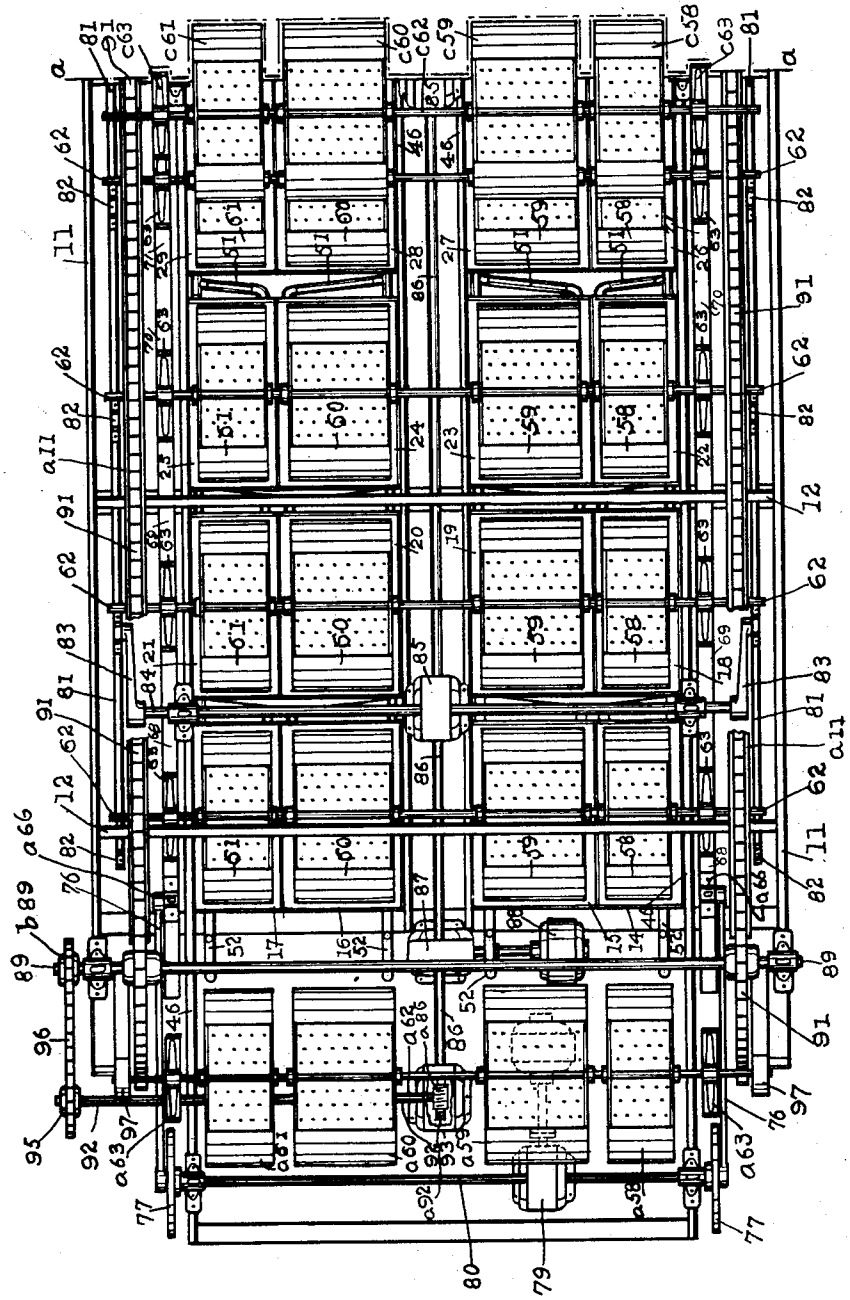
Aug. 7, 1934. E. KNUTSEN 1,969,082

LAUNDRY WASHING MACHINE

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Fig. 1



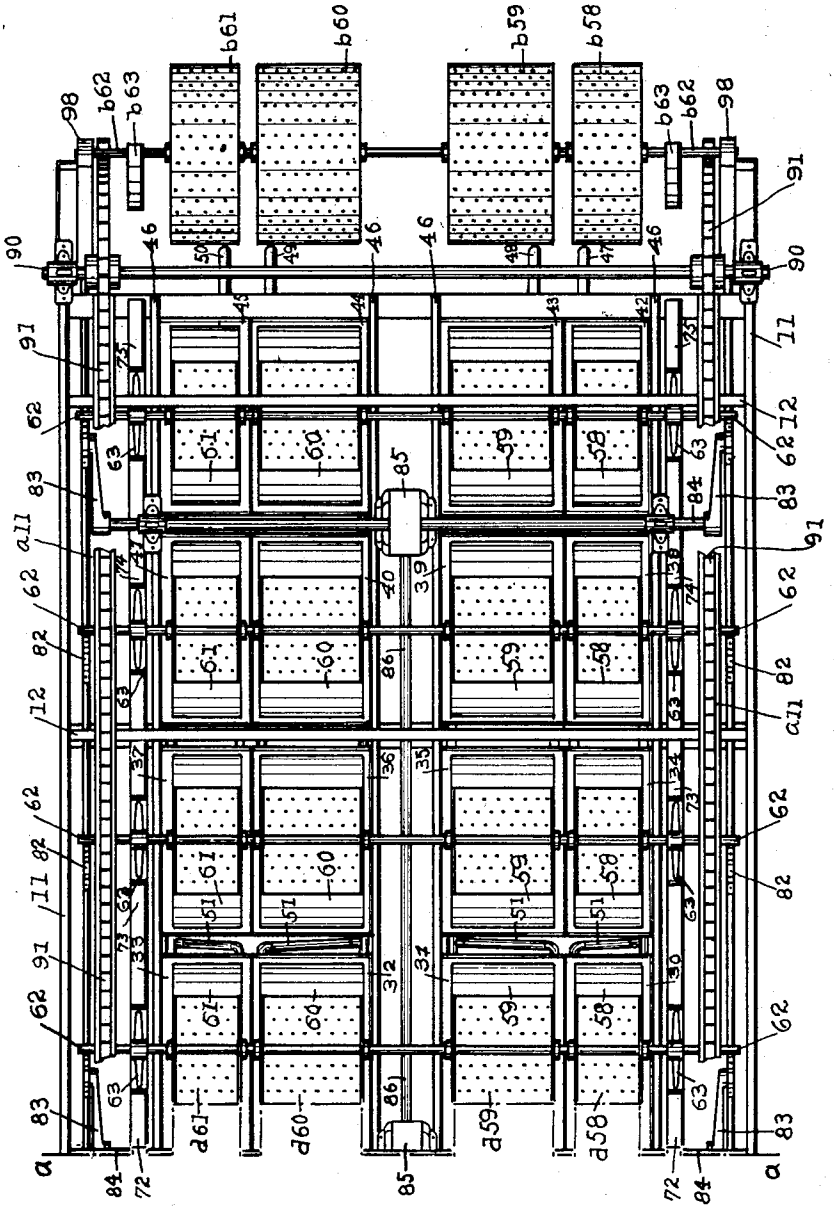
INVENTOR,
Elmer Knutsen.
BY David E. Lain,
ATTORNEY.

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LAUNDRY WASHING MACHINE

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Fig. 2



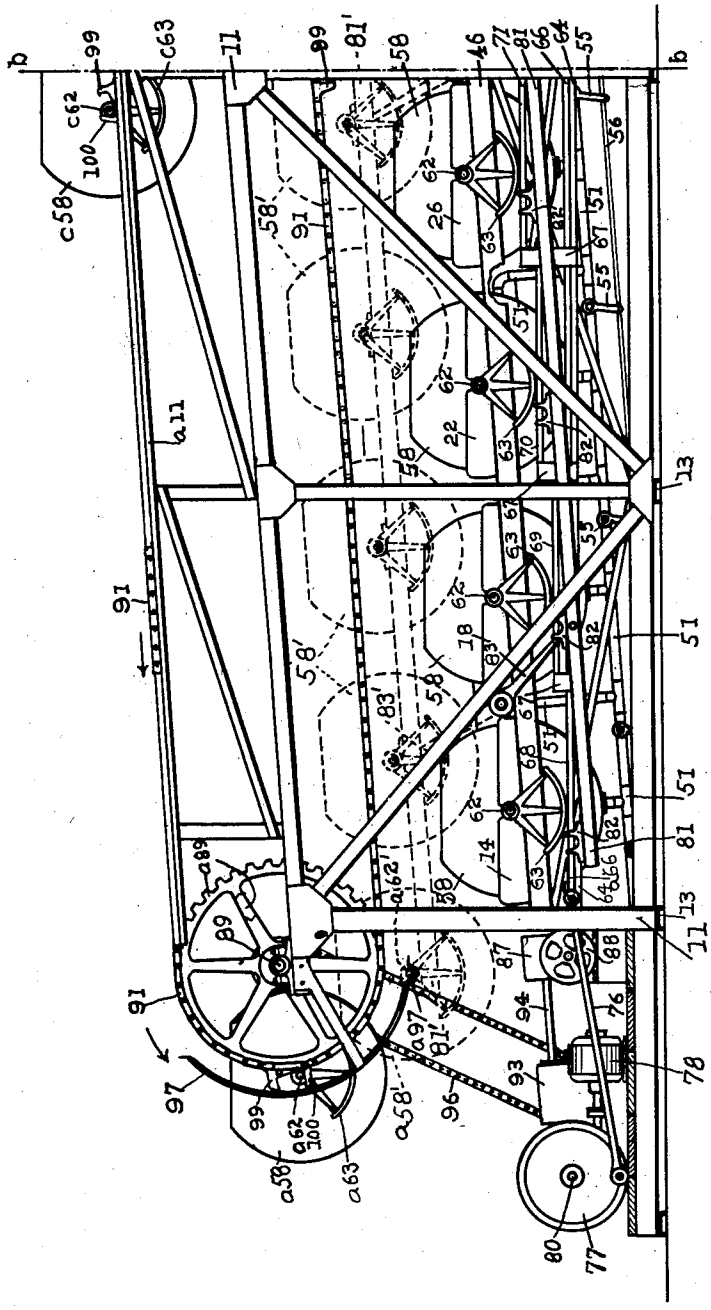
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LAUNDRY WASHING MACHINE

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Fig. 3



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LAUNDRY WASHING MACHINE

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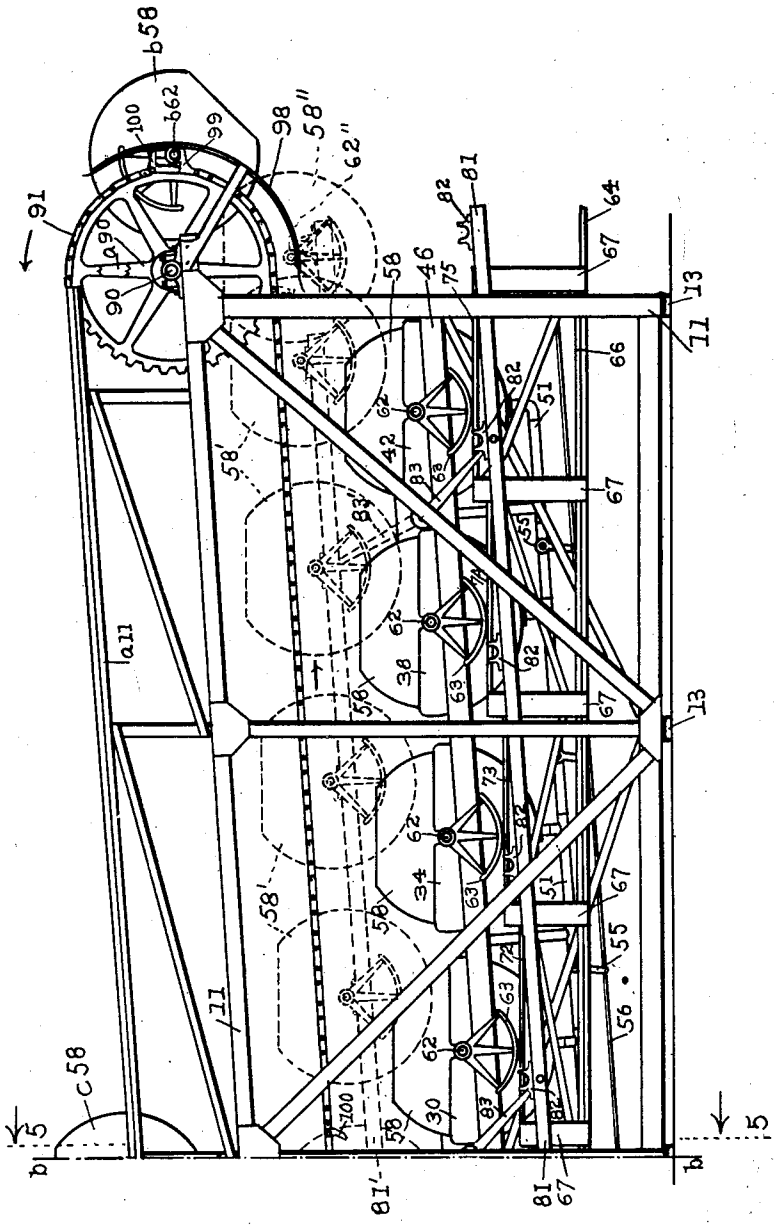


Fig. 4

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LAUNDRY WASHING MACHINE

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Fig. 6

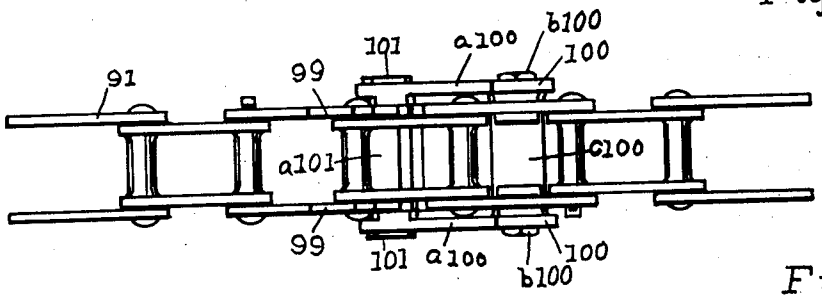


Fig. 7

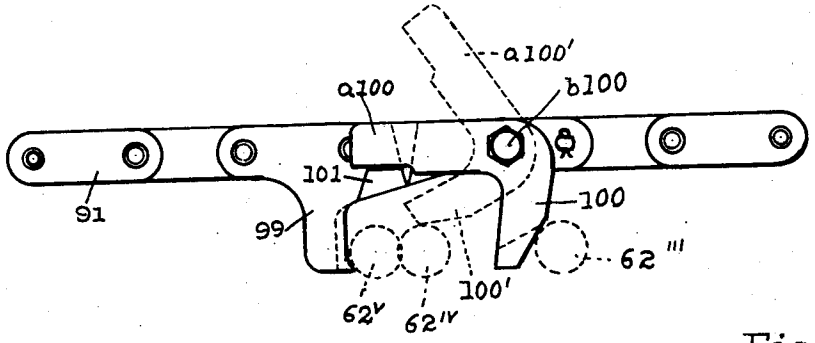
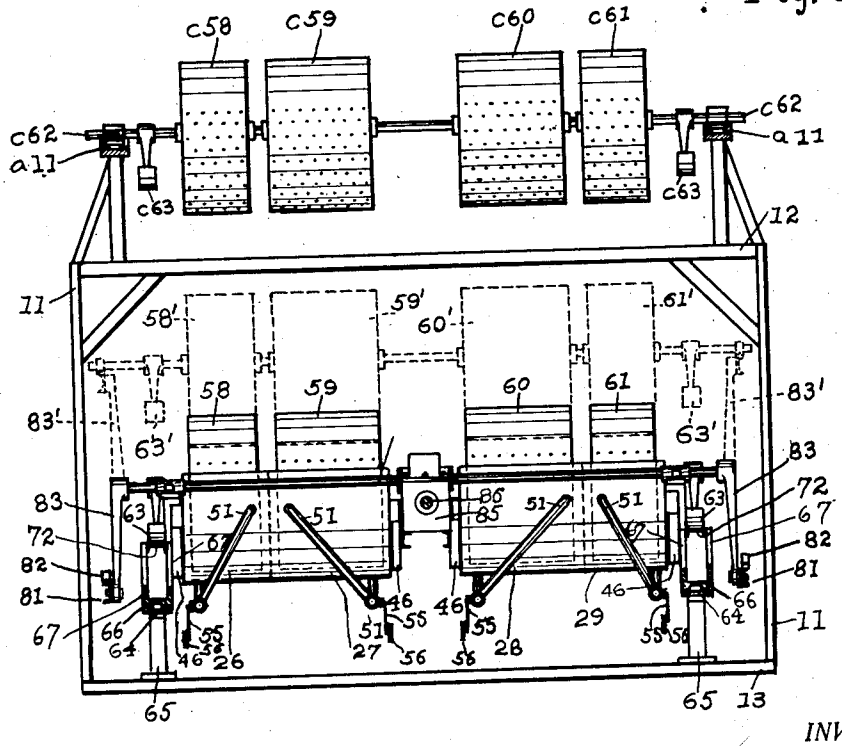


Fig. 5



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LAUNDRY WASHING MACHINE

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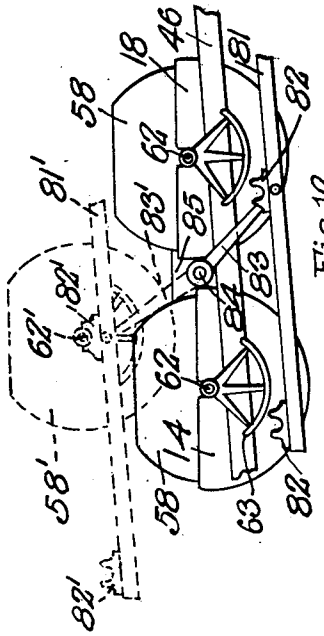


Fig. 11

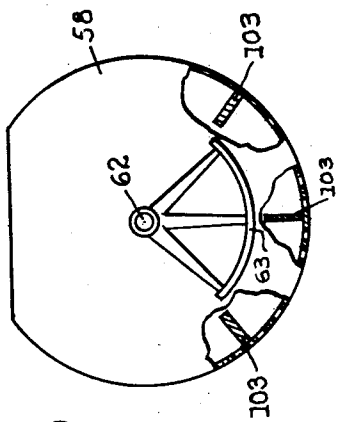
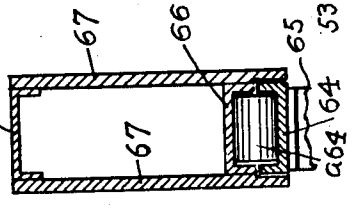


Fig. 10



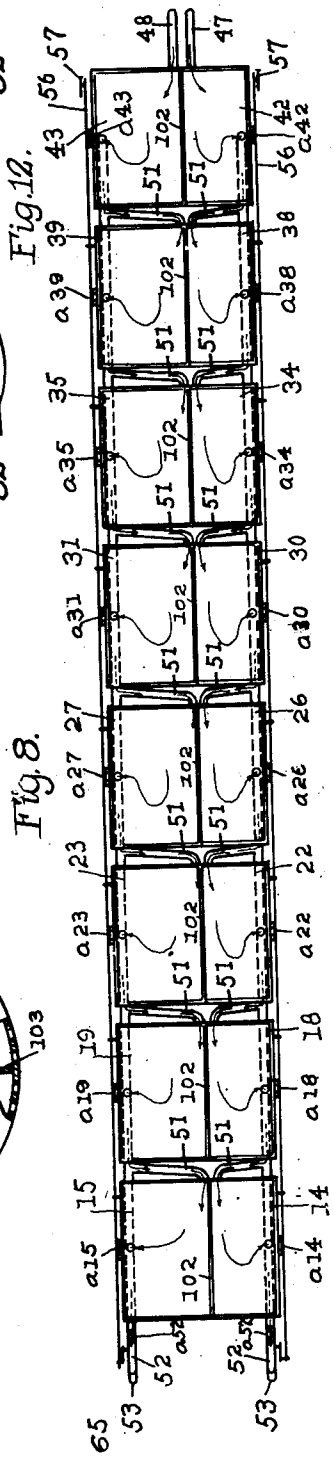


Fig. 8.

Fig. 12.

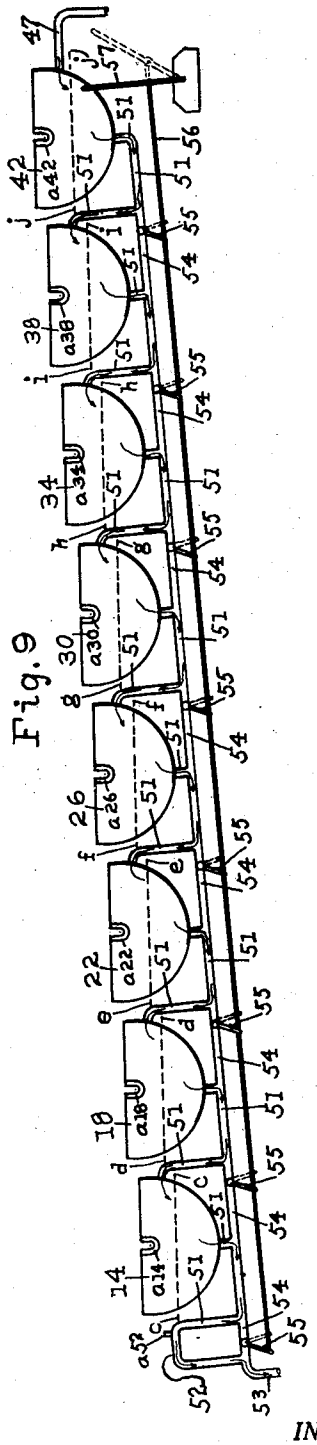


Fig. 9

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UNITED STATES PATENT OFFICE

1,969,082

LAUNDRY WASHING MACHINE

Elmer Knutsen, Bellingham, Wash.

Application July 24, 1931, Serial No. 552,811

7 Claims. (Cl. 68—18)

My invention relates to improvements in laundry washing machines, and has for an object to provide a laundry washing machine in the operation of which the unit for identification is the entire family wash rather than the individual pieces thereof as is usual.

Another object of my improvement is to provide a unit-family wash basket suitable for containing the entire family wash segregated relative to kinds of materials and suitable treatment therefor in the washing processes.

Another object of my improvement is to provide a series of unit-assembly wash tubs suited to contain said unit-family wash baskets one at a time in the order of their progression through the several washing solutions in the series of tubs.

Another object of my improvement is to place the series of wash tubs for each individual class of the family wash in separate lines.

Another object of my improvement is to provide mechanism for simultaneously moving a group of said unit-family wash baskets in order by stages through said series of wash tubs, maintaining said unit-family wash baskets as separable units throughout the entire washing process.

Another object of my improvement is to provide mechanism for simultaneously driving each member of said group of unit-family wash baskets in washing operations, but only when in said wash tubs, said mechanism automatically engaging and disengaging the unit-family wash baskets as the same enter and leave the wash tubs.

Another object of my improvement is to provide controllable, simultaneous regular progression in stages of the members of said group of unit-family wash baskets from the filling station therefor, through said series of wash tubs, then to a station where the contents of said baskets may be removed and thence back to said filling station.

Another object of my improvement is to provide for a continuous gravity flow of water through said series of wash tubs—a separate stream for each line of tubs—said flow beginning in the rinsing tubs and continuing through all of the tubs and the varying strength of washing liquids therein and finally flowing from the soak tubs into the waste pipe.

Another object of my improvement is to provide pipe connections including stop cocks between the tubs which remain closed during washing operations but which may be simultaneously opened to empty the tubs when so desired.

I attain these and other important objects of my invention with the mechanism illustrated in the accompanying six sheets of drawings which form a part of this specification in which Figure 1 is a plan view of the front part of my washing machine to the broken and bent line *a*—*a*, Fig. 2 is a plan view of the rear part thereof from said line *a*—*a* to the rear end thereof, Fig. 3 is a side elevation of the front part of the machine to the broken line *b*—*b*, Fig. 4 is a side elevation of the rear part of the machine from said line *b*—*b* to the rear end of the machine, Fig. 5 is a lateral cross section elevation of the machine on the dotted line 5—5 of Fig. 4, Fig. 6 is a plan view of a short part of one of the conveyor chains drawn on a larger scale, the remainder of which is broken away, showing the special shaft-holding device used thereon, Fig. 7 is a side elevation of Fig. 6, Fig. 8 is a plan view of two lines of the four-line series of wash tubs, drawn on a smaller scale, Fig. 9 is a side elevation of Fig. 8 showing the ends of said tubs, Fig. 10 is a portion of Fig. 5 drawn on a larger scale, Fig. 11 is an end elevation of one of the unit-family wash basket groups drawn on a larger scale, and Fig. 12 is a fragmentary view in side elevation of the mechanism used to convey the wash basket groups from wash tub to wash tub.

Similar characters refer to similar parts throughout the several views.. Certain parts are broken away to show other parts hidden thereby.

With more particular reference to the designated parts: The side frames of the supporting frame work consist of horizontal, perpendicular and brace bars which in general are designated by numeral 11, top cross frame bars 12 and bottom cross frame bars 13 tie said side frames together. Channel bars *a*11, *a*11 are fastened to the tops of the side frames and provide guides and supports for two conveyor chains.

Within the frame thus constituted the washing machine is erected.

Four parallel inclined longitudinal bars 46, 46, 46, 46 are fastened to the machine frame spaced apart and disposed in two pairs and between each pair of which is fastened one row of double tubs altogether providing four lines of wash tubs consisting of eight tubs in each line. The double-tub row between each pair of bars preferably being a single tub divided by a partition, and the two double tubs that is, four

tubs in a transverse row between said two pairs of bars constitute the unit tub assembly. Beginning at the front end of the machine the separate tubs in unit assemblies are designated as follows: 14, 15, 16 and 17; 18, 19, 20 and 21; 22, 23, 24 and 25; 26, 27, 28 and 29; 30, 31, 32 and 33; 34, 35, 36 and 37; 38, 39, 40 and 41; and 42, 43, 44 and 45. The plan view of one row of these double tubs is clearly shown in Fig. 8 where they are shown as separate from other parts of the machine, and an end elevation thereof is shown in Fig. 9 where their stepped relation is plainly indicated.

As shown, wash tubs 14, 18, 22, 26, 30, 34, 38 and 42 are in line longitudinally of the machine. Also in similar parallel lines are wash tubs 15, 19, 23, 27, 31, 35, 39 and 43; 16, 20, 24, 28, 32, 36, 40 and 44; and 17, 21, 25, 29, 33, 37, 41 and 45. Also, as shown, the inclined lines of tubs beginning with lowest tubs 14 and 17 are disposed at the sides of the machine and the tubs of these two lines are shorter than are the tubs of the two intervening lines of tubs the lowest of which are shown at 15 and 16. The entire group being considered as a bank of tubs.

Each unit tub assembly has upwardly open bearings centrally disposed in the top edges of the ends of each double tub thereof in the same axis. The inclined lines of double tubs illustrated in Figs. 8 and 9 have said bearings at *a*14, *a*15; *a*18, *a*19; *a*22, *a*23; *a*26, *a*27; *a*30, *a*31; *a*34, *a*35; *a*38, *a*39; *a*42, *a*43 in the ends of tubs 14, 15; 18, 19; 22, 23; 26, 27; 30, 31; 34, 35; 38, 39; and 42, 43, respectively. Likewise, the other inclined line of double tubs, the lowest tubs of which are at 16 and 17, have similar bearings, similarly disposed but not particularly shown.

Each of the stepped lines of tubs has its individual line of pipe connections providing for an individual gravity flow of liquids therethrough. Said liquid flow enters the highest tub of the line through a pipe individual thereto, passes through each of the next lower tubs in turn and leaves the line from the lowest tub through an outlet pipe individual thereto. The inlet pipe for highest tub 43 is at 48, the inlet pipes for highest tubs 44, 45 and 42 are at 49, 50 and 47, respectively.

The pipes connecting the adjacent tubs in each line are quite similar and each is designated by number 51. Each of connecting pipes 51 leaves from the bottom of one of the tubs near one end thereof and enters the side of the next lower tub near the other end thereof determining the water level for that tub from the bottom of which it leaves. This is the rule for all of said pipe connections for the tubs except for lowest tubs 14, 15, 16 and 17, which, not having lower adjacent tubs, have their outlet pipes 51 rise to a height at goose neck 52, determining the water levels in said lowest tubs, and then turn down to join sewer connection 53, Pipe 52 is vented at *a*52.

The water levels for line of pipes 14—42 are shown in Fig. 9 by dotted lines *c*—*c*, *d*—*d*, *e*—*e*, *f*—*f*, *g*—*g*, *h*—*h*, *i*—*i* and *j*—*j* for tubs, 14, 18, 22, 26, 30, 34, 38 and 42 respectively. The water levels for the other lines of tubs are not particularly shown but preferably, the water level in each of the four tubs of each unit tub assembly are the same. Liquid entering each of said lines of tubs at the highest tub thereof cannot flow into the tubs of other lines but will continue to flow from higher tub into lower tub of said line till it flows from the lowest tub thereof.

Bypass pipes 54 are provided to connect the lowest parts of pipes 51 and each bypass pipe includes a stop cock therein having a handle shown at 55. All of the stop cock handles in each line are pivoted to a single rod 56 which in turn is pivoted to hand lever 57. The closed positions of the stop-cock handles are shown in full lines and the open positions thereof in dotted lines. When lever 57 is in its full-line position all of the cocks are closed and no liquid passes through the bypass pipes, this is the position during washing operations. But by moving hand levers 57 to their dotted position all of the stop cocks are opened and the liquid in all of the tubs will flow through the bypass pipes direct into the sewer connection, thus leaving the tubs empty.

Each of the double tubs, as stated, is divided by a water-tight partition 102 the top of which is not higher than the bottoms of the said bearings in the ends of the tub. These partitions are properly designated in Fig. 8 and are similar in all of the tubs. No attempt was made to attach designating characters to said tub partitions in Figs. 1 and 2 because of the closeness of the drawings, but they are clearly shown in these plan views.

The unit family basket group reserved for the wash of one family consists of four open-top, foraminous laundry baskets 58, 59, 60 and 61, all cylindrical in shape of equal diameter and fastened spaced apart on shaft 62 which is disposed in the axes thereof. Because the average family wash consists of pieces of fabrics of different materials and colors requiring different kinds, strengths and temperatures of washing fluids, the four baskets referred to are provided in each family unit basket group. Also, these different materials and colors vary in quantities relatively to about the same degree in different family washes, so that in practice it is found desirable to use baskets of different lengths in the family unit. As shown, baskets 58 and 61 are shorter than are baskets 59 and 60 and the former are placed at the ends of shaft 62 with the latter intervening thereon. The openings in the baskets provide access to the interior thereof and require no cover; they are clearly shown in Figs. 1 and 2 and some of them are designated at *d*58, *d*59, *d*60 and *d*61 in Fig. 2. Preferably in the bottom of each basket are fastened longitudinal baffle plates 103 as shown in Fig. 11.

Fastened on each basket shaft 62 are two rocker shoes 63 disposed near the ends thereof and pendant therefrom.

Two horizontal channel bars 64 extend lengthwise of the frame near the ends of the tubs and vertically beneath rockers 63, when the basket groups are in operative position in the tubs.

Bars 64 are fastened, channels up, to chairs 65 which are fastened to frame cross bars 13, see Fig. 5. These bars serve as roller races for rollers *a*64, mounted on which are the channeled lower members 66, 66 of stepped beams the upper members of which are pairs of steps 68, 68; 69, 69; 70, 70; 71, 71; 72, 72; 73, 73; 74, 74 and 75, 75, joined end to end in each of the beams and fastened to lower members 66, 66 by pairs of bridge plates 67, 67 in each beam, see Figs. 3, 4, 5 and 10. Each of said steps is

disposed to provide bearing for one of rockers 63 when its shaft 62 is in one of the tub bearings adjacent but not contacting with the bottom thereof. The construction provides for the oscillation of all basket groups, which by construction may occupy the tub assemblies, by the reciprocation of the pair of stepped beams described when said basket assemblies are in operative position in the tubs; and also for allowing the mounting and removal of the basket assemblies in and from the tubs during the reciprocation of said stepped beams.

In bearings on the front end of the machine frame transverse shaft 80 is mounted for revolution and has a worm wheel fastened thereon which is engaged by a worm on an end of the shaft of electric motor 78 whereby the rapidly revolving motor rotor may drive shaft 80 at a desired slow rate. Said worm and worm wheel gears are enclosed in gear casing 79 and are not shown. On each end of shaft 80 is fastened a crank disc 77 to which is pivoted one end of a connecting rod 76 the other end of which is pivoted to a bearing in the front end of one of said stepped beams shown at *a*66, the construction providing for the slow reciprocation of said stepped beams by electric motor 78, whereby the baskets are slowly oscillated.

There are two inclined, parallel lifting bars 81, 81 disposed longitudinally of the machine one being proximate to each of the outer ends of the rows of tubs. Each of bars 81 is mounted for reciprocative revolution on the wrist pins of three cranks 83. Cranks 83 are fastened on the ends of three transverse shafts 84 which are mounted for revolution in bearings on frame beams 46, 46 which support the outer ends of the tub assemblies. Shafts 84 are disposed between adjacent tub assemblies and do not intervene to prevent the free movement of the basket assemblies in and out of the tubs.

A central longitudinal shaft 86 is mounted for revolution between the divided tub assemblies in bearings in gear cases 85, 85, 85 which are fastened to central frame beams 46, 46 supporting the inner ends of said divided tub assemblies. Said transverse shafts 84, 84, 84 also pass through the gear cases 85, and each shaft 84 has a worm wheel fastened thereon within the gear case through which it passes. Also, shaft 86 has a worm fastened thereon within each of gear cases 85 engaged with the worm wheel on one of shafts 84 therein. Said worm gears are not shown. The construction provides for the driving of crank shafts 84 by shaft 86 at reduced speed. Shaft 86 also passes through gear case 87 and has a worm wheel fastened thereon within said case. The shaft of electric motor 88 enters said gear case 87 and has a worm fastened thereon engaged with said worm wheel on shaft 86. The gears within case 87 are not shown. The construction provides for slowly driving central shaft 86 by electric motor 88 whereby crank shafts 84 are yet more slowly revolved.

Thus, when motor 88 is activated lifting bars 81, 81 are moved in reciprocative revolution by cranks 83 meanwhile being retained in parallel relation thereby.

On the top edge of each of lifting bars 81 are nine pillow blocks 82 spaced apart opposite each other on the two bars. The spaces between the pillow blocks equal those between the end bearings in the wash tubs, and they are disposed to engage the basket group shafts, when in the tub bearings, on approaching the same from below. The first pair of pillow blocks 82, 82 at the front and lowest ends of bars 81, 81 pass forward of the row of lowest tubs 14, 15, 16, 17 but the second pair of said pillow blocks 82, 82 engage with any basket shaft in the bearings of the said first or lowest row of tubs 14, 15, 16, 17 when approaching the same from below moved by the forward revolution of cranks 83, as viewed in Figs. 3 and 4. And the other pairs of pillow blocks 82, 82 in order toward the rear engage any basket shafts in the tub bearings in order toward the rear; thus, each pair of said pillow blocks may be occupied by a shaft from the tub bearings except the pair on the front ends of the lifting bars first referred to.

A pair of shafts 89, 90 are mounted across the top of the frame for revolution in bearings fastened on upper side frame bars, and on the ends thereof are fastened pairs of sprocket wheels *a*89 and *a*90 respectively. Over said sprocket wheels are disposed a pair of conveyor chains 91, 91 engaged therewith the upper folds of which may move in and be supported by frame channel bars *a*11, *a*11. Particular conveyor links with engaging means thereon, shown in Figs. 6 and 7, are included in said chains at spaced intervals opposite each other in the pair of chains. Each of said engaging means consists of holding lugs 99 projecting outward from the link to which they are fastened being joined together by bridge piece *a*101. Dogs 100 are pivoted for oscillation on bolt *b*100 which is extended through a link engaged with the link to which lugs 99 are fastened. Dogs 100 are joined together by bridge *c*100 and have tails *a*100 thereon at right angles therewith adapted for bearing on channel bars *a*11 to hold the dogs at right angles with the chain when on the upper folds thereof and further adapted to bear on stops 101 to hold said dogs at right angles with said chain when they are on the lower folds of the chain as opposed to forces acting from the front but to swing on bolts *b*100 when opposed by forces acting from the rear. As seen in Fig. 7, three dotted positions of the end elevation of basket shaft 62 are given at $62''''$, where it is bearing against dog 100, at 62^{iv} where it is passing beneath the dog which is in dotted position 100′ with the tail thereof at *a*100′, and at 62^{v} where it bears against lug 99 and allows the dog to return to its full-line position to prevent the movement of the shaft from between lug and dog. In practice the dog moves over the shaft which is then stationary. But the relative relation is easier shown by assuming the shaft as moving beneath the dog as above given.

Conveyor chains 91 move in the directions indicated by arrows in Figs. 3 and 4.

Segmental guards 97, 97 are fastened on the front end of the frame at the top thereof in front of sprocket wheels *a*89, *a*89, spaced apart therefrom only to allow lugs 99 and dogs 100 to pass between. The lower ends of the guards 97 serve as supporting brackets and each has a recess *a*97 in the top surface thereof near its lower end to receive and temporarily retain the ends of the basket shafts in a position hereinafter referred to as the front waiting station for unit wash-basket groups.

Segmental guards 98, 98 are fastened to the rear end of the frame behind the rear edges of sprocket wheels *a*90, *a*90 and are spaced apart from the sprockets only to allow the lugs 99 and

dogs 100 to pass therebetween. They prevent the shafts from passing over the ends of the lugs and becoming disengaged therefrom when being carried upward between the sprocket wheels and said guards. The lower ends of the guards 98 also serve as brackets to support and retain the ends of basket shafts 62 as at 62'', Fig. 4. This position for a basket group is hereinafter referred to as the rear waiting station for said baskets.

The front end of shaft 86 is extended into the gear case 93 and has a worm *a*86 fastened on the front end thereof within the gear case.

Countershaft 92 is mounted for revolution in bearings on the frame at the front end thereof and has one end extended into gear case 93 where it finds a bearing and has worm wheel *a*92 fastened on said end engaged with said worm *a*86. The other end of the countershaft 92 has sprocket wheel 95 fastened thereon. Sprocket wheel *b*89 is fastened on the end of shaft 89 in chain relation with sprocket wheel 95 and over the two is disposed chain 96 engaged therewith whereby shaft 92 drives shaft 89 through chain 96. That is, motor 88 drives conveyor chains 91, 91 as well as driving lifting bars 81 as above explained.

In operation: Assume that water continuously flows into each of the highest tubs, 42, 43, 44 and 45 through pipes 47, 48, 49 and 50, respectively. In order to make the description definite, assume that line of tubs 14—42 is reserved for light colored fabrics, line of tubs 15—43 is reserved for white fabric, line of tubs 16—44 is reserved for silks and woolens and line of tubs 17—45 is reserved for dark colored fabrics. Then water entering tub 42 through pipe 47 should be hot, water entering tub 43 through pipe 48 should be very hot, water entering tub 44 through pipe 49 should be luke warm, and water entering tub 45 through pipe 50 should be hot. In addition to the water flowing into tub 43 a small stream of liquid bluing continuously flows thereinto.

Into each of the tubs of tub assembly 26, 27, 28 and 29 a controllable stream of liquid soap flows, each tub having its particular soap supply. The tubs of the lowest tub assembly, 14, 15, 16 and 17, referred to as the breaking or suds tubs, receive no particular treatment except that white-clothes tub 15 may require a controllable continuous stream of cooling water flowing thereinto and also may receive a continuous supply of liquid ammonia from a small controlled pipe. No attempt has been made to illustrate the means used to introduce the detergent, coloring and cooling solutions since a reference thereto is sufficient to disclose the method of their application to those skilled in the art. It will now be seen that the tub assemblies will contain soap solutions of increasing strength from the lowest assembly to the fourth assembly. Also, since soapy water is carried up from the fourth or soap assembly with the clothing being washed, the rinsing water is increasingly clear from the fifth to the eighth or highest tub assembly; meanwhile, the continuous gravity flow of liquids from the higher into the lower tubs carries with it into lower tubs some of the particular solutions from the higher tubs.

Assume that the present operative locations of all movable parts are those illustrated in full lines.

Assume that electric motor 78 revolves continuously during washing operations causing stepped beams 66, 67 to reciprocate continuously. There is a unit basket group in each of the tub assemblies and a pair of rocker shoes bear on each pair of steps of said reciprocating stepped beams, so that, all of the eight basket groups in the eight tub assemblies are continuously oscillating in the various washing solutions in and flowing through said tubs.

In addition to the eight basket groups in the tubs there is one shown on top of the frame at the front end thereof designated as baskets *a*58, *a*59, *a*60 and *a*61 on shaft *a*62, shown in Figs. 1 and 3. This particular basket group is at the filling station and it is assumed is being filled with a family wash which has been separated as to colors and materials, the light colored clothing being placed in basket *a*58, the white fabric in basket *a*59, the silks and woolens in basket *a*60 and the dark colored stuff in basket *a*61. As shown in Fig. 3 shaft *a*62 bears on dogs 100 the tails of which bear against stops 101 to hold the dogs in their illustrated position, also the shaft is retained on the dogs by guards 97.

Basket group *c*58, *c*59, *c*60 and *c*61 is on the conveyor chains 91 with shaft *c*62 thereof engaged by one set of lugs 99 and dogs 100. The tails of said dogs bearing on channel beams *a*11 retain the same in a holding position. As shown, this particular basket group is about midway of the machine on the conveyor chains.

Unit family basket group consisting of baskets *b*58, *b*59, *b*60, and *b*61 is at the top of the machine at the rear end thereof with shaft *b*62 engaged by a set of the lugs and dogs and bearing on lugs 99 while held thereon by guards 98. This basket group is at the station for removing the wash therefrom and is shown as tilted over, by hand, to aid in said clothing removal. Thus the full equipment of basket groups for an eight-tub assembly machine consists of eleven, eight of which are in the tubs while one is at the filling station, one is at the station where the clothing is removed therefrom and one is midway on the conveyor chains.

It will be further assumed that the eight basket groups in the tubs each have a family wash therein segregated and divided between the four baskets thereof as explained above, and that when the wash was placed in the baskets a tag designating the particular family to which the wash belonged was placed in each of the baskets with the clothing.

With the washing facilities explained the clothing should be in each one of the eight tubs in line about two and three quarter minutes. Assume that this amount or period of time has passed and it is desired to move each of the basket units to a higher tub. An operative in charge closes an electric switch, not shown, to activate motor 88 swinging cranks 83 in forward revolution, causing lifting bars 81 to rise beneath the basket shafts till all of said shafts in the tub bearings are seated in pillow blocks 82 on the same, occupying all of said pillow blocks except the ones on the front ends thereof which, when cranks 83 and lifting bars 81 are in their dotted-line positions shown in Figs. 3 and 4 at 83' and 81', respectively, engage with the shaft of the last filled basket group, now at the front waiting station lodged in recesses *a*97 of guards 87 and shown in dotted lines at *a*58' in Fig. 3. At this time the eight basket groups hitherto in the tubs are now above the same in their dotted-line positions shown in Figs. 3 and 4 at 58'. Pro-

ceeding in forward revolution said cranks carry the lifting bars, with their load of nine basket groups and clothing therein, upward and rearward till the most rearward basket group thereof reaches the rear waiting station of its dotted-line position at 58'' where its shaft ends bear on the bottom ends of guards 98 which retain said basket group. The continued forward revolution of said cranks 83 seats the eight basket assemblies in the eight tub groups with the basket shafts engaged in the tub bearings and the rocker segments on said shafts bearing on the reciprocating steps beneath causing the resumption of basket oscillations in the washing liquids flowing through the tubs. Under continued revolution forward of the cranks the lifting bars continue to move downward and forward till they reach the full-line illustration thereof, or a position near thereto, when the operative opens the switch controlling motor 88 and crank and bar motions cease.

The results of the explained single revolution of cranks 83 are: the basket group last to have wash placed therein has been moved into the lowest tub assembly, each of the basket assemblies hitherto in the tub groups has been moved into the adjacent higher tub assembly, except that hitherto in the highest tub assembly, which has been suspended on the lower ends of guards 91, at the rear waiting station.

As explained, shaft 86 not only drives cranks 83 but it also drives conveyor chains 91 which move when and only when the the cranks are moving. By construction the conveyor chains make only one-fourth of a revolution while the cranks make one revolution. There are four sets of the lugs 99 and dogs 100 equally spaced apart on the chains, and the chains move the length of one of these spaces while the cranks make on revolution. During the movement of the lifting bars, above described, the newly-filled basket group *a*58 at the filling station was moved therefrom into the lowest tub assembly. The movement thereof from recesses *a*97 into said tubs already has been described, but before that the moving conveyor chains had carried it from the filling station into said recesses. Also during said movement of cranks and lifting bars the conveyor chains carried basket group *c*58 from midway of the upper loop thereof to the filling station, carried basket group *b*58 from the removal station to midway of said upper loop, and carried the basket group at 58'' to the removal station.

Thus it is clear that when the cranks and conveyor chains cease to move it is found that during their movement each of the basket groups has been moved one stage: those in the tubs have each been moved into the next higher tub, except the one in the highest tub which has been moved up to the removal station on the chains, and those on the chains each has been moved one quarter the length thereof except the one at the filling station which has been moved therefrom into the lowest tubs.

The cycle of operations of the machine consists of the period during which the cranks and chains are at rest and the basket groups in the tubs are oscillating therein, known as the washing period, and the period during which said cranks and chains moving and all of the baskets are out of the tubs known as the transfer period. A complete cycle requires about three minutes of which, as stated, the washing period is about two and three-quarter minutes.

It is now apparent that the family wash or bundle idea is preserved throughout the washing process. The family wash being removed from the same group of baskets, after washing thereof is finished, into which they were placed at the beginning as soiled clothes.

Also, the bundle idea is preserved after the clothes pass from the washing machine to other operations thereon.

From the removal station each family bundle is placed alone in a centrifugal drier together with the designating tags therewith, care being taken to separate the parts of the wash taken from the separate baskets by placing a piece of canvas therebetween in the drier bowl. From the drier bowl the wash is redivided, certain pieces passing to the hand ironing tables, others to different machine ironers and still others are placed alone in one of the drier tumblers described in my Patent Number 1,756,366. With each of the new subdivisions of the bundle one of the designating tags placed therewith at the beginning is added. So that, when the several parts of the original wash come together at the close of the laundering process they are yet designated by the original tags placed therewith and may be accurately assembled into the finished wrapped bundle.

In addition to the advantages over other laundry washing machines gained in this machine by simplifying ownership identification, by shortening the washing period, by continuous washing operations, by cooperation of clothing oscillation and flowing water, and by reducing labor required, those skilled in the art will appreciate the operative advantages gained by using disconnected basket groups which may at all times be individually removed or replaced except when within the conveyor guards.

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

1. In a laundry washing machine, a plurality of horizontal rows of wash tubs the rows being in stepped relation providing aligned stepped tubs, a separate fluid supply pipe leading into each of the tubs in the highest of said horizontal rows, a separate pipe in fluid connection with the bottom of each of the said tubs and with the top of the adjacent lower tub in the same stepped line therewith, a goose-neck pipe leading from the bottom of each of the tubs in the lowest of said horizontal rows of tubs which after rising to near the top of the said tub is connected to a drain pipe beneath the bottom thereof, a foraminous wash basket removably mounted for oscillation in each of said tubs, and means to simultaneously oscillate said baskets while in the said tubs.

2. In a laundry washing machine, a plurality of horizontal rows of wash tubs, the rows being in stepped relation providing aligned stepped tubs, a separate fluid supply pipe leading into each of the tubs in the highest of the said horizontal rows of tubs, a separate pipe in fluid connection with the bottom of each of the said tubs and with the top of the adjacent lower tub in the same stepped line therewith, a goose-neck pipe leading from the bottom of each of the tubs in the lowest of the said horizontal rows of tubs which after rising to near the top of the said tub connects with a drain below the bottom of the said tub, a by-pass pipe connecting the lowest parts of each of the said stepped fluid connection pipes between the said stepped tubs

with the said drain, a stop cock in said by-pass pipe between each of the said lowest parts of the said pipes, a foraminous wash basket removably mounted for oscillation in each of the said wash tubs, and means to oscillate the said baskets while in the said wash tubs.

3. In a laundry washing machine, a plurality of horizontal rows of wash tubs the rows being in stepped relation providing aligned stepped tubs, a system of fluid supply pipe connections from a source of liquid supply into the tops of the highest of the said horizontal rows of wash tubs from the bottom of each of the said wash tubs into the top of the lower tub adjacent thereto and from the bottoms of the tubs in the lowest of the said horizontal rows of wash tubs into goose-neck discharge pipes providing for a separate free gravity flow of liquid through each of the said stepped lines of wash tubs with a depth of said liquid in each of the said tubs, alined upwardly-open bearings in each of the said horizontal rows of tubs, a shaft removably mounted for oscillation in the said alined bearings in each of the said horizontal rows of tubs, a wash basket in each of the said tubs in each of the said horizontal rows of tubs fastened to the said shaft therein for oscillation therewith, a driving bar mounted for reciprocation outside of and adjacent the said rows of tubs beneath a said extended end of the said shaft, means to reciprocate the said driving bar, and driving means fastened on a said extended end of the said shaft disposed to contact with and be oscillated by the said reciprocating driving bar when the said shaft is mounted in the said upwardly-open bearings.

4. In a laundry washing machine, a plurality of horizontal rows of wash tubs the rows being in stepped relation providing aligned stepped tubs, a system of pipe connections from a liquid supply into the tops of the highest of the said horizontal rows of tubs and from the bottom of each of the said wash tubs into the top of the lower wash tub adjacent thereto and from the bottoms of the tubs in the lowest of the said horizontal rows of wash tubs into goose-neck discharge pipes providing for a separate free gravity flow of liquid through each of the said stepped lines of tubs with a depth of liquid in each of the said wash tubs, alined upwardly-open bearings in each of the said horizontal rows of tubs, a shaft removably mounted for oscillation in the said alined bearings in each of the said horizontal rows of tubs having its ends protruding beyond the same, a foraminous wash basket in each of the said wash tubs fastened to the said shaft therein for oscillation therewith, means to simultaneously oscillate all of said wash-basket shafts while in the said tub bearings, two parallel lifting bars disposed beneath the said protruding ends of the said basket shafts mounted on parallel driving cranks to simultaneously lift each of the said basket shafts with the baskets thereon from the said alined bearings in a horizontal row of wash tubs and carry the same to the said alined bearings in the adjacent horizontal row of tubs above, parallel crank shafts mounted for revolution between and parallel with the said horizontal rows of wash tubs, said driving cranks fastened on the said crank shafts, and means to revolve one of the said crank shafts.

5. In a laundry washing machine, a plurality of horizontal rows of wash tubs the rows being in stepped relation providing aligned stepped wash tubs, alined upwardly open centrally disposed bearings in each of the said horizontal rows of tubs, a plurality of unit wash basket groups each including a shaft and wash baskets fastened thereon spaced apart one of said basket groups being disposed in each of the horizontal rows of tubs with the shaft thereof mounted in the alined bearings and protruding beyond the ends of the horizontal row of tubs, a machine frame, a pair of supporting brackets fastened on the machine frame disposed above the said highest row of horizontal tubs for supporting the said protruding shaft ends of a said unit wash basket group providing a rear waiting station for the said basket group, another pair of supporting brackets fastened on the said machine frame disposed above the said lowest horizontal row of wash tubs for supporting the said protruding shaft ends of a unit wash basket group providing a front waiting station for the said unit wash basket group, parallel shafts mounted for revolution in bearings on the said machine frame disposed between and parallel with the horizontal rows of tubs, parallel driving cranks fastened on the ends of the said parallel shafts, two parallel lifting bars mounted on the said driving cranks being operated thereby disposed beneath the said protruding basket shaft ends, operating to simultaneously lift each of the wash basket groups from a horizontal row of tubs and place the same in the adjacent horizontal row of tubs above to carry a basket group from a front waiting station and dispose the same in the lowest horizontal row of tubs and to lift a basket group from the highest horizontal row of tubs and dispose the same at a rear waiting station therefor, means to revolve one of the said parallel shafts, a conveyor chain transfer mounted in bearings on the said machine frame disposed above the said wash tubs engaging a said unit wash basket group, being supported on the said brackets at the said rear waiting station, and moving the same on to the said supporting brackets at the said front waiting station, and means to drive the said conveyor chain transfer.

6. In a laundry washing machine, a plurality of horizontal rows of wash tubs the rows being in stepped relation providing aligned stepped wash tubs, a system of pipes from a source of liquid supply connected with each of the said wash tubs providing a separate free gravity flow of liquid through each of the said stepped lines of tubs, a plurality of laundry wash basket groups including a shaft and baskets fastened thereon spaced apart, a frame, an endless chain conveyor mounted on the said frame over the stepped lines of wash tubs operating longitudinally thereover adapted to carry a plurality of the said wash basket groups over the said stepped lines of wash tubs, conveyor means to simultaneously carry a plurality of the said wash basket groups moving each one thereof from one end of the said chain conveyor through each horizontal row of wash tubs from the lowest thereof to the highest and placing the same on the other end of the said chain conveyor, means to simultaneously operate the said chain conveyor and the said conveyor means providing periods of pause in the said operation while some of the said wash basket groups are in the said wash tubs and others thereof are on the said chain conveyor, and means to simultane-

ously oscillate the said wash baskets while the same are in the said wash tubs.

7. In a laundry washing machine, a plurality of horizontal rows of wash tubs, the said rows being in stepped relation, providing aligned stepped tubs, a separate fluid-supply pipe leading into each of the highest tubs, a stand-pipe drain outlet having fluid connections with the bottoms of each of the lowest tubs, the said stand-pipe drain outlet being disposed for retaining a depth of fluid in each of the said lowest tubs, a separate pipe in fluid connection with the bottom of each of the tubs and with the top of the adjacent lower tub in the stepped line therewith, aligned upwardly-open shaft bearings in each of the said horizontal rows of tubs, a shaft adapted for oscillation in the said aligned bearings in each of the said horizontal rows of tubs and having ends extended beyond the ends of the said rows of tubs, a plurality of foraminous laundry baskets spaced apart and fastened on each of the said shafts, each basket being separately disposed for oscillation in one of the said tubs while the said shaft is mounted in the said aligned bearings, means for oscillating all of the said shafts and the said baskets thereon in the said tubs simultaneously while the said shafts are mounted in the said aligned bearings, means for simultaneously moving all of the said shafts and the said baskets thereon from lower to higher horizontal rows of tubs, and means for separately moving the said shafts and the said baskets thereon from the said highest to the said lowest horizontal row of tubs.

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