing the small gap which will remain after initial engagement of the latch as described.

When the latch has been released, the stave 29 can be swung down into the position shown in Fig. 5 where it is supported on the sill 17 of the casing 13. As shown, the portion 57 of the latch bears directly on this sill. Thus the stave 29 serves as a loading or unloading shelf spanning the space between the sill 20 of the cylinder opening and the edge 18 of the sill 17 of the casing, preventing small articles of clothing from dropping into the space between the cylinder and casing.

An important feature of my construction resides in the particular cooperation between the door 11, latch stave 29, and latching mechanism. The arrangement is such that no direct load is applied to the latches. This feature will now be explained with particular reference to Fig. 6 in which it will be seen that the latch stave 29 bears against the door 11 only at the lower edge of the latter. This condition may be insured by proper disposition of the pivot 70 so as to leave a small clearance between the upper part of the latch stave and the inset portion 28 of the door. In the construction shown, this condition is further insured by the provision of a bead or projection 73 at the outside edge of the door to leave a clearance at 74 between the upper part of the latch stave and offset 28 of the door. The load imposed on the door during operation of the machine acts radially outwardly over the surface of the door at $p, p, p \ldots$, and the total load on the door may be considered as a resultant force P acting in a direction tangent to a circle having the hinge 21 (Fig. 2) as its center, this force tending to swing the lower edge of the door in a counterclockwise direction (as viewed in Fig. 6) about the hinge. The force P acting against the stave 29 tends to rotate it in a clockwise direction about the axis of the pivot pin 70. The effective lever arm of this force with respect to its tendency to produce the aforesaid counterclockwise rotation is the distance from the axis of the pin 70 to the point of tangency of the line of force to an arc drawn with that axis as its center, this distance being shown at a in Fig. 6. The force of reaction R which resists the aforesaid counterclockwise rotation has an effective lever arm represented by the distance from the axis of the pin 70 to the center of the engaging surfaces of the latch and keeper. Therefore, the force of reaction R set up by the force P is to the force P as the inverse of the respective lever arms of the two forces, that is,

$$\frac{R}{P}=\frac{a}{b}$$

from which

$$R=P\frac{a}{b}$$

In the embodiment illustrated, the force which is applied to the latch is reduced by more than 60%, and if desired, the parts can be designed to produce an even greater reduction.

Another feature of my invention is the initial tightness of the lock, which reduces rattle and wear during operation of the same. This initial tightness is achieved as a result of the combination of an adjustable keeper with the proper disposition of the engaging surfaces of the latch and keeper. It will further be observed that the locking arrangement I have disclosed herein is characterized by ruggedness, compactness and simplicity of construction. It is readily adaptable to existing types of washing machine cylinders whether constructed of wood or of metal. It will be understood, of course, that various modifications may be made in the construction specifically described, particularly where it is desired to adapt the lock to cylinders of different forms; and it should further be understood that the terms and expressions which I have employed are used as terms of description and not of limitation, for I have no intention of excluding such equivalents of the invention set forth, or of portions thereof, as fall within the purview of the claims.

While I have described my invention with particular reference to its application to washing machine cylinders, it will be understood that it is also applicable to other types of machines employing rotary cylinders, such as tumblers, fur treating drums, etc.

I claim:

1. In combination with a rotary cylinder having a door opening and a door sill at one side of said opening, a door hingedly mounted on the cylinder and extending across the opening, an edge of the door being arranged to engage the sill when in closed position, a member hingedly mounted on the cylinder adjacent the sill, a keeper mounted on the door casing, and a latch mounted on said member for engagement with the keeper to hold said member against the edge of the door to lock the door in closed position.

2. In combination with a rotary cylinder having a door opening and a door sill at one side of said opening, a door hingedly mounted on the cylinder and extending across the opening, an edge of the door being arranged to engage the sill when in closed position, a member hingedly mounted on the cylinder adjacent the sill, said member extending along the edge of the door and being constructed and arranged to have a continuous bearing adjacent the edge of the door against the sill across the entire width of the door opening.

3. In combination with a rotary cylinder having a door opening and a door sill at one side of the opening, a door hingedly mounted on the cylinder and extending entirely across the opening, an edge of the door being arranged to en-

gage the sill along substantially the entire width of the opening, a latch stave hingedly mounted on the cylinder adjacent the sill, a keeper mounted on the cylinder, and a latch mounted on the latch stave arranged to engage the keeper to hold the stave against the edge of the door when in closed position.

4. A door latching mechanism comprising a hinged member for attachment to the door casing, a latch mounted on said member for pivotal movement about an axis substantially parallel with the hinge axis at a point removed from the hinge point of said member, and a keeper arranged for engagement with the latch, the engaging surfaces of the latch and keeper lying in a plane which passes to the inside of the hinge point of said member.

5. A door latching mechanism comprising a hinged member for attachment to the door casing, a latch pivotally mounted on said member at a point removed from the hinge point of said member, and a keeper arranged for engagement with the latch, the engaging surfaces of the latch and keeper when the parts are in locking relationship lying wholly to the outside of a plane which passes through the axis of the latch pivot and which is normal to the engaging surfaces whereby the latch swings away from the keeper during its initial unlocking motion.

6. In combination with a hinged member, a latch pivotally mounted on said member at a point removed from the hinge point of said member, a keeper arranged for engagement with the latch, and means for adjusting the keeper comprising a bolt extending parallel to the axis of the latch pivot and a threaded bolt extending at substantially right angles to the engaging surfaces of the latch and keeper for pulling said engaging surfaces tightly together.

7. In combination with a rotary cylinder having a door opening and a door sill at one side thereof, a door hingedly mounted on the cylinder and arranged to engage the sill when in closed position, a keeper mounted on the cylinder, a locking lever overlying the area of engagement of the sill by the door, said lever being fulcrumed at a point to one side of said area, and a movable latch mounted on said lever at a point to the other side of said area for engagement with the keeper.

8. In combination with a rotary cylinder having a door opening and a door sill at one side thereof, a door engaging the sill when in closed position, a latch stave overlying the area of engagement between the door and sill when in locking position, a hinge plate attached to the stave, and a latch element pivotally mounted on said hinge plate and arranged to engage an element of the cylinder.

9. In combination with a rotary cylinder having a door opening and a door sill at one side thereof, a door engaging the sill when in closed position, a latch stave overlying the engagement between the door and sill when in locking position, the door having an inwardly offset portion to receive the latch stave, the latch stave being in the form of a channel running axially of the cylinder and latch means disposed within the channel for holding the stave against the edge of the door.

ANTON KRUPP.