June 25, 1929. D. G. SMELLIE 1,718,261

CLOTHES WASHING MACHINE

Filed Nov. 3, 1924 3 Sheets-Sheet 1

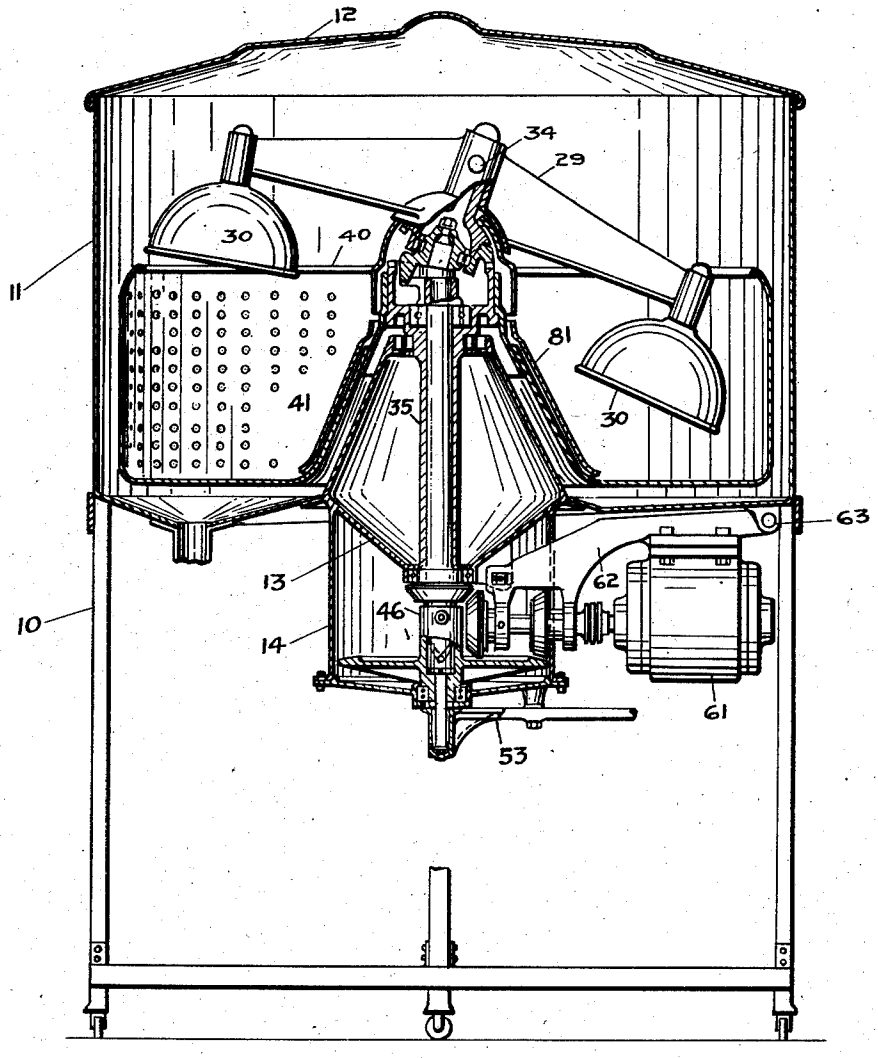


Fig. 1.

Inventor
Donald G. Smellie
By H. G. Demarse
Attorney

June 25, 1929. D. G. SMELLIE 1,718,261

CLOTHES WASHING MACHINE

Filed Nov. 3, 1924 3 Sheets-Sheet 2

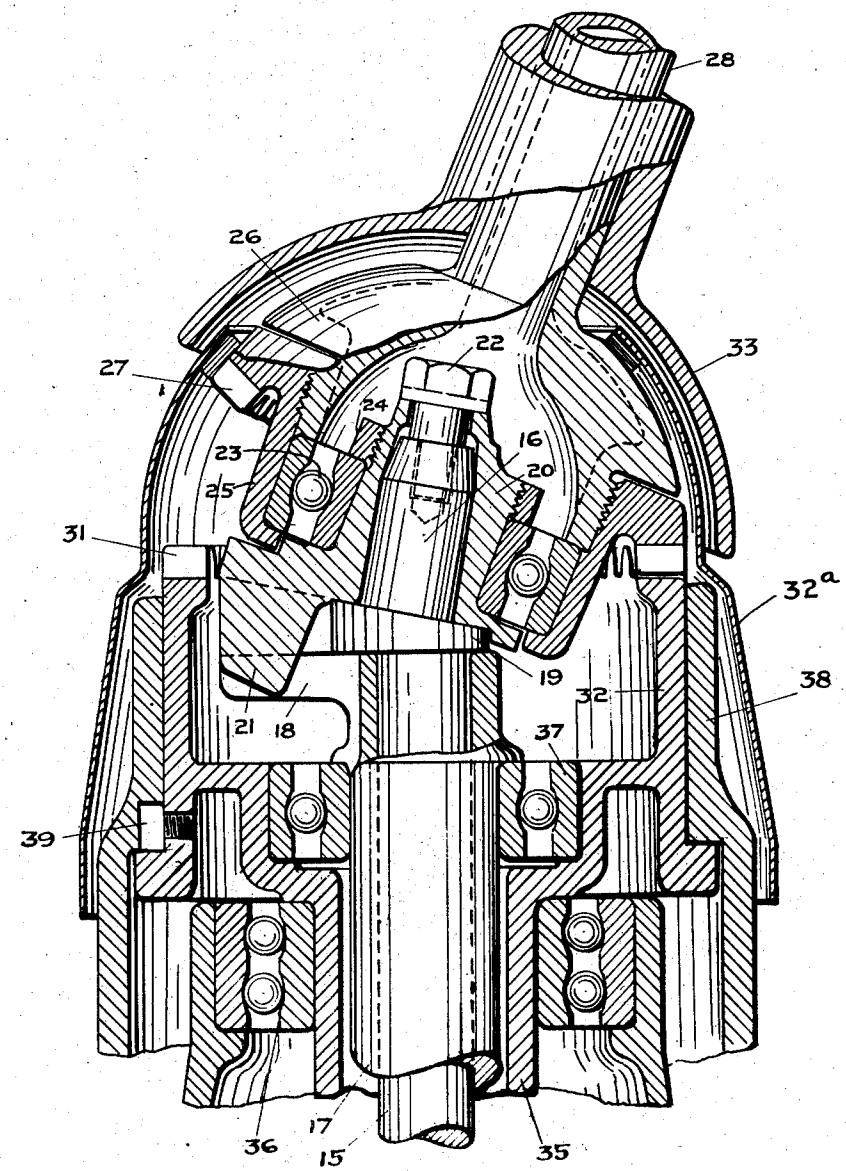


Fig. 2.

Inventor
Donald G. Smellie
BY H. D. Dwiggins
Attorney

June 25, 1929. D. G. SMELLIE 1,718,261

CLOTHES WASHING MACHINE

Filed Nov. 3, 1924 3 Sheets-Sheet 3

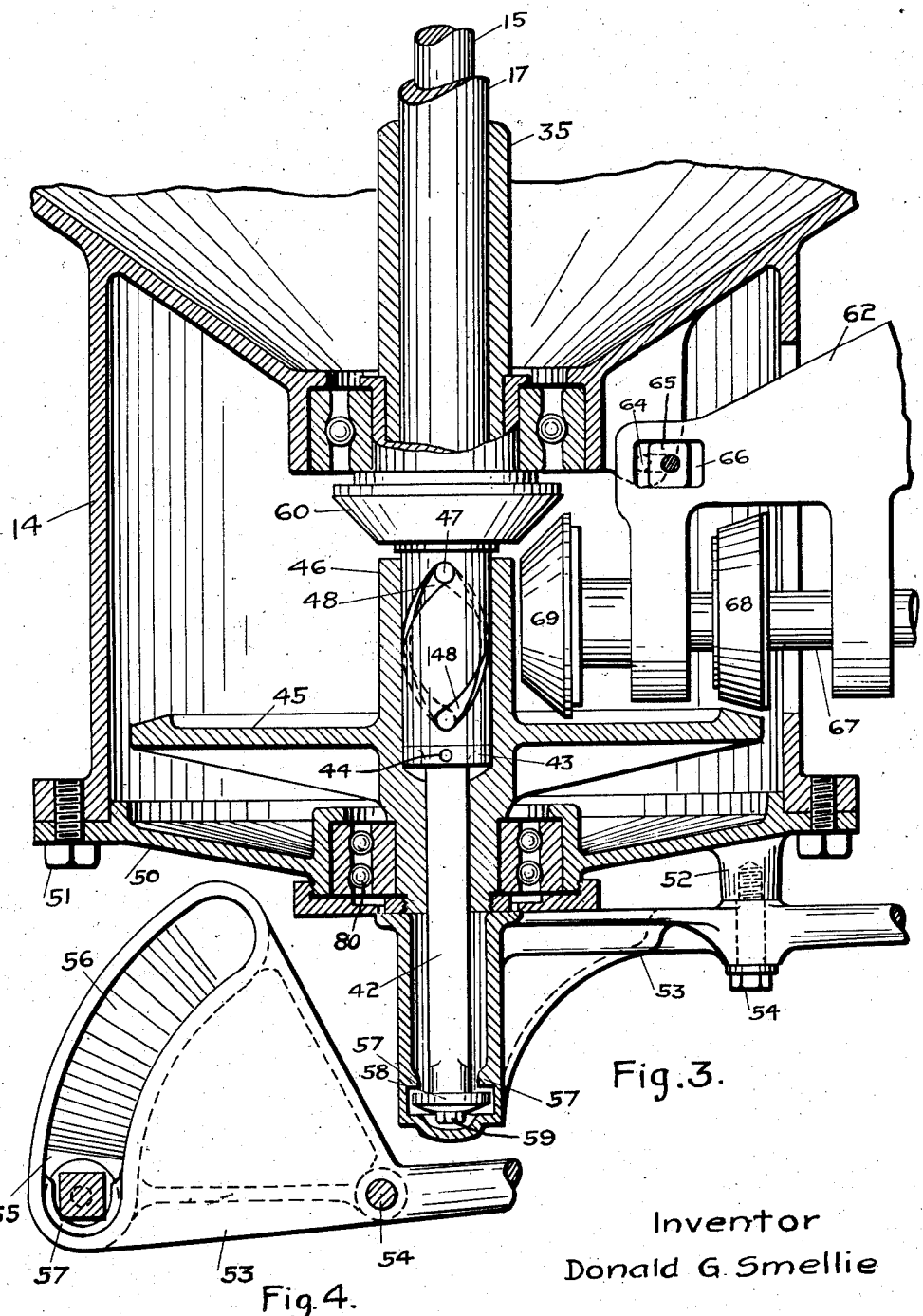


Fig. 3.

Fig. 4.

Inventor
Donald G. Smellie

By H. J. Schwarze
Attorney

Patented June 25, 1929. 1,718,261

UNITED STATES PATENT OFFICE.

DONALD G. SMELLIE, OF MAYWOOD, ILLINOIS, ASSIGNOR TO THE HOOVER COMPANY, A CORPORATION OF OHIO.

CLOTHES-WASHING MACHINE.

Application filed November 3, 1924. Serial No. 747,480.

The primary object of the invention is the provision of a new and improved type of clothes washing machine wherein the washing element, comprising the well known vacuum cup, is actuated in a novel manner by a new form of mechanism and more particularly wherein there is combined in the clothes washing machine a centrifuge whereby the clothes may be washed and rinsed and wrung out without removing them from the machine.

The invention involves not only novel mechanism for operating the vacuum cup but also includes a new and novel method of centrifuge drive and mounting together with a novel and efficient form of drive therefor, the whole being so arranged and constructed that the operation of washing clothes may be done with the least expenditure of human effort and with a maximum of convenience.

For a clear and full understanding of my invention, reference is had to the accompanying drawings wherein—

Figure 1 is a substantial sectional view through the machine;

Fig. 2 is an enlarged detail of the upper part of the actuating mechanism;

Fig. 3 is an enlarged detail of the lower part of the actuating mechanism; and

Fig. 4 is an enlarged view of the vacuum cup elevating cam.

The machine disclosed in the drawings has the usual main supporting frame 10 and tub 11 having a top 12.

Located centrally of the bottom of the tub there is provided a housing for the operating shaft which housing tapers conically in both directions substantially from the tub bottom, and which is indicated generally by 13. Suspended from this conical housing 13 is a cylindrical housing formed as a part of the conical housing and extending downwardly from substantially the bottom of the tub wherein the speed reducing mechanism is housed, this cylindrical housing being denoted by numeral 14. Within housings 13 and 14 there is a series of shafts comprising central shaft 15 which is the shaft for driving the washing mechanism and which has formed on the upper end thereof an angular crank 16, the angularity being one-half of the desired cup throw. Immediately surrounding shaft 15 is provided annular shaft 17 carrying at its upper end a slotted guide 18. On shaft 15 and at the base of crank 16 there is provided a cam member 19 whose upper face is inclined one-half the angle of throw of the vacuum cup rocking mechanism. Driven by crank 16 there is provided a member which may be termed the cup rocking mechanism which comprises member 20 having located centrally thereof a bore inclined relative to its exterior bearing mounting one-half the angle of the desired cup throw adapted for mounting on crank 16 and having a lower face normal to the axis of the bore, the sum of the angularities of the crank 16 and bore of member 20 being the desired total crank angle. The lower face of this member 20 is also provided with a tooth 21 co-operating with guide slot 18 in annular shaft 17, and the entire member is secured to crank 16 by means of capscrew 22. Mounted on member 20 by means of the ball bearings 23 and lock ring 24 are two members 25 and 26 which constitute the actual means imparting rocking motion to the washing cups. Member 25 has formed thereon gear teeth 27 as is clearly shown in the drawings and member 26 is provided with an upstanding shaft portion such as 28 on which is mounted cup arm member 29 to which the vacuum cups 30 are secured at its extremities. Gear teeth 27 on member 25 co-operate with gear teeth 31 on annular member 32 to prevent relative rotation between annular member 32 and the vacuum cup operating means comprising members 20, 25 and 26 when there are the same number of teeth in each of the gears 27 and 31. Should it be desirable to have relative rotation between these two parts such may be readily obtained and in a definite amount by varying the number of teeth in the two gears and the construction can be such that the relative rotation between the parts will be either clockwise or counterclockwise as found desirable.

The operation of the mechanism thus far described, is, that on rotation of shafts 15 and 17 which necessarily rotate together as will be hereinafter more fully described, crank pin 16 will be caused to rotate and due to its angularity and that of member 20 the cup operating mechanism 26 and 25 will be caused to have a gyratory motion, since substantial rotary motion is restrained through the co-operation of gear teeth 27 and 31. As shown in the drawings, the vacuum cup 30 will have a substantial rocking

movement and the actual travel thereof will be through an ellipse the major axis of which is vertical, and due to the slight angularity at which the cups enter the water, and because of the angle at which they operate on the clothes contained in the machine there will be a certain tendency to cause the whole sustaining structure, or what might be better termed the constraining structure, comprising annular member 32 and the parts associated therewith, to rotate somewhat about its axis, or it may be that under certain conditions of loading, the member 32 will not revolve but that instead the clothes will traverse the circumference of the centrifuge, and thus the cups will not always operate on the clothes at the same point but will traverse the circumference of the tub acting on various portions of the clothes contained therein at various times.

Surrounding the upper part of the construction thus far described there is provided member 32A to prevent water and soap from being splashed up into the mechanism and to prevent clothes becoming anyway entangled in the operating parts of the machine. The upper part of this shroud 32A is of course open as shown in the drawings in order that shaft 28 may operate therethrough and in order that water shall not splash into this opening or clothes become entangled therein, the lower part of the cup carrying means is provided with a substantially hemispherical portion 33 affording protection at this otherwise open part.

The vacuum cup carrying means 29 is mounted on shaft 28 and may be secured thereto by means of a pin 34 or may be allowed to rotate freely thereon as is found more practical in actual operation, this particular matter not being in any way of the essence of the invention.

So far the description of the construction of this machine has only been in connection with the upper end of the vacuum cup driving means and now a description will be given of the upper end of the centrifuge drive.

Annular member 32 heretofore noted decreases at the lower end to a smaller diameter comprising an annular shaft 35 which is mounted in ball bearings 36 carried by the upper portion of conical housing 13, and in turn within the lower portion of the annular part 32 there is provided a ball bearing mounting 37 in which runs the inner cup driving shaft. Mounted on annular member 32 is a further annular member 38 comprising the supports for the centrifuge tub and which is prevented from rotation relative thereto by means of stud 39, the centrifuge tub being indicated at 40 as a large diameter basket provided with perforations 41 through which the water from the clothes may be ejected. A floating sleeve or collar 81 surrounds the conical center of the washing compartment serving to prevent the load of clothes from gradually tightening down on the center portion of the container and being unduly stretched or torn on account of the combination of a centrally directed motion of the cups in a substantially vertical plane, and a lateral component due to the passage of the cup from one side of its elliptical orbit to the other while in contact with the clothes.

The upper part of the drive mechanism having been described, the lower part will now be described and then the relation between the two parts will be evident.

For rotating shaft 15 there is provided a friction disc 45 of large diameter, the friction disc having a square central opening receiving squared portion 42 of shaft 15 whereby rotation of disc 45 will rotate shaft 15. It should be noted that that portion of shaft 15 which projects below the lower end of annular shaft 17 is squared as at 42, and immediately below the lower end of shaft 17 there is provided a collar 43 secured to shaft 15 by pin 44.

Extending upwardly from disc 45 there is an annular member 46 carrying pins 47 co-operating with cam grooves 48 formed in annular shaft 17.

On the annular housing 14 there is secured a closure plate 50 secured thereto by means such as bolts 51 and in this plate is provided bearing 80 in which disk 45 is mounted for rotation. Pivoted to boss 52 formed on plate 50 there is provided a cam raising mechanism 53 pivoted on a member such as 54. This cam member comprises an arcuate cam formed with flats at each end such as 55 and a rising portion as at 56. On the lower end of this cam portion at the flat 55 there is provided shoulders such as 57 adapted to co-operate with washer 58 secured to the lower end of shaft 15 by a member such as capscrew 59.

The outer annular shaft 35 comprising the centrifuge drive is provided at its lower end with a friction disc 60.

For driving the entire machine there is provided an electric motor 61 mounted on arm 62 which arm is pivoted on the bottom of tub 11 by means of a pin such as 63, the other end of the pivoted arm being carried on a crank 64 which crank through block and slot 65 and 66 respectively allows pivoted arm 62 to be raised or lowered. Mounted on shaft 67 of motor 61 there are two bevel friction discs 68 and 69 respectively adapted to co-operate with bevel discs 45 and 60 respectively.

The construction of the machine having been described, the operation thereof will now be set forth.

For washing clothes the machine is operated in the condition as shown in the draw-

ings with the exception that crank 64 is turned so as to bring bevel wheels 45 and 68 into contact. Then on operation of the motor, wheel 68 will be driven through operation of motor shaft 67 and wheel 45 will in turn be driven, but at a relatively low rate of speed due to the difference in peripheral lengths of wheels 68 and 45. Through co-operation of the square opening in disc 45 and square part 42 of shaft 15, shaft 15 will be rotated and due to the co-action of pin 47 in slots 48, annular shaft 17 will also be rotated therewith in the position as shown in the drawings, and thus annular crank 16 will be rotated causing gyration of cup carrying shaft 28, since rotation thereof is prevented by coaction of gear teeth 27 and 31.

After the clothes have been washed, in order to wring them, crank arm 64 is turned upward to take discs 68 and 45 out of contact and cam lever 53 is swung about its pivot to raise shaft 15 on cam track 56 and to sustain the shaft in raised position on flat portion 55 of the cam. Raising of shaft 15 will cause shaft 17 to be raised therewith due to collar 43 secured to shaft 15 and since pins 47 remain stationary they will, because of the inclination of cam grooves 48 cause 180 degree rotation of shaft 17 with respect to shaft 15, which rotation causes the member 20 because of coaction between slot 18 and tooth 21 to rotate through an angle of 180 degrees around axis of crank 16 whereby the angularity of the crank 16 and the bearing seat on member 20 compensate and the cup operating shaft 28 is brought into a vertical position. Raising of shaft 15 not only acts as above mentioned but also raises the entire cup driving mechanism and thereby raises the cups out of the water so that the centrifuge may be operated without conflict therewith.

For actual rotation of the centrifuge, crank shaft 64 is raised still further until disc 69 contacts with disc 60 and on operation of the motor outer annular shaft 35 will be caused to rotate at relatively high speed because of the approximately equal perimeter of the disc faces and because of the connection by member 39 between the upper enlarged annular end 32 of the shaft and member 38 of the centrifuge, the centrifuge will be caused to rotate at relatively high speed.

Attention is directed to the design of the entire mechanism whereby the matter of assembly is greatly simplified noting particularly the construction wherein the entire mechanism for driving the machine comprises two units, one the large unit contained in conical housing 13 and annular housing 14, which unit is put in from the bottom of the machine and then secured in place the other unit comprising the pivoted lever 62 carrying the motor and motor shaft with its friction wheels which is mounted merely by slipping in pin 63 and securing crank 64 through block 65 placed in slot 66. By this construction it is made very easy to service this machine since should anything go wrong the entire works may be taken out with a minimum of trouble and a new unit may be replaced or a service unit substituted while repairs are being made at some place where there are ample facilities for such repair work.

Another important feature is the construction whereby danger of oil leakage of the machine is substantially eliminated in that any oil or grease from the working parts will fall down into the lower part of housing 14 and will drain down into the solid bottom cam portion of pivoted lever 53 which, should this become full will overflow slightly and give indication that there is an excess of oil in which event it is very easy to remove this member and to empty out such excess oil.

It will be seen from the above description that I have provided a washing machine which is very simple in construction and one in which there is provided very novel means of shifting from washing condition to condition for centrifuging and one wherein the matter of assembly and repair is greatly simplified because of the particular design employed. Also the design is one wherein the parts are easy to manufacture, simple and durable.

I claim:—

1. In a clothes washing machine, a revolubly driven shaft having an angular crank thereon, agitating means gyrated by the crank, and means simultaneously raising the agitating means and compensating for the angularity of the crank.

2. In a clothes washing machine, a revolubly driven shaft having an angular crank, a bushing thereon of angularity equal that of the crank, a gyrating member mounted on the bushing in operative relation and means limiting relative rotation of the shaft and the gyratory member.

3. In a clothes washing machine, a revolubly driven shaft having an angular crank, a bushing mounted thereon having interior and exterior bearing surfaces disposed in angular relation equaling the angularity of the crank, and means varying the total angularity of the crank and its bushing.

4. In a clothes washing machine, a revolubly driven shaft, an angular crank thereon, a member gyrated by revolution of the shaft, and means including an annular shaft surrounding the driven shaft and having pin and slot connection therewith to on relative rotation of the shaft vary the effective angularity of the crank.

5. In a clothes washing machine, a driven

shaft, an angular crank on the shaft, an angular bushing on the crank and an agitating member mounted on the bushing, the bushing having a projecting tooth, an annular shaft about the driven shaft, driving means for the driven and annular shafts, the annular shaft having a slot at its upper end and at its lower end having pin and inclined slot connection with the driving means, and means moving the driven and annular shafts longitudinally relative to the driving means.

6. In a clothes washing machine, a driven shaft, clothes agitating means mounted thereon, and means vertically moving the driven shaft comprising a member having a cam surface supporting said shaft and having well defined flat surfaces at its high and low points, said member enclosing the lower end of said shaft.

7. A clothes washing machine comprising a receptable and a supporting frame, a vertical shaft mounted centrally of the receptacle and having an oblique crank portion at the free end, a clothes agitator mounted on said crank portion, a source of power, and means acting simultaneously to raise said clothes agitator to move said clothes agitator to a position coaxial with said vertical shaft, and to disconnect it from the source of power.

8. A clothes washing machine comprising a receptacle, a supporting frame thereon, a vertical shaft mounted centrally of the receptacle, a clothes agitator mounted on said vertical shaft with its axis at an angle to that of the shaft, means to raise said shaft and agitator and simultaneously to move said agitator to a position coaxial with said vertical shaft.

9. In a clothes washing machine, a tub, operating means centrally disposed thereof, an open top protecting shell surrounding the operating means, clothes agitating means operated by the operating means, the clothes agitating means having a protective portion for the operating means and a telescoping shell overlapping the open top protecting shell and the protecting portion carried by the clothes agitating means.

10. In a clothes washing machine, a driven shaft, an angular crank on said shaft, an agitator-supporting bushing on the angular crank having an angularly disposed bore, an annular shaft enclosing the driven shaft and adapted to rotate therewith, means preventing relative rotation between said bushing and said annular shaft and means to rotate said annular shaft relative to said driven shaft to vary the total angularity of the angular crank and the bushing.

11. In a clothes washing machine, a driven shaft, an angular crank on said shaft, an agitator-supporting bushing on the angular crank having an angularly disposed bore, an annular shaft enclosing the driven shaft and adapted to rotate therewith, means preventing relative rotation between said bushing and said annular shaft comprising a projecting finger on said bushing in interfitting relation with the slotted end of said annular shaft, and means to rotate said annular shaft relative to said driven shaft to vary the total angularity of the angular crank and the bushing.

12. A clothes washing machine comprising a driven shaft, an angular crank on said shaft, agitating-cup-carrying arms rotatably mounted on said angular crank, a toothed member rotatable with said arms having intermeshing relation with a stationary toothed member and imparting a rotary speed to said arms upon the rotation of the angular crank which is determined by the relative number of teeth of the two toothed members.

13. In a clothes washing machine an agitating cup gyrating mechanism comprising a driven shaft, an angular crank on said shaft, cup-carrying arms rotatably mounted on said crank and differential means giving said cup-carrying arms an angular rotation less than that of said angular crank.

14. A clothes washing machine comprising a tub having a housing at its center, said housing consisting of a frusto-conical portion extending into said tub and providing supporting means for agitating means in said tub, an inverted frusto-conical portion extending below said tub and providing support for a driven shaft extending through said housing and a cylindrical housing having a bottom closure which encloses said inverted frusto-conical portion and houses the power transmission means connected to the driven shaft.

Signed at Chicago, in the county of Cook, and State of Illinois, this 31st day of October, A. D. 1924.

DONALD G. SMELLIE.