Jan. 17, 1933. E. KNUTSEN 1,894,694

LAUNDRY DRY CLEANING MACHINE

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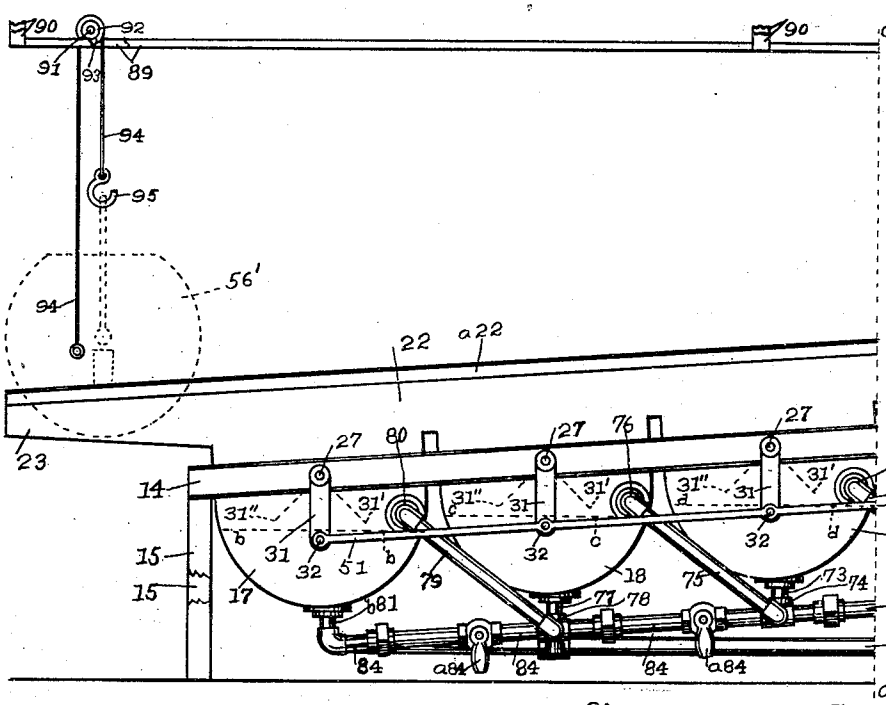


Fig.1

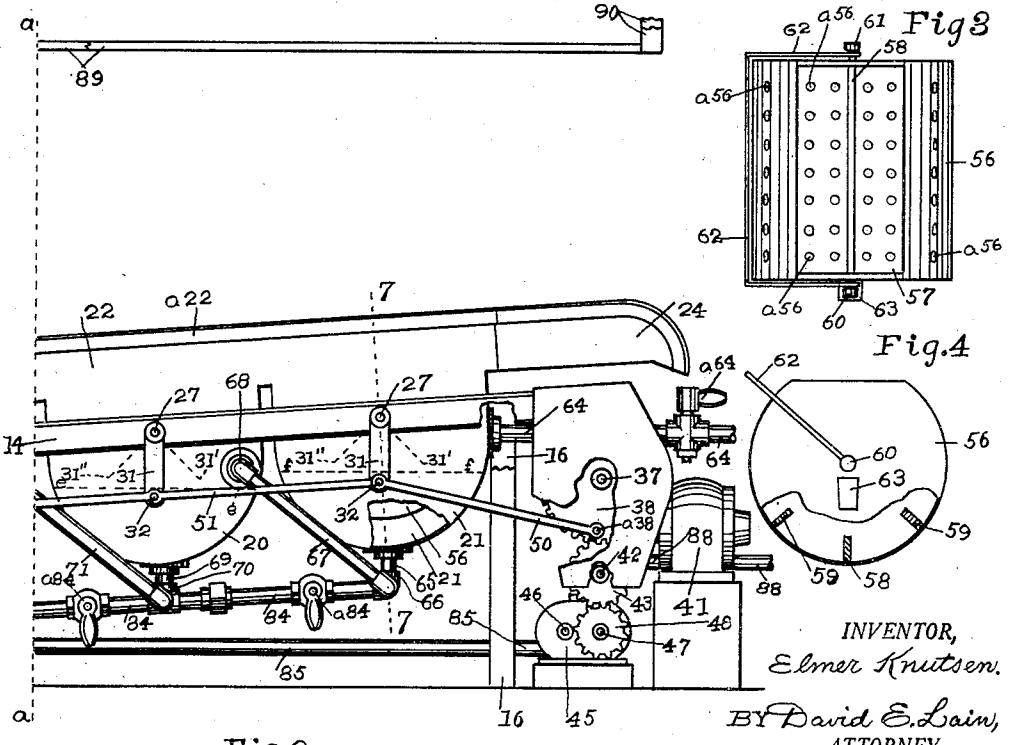


Fig.2



Fig.3



Fig.4

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

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Fig. 5

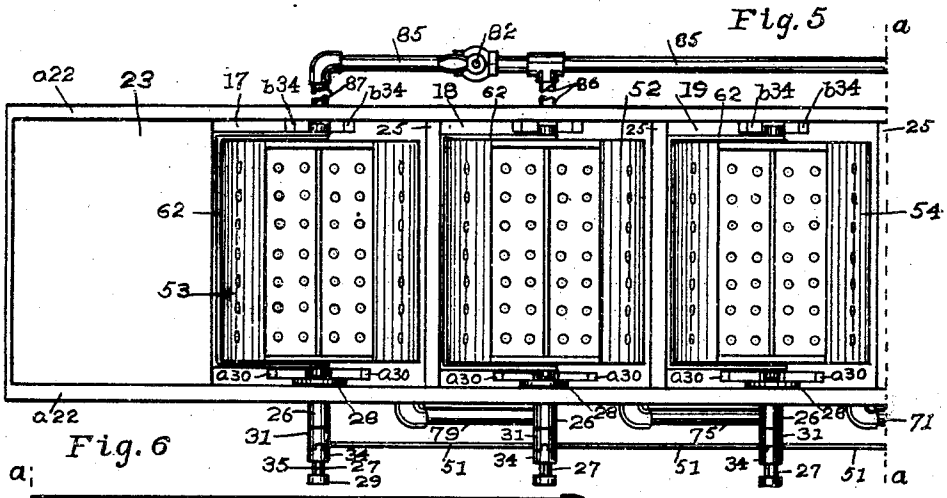


Fig. 6

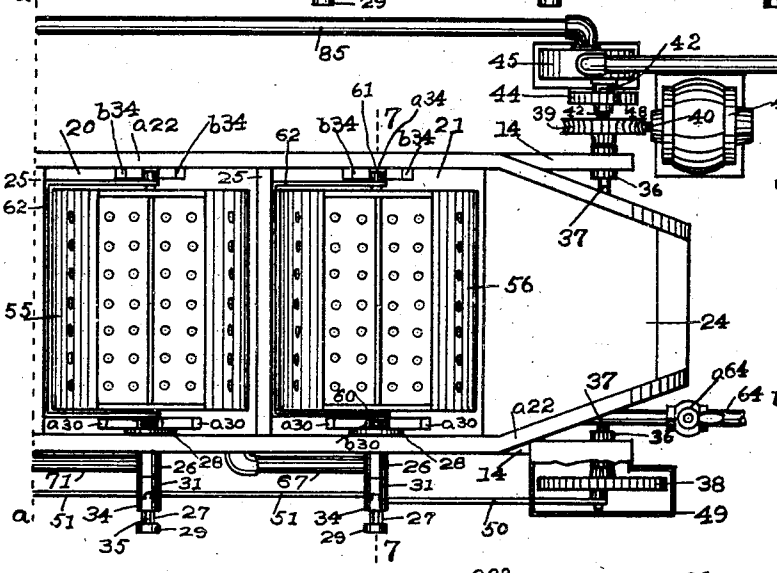


Fig. 8

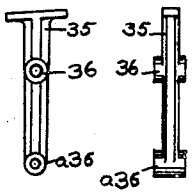


Fig. 9

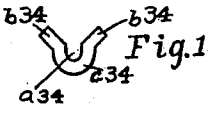


Fig. 10



Fig. 7

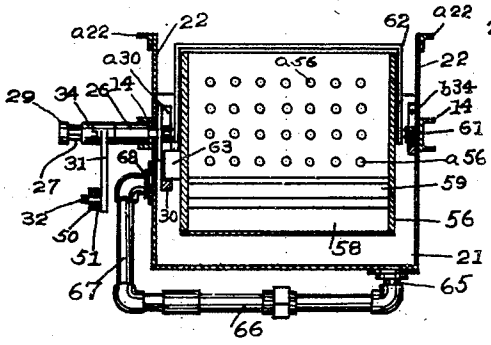


Fig. 11

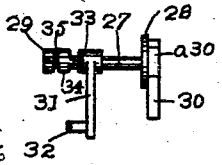
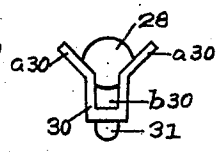


Fig. 12



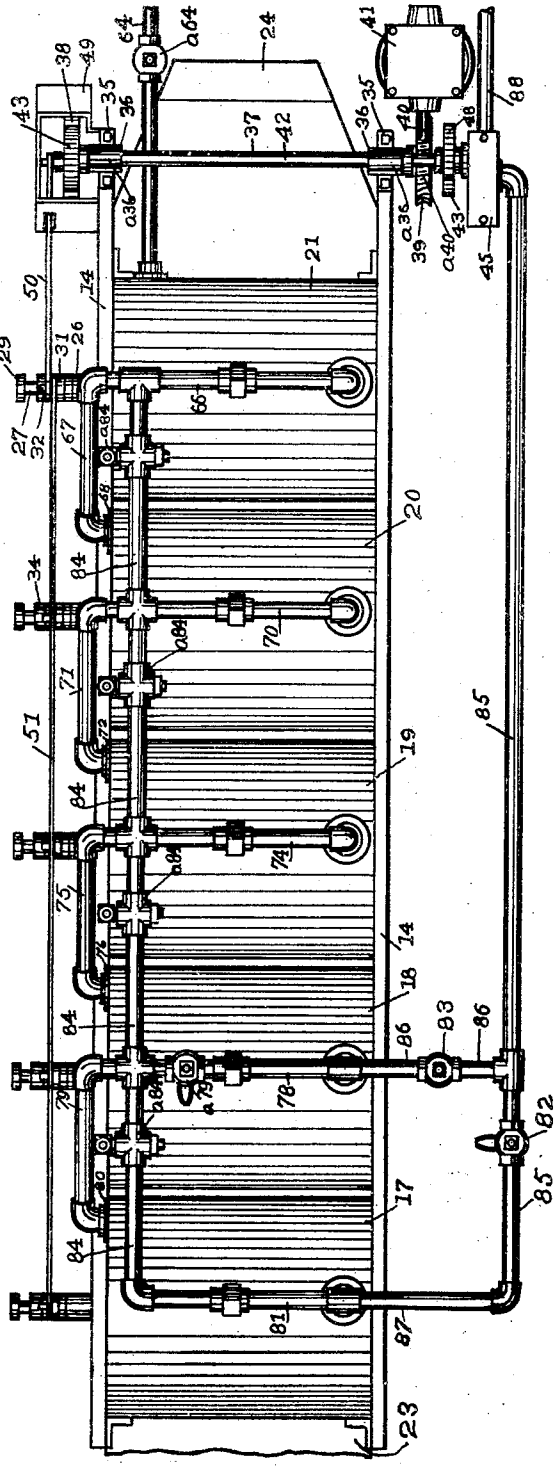
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Fig. 13



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

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# UNITED STATES PATENT OFFICE

ELMER KNUTSEN, OF BELLINGHAM, WASHINGTON

## LAUNDRY DRY-CLEANING MACHINE

Application filed July 7, 1930. Serial No. 466,017.

My invention relates to improvements in laundry dry-cleaning machines and has for an object to provide a series of washing-machine tubs in stepped relation and a system of relatively stepped stand pipes connected thereinto to convey a gravity flow of liquid from tub to tub.

Another object of my improvement is to provide a combined outlet and inlet pipe from tub to tub to convey the liquid between the tubs and to control the level of liquid therein.

Another object of my improvement is to provide a wash tub at the lower end of the series of tubs with conduit connections therefor, which is not required in the washings operations when cleaning woolens but is used when cleaning silks, and it is not included in the flow of liquid through the series of tubs at any time except when emptying all of the tubs on shutting down operations and when filling the tubs before beginning the same.

Another object of my improvement is to provide a foraminous wash basket for each tub and means to mount the same for oscillation in the tubs.

Another object of my improvement is to cause one or more of the baskets to cease operating while the others continue to oscillate.

Another object of my improvement is to provide means for removing the baskets separately from the tubs while the oscillative mechanism continues to operate.

Another object of my improvement is to provide for manually putting in and removing apparel from the baskets while in the tubs.

Another object of my improvement is to provide for the return of soapy cleaning liquid, carried by the apparel up into the rinsing liquid tub, back into the soapy liquid tub by gravity.

I attain these and other objects of my improvement with the mechanism illustrated in the three sheets of accompanying drawings, which form a part of this specification, in which Figure 1 is a front side elevation of the forward portion of my dry-cleaning machine shown only to the line *a*—*a*, Fig. 2 is a front side elevation of the rearward portion of said machine shown only from the line *a*—*a*, Fig. 3 is a plan view of one of the foraminous baskets used in my machine, Fig. 4 is an end elevation of Fig. 3, Fig. 5 is a plan view of the forward portion of my mechanism shown only to the line *a*—*a*, Fig. 6 is a plan view of the rearward portion of my mechanism shown from the line *a*—*a*, Fig. 7 is a cross section of my machine on the line 7—7, Figs. 8 and 9 are two elevation views of one of two similar bearing brackets fastened beneath the rear ends of the extended frame channel bars of the machine, Fig. 10 is a side elevation of one of the bearing crotches fastened on the inside rear end wall of each of the tubs, Fig. 11 is a side elevation of one of the operating crank and shaft assemblies and Fig. 12 is an end elevation of Fig. 11 and Fig. 13 is a bottom plan view thereof.

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

With more particular reference to the designated parts: The frame to support the series of wash-tubs consists of two channel bars, 14, 14, one of which is fastened to the series of front tub ends and the other is fastened to the rear ends of the series of tubs. These channel bars are supported by two front end legs 15, 15 fastened to the front ends of the channel bars and two rear end legs 16, 16 fastened to the channel bars near their rear ends. The tubs are disposed side by side in a row and, beginning at the front end thereof, are designated by numbers 17, 18, 19, 20 and 21 in order. The tubs are preferably close together with but a small space between occupied by partitions 25 and the end walls thereof are continued upward as integral side walls of the range or series of tubs as shown at 22, 22 and have angle bars *a*22, *a*22 fastened as rails along their top edges. The front ends of side walls 22 are extended and joined by bottom and end walls to provide a supporting and drainage place 23 where a basket may rest as hereinafter explained. The rear ends of side walls 22 are also extended and provided with a bottom wall which is inclined downward at the very end

thereof and also the side walls are at their rear ends inclined toward each other to provide spout 24 the end of which overhangs a centrifugal extractor not shown.

A shaft bearing 26 is fastened to the front channel bar 14 at each of the intersections therewith of a central plane longitudinal to each of the tubs to provide a bearing for one of rocker shafts 27 mounted therein for oscillation. On the inner end of each of shafts 27 is relatively large flange 28 and on the outer end thereof is set ring 29. Crotch 30 provides recess or socket *b*30 to engage basket block 63 and has flaring ends *a*30, *a*30 to direct said block into the socket. Crotch 30 is fastened to flange 28 disposed with its ends upward.

Each shaft 27 is provided with a crank 31 mounted loose thereon to bear against the end of bearing 26, and in the front or outer end of its hub are positive-clutch notches 33. A spline 35 is embedded in each of shafts 27 between set ring 29 and the hub of crank 31 and the movable part of a positive clutch 34 is mounted for reciprocation on shaft 27 between set ring 29 and the crank hub engaged with spline 35 on each of the rocker shafts and engageable with and disengagable from the notches 33 in the crank hub by reciprocation. When clutch 34 is disengaged from the hub of crank 31, as shown in Fig. 11, the crank is loose on shaft 27 and its movement will not rock the shaft. But when the clutch engages the crank hub, as shown in Figs. 5, 6 and 7, the oscillation of the cranks 31 will oscillate the shafts 27. Each of cranks 31 has a crank pin 32.

Shaft 37 is mounted for revolution in bearings 36, 36 of brackets 35, 35 across and beneath the rear ends of channel bars 14, 14 and has driving spur gear 38 fastened on its front end which is extended beyond the front one of said bearings and also has worm wheel 39 fastened on its rear end which is extended beyond the rear one of bearings 36. Shaft 40 of gas-proof electric motor 41 has a worm gear *a*40 fastened thereon, engaged with the bottom edge of worm wheel 39 to drive the same. Countershaft 42 is mounted for revolution in bearings *a*36, *a*36 on the lower ends of brackets 35 beneath and parallel with shaft 37 and has spur gear 43 fastened on its front end engaged with spur gear 38 and driven thereby. On the rear end of shaft 42 is fastened spur gear 44 engaged with spur gear 48 to drive the same. Spur gear 48 is fastened on the front end of shaft 47 of rotary pump 45, the other shaft of which is shown at 46. The construction disclosed provides for driving rotary pump 45 by motor 41. Gear casing 49 is fastened to the rear end of the front channel bar 14 and protects the operative from gears 38 and 43.

In gear 38 is fastened crank pin *a*38 protruding from the front thereof and with this pin is connected the rear end of the connecting rod 50 for revolution thereon. The front end of connecting rod 50 is connected with crank pin 32 of the rear one of cranks 31 which oscillates the basket mounted in rear tub 21. Connecting bar 51 connects with each of pins 32 of the five cranks 31 to drive all of said cranks simultaneously. The crank radius of pin *a*38 provides for the oscillation of cranks 31 to their oscillative limits at 31′ and 31″ as shown in dotted center lines of said cranks in Figs. 1 and 2.

There are five similar baskets required for the full complement of this machine, one for each of the tubs. Although they may be exactly alike, they are designated by numbers 52, 53, 54, 55 and 56 and are shown in place respectively in tubs 17—21 respectively. Reference being had to Figs. 3, 4 and 7, where the basket illustrated is designated by number 56, an opening 57 is provided in the top part of the basket for the passage of articles of apparel therethrough. No provision need be made to close this opening. The ends of the basket, which is cylindrical in shape, are tight but the side wall thereof has multifarious openings *a*56 therethrough. A longitudinal central baffle 58 is fastened in the bottom of the basket and additional baffles 59, 59 are fastened at the sides thereof. A gudgeon 60 is centrally placed on the front end of the basket and a gudgeon 61 is centrally placed on the rear end thereof. These gudgeons are in the axis of the cylindrical basket wall and are of smaller diameter between the ends thereof to provide engagement for the eyes of bail 62 with which each basket is furnished.

Crotch *c*34 has bearing groove *a*34 and outwardly inclined ends *b*34, *b*34, see Fig. 10. One of these crotches *c*34 is fastened on the inner rear end wall of each of the tubs disposed with ends upward and the center of groove *a*34 in line with the axis of the rocker shaft 27.

Tapering block 63 is fastened on the front end of each basket in a vertical center line thereof.

Basket 56 is shown in operative position in tub 21 with gudgeon 61 mounted for oscillation in bearing groove *a*34 and tapering block 63 engaged in socket *b*30, see Fig. 7. Block 63 is disposed in crotch 30 at a location to cause the axis of gudgeon 60 to coincide with the axis of shaft 27. The construction provides for the axes of the cylindrical baskets to coincide with the extended axes of shafts 27, when the baskets are in the operative positions shown in the illustrations; and since motor 41 operates connecting bar 51 it also may operate simultaneously all baskets mounted for oscillation in the tubs in crotches 30 and 34.

The rear end of the range of tubs 17—21 is disposed on a higher level than the front

end thereof, as shown in Figs. 1 and 2. Pipe 64, with control cock *a*64 therein, is assumed to be from the outlet of the clarifying system for the dry-cleaning liquids for use in my dry-cleaning machine. Inasmuch as there are several successful and well known clarifying systems of this kind now in use they are well known in the art and the illustration thereof does not need to be made a part of my illustrations in order that a full and clear specification thereof may be imparted.

Pipe 64 is connected into the rear wall of highest tub 21 near the top thereof and near the front end of the tub. Pipe 66 through nipple 65 connects with the rear end of the bottom of tub 21 and is carried forward beneath the tub to the front end thereof from where it rises as oblique stand pipe 67 the upper end of which connects with tub 20 in the front end thereof near the top and is disposed at a height to cause the level of the liquid in tub 21 to be at dotted line *f*—*f* shown in Fig. 2. Pipe 66, 67 serves as outlet pipe for tub 21 and inlet pipe for tub 20.

The rear end of pipe 70 beneath tub 20 connects through nipple 69 with said tub at the rear of the bottom thereof and is extended in front beyond the tub where it is continued as oblique stand pipe 71 the upper end of which is connected into tub 19 near the top of the front end thereof at 72 and it provides an overflow outlet from tub 20 the level of the liquid in which it fixes at dotted line *e*—*e* in Fig. 2. Pipe 70, 71, also, is thus the feed pipe for tub 19. The rear end of pipe 74 beneath tub 19 is connected through nipple 73 with the tub through the bottom near the rear end thereof from where it extends forward beneath the tub to join oblique stand pipe 75 the upper end of which connects with tub 18 at 76 through the front end near the top thereof and provides an overflow outlet from tub 19 the level of the liquid in which is fixed thereby at dotted line *d*—*d* in Fig. 2. Pipe 74—75 thus also serves as feed pipe for tub 18 conducting liquid thereinto from tub 19. The rear end of pipe 78 connects with tub 18 through nipple 77 in the bottom near the rear end thereof and it extends beneath the bottom of the tub to the front end thereof where it joins oblique stand pipe 79 which connects with tub 17 at 80 through its front end near the top thereof providing an overflow outlet from tub 18 to tub 17 and fixing the level of liquid in tub 18 at dotted line *b*—*b* in Fig. 2. Pipe 78—79 thus, also, is the feed pipe for tub 17 conducting liquid thereinto from tub 18 which has flowed from clarifying-system pipe 64 through each tub in succession by gravity and finally enters the lowest tub 17.

An outlet for tub 17 is provided through nipple *b*81 connected into the bottom near the rear end thereof which is joined with pipe 81 extended beneath the tub to near the front end thereof where it joins pipe 84. Pipe 84 passes beneath the series of tubs near their front ends and in turn is joined with pipes 78, 74, 70, and 66 as well as pipe 81 referred to. In order to provide against continuous connections between pipe 84 and said pipes joined therewith, a cock *a*84 is included in pipe 84 between each of pipes 66 and 70, 70 and 74, 74 and 78, 78 and 81, and pipe 81 is connected with outlet or pump pipe 85 by a rear extension thereof at 87. Pipe 78 is joined to outlet pipe 85 through by-pass pipe 86 in which is included cock 83 to control the flow of liquid therethrough. In outlet pipe 85, between its connections with pipes 86 and 87 is placed cock 82 to control the flow of liquid therethrough. Outlet pipe 85 extends preferably parallel with the range of tubs at the rear thereof and its rear end is connected with the inlet port of pump 45. The outlet port of this rotary pump is connected with the holder, not shown, of the gasoline clarifying system, referred to above, by pipe 88.

For convenience when removing the wash baskets from the tubs or replacing them therein and also for moving the baskets from tub to tub or on to platform 23 parallel tracks 89, 89 are fastened above the range of tubs over the longitudinal center of the range by hangers 90 which are attached to overhead supports, not shown.

On tracks 89 are mounted wheels 92 fastened on axle 91 to roll on the tracks. Mounted on the axle between the wheels for revolution thereon is sheave 93 of larger diameter than the wheels and wide enough to nearly fill the space between the tracks to maintain the trolley on the tracks. On sheave 93 is placed rope 94 having hook 95 fastened to one end thereof.

To use the trolley in lifting and shifting the wash baskets hook 95 is engaged with bail 62 of the basket which then may be raised above the tubs by pulling on rope 94 and moved on the trolley and tracks to the desired location as basket 56 to 56′, shown in Fig. 1.

In practice I have found the following method of using this dry cleaning machine satisfactory: Tub 17, the lowest tub in the series, is reserved for the stronger soap tub when cleaning silks and for a soap supply when cleaning woolens and is shut out of the liquid flow by maintaining cock *a*79 closed during cleaning operations.

To fill the tubs,—it is assumed that supply pipe 64 is disposed to provide a flow of gasoline, from said gasoline clarifying system or from another source of gasoline supply. Then open cock *a*79 and close cock 83 and open cock *a*64 to allow gasoline to flow into tub 21 which, when filled to line *f*—*f* will overflow through pipe 66, 67 to fill tub 20, and so on till one after another tubs 19 and 18 are also filled, to the levels indicated by dotted level lines in Figs. 1 and 2, and the gasoline from

tub 18 overflows into tub 17. When the desired level in tub 17 has been reached by the liquid all of the tubs are properly filled with gasoline and cock *a*64 is closed.

When cleaning silks a quantity of liquid soap is added to the liquid in tubs 17 and 19. Motor 41 is started causing pump 45 to operate which produces a vacuum in pipe 85. Connecting bar 51 also is caused to operate which oscillates all of crotches 30 in the tubs which at present do not contain the baskets. Basket 56, while on platform 23 at 56′ having had silk apparel to be cleaned placed therein, with the aid of the rope and trolley is placed in tub 18 and immediately is caused to oscillate as described. Cock 83, which had been closed, is now opened, also valve *a*64 is opened and all of the cocks are in the positions shown in Fig. 13. Pump 45 draws liquid from tub 18 and cock 83 is adjusted in connection with the adjustment of supply cock *a*64 to cause the outflow of liquid drawn through cock 83 by the pump to provide sufficient liquid in tub 18 to maintain the level thereof at about the line *c*—*c*. After having remained in tub 18 the desired length of time under oscillation basket 56 is removed therefrom and placed in tub 17 where it at once commences to oscillate. Meanwhile basket 55 has been supplied with silk apparel to be cleaned and this basket is placed in tub 18 and begins to oscillate. Basket 56 is removed from stronger or first soap tub 17 and placed in weaker or second soap tub 19 where it is again under oscillation. Basket 55 is taken from tub 18 and placed in tub 17 where it oscillates. Then basket 54, into which silk apparel has been placed for cleaning, is placed in tub 18 and oscillates therein. Basket 56 is removed from second soap tub 19 and placed in first rinsing tub 20. Basket 55 is taken from tub 17 and placed in tub 19. Basket 54 is taken from tub 18 and placed in tub 17. Basket 53, having had silk apparel to be cleaned placed therein, is placed in tub 18. Basket 56 is taken from tub 20, the first rinsing tub, and placed in second rinsing tub 21. Basket 55 is taken from second soap tub 19 and placed in first rinsing tub 20. Basket 54 is taken from first soap tub 17 and placed in second soap tub 19. Basket 53 is taken from tub 18 and placed in first soap tub 17. Basket 52, having had silk apparel to be cleaned placed therein, is placed in tub 18. Now all of the tubs have baskets oscillating therein and there is a continuous flow of liquid from tub to tub by gravity except as regards the lowest tub 17 the liquid in which is not changing. The next step is to remove the apparel from basket 56 which is now in tub 21. The clutch 34 connected with this tub is moved out of engagement allowing the oscillations of basket 56 to cease. Then the cleaned apparel therein is easily removed by hand through opening 57 therein and the same is moved along spout 24 to pass over the end thereof into the centrifugal extractor placed beneath, but not shown. Basket 56, now empty, is removed from tub 21 with the aid of the rope and trolley and carried to platform 23 to again have apparel to be cleaned placed therein. Then the clutch for tub 21 is again engaged and, continuing with basket 55 in tub 20, each of the baskets is in turn moved from tub to tub, as stated, and, having occupied each tub in turn under oscillation the desired length of time, either the contents of each basket is in turn removed while the basket is in second rinsing tub 21, or the basket with the contents therein is removed and the contents thereof is taken out later.

Preferably following this routine, the dry cleaning proceeds effectively at a relatively moderate expense.

At the close of cleaning operations it may be desirable to empty all of the tanks of liquid and store the same in the said holder. This is easily accomplished as follows: While all of the machinery is operating and each of the baskets is in place in a tub and oscillating to prevent the settling of solids therein, supply cock *a*64 is closed, each of cocks *a*84 is opened, cock 82 is opened and cock 83 remains open then outlet pipe 85 is in gravity connection with the bottom outlet of each of the tubs and pump 45 withdraws all liquid from the tubs and with it whatever small solids were washed out of the apparel and then in the tubs and pipes.

When cleaning woolens in this machine only four of the tubs are needed and tub 17 is not used in the cleaning line but is useful as a container for a soap supply, and in this tub is kept a quantity of a mixture of gasoline and soap of standard strength. That is, having determined the desired proportions of gasoline and liquid soap to be stored in tub 17, the withdrawals therefrom needed to maintain the liquid in the soap tub are made in measured quantities which are restored by equal quantities of standard mixture.

As in the case of silk cleaning described, all of the tubs are first filled with gasoline through pipe 64 and then the arrangement for the cocks described above as used when cleaning silks is suitable also when cleaning woolens. As before, no liquid flow is allowed through tub 17. For woolens tub 19 alone is used with soap therein. The baskets containing woolens to be cleaned are one at a time placed first in tub 18 under oscillation and, after remaining therein the desired length of time, they are in order advanced through soap tub 19, first rinsing tub 20 and second rinsing tub 21, and having completed the desired length of time in the highest tub, either the oscillations of the basket therein are caused to cease by disengaging the clutch connected therewith and removing the wool-

ens from the basket while stationary in the tub, or the basket with the cleaned apparel therein is taken from the tub and the contents thereof are removed later. After being removed from tub 21 the woolens are placed in the centrifugal extractor located beneath the end of spout 24 but not shown.

While cleaning either silks or woolens in this machine the desired strength of the solution in the soap tubs is maintained by additions of liquid soap thereto as needed. Also, while cleaning either of the said materials soapy liquid is carried from tub 19 into tub 18 by the liquid flow where it again aids in the cleaning before passing into the outlet; and soapy liquid is carried from soap tub 19 up into the first rinsing tub 20 in the fabric passing upward from tub to tub. This soapy liquid is returned to tub 19 by the liquid flow to again aid in cleaning operations in the soap tub.

As understood, it is now customary, when washing fabric in laundries by the dry-cleaning method, to use but one tub for the not less than four separate operations required. This tub must be filled and emptied not less than twice during the cleaning of each "wash", requiring no small amount of time to open and close valves. Also, often, garments have small insoluble solids embedded therein which are freed by the cleaning and float about in the cleaning liquid under the stirring thereof by the moving basket during the time of one or two of the cleaning stages and some of these solids may again adhere to the garments while the tub is being emptied.

In practice, I have used my machine continuously hour after hour without opening or closing a valve while a succession of "washes" are passed up stream in a continuous flow of solvent and cleaning liquids which is continuously purified by the outflow of impure liquid and the inflow of clean liquid which, as and where needed, may be reinforced by liquid soap.

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

1. Apparatus of the kind described including a series of washing machine tubs disposed side by side in stepped relation, a pair of alined bearings fastened in each of said tubs, a controllable outlet from the bottom of the lowest of said tubs, a series of intervening stand pipes in stepped-down relation joining the bottom of each higher tub with the top of the adjacent lower tub adapting said series of tubs for the free gravity flow of liquid through said tubs from the top to the bottom thereof and between said tubs from the bottom of each higher tub into the top of the adjacent lower tub, and a liquid supply pipe leading into the top of the highest of said series of tubs.

2. Apparatus of the kind described including a series of washing machine tubs disposed side by side in stepped relation, a controllable outlet from the bottom of the lowest of said tubs, a series of inclined stand pipes in stepped-down relation joining the rear end of the bottom of each higher tub with the front end of the top of the adjacent lower tub adapting said series of tubs for the free gravity flow of liquid within the tubs from the front end at the top of each tub to the rear end at the botton thereof and between the tubs from the bottom of each higher tub at the rear end thereof into the top of the adjacent lower tub at the front end thereof, and a liquid supply pipe leading into the top of the highest tub of said series of tubs at the front end thereof.

3. Apparatus of the kind described including a series of washing machine tubs disposed side by side in stepped relation, a series of intervening stand pipes in stepped-down relation joining the bottom of each higher tub with the top of the adjacent lower tub, a liquid-control valve included in the one of said stand pipes joining the lowest of said tubs with its adjacent higher tub, a pump being adapted for lifting liquids to higher levels, a pipe connecting the inlet of said pump with the bottom of the lowest of said tubs, another pipe connecting the inlet of said pump with the bottom of the next to the lowest of said tubs, and separate means for controlling the flow of liquids through each of said pump pipes.

4. Apparatus of the kind described including a series of washing-machine tubs disposed side by side in stepped relation, a controllable outlet from the bottom of the lowest of said tubs, a series of intervening stand pipes in stepped-down relation joining the bottom of each higher tub with the top of the adjacent lower tub, a series of by-pass drain pipes one of each of which connects together each adjacent pair of said stand pipes at the lowest parts thereof, and a liquid-control valve included in each of said by-pass drain pipes.

5. Apparatus of the kind described including a series of washing-machine tubs disposed side by side in stepped relation, a conduit leading from a source of liquid supply into the top of the highest of said tubs, a controllable outlet from the bottom of the lowest of said tubs, a series of intervening stand pipes in stepped-down relation joining the bottom of each tub with the top of the adjacent lower tub adapting said series of tubs for the free flow of liquid by gravity therethrough from the top to the bottom in each of said tubs and between said tubs from the bottom of each tub into the top of the adjacent lower tub, a foraminous laundry basket mounted for oscillation in each of said tubs being adapted for the free flow of liquid

therethrough, and means to oscillate said laundry baskets in said tubs during said flow of liquid therethrough.

6. Apparatus of the kind described including a series of washing-machine tubs disposed side by side in stepped relation, a conduit leading from a source of liquid supply into the top of the highest of said tubs, a controllable outlet from the bottom of the lowest of said tubs, a series of intervening stand pipes in stepped-down relation joining the bottom of each tub with the top of the adjacent lower tub adapting said series of tubs for the free flow of liquid by gravity therethrough from the top to the bottom in each tub and between said tubs from the bottom of each tub into the top of the adjacent lower tub, a foraminous laundry basket removably mounted for oscillation in each of said tubs being adapted for the free flow of liquid therethrough, means to oscillate said laundry baskets simultaneously during said flow of liquid therethrough, and means for removing and replacing any of said laundry baskets during the oscillation of the other of said baskets in said tubs and the flow of liquid therethrough.

7. Apparatus of the kind described including a series of washing-machine tubs disposed side by side in stepped relation, a conduit leading from a source of liquid supply into the top of the highest of said tubs, a controllable outlet from the bottom of the lowest of said tubs, a series of inclined relatively stepped-down stand pipes connecting the rear of the bottom of each of said tubs with the top at the front end of the adjacent lower tub adapting said series of tubs for the free gravity flow of liquid therethrough within the said tubs from the front end at the top of each tub to the rear end at the bottom thereof and between the tubs from the rear end at the bottom thereof to the front end at the top thereof of the adjacent lower tub, a foraminous laundry basket removably mounted for oscillation in each of said tubs being adapted for a free flow of liquid therethrough, means to oscillate said baskets simultaneously during free flow of liquid therethrough, and means for removing and replacing any of said baskets during oscillation of the other of said baskets in said tubs and the flow of liquid therethrough.

ELMER KNUTSEN.