Feb. 18, 1930. E. D. CLARKE 1,747,620

WASHING MACHINE

Filed Feb. 16, 1925 3 Sheets-Sheet 1

Fig. 1

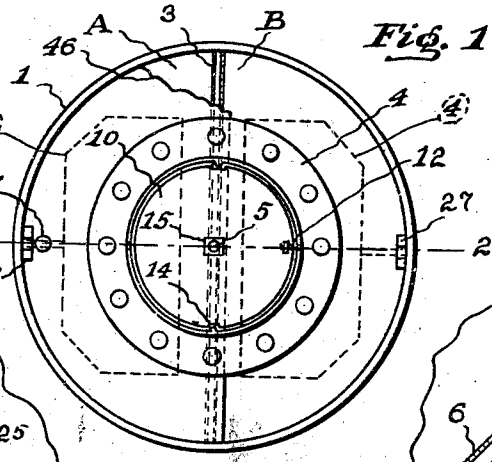
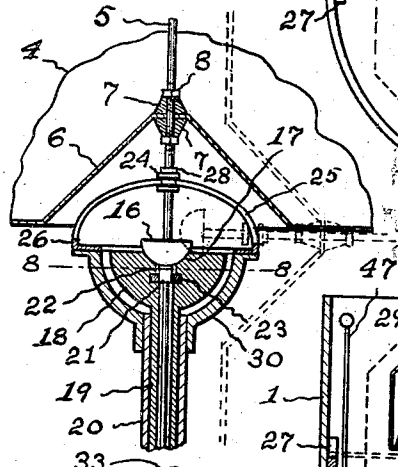


Fig. 4.



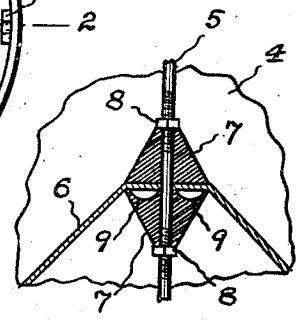


Fig. 5.

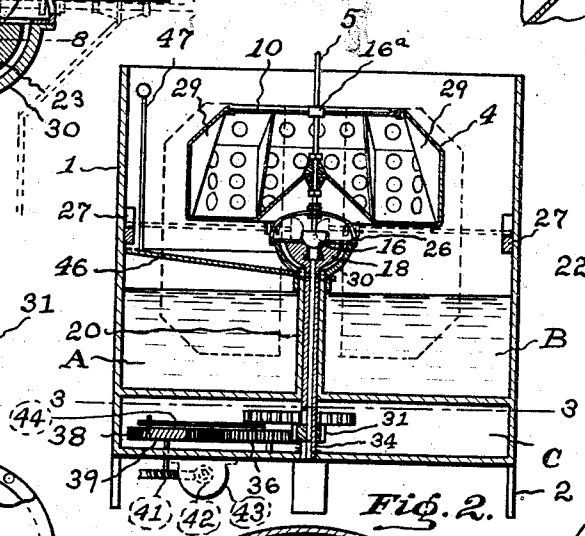


Fig. 2.

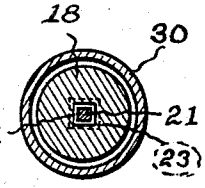


Fig. 8.

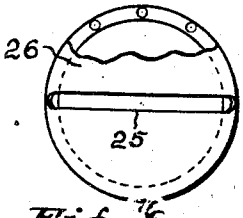


Fig. 6.

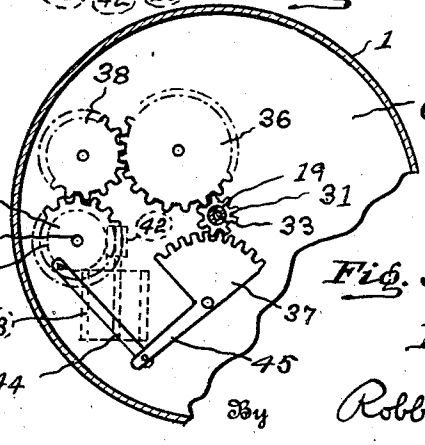


Fig. 3.

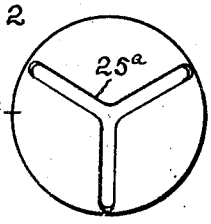


Fig. 7.

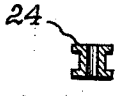


Fig. 9.

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WASHING MACHINE

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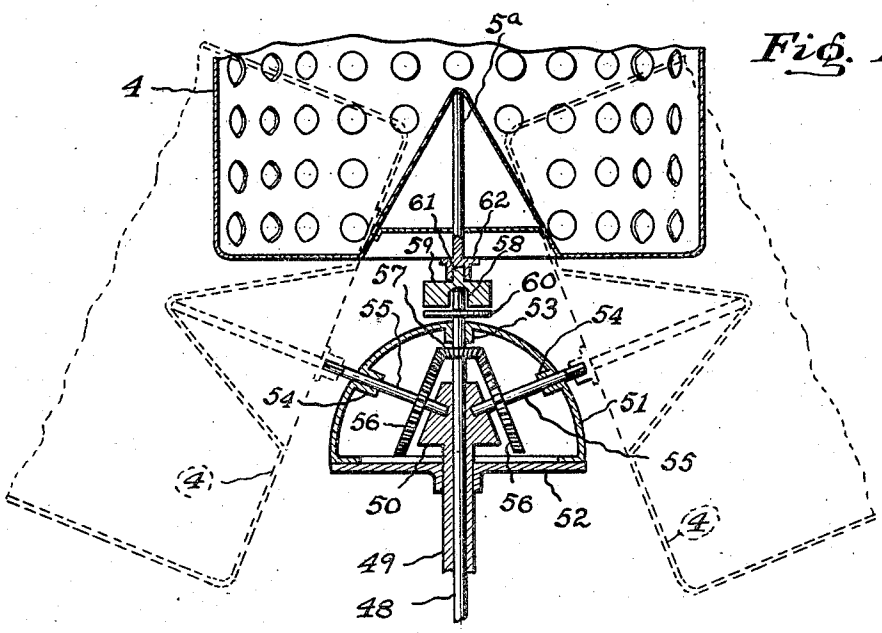


Fig. 10.

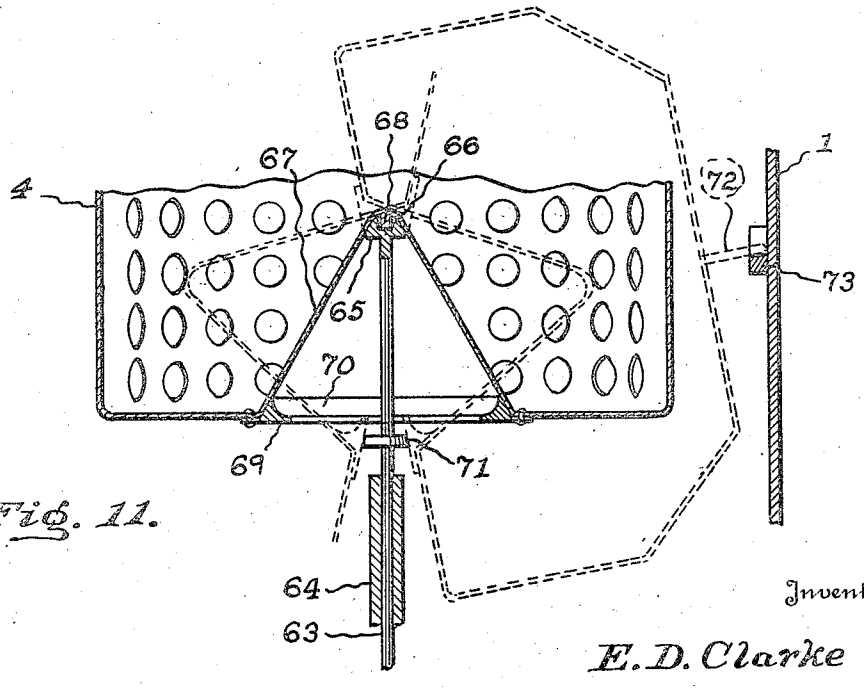


Fig. 11.

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WASHING MACHINE

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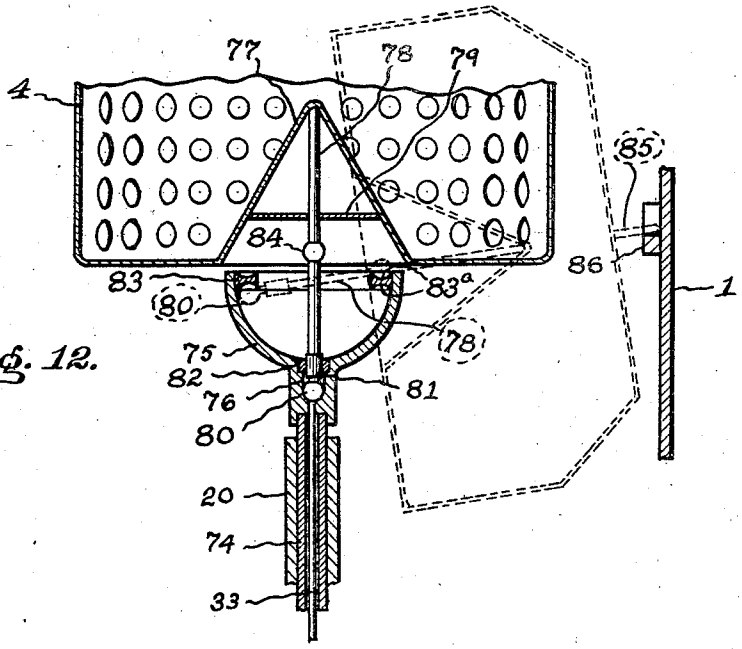


Fig. 12.

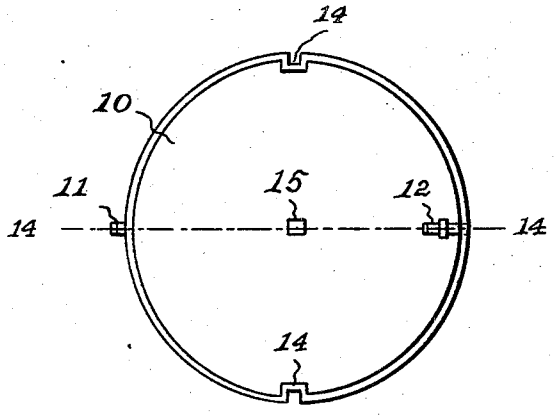


Fig. 13.

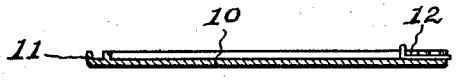


Fig. 14.

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Patented Feb. 18, 1930 1,747,620

UNITED STATES PATENT OFFICE

ERIC D. CLARKE, OF CLEVELAND, OHIO

WASHING MACHINE

Application filed February 16, 1925. Serial No. 9,622.

The present invention relates to washing machines and has for its object to provide a device of this character which embodies novel features of construction, whereby the clothes receiving drum or basket is mounted in such a manner that it can either be swung upwardly into an upright position and rapidly rotated about a vertical axis to centrifugally expel moisture from the contents thereof, or swung downwardly to permit of the clothes being acted upon by a fluid in a tub or compartment.

Among the objects of the invention are to provide a washing machine of this character which admits of the clothes receiving drum or basket being readily moved into either a washing position or a drying position and which provides for spinning the drum at a high rate of speed when it is in an upright position and oscillating it at a comparatively low speed when it is swung downwardly into a tub compartment.

The invention also contemplates a mounting of the drum which enables it to have a yieldable universal swaying movement when it is held in an upright position. This permits the drum to bear down upon one side or the other when the load is being placed therein, according to the disposition of the weight of the material, and the operator is thereby enabled to distribute the clothes within the drum so as to substantially balance the same.

The yieldable universal swaying movement of the drum also enables the drum, when driven at a high rate of speed, to rotate and gyrate about its true center of gravity. The term "true center of gravity" as used in this application refers to the center of support of the drum at the yieldable connection between the drum and shaft, on which the drum can sway when unevenly loaded, and about which the drum can oscillate and gyrate during rotation of the drum, so that the drum may balance itself during the drying operation, thereby reducing vibration to a minimum and relieving the shaft and bearings of excessive strains. By thus mounting the drum so that it is permitted to have a yieldable universal swaying movement the machine is enabled to perform its offices without shocks and jars and unnecessary wear upon the journals and bearings.

The invention also contemplates the provision of a construction in which the clothes or fabrics being treated can be washed and rinsed or washed, rinsed and blued without being removed from the drum until after the several operations have been completed.

While certain forms and embodiments of the invention have been shown and described in detail for illustrative purposes, it will be understood that many modifications and changes can be made in the details of construction without departing from the spirit of the invention.

The construction of the drum, and certain features of the drive for the drum are claimed in application 47,205 filed by me July 31, 1925.

For a full understanding of the invention reference is to be had to the following description and accompanying drawings, in which

Figure 1 is a top plan view of a washing machine which is constructed in accordance with the invention, the clothes receiving drum being shown by full lines in an upright position and by dotted lines in the positions assumed when swung downwardly into the respective compartments of the tub.

Figure 2 is a vertical sectional view on the line 2—2 of Figure 1, the drum being shown by full lines in an upright position and by dotted lines in its lowered positions.

Figure 3 is a horizontal sectional view on the line 3—3 of Figure 2, showing the gearing for operating the drive shaft, a portion of one side of the tub being broken away.

Figure 4 is an enlarged detail sectional view showing the connection between the base of the drum and the drive shaft.

Figure 5 is an enlarged sectional view showing the joint between the drum and the drum shaft.

Figure 6 is an enlarged plan view of the cage which is provided for guiding the drum shaft in its swinging movements as the drum is swung up and down.

Figure 7 is a similar view showing a modified form of guide cage which is adapted to be used where the tub has three separate com-

partments instead of two separate compartments.

Figure 8 is a horizontal sectional view on the line 8—8 of Figure 4, showing the resilient buffer which engages the stud at the bottom of the head at the lower end of the drum shaft.

Figure 9 is an enlarged detail view of the bearing member which engages the drum shaft and is slidably mounted upon the guide cage.

Figure 10 is a detail sectional view showing a modification in which the clothes receiving drum is provided at the bottom thereof with a socket or joint member by means of which the tub can be operatively connected to any one of a plurality of shafts, the drum being shown by full lines in the position assumed when applied to the vertical shaft and being shown by dotted lines in the positions assumed when applied to the inclined shafts.

Figure 11 is a similar view showing a further modification in which a different construction is utilized for enabling the drum to be driven from a vertical shaft and supported thereon either in an upright position or in an inclined position.

Figure 12 is a similar view showing a still further modification which provides a different mechanical means for driving the drum from a gear shaft and supporting it thereon either in an upright position or in a lowered position.

Figure 13 is an enlarged plan view of the cover for the drum.

Figure 14 is a sectional view through the same on the line 14—14 of Figure 13.

Corresponding and like parts are referred to in the following description and indicated on all of the views of the drawings by like reference characters.

Referring to Figures 1 and 2 of the drawings, the numeral 1 designates a tub which is supported in an elevated position by the legs 2 and which has the lower portion thereof subdivided by a transverse partition 3 into two separate compartments A and B. These compartments are adapted to contain different fluids with which the clothes or fabrics are to be treated. For illustrative purposes it may be considered that the compartment A contains a cleansing fluid such as soapy water, while the compartment B contains rinsing water. A chamber C is arranged under the compartments A and B and contains the gearing which is employed for rotating the drive shaft to actuate the drum in the required manner.

A clothes receiving drum 4 has perforated side walls and is mounted upon a drum shaft 5 which extends through the axis thereof. The bottom of the drum is provided at the central portion thereof with a raised portion 6 which provides a substantially conical pocket in the bottom of the drum. The drum shaft 5 extends through the center of this raised portion and in order to obtain a tight joint packing washers 7 of rubber or the like are applied to the drum shaft and held tightly against the upper and lower faces of the raised portion of the drum bottom by means of nuts 8 which are threaded on the shaft. The edges of the drum bottom may have depending portions 9 which bite into one of the rubber washers and assist in locking the drum to the shaft.

The upper end of the drum shaft 5 projects through a cover 10 which is removably applied to the drum. This cover which is shown in detail by Figures 13 and 14, engages a seat at the top of the drum, being provided upon one side thereof with a hooked portion 11 which is adapted to enter an opening in the upper edge of the drum, and at the opposite side thereof with a sliding latch 12 which is adapted to lock the cover on the drum. The edges of the cover may also be provided with notches 14 which interlock with corresponding projections on the tub so that the cover may be utilized as a means for obtaining a driving connection between the shaft and the drum. The central portion of the cover has a polygonal opening 15 which engages a corresponding polygonal portion 16^a on the drum shaft, so that the cover is locked to rotate with the shaft when it is in position. It will be obvious that when the cover 10 is removed from position the drum is free to have a limited universal tilting movement about the yieldable connection with the drum shaft which is provided by the rubber washer members 7. However, when the cover 10 is placed in position it not only provides a locking connection between the drum and the drum shaft, but also prevents the yieldable joint between the bottom of the drum and the drum shaft from functioning to permit a tilting movement of the drum relative to the drum shaft. When the drum is being spun in an upright position to centrifugally dry the clothes the tilting movement is desirable and the cover 10 is preferably removed. When the drum is thus being spun in an upright position the frictional engagement between the drum shaft and the drum at the yieldable joint is sufficient to obtain a driving connection between the parts, because there is no successive elevating and dropping of the contents of the drum by the action of the baffle plates 29. When the drum is swung downwardly into one of the compartments the cover 10 is placed in position to hold the contents of the drum in place and lock the drum against any tilting movement relative to the drum shaft. In the lowered position of the drum the cover is also desirable to provide a locking connection between the drum and the drum shaft, because the baffle plates 29 then act to successively elevate and drop the clothes as the drum revolves, thereby placing a greater

strain on the driving connection between the drum and the drum shaft than exists when the drum is in a raised position and the baffle plates do not operate to successively elevate and drop the clothes.

The lower end of the drum shaft extends downwardly below the bottom of the drum and has a semi-spherical friction head applied thereto. When the drum is in an upright position the rounded end of the head fits in a depression 17 in the top of a driving head 18 which is applied to the upper end of a substantially vertical drive shaft 19, said shaft being journaled in a bearing sleeve 20 which is arranged at the middle portion of the partition 3. A polygonal stud 21 projects from the friction head 16 of the drum shaft and is adapted to enter a polygonal pocket 22 in the base of the depression 17 in the driving head. As shown clearly by Figure 8 the stud 21 has a cross section which is somewhat less than the pocket 22, so that the stud can have a limited amount of play within the pocket, although the polygonal base of the stud and pocket produces an interlocking connection between the drive shaft and drum shaft so that the two shafts must rotate in unison. The play of the stud 21 in the pocket 22 enables the drum to have a limited universal swaying movement, the rounded end of the friction head 16 rocking in the depression 17 as the drum tilts to one side or the other side. This tilting of the drum is of assistance to the operator in distributing the clothes or fabric within the drum so as to obtain an even loading thereof, and also enables the axis of the drum and load to tend to assume a vertical position when being rapidly rotated to expel moisture from the contents thereof by centrifugal force, even though the floor upon which the washing machine rests is not level and the drive shaft is not exactly vertical. This would serve to reduce the vibration and relieve the bearings of excessive strain.

The base of the pocket 22 is shown as provided with an elastic buffer member 23 of rubber or like material which engages the lower end of the stud 21 and tends to position the stud at the center of the pocket. However, the buffer is elastic and will yield to any force sufficient to partially compress the same. Unnecessary looseness and play of the drum is thereby prevented, although the drum is not held rigidly in position and can have a limited swaying movement in any direction.

A bearing member 24 is loosely applied to the drum shaft 5 and engages a guide-way 25 in a spider 26 which is arranged over the driving head 18, said spider being supported rigidly in position. When it is desired to swing the drum downwardly to subject the contents thereof to the action of the fluid in one of the tub compartments, the drum is first bodily lifted a sufficient amount to disengage the stud 21 from the pocket 22, after which the drum is swung to one side and lowered into the desired compartment. The end of the drum shaft 5 then engages a notched bearing 27 at the side of the tub so that the outer end of the drum is properly supported and the periphery of the friction head 16 then rests upon the upper surface of the driving head 18, so that the two members 16 and 18 provide a friction gear connection between the drive shaft and the drum shaft. The drum shaft is provided with a stop collar 28 which loosely engages the bearing member 24 and cooperates therewith to prevent longitudinal movement of the drum shaft toward the center of the tub. The drum is thus properly supported in a lowered position with the axis thereof substantially horizontal, and a driving connection is provided between the drum and the drive shaft.

When the drum is swung downwardly into a horizontal position it is partially submerged in the fluid so that the clothes or fabrics within the drum will be acted upon by the fluid when the drum is oscillated in the usual manner. In order to facilitate this action the interior of the drum is provided at the periphery thereof with the baffle plates 29. The spider 26 may be supported in any suitable manner and is shown as secured to a frame or cage 30 which is mounted upon the upper end of the bearing sleeve 20.

The spider or guide member 26 which is shown by Figure 6 has a guide-way 25 extending diametrically across the same and is intended to be used with a tub having two compartments, such as that illustrated by Figures 1 and 2. A modified form of spider is shown by Figure 7 in which the guideway 25^a has three branches arranged at angles of 120° apart. This form of guide member is adapted for use in connection with a tub having three compartments and admits of the drum being swung downwardly into any selected one of the said compartments.

The drive shaft 19 has a tubular formation and is provided at the lower end thereof with a sliding pinion 31 which is keyed thereon. The pinion is provided with an arm 31^a projecting into the central opening thereof and sliding within a longitudinal slot 32 in the drive shaft. This arm 31^a is connected to a gear shifting rod 33 which extends upwardly through the tubular shaft and is engaged by the stud 21 of the friction head 16 when the drum is in an upright position. The sliding pinion 31 is then pushed downwardly against the action of a coil spring 34 which surrounds the drive shaft and is interposed between the pinion and a collar 35 on the drive shaft. When the pinion 31 is thus moved downwardly it meshes with a gear 36 and when the pinion is permitted to move upwardly it disengages itself from the gear 36 and engages a toothed segment 37. The

gear wheel 36 meshes with an intermediate gear wheel 38 which in turn meshes with a gear 39, the latter gear being rigidly mounted upon a shaft 40 which extends below the bottom of the tub and has a worm gear 41 applied thereto. This worm gear meshes with a worm 42 on the shaft of an electric motor 43. The gear wheel 39 is connected by a link 44 to a lever arm 45 which projects rearwardly from the toothed segment 37. The toothed segment thus has an oscillating or back and forth movement imparted thereto, while the gear wheel 36 is rotated continuously in one direction. When the drum 4 is swung upwardly with the axis thereof in a vertical position the gear shifting rod 33 is forced downwardly to slide the pinion 31 into engagement with the gear wheel 36 and the ratio of the gearing is such that the shaft and drum will then be rotated at a high rate of speed, thereby expelling any water from the clothes or fabric within the drum by centrifugal force. When the drum is swung downwardly to bring the axis thereof into a horizontal position, as indicated by dotted lines on Figure 2, the gear shifting rod 33 is permitted to move upwardly and the spring 34 slides the pinion 31 into engagement with the toothed segment 37. The drum is then oscillated back and forth at a much slower rate of speed. The shifting of the gears may, of course, be accomplished in any suitable manner and the exact mechanism for accomplishing this result is not material to the present invention.

A drain plate 46 is arranged within the tub and has one diameter which is greater than the diameter of the tub, so that it rests on the sides of the tub in an inclined position, where it is held by the partition 3 and frame 30, about which it is adapted to be rotated over either one of the compartments A or B. A handle 47 extends upwardly from a marginal portion of the drain plate and the drain plate is preferably inclined so that any liquid falling upon the same will be drained into the uncovered compartment. The fluid expelled from the clothes or fabrics while the latter are being centrifugally dried will thus be conveyed back into the tub compartment from which it was originally taken.

A modified form of the invention is shown by Figure 10, in which the drum is adapted to be mounted upon and driven by any selected one of a plurality of shafts. The drive shaft 48 is journaled in a bearing 49 which has an enlargement 50 at the upper end thereof. A cage 51 extends over and around the enlargement 50 and is supported on a plate 52 secured to the bearing. The cage is provided at the top thereof with a bearing 53 receiving the drive shaft 48, and the opposite sides thereof with auxiliary bearings 54 receiving inclined shafts 55. The inner ends of these lateral or inclined shafts 55 are journaled in bearings formed in the enlargement 50 of the main bearing so that the lateral shafts are sturdily mounted and can carry a heavy load. The inner ends of the lateral shafts are provided with gear wheels 56 which mesh with a pinion 57 on the main drive shaft 48 so that all of the shafts are geared together to rotate in unison.

The upper end of the drive shaft 48 has a polygonal cross section and is loosely received in a socket 58 formed in the bottom of a disc 59 which normally has the lower face thereof slightly spaced from a stop flange 60 on the drive shaft. The top of the disc 59 is formed with a polygonal stud 61 which is detachably engaged by a socket member 62 at the lower end of a drum shaft 5ª which is rigid with the drum. The drum is mounted upon the disc 59 when it is in an upright position and is intended to be rapidly rotated to centrifugally dry the clothes, and owing to the fact that the socket 58 of the disc is slightly larger than the polygonal upper end of the drive shaft, the disc and drum have a universal swaying movement. This movement, however, is limited by engagement of the lower edge of the disc with the stop flange or plate 60.

When it is desired to mount the drum for subjecting the contents thereof to the action of a fluid in one of the tub compartments, the drum is lifted to disengage the socket 62 of the drum from the stud 61 of the disc 59, and the socket 62 is then brought into engagement with the polygonal outer end of one of the lateral shafts 55. The drum then assumes one of the dotted line positions indicated by Figure 10, and the arrangement within the tub may be such that the drum is then partially submerged in the fluid with which the clothes are to be treated. Any suitable means may be provided for operating the drive shaft in the proper manner when the drum is in the different positions. When the drum is elevated with the axis thereof substantially vertical, it will be driven at a high rate of speed to centrifugally dry the contents thereof, while when the drum is in one of the dotted line positions it is preferably operated at a much lower rate of speed and revolves alternately in reverse directions. Any suitable means may be provided for imparting the necessary motion to the drive shaft.

A different modification is illustrated by Figure 11, in which the upright drive shaft is designated by the numeral 63, said shaft being journaled in a suitable bearing 64. The drive shaft extends upwardly above the bearing and terminates in a substantially semi-spherical friction head 65 which has a polygonal socket 66 in the top thereof. The drum 4 has a cone shaped raised portion 67 in the bottom thereof, the apex of the cone being rounded to fit over the friction head 65 and being formed with a polygonal stud 68 which

is adapted to be received within the socket 66 when the drum is supported in a raised position with the axis thereof vertical, as indicated by full lines on Figure 11.

Extending around the base of the cone shaped socket 67 is a friction gear ring 69 which has an inwardly facing concave wall 70. When it is desired to swing the drum downwardly into the dotted line position for the purpose of subjecting the contents thereof to the action of a fluid, the drum is lifted to disengage the stud 68 from the socket 66 and then tilted laterally to bring the friction head 65 into engagement with the concave wall 70 of the friction ring 69. The outer face of the friction gear ring then rests against a friction pinion 71 which is rigid with the drive shaft 63. The cover of the drum is provided with a stub shaft 72 which engages a bearing 73 at one side of the tub and serves both to support the outer end of the tub and to prevent the tub from swinging around on the drive shaft as an axis. The drive shaft can be suitably rotated to impart the desired movement to the drum, the friction head and friction pinion engaging opposite sides of the friction gear ring 69, so that a driving connection is obtained between the shaft and the drum.

A further modification is shown by Figure 12, in which the upper end of the tubular driving shaft 74 is provided with a cup shaped head 75 which has a pocket 76 in the bottom thereof. The drum 4 has a raised portion 77 at the center of the bottom thereof and is provided with a drum shaft 78 which extends downwardly below the bottom of the drum and is disposed at the axis thereof. The shaft 78 is rigidly connected to the drum and an internal web 79 may extend across the hollow interior of the raised portion 77 and engage the shaft for assistance in obtaining a rigid connection between the shaft and the drum. The lower end of the drum shaft terminates in a friction ball 80 which is received within the pocket 76 in the bottom of the depression in the driving head 75 when the drum is in an upright position. Just above the friction ball 80 the drum shaft is provided with an enlarged portion 81 which is engaged by a buffer ring 82 of rubber or similar elastic material which is arranged at the upper end of the pocket or recess 76. The lower end of the drum shaft is removably received within the pocket when the drum is supported in an upright position with the axis thereof disposed vertically and the ball 80 then has a frictional engagement with the walls of the pocket while the enlarged portion 81 of the shaft is engaged by the buffer ring 82 to hold the drum resiliently in position. The drum shaft thus has a frictional engagement with the drive shaft so that the drum can be driven from the drive shaft, although the drum can rotate independently of the drive shaft when starting or stopping so that sudden shocks and jars are avoided. The rubber buffer ring 82 holds the drum shaft resiliently in an upright position, although the drum shaft has a limited universal movement and can be tilted in any direction by compressing the buffer ring. If the machine is not level and the driving shaft is slightly out of a vertical position the buffer ring 82 will yield and permit the drum shaft to assume a vertical position when the drum is being rapidly rotated to centrifugally expel moisture from the contents thereof.

A friction ring 83 is arranged within the mouth of the cup shaped drive head 75 and this ring has upper and lower concave friction surfaces 83^a. A second friction ball 84 is formed upon the drum shaft 78 and the distance between the two friction balls 84 and 80 is equal to the diameter of the friction ring 83. When it is desired to oscillate the drum with the axis thereof swung downwardly into a substantially horizontal position, the drum is lifted to disengage the lower end of the drum shaft from the pocket 76 and then swung downwardly into the position indicated by dotted lines on Figure 12. The friction ball 80 then engages the lower concave friction surface 83^a of the friction ring 83, while the other friction ball 84 of the drum shaft engages the upper concave friction surface of the friction ring at a diametrically opposite point on the friction ring. The drum is thus supported by the engagement of the friction balls on the drum shaft with the upper and lower surfaces of the friction ring 83. The cover of the drum may be provided with a stub shaft 85 which engages a notched bearing 86 on the side of the tub to prevent the drum from rotating bodily around the upright drive shaft. The universal engagement between the friction ring 83 and the two friction balls 80 and 84 of the drum shaft will serve to import rotary motion from the head 75 of the drive shaft to the drum shaft and drum, and the mechanism for driving the main shaft 74 may be such that the shaft can be spun at a high rate of speed when the drum is swung upwardly and the contents thereof will be centrifugally dried, and oscillated at a comparatively low rate of speed when the drum is swung downwardly and partially submerged in the fluid contents of a tub compartment. The gearing may be controlled by a gear shifting rod 33 which is arranged within the tubular main shaft, just as described in connection with the embodiment of the invention shown by Fig. 2.

Referring again to the construction shown by Figs. 2 and 5, it may be explained that the cover 10 may be removed from the drum when the drum is being spun in an upright position to expel moisture from the contents thereof by centrifugal force. The rubber

washer members 7 then provide a resilient connection between the drum and the drum shaft so that the drum can have a limited tilting movement about the drum shaft and assume a balanced position thereon. The drum can thus have a limited tilting movement with respect to the drum shaft, and the drum shaft, as previously explained, has a limited tilting movement with respect to the main drive shaft, so that the drum can adjust itself when driven at a high rate of speed to bring the center of gravity of the drum and load over the vertical axis, and thereby reduce friction and strains to a minimum. The baffle plates 29, which are arranged around the inside periphery of the drum, are preferably wide at the top of the drum and taper or decrease in width toward the bottom of the drum so as to minimize the possibility of the clothes or fabric within the drum being torn when the drum is rapidly rotated to centrifugally dry the same. As indicated by Fig. 1, the interior partition 3 of the tub is preferably hollow so as to provide an air space or vacuum between the spaced side walls thereof. This enables the different compartments of the tub to contain fluids at different temperatures without the heat from the fluid in one of the compartments being quickly conducted through the partition into the fluid in another compartment. When washing clothes it is frequently desirable to have cold water in one tub compartment and hot water in another tub compartment and this is possible where the partition 3 has a hollow formation so as to provide a dead air space or a vacuum space.

When washing clothes or fabrics in a rotating drum there is a tendency for the clothes or fabrics to roll up into a ball or balls if the drum is rotated continuously in one direction, and in order to avoid this difficulty it is customary to mount the drum so that it can be rotated alternately in reverse directions. However, with a drum constructed and mounted as shown in Figures 10, 11 and 12, it is not necessary that the drum alternate in its direction of rotation to prevent the rolling up of the clothes, since the substantially triangular baffle plates 29 pick up the clothes and carry them out of the water, the clothes having a tendency to slide toward the narrow end of the baffle plates as they are being carried up, due to the inclination of the drum. After being carried up by the baffle plates the clothes slide off and drop on the conical projection in the center of the drum, and they then slide over the walls of the cone and drop upon the lower portion of the drum. The triangular baffle plates and conical projection within the drum thus cooperate with each other to cause the clothes to slide against the respective members, hitting the cone first and then the liquid after being dropped from the top of the drum, thus hitting twice each time they are carried up and dropped and sliding instead of rolling off the obstruction. This tends to prevent the clothes or fabrics from rolling up into a ball or balls, so that if it is desirable a drum constructed in this manner may be rotated continuously in one direction while the clothes are being subjected to the action of the cleansing fluid.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is,

1. In a combined washing and drying machine, a drum, a shaft carrying the drum, a connection between the drum and shaft, for allowing universal swaying movements of the drum, and means for locking the drum to the shaft, to prevent the said movements.

2. A machine of the character described, comprising a drum, a shaft carrying the drum, means for operating the drum in the drying position, and means for operating the drum in a washing position, a yieldable joint between the drum and shaft, for allowing universal swaying movements of the drum, when in the drying position, and means for locking the drum to the shaft to prevent the said movements of the drum, when in the washing position.

3. A machine of the character described, including an upright shaft provided with a driving head which is provided with a socket having a recess at the base thereof, a drum, a drum shaft, a friction head on the drum shaft which is tiltably received within the recess, and a stud projecting downwardly from the head and fitting detachably within the socket to provide an interlocking connection between the upright shaft and the drum shaft and permit the drum to be lifted out of position at any time.

4. A machine of the character described, including a tub, a drive shaft, a drum, means for driving the drum in a lowered position for washing, and means for driving the drum in an upright position for centrifugal drying, and a yieldable joint for allowing universal swaying movements when the drum is in an upright position for centrifugal drying, and means for locking the drum against said movements when in the lowered position for washing.

5. In a combined washing and drying machine, a tub, a tubular shaft, a drum carried thereby, means for rotating the drum in either an upright or lowered position, and means for supporting the drum in the said positions, and means extending through the tubular shaft and actuated automatically by the movements of the drum for causing the drum to be driven at one speed when in an upright position and at a different speed when in a lowered position.

6. A machine of the character described, including an upright shaft, a drum, a drum shaft carried thereby, means for detachably

connecting the drum shaft to the upright shaft to hold the drum in an upright position, the drum being adapted to be swung downwardly when the drum shaft is disengaged from the upright shaft, a guide cage cooperating with the drum shaft to direct the drum in its downward movement, and means for obtaining a driving connection between the drum shaft and the upright shaft when the drum is swung downwardly.

7. A machine of the character described, including an upright shaft, a drum, a drum shaft carried thereby, means for detachably connecting the drum shaft to the upright shaft to hold the drum in an upright position, the drum being adapted to be swung downwardly when the drum shaft is disengaged from the upright shaft, a bearing sleeve on the drum shaft, a guide cage having a slot receiving the bearing sleeve to direct the drum in its downward movement, and means for obtaining a driving connection between the drum shaft and the upright shaft when the drum is swung downwardly.

8. A machine of the character described, including an upright shaft provided with a driving head formed with a socket and an annular friction surface, a drum, a drum shaft, and a friction head on the drum shaft which engages the socket of the driving head when the drum is in an upright position and has a rolling engagement with the friction surface thereof when the drum is swung downwardly.

9. A machine of the character described, including an upright drive shaft, a drum, a drum shaft resiliently connected to the drum, and means for obtaining a resilient tiltable connection between the drum shaft and the drive shaft.

10. A machine of the character described, including an upright drive shaft, a drum, a drum shaft extending loosely through the drum, resilient packing members applied to the shaft and engaging opposite sides of the drum whereby the drum has a tilting movement on the drum shaft, and means for connecting the drum and drive shafts.

11. A machine of the character described, including a drum having a raised portion in the bottom thereof, a drum shaft extending loosely through the apex of the said raised portion, resilient packing members applied to the shaft and engaging opposite sides of the bottom whereby the drum is tiltably connected to the drum shaft, and means for engaging the drum shaft to support the drum.

12. A machine of the character described, including a drum, means for rapidly spinning the drum to centrifugally dry the contents thereof, baffle plates projecting inwardly from the peripheral walls of the drum, the free edges of the baffle plates being inclined downwardly and outwardly so that the baffle plates have a greater width near the top than they have near the bottom of the drum.

13. In a combined washing and drying machine, a drum, a shaft for rotating the drum, means for driving the drum in an upright position for centrifugal drying, and means for driving the drum in a lowered position for washing, and means for allowing the drum to rotate and gyrate about its true center of gravity on the drive shaft when in the drying position, and means for rigidly rotating the drum with the drive shaft when in the washing position.

14. In a combined washing and drying machine, including an upright drive shaft, a drum, and connecting means between the drum and drive shaft for permitting universal swaying movements when in an upright position, and means for locking the drum and shaft to prevent said movements.

15. A machine of the character described, including an upright drive shaft, a drum shaft, a yielding connection between the said shafts, a drum, and a yielding connection between the drum and drum shaft whereby the drum has a limited universal swaying movement.

16. A machine of the character described, including a drum, a shaft, a yieldable connection between the drum and shaft for allowing universal swaying movements when the drum is in an upright position, and means for preventing said universal swaying movements when the drum is in a lowered position, and means for supporting the drum.

17. In a combined washing and drying machine, including a tub provided with a plurality of separate compartments, hollow walls between the compartments for insulating purposes, so that the compartments can hold various cleaning liquids at different temperatures, a drive shaft, a drum, means for spinning the drum to centrifugally dry the contents thereof, and means for draining the fluid expelled back to the compartment from which it came.

18. In a combined washing and drying machine, the combination of a tub having a plurality of compartments in the lower portion thereof, hollow walls between the compartments for insulating purposes, so that the compartments can hold fluids at different temperatures, a rotary clothes container mounted in the tub above the compartments and arranged to rotate about a vertical axis, and a drain arranged in said tub between the compartment and said clothes container, to deflect the fluid from the container into any one of said compartments.

In testimony whereof I affix my signature.

ERIC D. CLARKE.