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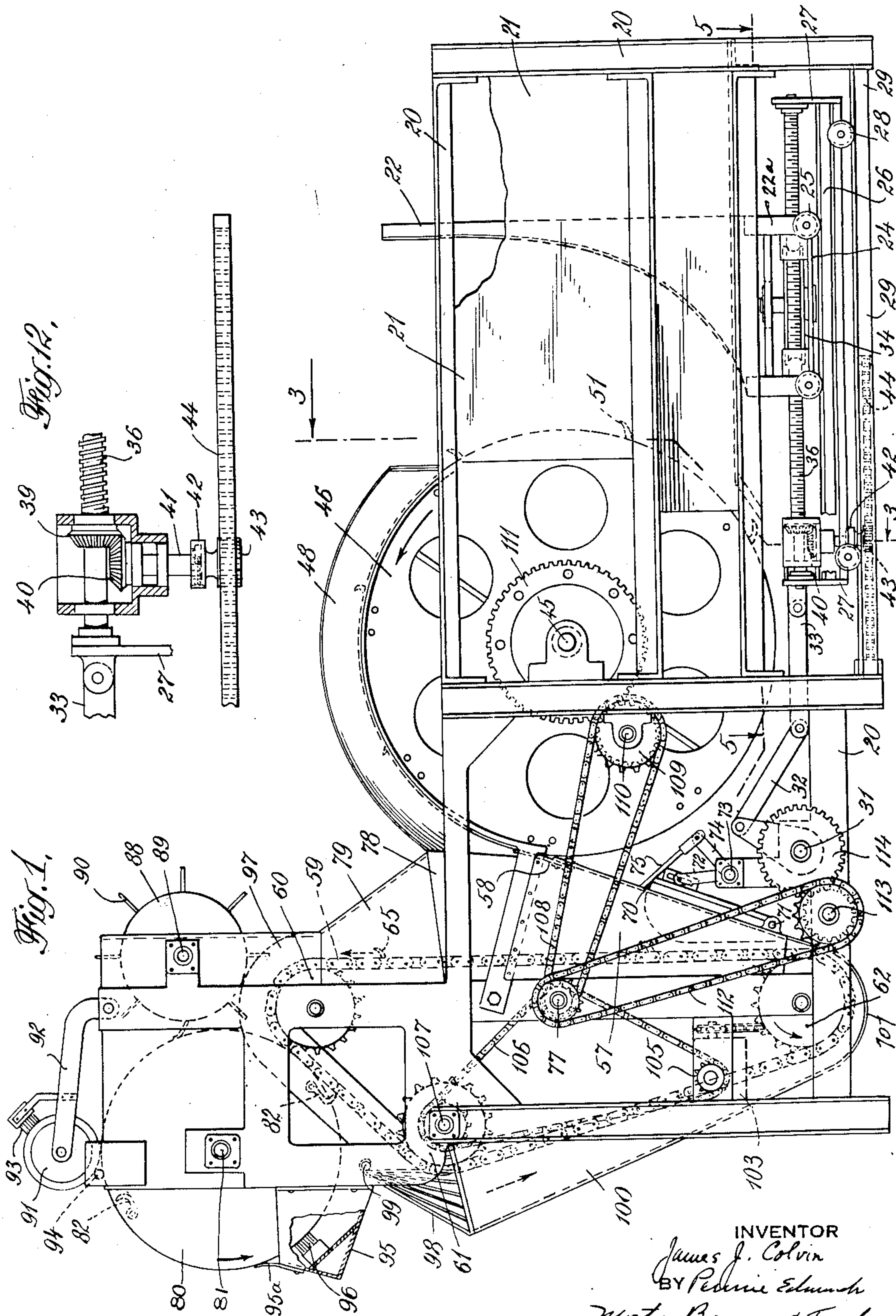
J. J. COLVIN

2,628,704

SOILED TOWEL COUNTER

Filed Aug. 11, 1950

4 Sheets-Sheet 1



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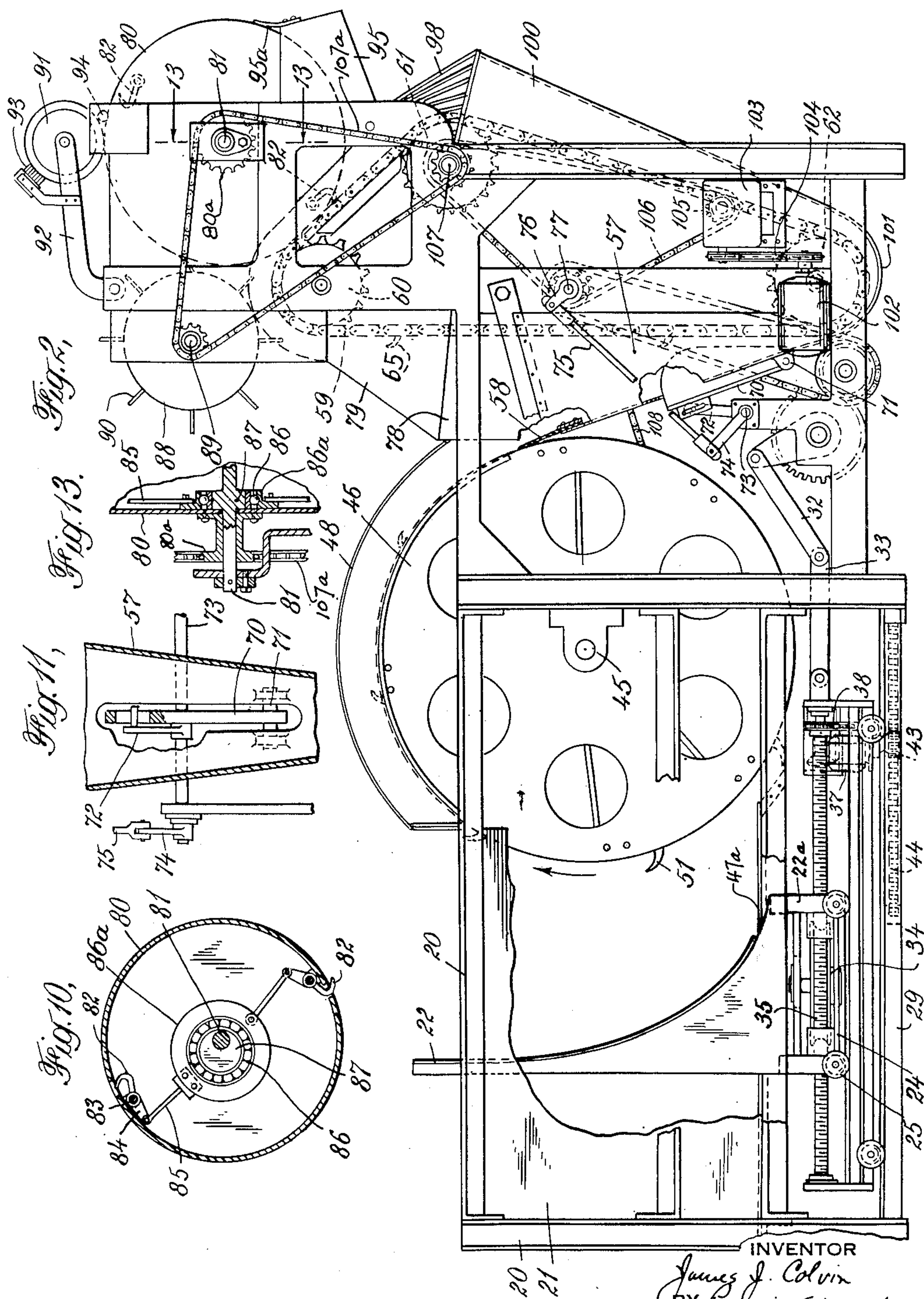
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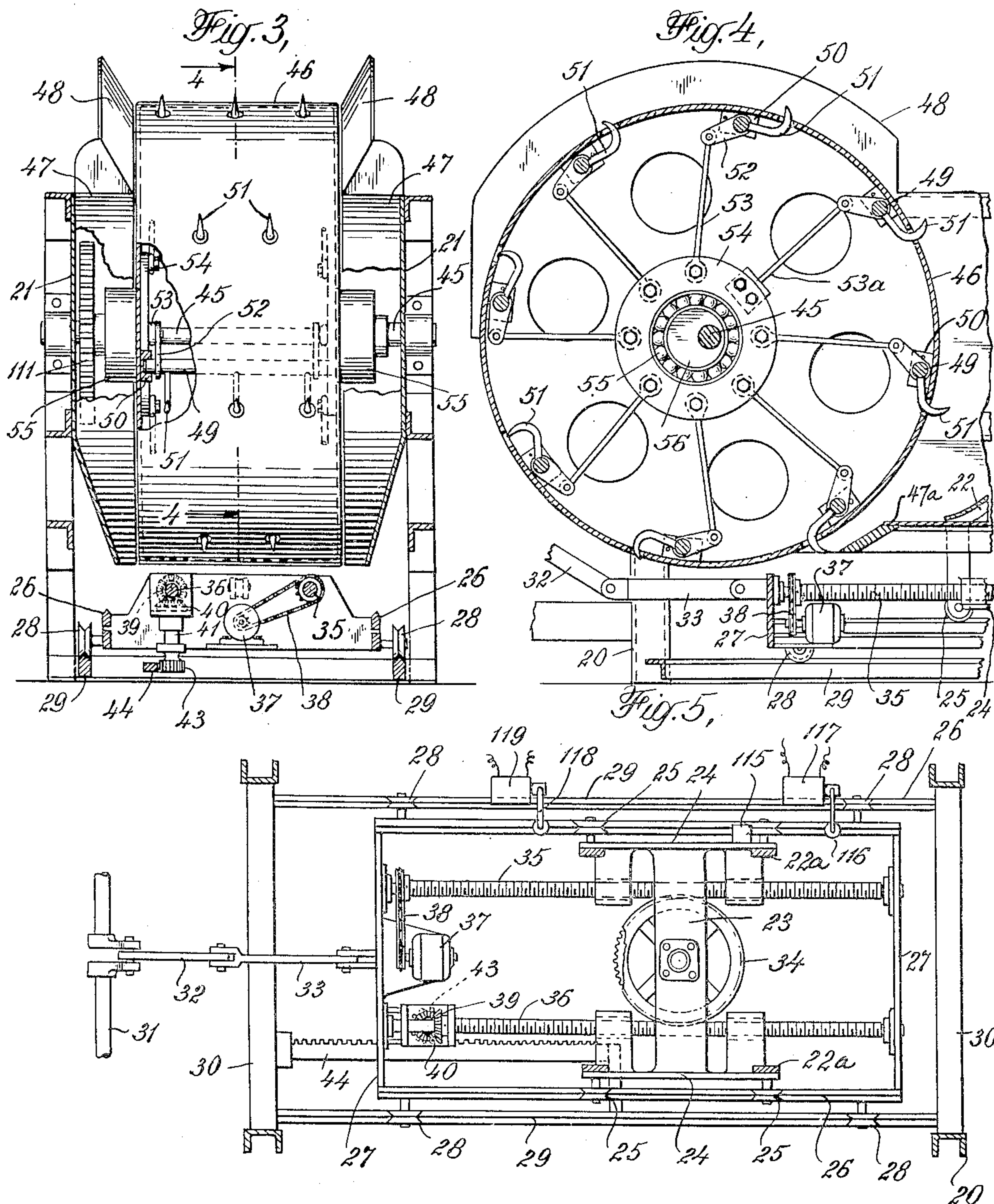
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SOILED TOWEL COUNTER

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4 Sheets-Sheet 3



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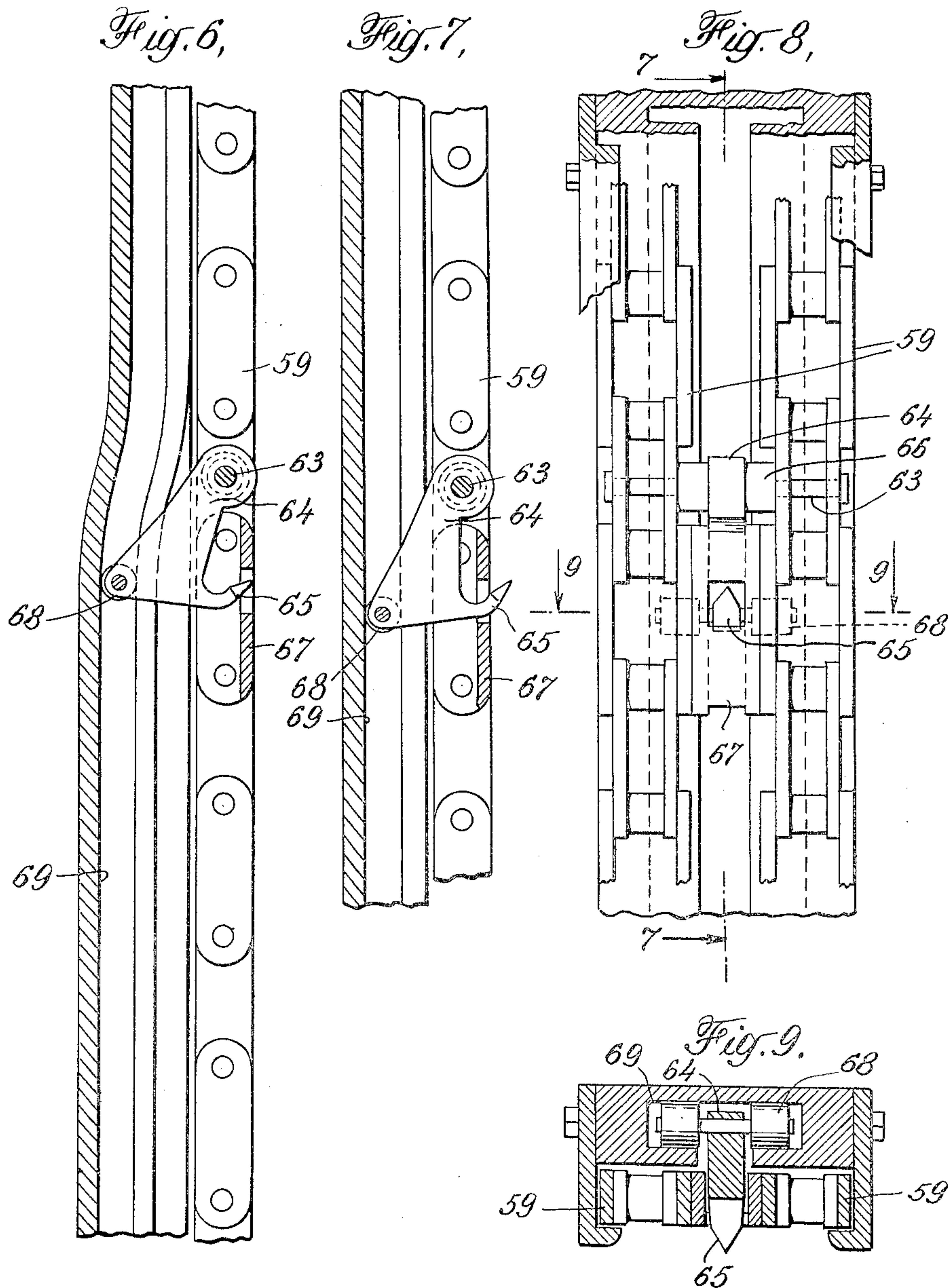
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SOILED TOWEL COUNTER

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,628,704

SOILED TOWEL COUNTER

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20 Claims. (Cl. 198—30)

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This invention relates to apparatus for acting on a mass of articles adherent to one another to separate the articles and deliver them one at a time, so that they can be counted. More particularly, the invention is concerned with novel apparatus of the type described, which is especially adapted for handling soiled textile articles, such as industrial wiping cloths or towels, napkins, diapers, etc., which are supplied to users by service companies and must be disentangled and counted prior to laundering. The new machine performs the functions described at a rapid rate and with a high degree of accuracy, and, in its operation, it requires little attention and few periodic adjustments.

At the present time, various users in quantity of towels and like articles subscribe to services, which deliver a supply of clean towels at intervals and pick up the soiled towels to be laundered for further use. Such soiled towels are commonly returned in large drums or in bundles tied together by a towel or by cord and, as received at the laundry, the towels are usually tangled together in masses and are frequently adherent to one another because of being damp or sticky because of the dirt thereon. Before the soiled towels are laundered, it is important that they be counted, so that the towel service may charge the user with any towels not returned.

The present invention is directed to the provision of a machine, which receives a charge of articles, such as soiled towels tangled together, separates the articles, and delivers them one by one, so that they can be counted. The new machine includes a receptacle for receiving the charge and a conveyor for engaging the charge, removing articles therefrom, and delivering them into a second receptacle. From the second receptacle, the articles are removed by a conveyor having elements, such as hooks, which engage the articles until they have reached a selected point on the conveyor and then release them. At the point referred to, the articles are picked up by elements, such as hooks, on a delivery member and are conveyed past a counting device. The articles being carried by the delivery member to the device are acted on by a beater, which removes from the member any article not firmly held by an element on the member, the articles so removed being returned to the second receptacle. In the machine, the tangled articles are efficiently separated without damage thereto and the chance of more than one article being delivered at a time to the counting device is so small that the machine operates with a high degree of accuracy in the count.

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For a better understanding of the invention, reference may be made to the accompanying drawings, which show one embodiment of the invention in the form of a machine for operation on industrial wiping cloths of such sizes as 18" x 18", 18" x 30", and 18" x 36". In the drawings,

Fig. 1 is a side elevational view of the machine referred to, with parts broken away;

Fig. 2 is a view similar to Fig. 1 but showing the opposite side;

Fig. 3 is a sectional view on the line 3—3 of Fig. 1 with parts broken away;

Fig. 4 is a sectional view on the line 4—4 of Fig. 3;

Fig. 5 is a sectional view on the line 5—5 of Fig. 1;

Fig. 6 is a fragmentary vertical sectional view of one of the conveyors of the machine;

Fig. 7 is a sectional view on the line 7—7 of Fig. 8;

Fig. 8 is a fragmentary front elevational view of the conveyor shown in Fig. 6 and with parts broken away;

Fig. 9 is a sectional view on the line 9—9 of Fig. 8;

Fig. 10 is a sectional view of the delivery wheel;

Fig. 11 is a fragmentary elevational view of the agitator in the second receptacle with parts broken away;

Fig. 12 is a vertical sectional view of the advancing means for the gate carriage; and

Fig. 13 is a sectional view on the line 13—13 of Fig. 2.

The machine illustrated in the drawings is constructed to operate on a charge of soiled towels, which adhere to one another, and disentangles and separates the towels, so that they can be delivered one by one and counted as they are delivered. The machine includes a frame made up of suitable side and end members and, at one end, the frame carries plates 21 which form opposite side walls of a receptacle for the soiled towels. One end of the receptacle is closed by a gate 22, which is attached by bars 22a to a carriage made up of a cross-bar 23 and end members 24 provided with wheels 25 running on rails 26. The rails are connected by cross-bars 27 to form a main carriage provided with wheels 28 running on rails 29 attached to cross-bars 30 of the frame structure. A driven crank shaft 31, mounted in bearings to extend across the frame, is connected by linkage 32, 33 to the adjacent cross-bar 27 of the main carriage. As the shaft is driven, the main carriage is reciprocated and carries the gate carriage with it.

A worm gear 34 is mounted on a vertical shaft freely rotatable in a bearing in the cross-bar 23 of the gate carriage and the gear meshes with worm screws 35, 36 extending between the opposite cross-bars 27 of the main carriage. Screw 35 is rotatable by a motor 37 connected to the screw by a chain 38. Screw 36 carries a bevel gear 39 (Fig. 12) near one end and the gear meshes with a similar gear 40 on a stud shaft 41, which carries the locking element of a directional clutch 42. The floating element of the clutch is secured to a gear 43, which meshes with a rack 44 secured to a cross-bar 30 of the framework and to a rail 29. With this arrangement, when the main carriage moves in one direction, gear 43 rolls on rack 42 and rotates the floating element of clutch 42 without turning stub shaft 41. When the main carriage moves in the opposite direction, the elements of clutch 42 engage, so that the rolling of gear 43 on rack 44 causes rotation of stub shaft 41 and of screw 36. Rotation of screw 36 drives worm gear 34 and causes it to roll on the stationary screw 35, so that the gate carriage is advanced forwardly a short distance on the main carriage, each time the main carriage is reciprocated.

A horizontal transverse shaft 45 mounted in brackets attached to vertical members of the frame carries a drum 46, which serves as a conveyor to raise articles from the receptacle, and the curved surface of the drum lies opposite the gate 22 and forms the central part of the front wall of the receptacle. The face of the drum is narrower than the distance between the side plates 21 and the space between the ends of the drum and the side plates is closed by curved plates 47 lying flush with the surface of the drum at the rear thereof and attached to plates 21. The lower ends of plates 21 are bent inwardly and a plate 47a lies between the inturned portions of the plates and forms the bottom of the receptacle. The plate is slotted for the passage of the connections between the gate and the carriage. At the top of the drum, plates 48 are mounted on the frame on opposite sides of the drum and extend outwardly and upwardly from the ends of the drum at the upper part thereof.

A plurality of shafts 49 are mounted in bearing blocks 50 attached to the inner faces of the ends of the drum near its periphery and each shaft carries a plurality of hooks 51, which are projected through openings in the surface of the drum and withdrawn into the interior of the drum, as the shaft is rocked. Each shaft has an arm 52 attached by a connecting rod 53 to a hub 54 mounted on bearings 55 encircling an eccentric 56 on shaft 45. All the connecting rods but one are pivotally attached to hub 54 and their associated arms 52. The connecting rod 53a is rigidly attached to the hub and acts as a master connecting rod to cause the hub to rotate with the drum. The eccentric is so mounted on shaft 45 that, as the drum rotates counterclockwise, the shafts 49 are so rocked that the hooks are fully projected as they enter the receptacle and fully retracted into the drum 180° later.

Beyond the drum is mounted a second receptacle formed in part by a sheet metal chute 57 attached to vertical members of the frame at opposite sides thereof. The top of the chute lies close to the surface of the drum and a feather-edged leather scraper 58 (Fig. 2) is mounted within the chute and lies with its edge against the surface of the drum.

A conveyor in the form of a double chain 59 is trained about pairs of sprocket wheels 60, 61, and 62 on transverse shafts mounted for rotation in bearings on the framework, and the chain has a vertical stretch rising through the second receptacle. At intervals, the aligned links of the two chains are connected by a bolt 63, on which is pivotally mounted the shank 64 of a hook 65, the shank lying between a pair of collars 66 encircling the bolt between adjacent links of the two chains. The adjacent links on the two chains, which lie next to the rear beyond each bolt 63 are connected by a plate 67 having an opening, through which hook 65 may be projected. The shank 64 of each hook has a pair of rollers 68 traveling in tracks 69 extending along the double chain and behind it and the track is so formed that, as each hook passes beneath sprocket wheels 62, the hook is swung outwardly through its plate 67 and continues in projected position until the hook passes over the top of sprocket wheels 60, whereupon it is retracted.

The chute 57 has a vertical slot near its lower end, through which extends an agitator (Fig. 2) in the form of a plate 70 pivoted in its lower end on a bracket 71 attached to the outer surface of the chute. The agitator is connected by a slot and pin connection to an arm 72 on a shaft 73 mounted in bearings on the side members of the frame. Shaft 73 is provided with another arm 74 connected by a link 75 to a crank arm 76 on a transverse shaft 77 mounted in bearings on the framework. As shaft 77 rotates, the agitator reciprocates through the slot in the chute toward and away from the vertical stretch of the double chain 59.

A pair of plates 78 extend forwardly from the forward ends of plates 48 to the vertical members of the frame, to which the edges of chute 57 are connected, and side plates 79 are mounted above plates 78 to shield the upper part of chain 59.

A rotary delivery or doffing wheel 80 is mounted on a fixed transverse shaft 81 supported on the framework and the wheel is provided with a pair of hooks 82, which may be projected through openings in the surface of the wheel or retracted in it. The hooks 82 are mounted on shafts 83 supported in bearings attached to the ends of the wheel and each shaft has an arm 84 connected by a connecting rod 85 to a hub 85a. One of the connecting rods is rigidly attached to the hub to act as a master connecting rod and cause the hub to rotate with the drum and the hub runs on bearings 86 encircling an eccentric 87 fast on shaft 81. The surface of wheel 80 lies close to the stretch of the double chain passing from sprocket wheels 60 to sprocket wheels 61 and the arrangement of the eccentric is such that each hook is fully projected from wheel 80 at the point where the hook lies nearest to the chain on its approach thereto and is fully retracted 180° later.

A beater wheel 88 is mounted on a transverse shaft 89 in bearings on the frame and it is provided with a plurality of flexible beating members 90 projecting from its surface in position to bear against the surface of the delivery wheel 80, as the beater wheel rotates. A pressure roll 91 is mounted for rotation in the ends of arms 92 pivoted to the framework and rests upon the surface of the delivery wheel 80. A stiff bristle brush 93 is mounted on arms 92 to bear against the surface of the pressure roll and to prevent fiber, yarn, or similar foreign material from collecting on the pressure roll.

Towels carried by the delivery wheel 80 be-

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neath the pressure wheel 91 are counted by an electronic counting device, one part 94 of which is mounted on the frame at one side of the delivery wheel just beyond its line of contact with the pressure wheel. The counting device is of the type which operates to count one unit each time a light beam traveling across the delivery wheel close to the surface thereof is interrupted.

A bracket 95 is mounted on the framework adjacent the surface of the delivery wheel approaching bottom center and the bracket carries a cleaning brush 96 bearing on the surface of the delivery wheel. The part of the delivery wheel approaching the conveyor chain 59 and receding therefrom lies between two side plates 97 similar to plates 48 and lying on opposite sides of the upper part of the chain and the stretch between sprocket wheels 60 and 61. The beater members 90 on wheel 88 extend through the space between the two side plates. A cage 98 is mounted at its upper end on a rod 99 extending across the frame and the lower end of the cage is attached to the upper end of a chute 100 which partially encloses the stretch of chain 59 between sprocket wheels 61 and 62. Beneath sprocket wheels 62, there is a cage 101 attached at one end to the lower end of chute 100 and at the other to the bottom of chute 57.

The machine is driven by a motor 102 (Fig. 2) mounted on the frame and driving the input shaft of a gear reduction box 103 through a belt or chain 104. The output shaft of the box carries a sprocket wheel 105 connected by a chain 106 to a sprocket wheel on shaft 107 to which sprocket wheels 61 are fast. Chain 106 also drives a sprocket wheel on shaft 77, which carries a pair of sprocket wheels, one of which is connected by a chain 108 to a sprocket wheel 109 on a shaft 110 provided with a gear meshing with a gear 111 fast to drum 46. The third sprocket wheel on shaft 77 is connected by a chain 112 to a sprocket wheel on a shaft 113, which carries a gear meshing with a gear 114 on shaft 31. Shaft 107 is connected by a chain 107a to a sprocket wheel on the shaft 39 of the beater wheel and to a sprocket wheel 80a secured to the delivery wheel 80.

At the start of operation of the machine, the gate carriage has been moved to its rearmost position on the main carriage by operation of motor 37, which has rotated screw 35 and caused worm gear 34 to roll along screw 36, until a trip block 115 on the gate carriage has struck the operating arm 116 of a switch 117 operating to shut off motor 37. The gate 22 is then at the limit of its rearward motion and a charge of towels is deposited in the first receptacle defined by the gate, the side plates 21, drum 46, etc. As the drum rotates, the hooks mounted therein are projected as they enter the bottom of the receptacle and the hooks, accordingly, engage the charge of towels. The reciprocating motion of gate 22 is synchronized with the travel of the hooks, so that the charge of towels is pressed against the drum 46, when the hooks are in the most effective position to engage the towels. The gate then recedes from the drum, so that the hooks can raise the towels engaged thereby free of the charge. On each backward motion of the main carriage, the gate carriage is advanced along the main carriage a short distance, so that the gate will more effectively press the charge against the drum, as the size of the charge decreases.

The single towels and groups of towels carried

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out of the first receptacle by the drum are released by the drum hooks at the top of the drum and are discharged from the drum into the second receptacle formed in part by chute 57, the scraper 58 insuring that all towels will be released from the drum. The towels in the second receptacle are agitated by the agitator 70, which is synchronized with the travel of hooks 65 on the double conveyor chain. These hooks are projected beyond the chain, as they enter the bottom of the second receptacle, and they engage towels in that receptacle and raise them over the top of sprocket wheels 60, at which point the hooks recede into the space between the chains. The towels are then carried along by the chains to be removed therefrom by the hooks 82 on the doffing wheel 80. At the place where the doffing wheel lies closest to the chains, the hooks on the wheel are moving in a direction opposite to that of the chain and the wheel hooks pick up towels lying on the chain and raise them to the place, where the towels are struck by the beating elements on the beater wheel 88. Any towels not firmly gripped by hooks 82 are knocked from the delivery wheel by the beating elements and are dropped back into the second receptacle or else pass down along the chain and drop to the bottom of chute 100, whence they are picked up by the hooks on the chain and raised into and through the second receptacle. The action of the beater wheel insures that only a single towel will be carried by each hook 82 on the delivery wheel and, as that towel is carried to the top of the delivery wheel, its hook is retracted into the wheel, and the towel is pressed against the surface of the delivery wheel by pressure wheel 91. Beyond wheel 91, the towel breaks the beam of the counting device, is counted, and is carried along and discharged by the delivery wheel. Any towels adhering to the delivery wheel are removed by a leather scraper 95a mounted on bracket 95 and lying in contact with the delivery wheel.

As the operation proceeds, the movement of the gate carriage along the main carriage reduces the size of the first receptacle so that the hooks on the first conveyor 46 will more effectively engage and remove towels from the charge. When the gate carriage has moved forward to the limit of its desired movement, trip block 115 engages the operating arm 118 of a switch 119, which starts motor 37 operating to move the gate carriage to its initial position at the rear of the main carriage. The machine is then ready to receive another charge of towels.

In the new machine, the soiled articles are disentangled and separated from one another in successive stages with the first two stages carried on in the receptacles by the operation of the conveyors. The final separation is effected in part by the action of the delivery wheel, which rapidly removes the articles from the chain conveyor with a change in the direction of their movement, and in part by the beater elements, which knock from the delivery wheel any articles not firmly held by the wheel hooks but being carried along by adhesion. The quick reversal in direction of the articles being taken from the chain conveyor by the delivery wheel hooks is similar in effect to shaking the articles and such action plus that of the beater elements causes the articles to be fed singly to the counter and counted with so low a percentage of error as to be negligible.

I claim:

1. Apparatus for acting on a mass of articles.

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which adhere to one another, and delivering the articles separately, which comprises a receptacle for a charge of articles, a conveyor for engaging the charge in the receptacle and removing portions thereof successively, a second receptacle receiving articles from the conveyor, a second conveyor for engaging articles in the second receptacle and removing them therefrom, a moving delivery member adjacent the second conveyor and having elements operating to engage articles carried by the second conveyor and to remove said articles from said second conveyor with a change of direction, and beating means for removing from the member articles not firmly held by said elements and returning them to the second receptacle.

2. Apparatus for acting on a mass of articles, which adhere to one another, and delivering the articles separately, which comprises a receptacle for a charge of articles, a second receptacle spaced from the first, a conveyor having a portion traveling in contact with the charge in the first receptacle, the conveyor being provided with elements operating to engage and carry along articles from the first receptacle for discharge into the second receptacle, a second conveyor having a portion traveling in contact with the articles in the second receptacle, the second conveyor being provided with elements operating to engage articles in the second receptacle, carry them along for a part of the travel of the second conveyor, and then release them, a moving delivery member having elements operating to engage articles carried by said second conveyor after being released by said elements on said conveyor and to carry said articles away from said second conveyor and then discharge the articles, and means engaging articles carried along with the member and operating to disengage articles not firmly held by the elements on the member.

3. Apparatus for acting on a mass of articles, which adhere to one another, and delivering the articles separately, which comprises a receptacle for a charge of articles, a second receptacle spaced from the first, a conveyor having a portion traveling in contact with the charge in the first receptacle, the conveyor being provided with elements operating to engage and carry along articles from the first receptacle for discharge into the second receptacle, means operating on the charge in the first receptacle for intermittently forcing the charge against said portion of the conveyor, a second conveyor having a portion traveling in contact with the articles in the second receptacle, the second conveyor being provided with elements operating to engage articles in the second receptacle, carry them along for a part of the travel of the second conveyor, and then release them, a moving delivery member having elements operating to engage and carry along articles carried by said second conveyor after being released by said elements on said conveyor and then discharge said articles at a place removed from said second conveyor, and means engaging articles carried along with the member and operating to disengage articles not firmly held by the elements on the member.

4. Apparatus for acting on a mass of articles, which adhere to one another, and delivering the articles separately, which comprises a receptacle for a charge of articles, a second receptacle spaced from the first, a drum having a portion of its curved surface closing the part of the first receptacle, the drum being provided with hooks

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operating to engage and carry along articles from the first receptacle for discharge into the second receptacle, a second conveyor having a portion traveling in contact with the articles in the second receptacle, the second conveyor being provided with elements operating to engage articles in the second receptacle, carry them along for a part of the travel of the second conveyor, and then release them, a moving delivery member having elements operating to engage and carry along articles carried by said second conveyor after being released by the elements thereon and then discharge the articles, and means engaging articles carried along with the member and operating to disengage articles not firmly held by the elements on the member.

5. Apparatus for acting on a mass of articles, which adhere to one another, and delivering the articles separately, which comprises a receptacle for a charge of articles, a second receptacle spaced from the first, a conveyor having a portion traveling in contact with the charge in the first receptacle, the conveyor being provided with elements operating to engage and carry along articles from the first receptacle for discharge into the second receptacle, a second conveyor having a portion traveling in contact with the articles in the second receptacle, the second conveyor being provided with elements operating to engage articles in the second receptacle, carry them along for a part of the travel of the second conveyor, and then release them, a delivery wheel having elements operating to engage and remove from the second conveyor articles released by the elements on said conveyor and then discharge the articles, a rotary beater provided with means striking articles carried along by the wheel and dislodging articles not firmly held by the wheel elements, and means counting articles being carried along by the wheel beyond the beater.

6. Apparatus for acting on a mass of articles, which adhere to one another, and delivering the articles separately, which comprises a receptacle for a charge of articles, a second receptacle spaced from the first, a drum having a portion of its curved surface closing one end of the first receptacle, hooks mounted within the drum for projection and retraction through openings in the curved surface of the drum, means for projecting the hooks to cause them to engage and remove articles from the first receptacle and retracting the hooks to cause the engaged articles to be discharged into the second receptacle, a second conveyor having a portion traveling in contact with the articles in the second receptacle, the second conveyor being provided with elements operating to engage articles in the second receptacle, carry them along for a part of the travel of the second conveyor, and then release them, a moving delivery member having elements operating to engage and carry along articles released by the second conveyor and then discharge the articles, and means engaging articles carried along with the member and operating to remove from said member articles not firmly held by the elements on the member and to return the articles removed from the member to the second receptacle.

7. In apparatus for acting on a mass of articles, which adhere to each other, and delivering the articles, the combination of a receptacle for a charge of the articles, a second receptacle spaced from the first, a traveling conveyor having a portion closing one end of the first receptacle, a plurality of elements mounted on the

conveyor and projectable therefrom to engage articles in the charge and retractable to release such articles for discharge into the second receptacle, and a gate closing the opposite end of the first receptacle and reciprocating to compress the charge intermittently against said portion of the conveyor.

8. In apparatus for acting on a mass of articles, which adhere to each other, and delivering the articles, the combination of a receptacle for a charge of the articles, a second receptacle spaced from the first, a drum mounted for rotation with its curved surface closing one end of the first receptacle, a plurality of hooks mounted within the drum and projectable through openings in the curved surface of the drum and retractable into the drum, means for projecting the hooks, as the hooks approach the charge, to engage articles and to retract the hooks, as they approach the second receptacle, to release the articles, a gate closing the other end of the first receptacle, and means for reciprocating the gate to compress the charge intermittently against the drum.

9. In apparatus for acting on a mass of articles, which adhere to each other, and delivering the articles, the combination of a receptacle for a charge of articles, a traveling conveyor having a portion closing one end of the receptacle, a plurality of elements mounted along the conveyor for projection beyond the surface of the conveyor and retraction within it, means for projecting the elements from the conveyor as they enter the receptacle and for retracting the elements at a point beyond the receptacle, the projected elements engaging and carrying along articles from the charge, a gate closing the other end of the receptacle, and means for reciprocating the gate toward and away from the drum to compress the charge intermittently against the portion of the drum from which the elements project.

10. In apparatus for acting on a mass of articles, which adhere to each other, and delivering the articles, the combination of a receptacle for a charge of articles, a drum mounted for rotation on a horizontal axis and closing one end of the receptacle, a plurality of hooks pivotally mounted within the drum and projectable and retractable through openings in the drum, means for projecting the hooks from the drum at the lower end of the receptacle and for retracting the hooks near the top of the drum, a gate closing the other end of the receptacle, and means for reciprocating the gate to compress the charge intermittently against the drum.

11. In apparatus for acting on a mass of articles, which adhere to each other, and delivering the articles, the combination of a receptacle for a charge of articles, a traveling conveyor having a portion closing one end of the receptacle, a plurality of elements mounted along the conveyor for projection beyond the surface of the conveyor and retraction within it, means for projecting the elements from the conveyor as they enter the receptacle and for retracting the elements at a point beyond the receptacle, the projected elements engaging and carrying along articles from the charge, a gate closing the other end of the receptacle, a carriage, on which the gate is mounted, and means for reciprocating the carriage to cause the gate to compress the charge intermittently against the conveyor.

12. In apparatus for acting on a mass of articles, which adhere to each other, and delivering the articles, the combination of a receptacle

for a charge of articles, a traveling conveyor having a portion closing one end of the receptacle, a plurality of elements mounted along the conveyor for projection beyond the surface of the conveyor and retraction within it, means for projecting the elements from the conveyor as they enter the receptacle and for retracting the elements at a point beyond the receptacle, the projected elements engaging and carrying along articles from the charge, a gate closing the other end of the receptacle, a carriage, on which the gate is mounted, means for reciprocating the carriage to cause the gate to compress the charge intermittently against the conveyor, and means for moving the gate stepwise along the carriage toward the drum, one step for each reciprocation of the carriage.

13. In apparatus for acting on a mass of articles, which adhere to each other, and delivering the articles, the combination of a receptacle for a charge of articles, a traveling conveyor having a portion closing one end of the receptacle, a plurality of elements mounted along the conveyor for projection beyond the surface of the conveyor and retraction within it, means for projecting the elements from the conveyor as they enter the receptacle and for retracting the elements at a point beyond the receptacle, the projected elements engaging and carrying along articles from the charge, a gate closing the other end of the receptacle, a carriage, on which the gate is mounted, means for reciprocating the carriage to cause the gate to compress the charge intermittently against the conveyor, means for moving the gate stepwise along the carriage toward the drum, one step for each reciprocation of the carriage, and means operating when the gate has advanced a selected distance on the carriage, for returning the gate to its initial position on the carriage.

14. In apparatus for acting on a mass of articles, which adhere to one another, and delivering the articles separately, the combination of a receptacle for a charge of the articles, a conveyor engaging the charge and removing articles therefrom, a second receptacle receiving articles from the conveyor, a second conveyor having a portion traveling through the second receptacle and operable to engage and withdraw articles therefrom, a moving delivery member provided with elements operating to engage and remove articles from the second conveyor, and means engaging articles carried along by the member and operating to disengage articles not held firmly by the elements on the member.

15. In apparatus for acting on a mass of articles, which adhere to one another, and delivering the articles separately, the combination of a receptacle for a charge of the articles, a conveyor engaging the charge and removing articles therefrom, a second receptacle receiving articles from the conveyor, a second conveyor having a portion traveling through the second receptacle and operable to engage and withdraw articles therefrom, a moving delivery member provided with elements traveling in the opposite direction to articles on the second conveyor and operating to engage and remove said articles, and means engaging articles carried along by the member and operating to disengage articles not held firmly by elements on the member.

16. In apparatus for acting on a mass of articles, which adhere to one another, and delivering the articles separately, the combination of a receptacle for a charge of the articles, a con-

veyor engaging the charge and removing articles therefrom, a second receptacle receiving articles from the conveyor, a conveyor chain having a stretch traveling through the second receptacle, a plurality of hooks mounted on the chain and projectable beyond it to engage articles in the receptacle, a rotary delivery wheel mounted with its periphery close to the chain beyond said stretch and having hooks projectable from its periphery to remove articles from the chain, and means engaging articles being advanced by the wheel and operating to disengage articles not firmly held by the hooks on the wheel.

17. In apparatus for acting on a mass of articles, which adhere to one another, and delivering the articles separately, the combination of a receptacle for a charge of the articles, a conveyor having a portion closing one end of the receptacle and having elements engageable with the charge to raise articles therefrom, a second receptacle receiving articles from the conveyor, a second conveyor having a portion traveling upwardly through the second receptacle, the second conveyor being provided with elements for engaging articles, a doffing wheel mounted for rotation with its periphery close to the second conveyor beyond said portion thereof and traveling in the opposite direction, the wheel having elements for engaging articles on the second conveyor and removing them therefrom, and beating means striking articles on the wheel and removing those not firmly engaged by the elements on the wheel.

18. In apparatus for acting on a mass of articles which adhere to one another, and delivering the articles separately, the combination of a receptacle for a charge of the articles, a conveyor having a portion closing one end of the receptacle and having elements engageable with the charge to raise articles therefrom, a second receptacle receiving articles from the conveyor, a conveyor chain having a stretch rising through the second receptacle, a plurality of hooks mounted on the chain for projection beyond the chain and retraction within the chain, means for causing the hooks to project from said stretch of the chain and to be retracted elsewhere, a doffing wheel mounted with its periphery close to the end of said stretch of the chain, hooks mounted within the wheel and projectable beyond its periphery, means for causing the wheel hooks to project from the wheel as the hooks approach the chain, the wheel hooks traveling in the opposite direction to the chain and removing articles therefrom, and a rotary beater having flexible projections striking articles engaged by the wheel hooks and disengaging articles not firmly held by the wheel hooks.

19. In apparatus for separately delivering articles from a group of mingled articles, the combination of a receptacle containing the group of articles, a conveyor chain having a stretch rising through the receptacle, hooks movably mounted

on the chain for projection beyond the chain and retraction into the chain, means causing the hooks to be projected from the chain throughout said stretch and to be retracted elsewhere, a doffing wheel mounted with its periphery close to the upper end of said stretch of the chain, hooks mounted on the wheel for projection beyond the periphery of the wheel and retraction into the wheel, means for causing the hooks to project from the wheel as they approach the chain, the projected wheel hooks traveling in the opposite direction to the chain and removing articles therefrom, and a rotary beater carrying flexible straps projecting from its periphery and engaging articles held by the wheel hooks, said straps dislodging articles not firmly held by the wheel hooks.

20. Apparatus for acting on a charge of towels adherent to one another and discharging the towels separately, which comprises a receptacle for a charge of towels, a drum rotating on a horizontal axis with the curved surface of the drum forming one end of the receptacle, a plurality of hooks mounted within the drum and projectable and retractable through openings in its periphery, means for rotating the drum to cause its curved surface to rise through the receptacle, means for projecting the hooks from the drum as they enter the receptacle and retracting them as they leave the receptacle, a gate forming the other end of the receptacle and reciprocable to compress the charge intermittently against the drum, a second receptacle receiving towels removed from the charge by the hooks on the drum, a conveyor chain having a stretch rising through the second receptacle, hooks distributed along the chain and projectable beyond the chain and retractable into the chain, means for projecting the hooks from the chain as they enter the second receptacle and retracting the hooks at a point beyond that receptacle, a doffing wheel having hooks operable to engage towels removed from the second receptacle by hooks on the chain and then released by the chain hooks, the adjacent portions of the wheel and chain traveling in opposite directions, and a rotary beater mounted adjacent the wheel and having flexible projections striking towels on the wheel and removing those not firmly held by the wheel hooks.

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