Aug. 16, 1932. E. J. CARROLL 1,871,663

LAUNDRY SYSTEM

Filed Aug. 7, 1926 3 Sheets-Sheet 1

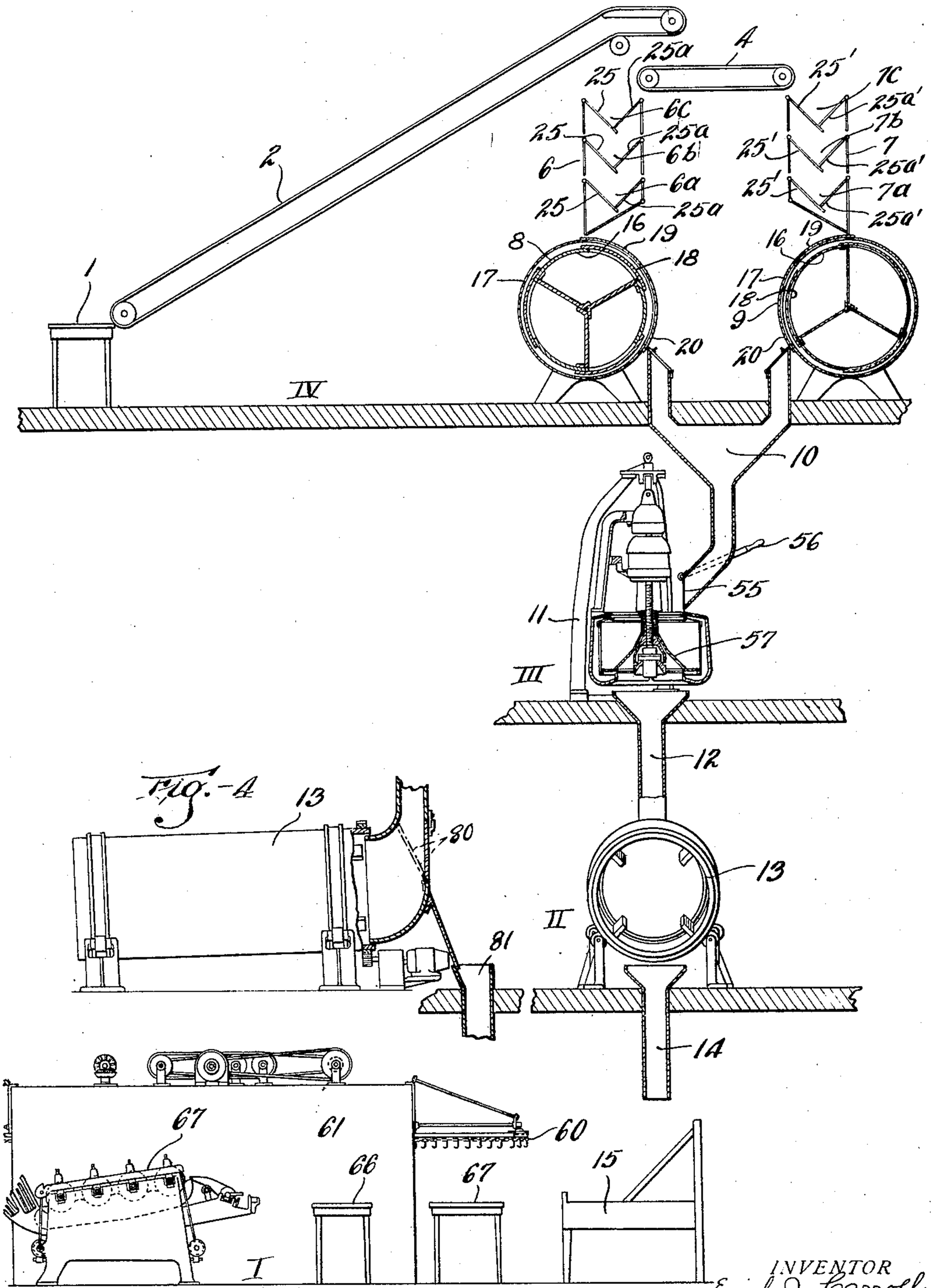


Fig. -4

Fig. -1

INVENTOR
Emil J. Carroll.

BY
Brockett & Hyde
ATTORNEYS.

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LAUNDRY SYSTEM

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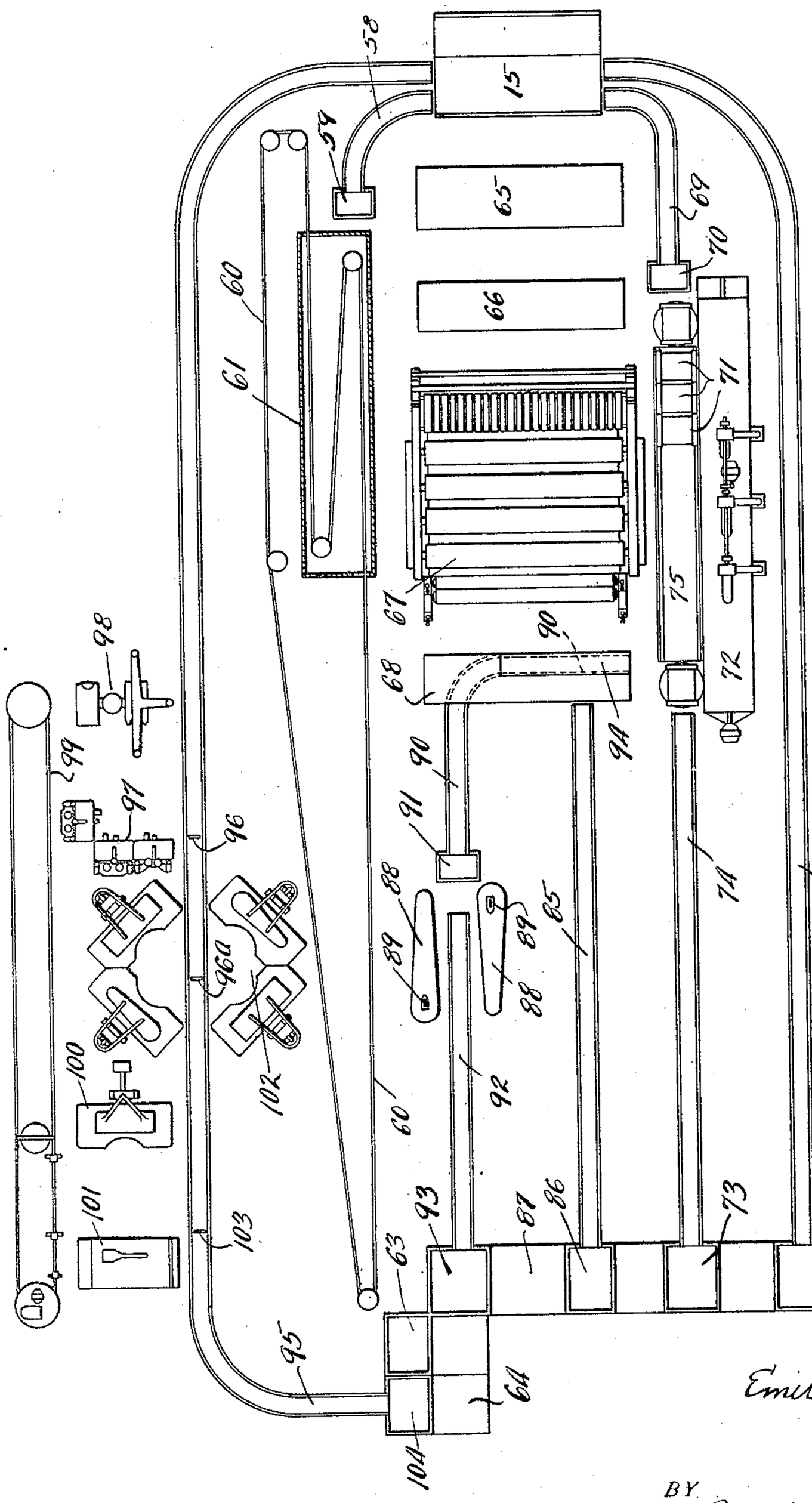


Fig. 2

Emil J. Carroll,
INVENTOR

BY Brockett & Hyde
ATTORNEYS

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Filed Aug. 7, 1926 3 Sheets-Sheet 3

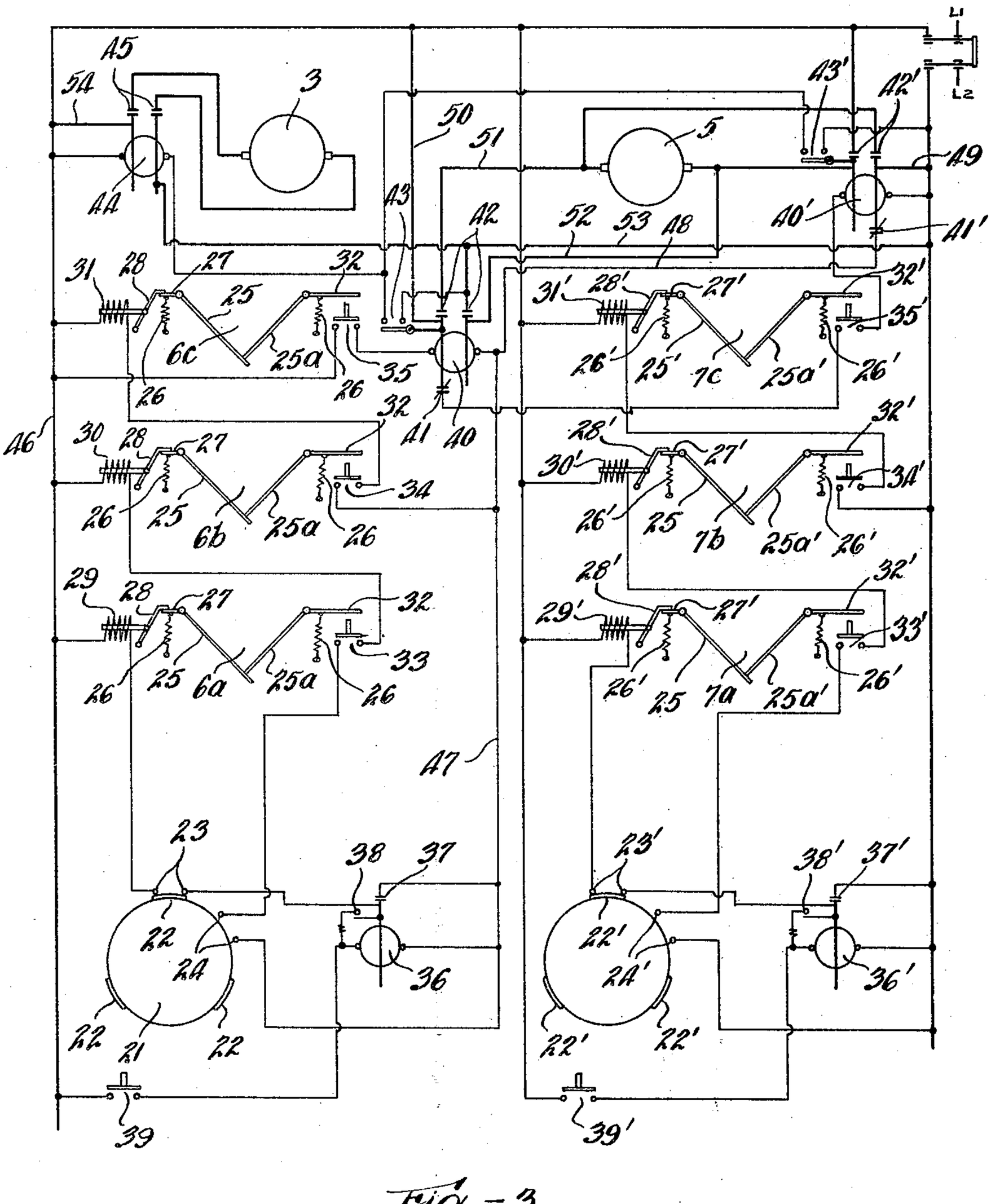


Fig.-3

Emil J. Carroll.
INVENTOR

BY Brockett + Hyde
ATTORNEYS

Patented Aug. 16, 1932 1,871,663

UNITED STATES PATENT OFFICE

EMIL J. CARROLL, OF NORWOOD, OHIO, ASSIGNOR TO THE AMERICAN LAUNDRY MACHINERY COMPANY, OF NORWOOD, OHIO, A CORPORATION OF OHIO

LAUNDRY SYSTEM

Application filed August 7, 1926. Serial No. 127,897.

This invention relates to laundries, and more particularly to a system of laundering wherein the various machines employed as operating units in the laundering process, and the necessary conveying means between machines, are so arranged in relation to each other that the articles to be laundered may progress in the most efficient manner to the completion of the process.

The objects of the invention are, first to provide an arrangement of the various operating units best adapted to take advantage of their characteristics such as their manner of loading and discharging, capacities, and requirements as to space, atmospheric conditions, etc., and also to provide such special auxiliary apparatus as is necessary for best adapting the usual apparatus to this end.

The advantages of my invention will be made apparent from the following description, reference being had to the drawings in which Fig. 1 is a sectional elevation of a four story laundry building with various laundry machines, some appearing in typical section, installed therein according to this invention; Fig. 2 is a plan view of the first floor of the building showing arrangement of the units on this floor; Fig. 3 is an electrical diagram of the feeding means employed in connection with the battery of washing machines used in the invention; Fig. 4 is a side elevation partly in section of the tumbler shown in Fig. 1.

In particular, my invention consists partly in so arranging the various units employed in the process of laundering that generally speaking the articles to be laundered enter the process at the highest elevation and are routed downward therefrom through the various units emerging at the lowest elevation.

More in detail, in Fig. 1, I, II, III, IV indicate the first to fourth floors respectively in the laundry building.

Bundles of articles to be laundered are delivered in bulk to the feeding or classification table 1 on the fourth floor where they are opened and their contents are placed upon the elevating feeding conveyor 2 driven by a motor 3, which feeding conveyor delivers them to a distributing conveyor 4 operated by a motor 5. The distributing conveyor is reversible and selectively feeds from either end into two metering bins 6, 7 each having three compartments 6^a, 6^b, 6^c and 7^a, 7^b, 7^c, from which the work is fed to two washing machines 8, 9 arranged to discharge into the branches of a conveying and storing chute 10 which delivers the work into an extractor 11, from which it is carried by a chute 12 to a continuous drying tumbler 13 delivering through a chute 14 upon a table 15 on the first or finish floor, the apparatus upon which floor will be later described.

The two washing machines 8, 9, shown, may be of any suitable type adapted to have the work fed thereinto by gravity and to discharge the work into a chute. As illustrated the washing machines are alike, each having the customary foraminated cylindrical drum 16 arranged to revolve within a closed tub 17 partly filled with detergent liquid, the drums being divided by three radial and longitudinally extending foraminated partitions into three pockets, each pocket being provided with a circumferentially sliding door 18 adapted to be moved into registry with a loading opening in the tub closed by a loading door 19, or with a dumping or unloading opening closed by an unloading door 20. The doors 19, 20 in the tubs being open and the drums of the two machines being in the positions indicated, Fig. 1, with their near doors 18 open, work may be fed into the upper drum pocket of the machine 8 from the bin 6 by gravity and by moving the drum to the position as shown in machine 9 the work may be allowed to fall by gravity from the corresponding drum pocket into the chute 10.

Loading of the washing machine drums is accomplished by co-ordinated operation of the conveyors and chutes, the control system being illustrated in Fig. 3. Since said controlling system includes in a large measure, like parts for the two washing machines, plain reference numerals will be used for the control circuits and parts for one washing machine, and without specific reference to them in the description, like parts

and circuits for the other washing machine will be designated by like prime numbers.

Each washing machine drum is rotatable synchronously or in timed relation with a pilot or contactor drum 21 provided with three insulated conducting bridges 22 insulated from each other and adapted to cooperate with two sets of contacts 23, 24. The compartments of the bins 6, 7 are of hopper shape formed by hinged leaves, two for each compartment, marked 25, 25ª. Both sets of leaves 25, 25ª are normally moved to closed position by tension springs 26. Leaves 25 are provided with latching arms 27 engaged by latches 28 urged to the latching position shown as by gravity or by a spring not shown, and capable of being moved to unlatching position by solenoids, marked 29, 30, 31 for the three compartments. Each leaf 25ª has an arm 32 adapted upon extreme movement of said leaf toward closed position to engage a button and close a pair of contacts, the contacts for the three compartments being marked respectively 33, 34 and 35. 36 is a single pole relay or magnetic contactor, the pole of which actuates the normally open contacts 37, 38, the latter of which completes a maintaining circuit for the coil of the contactor after the starting button 39 is closed. 40 is a double pole magnetic contactor, having the normally closed contacts 41, normally open contacts 42 and the normally open contacts 43. 44 is a double pole magnetic contactor or relay, having the normally open contacts 45.

Let us assume that washing machine 8, at the left, has completed its washing duty and has been stopped, ready for unloading and reloading. The first operation is to completely unload the washing machine, by opening both the loading and unloading doors in the tub and successively moving the several drum pockets, first to loading position where the pocket door is opened and then to dumping position where the load is discharged, until all pockets are emptied. The drum is now turned to the loading position for one of the compartments, as shown in Fig. 1, in which position the contactor drum 21 occupies the position shown in Fig. 3. Thereupon button 39, Fig. 3, is depressed, closing a circuit from L1 by wire 46, button 39, the coil of relay 36, wire 47, wire 48, normally closed contacts 41′ and wire 49 to L2. Energization of coil 36 closes the contacts 37, 38, completing a circuit from L1 by wire 46, solenoid 29, contact 22, contacts 37 to wire 47 and to L2 and also by contacts 38 and the coil 36 and wire 47 to L2. Contacts 38 complete the maintaining circuit for coil 36 and the energization of solenoid 29 unlatches the leaf 25 of the compartment 6ª and permits the load therein to slide downwardly into the pocket of the washer drum. As soon as released by the load the springs 26 pull the leaves or doors back to the position shown and indeed, leaf 25ª moves back so far as to depress the button and close the contacts 33, but the circuit there closed is not yet effective. Neither is the leaf 25 latched.

The operator now operates the washing machine to move its drum one-sixth ($\frac{1}{6}$) of a revolution or to the dumping position in which one of the bridges 22 bridges contacts 24. As the cylinder starts moving, the circuit through the coil 29 is broken at the contacts 23 and the latch 28 moves over to latch the doors of the compartment 6ª closed. When bridge 22 reaches contacts 24, a circuit is completed through said contacts and through the contacts 33 and also through a second solenoid coil 30, thereby unlatching the leaves of compartment 6ᵇ, the work in which drops to the lower compartment 6ª, depressing leaf 25ª until the circuit is broken at contacts 33. This operation allows the leaves of compartment 6ᵇ to move back to closed position to be latched by the latching effect occurring when coil 30 is deenergized. Leaf 25ª of compartment 6ᵇ moves back so far as to close the contacts 34 and complete a circuit through said contacts and through the solenoid 31, which unlatches the leaves of the compartment 6ᶜ and allows the work therein to drop to the now latched leaves of compartment 6ᵇ, depressing the leaf 25ª thereof, and opening contacts 34 and de-energizing solenoid 31. The leaves of compartment 6ᶜ return to closed position and are latched and the leaf 25ª thereof depresses its button and closes the contacts 35, thereby completing a circuit from L1 by wire 46, contacts 35, the coil of the contactor 40 and by wire 48, normally closed contacts 41′ etc. to L2.

Energization of coil 40 opens the contacts 41 and closes contacts 42 and 43. Closing of contacts 42 completes a motor circuit from L1 by wire 46, wire 50, a contact 42, wire 51, the armature of motor 5, wire 52, a contact 42, a wire 53 to L2. Current flows through the armature of motor 5 in that direction which causes it to drive the conveyor 4 in a direction to feed the work into the compartment 6ᶜ of bin 6. Closing of contacts 43 completes a circuit through the coil of the contactor 44 by wire 46, the coil of said contactor, contacts 43 and wire 53 to L2. Energization of contactor 44 closes contacts 45, completing a motor circuit from L1 by wire 46, wire 54, and contact 45, the armature of motor 3, a contact 45 and wire 53 to L2. Motor 3 therefore drives the elevating conveyor 2 to feed work upon the distributing conveyor 4 from which it is then fed into the compartment 6ᶜ until the leaf 25ª thereof is so depressed as to permit the contacts 35 to open, whereupon the coil of contactor 40 is de-energized and the circuit of motor 5 immediately opened and contactor 44 is de-energized and the circuit of motor 3 is opened.

Thus with movement of the washing machine drum to the intermediate or unloading position the batches of work in the upper two bin compartments each move down one compartment, and the conveyors feed work into the upper compartment until it is filled with the proper weight, whereupon all parts stop automatically and the drum can be advanced to the loading position for the next pocket thereof.

In the same manner the starting button 39 of the washer 9 is depressed whenever it is desired to discharge a load of work into an open pocket of that washer and when the washer drum is moved to the intermediate position the second and third compartments of its bin discharge their loads downwardly, finally energizing the coil of contactor 40 to complete a circuit through motor 5, but through the armature of said motor in the reverse direction from before, and also a circuit from the contactor 44 to complete the circuit of motor 3, as the result of which the feeding operation is produced as before, but in this case feeding the work to the bin 7 instead of to bin 6.

It will be noted that the circuit through the starting button 39 and coil of contactor 36 includes the normally closed contacts 41′ of contactor 40′. Consequently said starting circuit cannot be completed when coil 40′ is energized and the motors are feeding to the compartments of bin 7. The circuit through contacts 35 and coil 40 also includes the normally closed contacts 41′. Also, the circuit through contacts 35′ and the coil of contactor 40 includes the normally closed contacts 41 of contactor 40. Therefore, the control circuits for the two sets of bins are interlocked so that energization of either coil 40 or 40′ to complete proper motor circuits for feeding to one bin or the other renders the other motor starting circuit ineffective and prevents interference by the control circuits on one side with those of the other.

By following the steps described, the operator is enabled to successively load any number of pockets in each washing machine and as each pocket is loaded the batches of work in the bin compartments both descend one step and the upper compartment thus emptied is re-filled. Customarily the two washing machines are operated in staggered or alternate relation, one washing machine being unloaded and reloaded as the other machine performs its washing operation.

Chute 10 leads through the floor IV to the extractor 11 on the third floor, its lower end being closed by a manually operated flap 55. The extractor may be of the form shown in my copending application for dump bottom extractor, filed November 22, 1924, Serial No. 751,559. As shown it consists of a perforated cylindrical basket, rotatable at a high velocity about a vertical axis, as is customary in the art. To load the extractor the operator by pulling on the lever 56 opens the flap 55 sufficiently to allow the desired load to pass from the chute 10 through the open top of the extractor into the extractor basket, which may be rotated slowly to distribute the load being fed into it. The extractor is then started.

Upon completion of the extracting process, the contents of the extracting basket, by raising the cone 57, are allowed to drop into the chute 12 which leads through the third floor and optionally into the chute 14, or into the continuously rotating tumbler 13 and thence into the chute 14. The function of the tumbler is to break up the load passing through it, and the tumbler may be of the form shown in my copending application for drier, filed June 14, 1922, Serial No. 568,257, except that it need have no heating means.

The chute 14 leads to the sorting table 15 on the first floor, where the various articles are sorted and directed to the succeeding steps in the process according to their need and the desired treatment of them.

Referring now to Fig. 2, articles to be dried are placed in the conveyor 58 leading to the bin 59 whence they are placed on hooks carried by a conveyor chain 60 running through the drying room 61. Upon emerging from the drying room these articles progress to a point adjacent a bin 63 beside the wrapping table 64, and are placed in the bin ready to be wrapped with the remaining articles of the same lot.

Large articles to be ironed are placed upon the shaking table 65 by the sorter at the distributing table, whence, after arranging the articles for feeding into the ironer, they are placed upon the feeder 66. These articles are passed from the feeder 66 through the flat work ironer 67 onto the folding table 68. When all of the articles of the bundle have been ironed they are placed on conveyor 85 and delivered to bin 86 and later wrapped on table 87.

Certain articles passed through the flat work ironer require retouching by hand. These are delivered from the table 68 by way of the conveyor 90 to the bin 91, retouched by hand irons 89 on the ironing boards 88, then delivered by the conveyor 92 to the bin 93. Access to conveyor 90 through table 68 is had by raising cover 94.

The flatwork is separated from the body clothes on the table 15, the flatwork being sent to the flatwork ironer for ironing, and the remainder of the bundle is placed on conveyor 95, preferably in a box and delivered to the pressing units. The box is first stopped, by means of a stop 96, at which point the operator for the shirt finishing unit removes all of the shirt and releases the box which is next stopped by means of stop 96ª. The cuffs and neckbands are ironed on the machines 97,

bosoms and yokes ironed on machine 98, and then the operator hangs them on conveyor 99 for delivery to the body ironer 100, where the unironed portions of the shirts are finished. These are again hung on the conveyor and are delivered to the folding table 101 where the shirts are folded. The rest of the body clothes, which have been delivered to the stop 96, are removed by the operator of the pressing machine 102 and ironed thereon.

When the articles in this box have been finished they are returned thereto and the box released and conveyed to the stop 103 where the finished shirts are added and the box being again released is delivered by conveyor 95 to bin 104.

Articles to be tumbler dried are placed upon the conveyor 69 leading to the bin 70, whence the articles are placed within perforated cylindrical containers 71 and pass through the continuous drying tumbler 72. As the cylinders 71 emerge from the tumbler 72 their contents are removed and delivered to the bin 73 by way of the conveyor 74, and the empty cylinders 71 are returned to their starting position by gravity along the inclined track 75. This tumbler may be of the form shown in my prior application for drying machines, filed October 13, 1923, Serial No. 668,353.

If bulk work is being done the articles are delivered from the table 15 directly to bin 83 upon the conveyor 82.

Where the work is being done in nets, the damper 80 is placed in the dash dot position (Fig 1) and the nets are delivered from the extractor directly to the table 15, when the flat work is removed from the nets and placed on table 65. As each net is emptied the articles that were in it are placed on top of the net so that the feeder will know when all of that bundle has been ironed and the net is then passed through the flat work ironer, and dried out. The net thus also acts as a signal to the folder at the other end of the ironer that the entire bundle has been finished.

At the wrapping table the various components of the several laundry bags originally delivered to the table 1 on the fourth floor, are assembled and wrapped ready for delivery. It is apparent from the above that the laundering process, regardless of the variations therein, as for example the optional treatment subsequent to the extracting operation, and especially between the distributing table 15 and the wrapping table, is an approximately continuous one, and at least sufficiently so that the contents of the several original bundles will arrive at the wrapping table very nearly together so that they may be re-assembled and wrapped for delivery in a single bundle with a minimum of identifying effort.

By arrangement of units according to my invention the damp wash and extracting rooms are entirely separated from the finishing room below, decreasing the required ventilation provisions, as well as the possibilities of absorption of moisture by the finished articles.

Further, by this arrangement not only is a minimum of floor space required, owing to the utilization of overhead space, but the usual trucks are entirely unnecessary.

By arrangement of bins as at 10, unequal capacities of units in successive operations of the process may be equalized, and batteries of similar units in parallel may be employed where the individual capacity is below the requirement of the process as a whole. Likewise, where the process is varied for a portion of the articles, smaller units may be employed, as upon the first floor, then upon the second and third floors in the example illustrated.

In my invention the only substantial conveying power required is that necessary to raise the articles to be laundered to the level of the feeding table and thence to the feeding hoppers; the articles progressing in steps to the finishing room by gravity; and handling of the articles in the finishing room being easily accomplished manually in connection with the conveyors indicated since here the bulk passing through the prior steps in the process is necessarily separated into small amounts.

What I claim is:

1. Laundry apparatus, comprising a laundry washing machine having a load-receiving chamber adapted to receive as a load a predetermined batch of laundry work of volume smaller than its own volume, means for metering laundry work into such a predetermined batch, said metering means being located above the floor upon which said washing machine is located, and operator-controlled means for effecting delivery of such a predetermined batch from said metering means to said laundry washing machine, whereby during one laundry washing operation, another predetermined batch of work may be metered out for the following laundry washing operation, with the result that the operation of said laundry washing machine is substantially continuous, interrupted only by the emptying and loading of its chamber, and with the further result that the floor on which the washing machine is located is not cluttered up by laundry work awaiting metering.

2. Laundry apparatus, comprising a laundry washing machine having a plurality of equal-sized, circumferentially arranged load-receiving chambers, each adapted to receive as a load a predetermined batch of laundry work of volume smaller than its own volume, means for metering laundry work into a corresponding number of such predetermined

batches, said metering means being located above the floor upon which said washing machine is located, and operator-controlled means for effecting delivery of such predetermined metered batches from said metering means to said laundry washing machine, whereby during one laundry washing operation, a sufficient number of predetermined batches of laundry work may be metered out for the following laundry washing operations, with the result that the operation of said washing machine is substantially continuous, interrupted only by the emptying and the loading of its chambers, and with the further result that the floor upon which the washing machine is located is not cluttered up by laundry work awaiting metering.

In testimony whereof I hereby affix my signature.

EMIL J. CARROLL.