

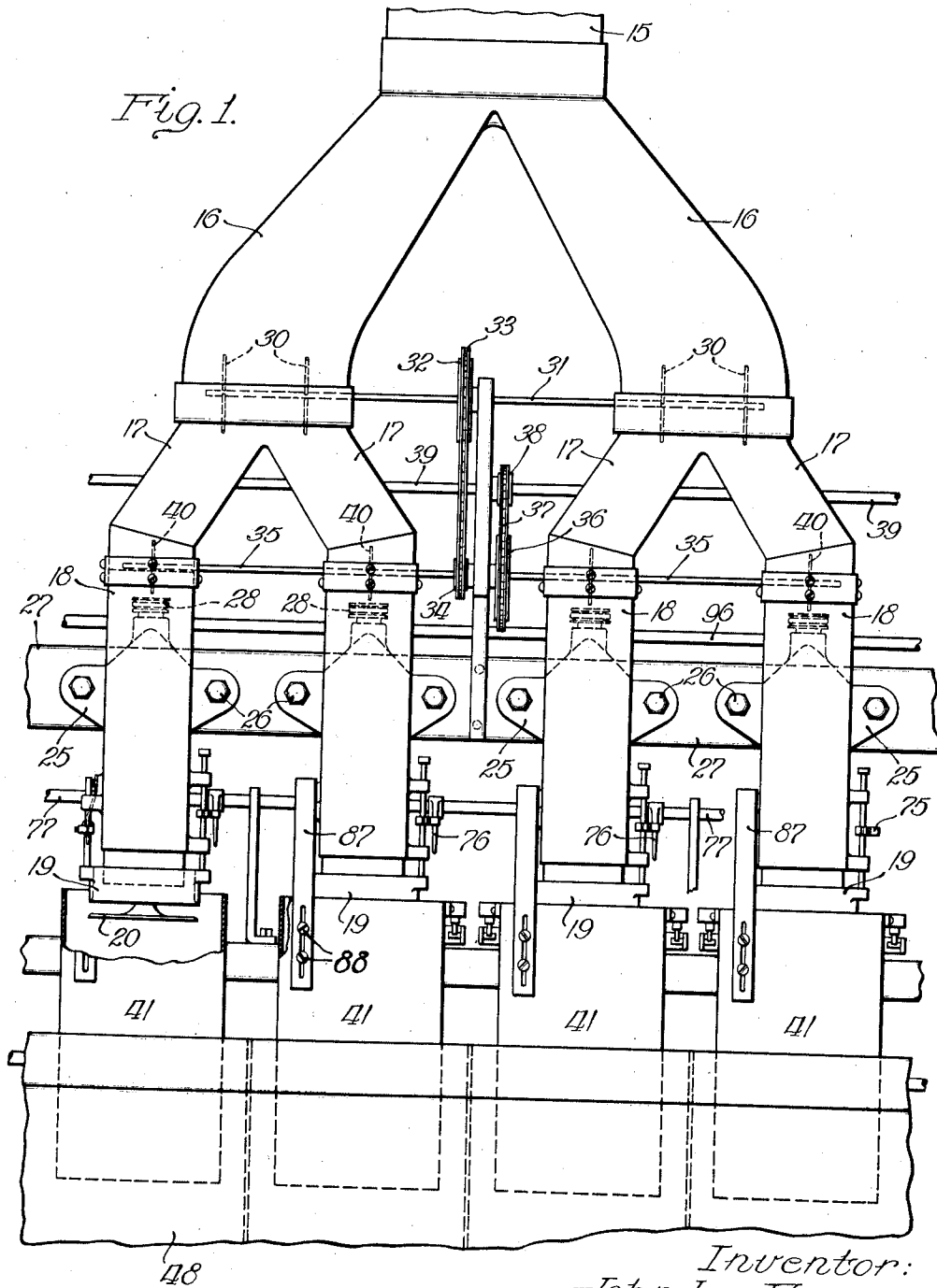
Jan. 7, 1941.

J. L. FERGUSON
PACKAGE FILLING MACHINE

2,227,640

Filed Oct. 26, 1938

5 Sheets-Sheet 1



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Jan. 7, 1941.

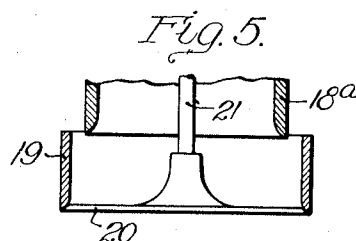
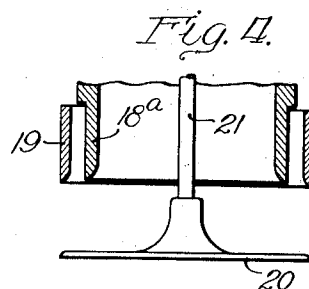
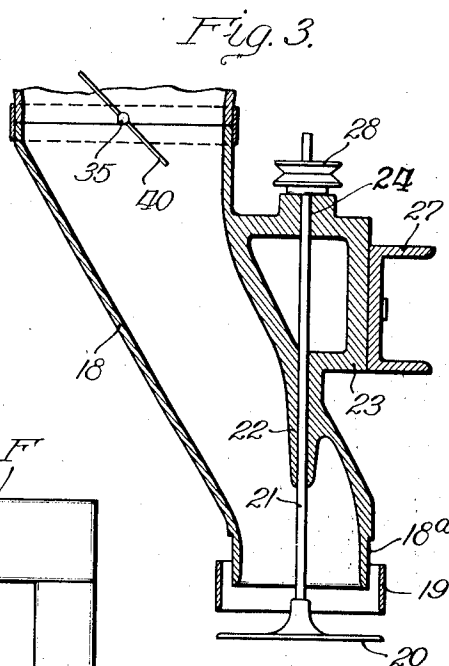
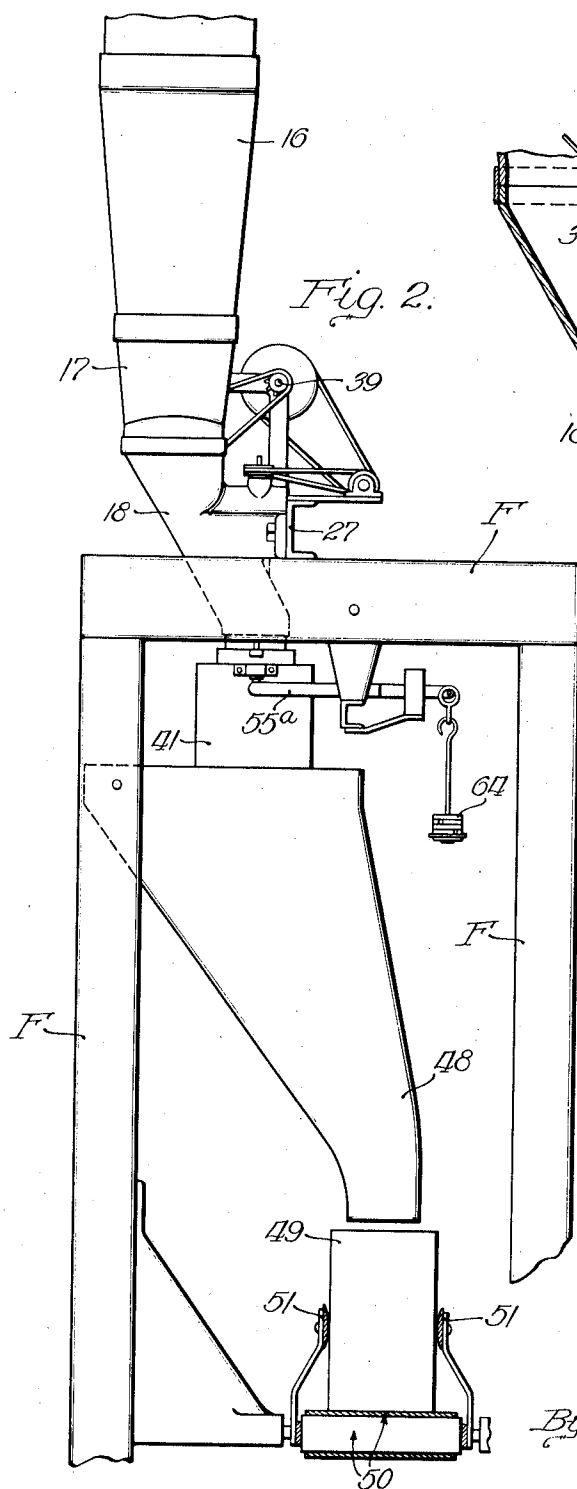
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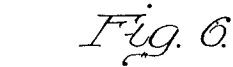
5 Sheets-Sheet 2



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J. L. FERGUSON
PACKAGE FILLING MACHINE

5 Sheets-Sheet 3



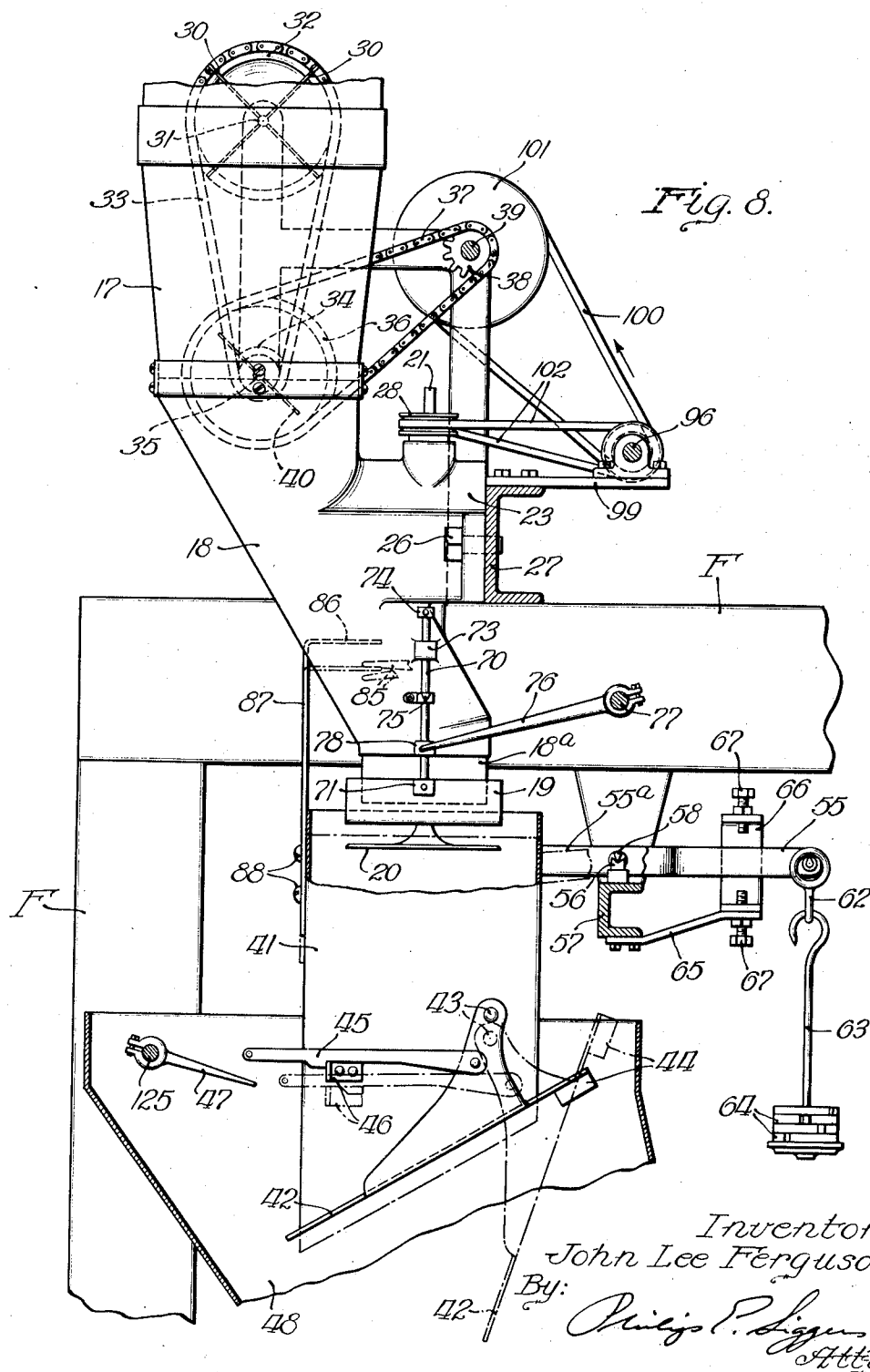
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PACKAGE FILLING MACHINE

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Jan. 7, 1941.

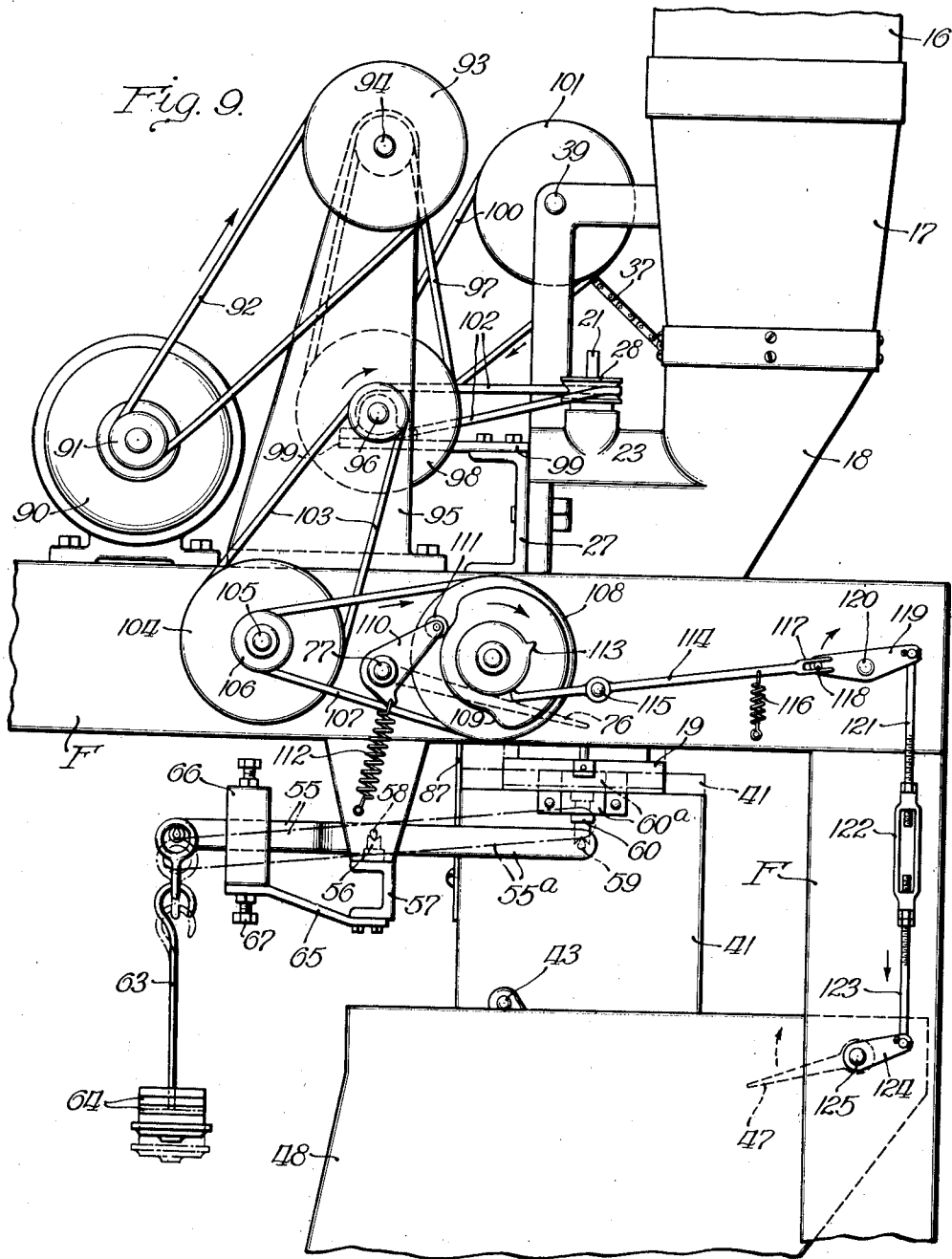
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PACKAGE FILLING MACHINE

Filed Oct. 26, 1938

5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

2,227,640

PACKAGE FILLING MACHINE

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Application October 26, 1938, Serial No. 237,129

8 Claims. (Cl. 249—22)

This invention relates to package filling machines, and among other objects, aims to provide improved feeding mechanism for such machines; the particular objects, advantages and details of construction of the improved mechanism being described in the following specification of a preferred embodiment of the invention.

In the accompanying drawings forming a part of this specification:

Fig. 1 is a fragmentary front elevation of the machine;

Fig. 2 is a fragmentary side elevation of the same, showing a package on a conveyor beneath the filling spout ready to receive the product to be packaged;

Fig. 3 is a vertical section, on an enlarged scale, of the improved gate for controlling feed, shown in partly closed position, some of the parts with which the gate co-operates being shown in elevation and section;

Fig. 4 is a fragmentary vertical section showing the gate in raised or open position for full discharge, the scale being larger than that of Fig. 3;

Fig. 5 is a view similar to Fig. 4 but showing the gate completely closed;

Fig. 6 is a fragmentary side elevation on the scale of Fig. 3, showing the measuring device which receives the product discharged through the gate of Figs. 3, 4 and 5, also showing the gate and some adjacent parts;

Fig. 7 is a horizontal section on line 7—7 of Fig. 6;

Fig. 8 is a fragmentary elevation on the scale of Fig. 6, showing the measuring device, gate and co-operating parts from the other side of Fig. 6; and

Fig. 9 is a fragmentary elevation from the opposite side of Fig. 8, and on the same scale, showing the actuating and driving mechanisms for certain parts of the machine.

Referring particularly to the drawings, there is shown in Fig. 1 part of a package filling machine designed to be used for filling cans, cartons and packages of various sizes, shapes and materials with powdered, flaked, granular and other dry products. That part of the machine shown is capable of filling but four packages at a time, but machines embodying the invention may fill any number of packages from one up to twenty or more, in each cycle of the machine. The product to be packaged is preferably contained in a hopper (not shown) the lower part of which discharges by gravity to a tube 15 from the lower end of which branch tubes 16 lead, said branch

tubes 16 separating and each discharging into two smaller diverging branch tubes 17, the latter each discharging into feed tubes 18. Flow of the product out of the lower end of each feed tube 18 is controlled by an annular valve or gate 19, which is actuated as will be described below. Even, steady feed of the product is promoted by a rotating horizontal disk 20 spaced from the discharge end of each feed tube 18 and having a diameter approximating that of the gate 19. Each disk 20 is mounted on the lower end of a small shaft 21 having a bearing 22 in the wall of the feed tube 18 (Fig. 3), a bracket 23 providing another bearing 24 for shaft 21 and also providing supporting means for the feed tube in the form of two ears 25 (Fig. 1) secured by studs 26 to a beam 27. A grooved pulley 28, driven by mechanism to be described, rotates disk 20.

To assist in feeding the product and prevent packing thereof, rotating pin agitators are used, said agitators comprising a plurality of pins 30 within branch tubes 16 secured to a countershaft 31 driven by a sprocket wheel 32, sprocket chain 33, sprocket wheel 34, countershaft 35, sprocket wheel 36, chain 37, sprocket wheel 38 and power-driven shaft 39 (Figs. 1 and 8), the arrangement being such that shaft 39 drives countershaft 35 at a faster speed than countershaft 31. Countershaft 35 carries pins 40 within the feed tube 18. The slowly rotating pins 30, 40 turn in vertical planes and push the product down the tubes, insuring complete filling of the feed tubes 18 with the product and an even feed past the gates 19.

The product discharged past each of the gates 19 falls into a measuring device or receptacle 41 (Figs. 2, 6, 7 and 8) which is adapted to descend when a predetermined quantity by weight of the product is received by it, thereby cutting off the flow of the product into it. The bottom 42 of receptacle 41 is pivoted as at 43, and has a counterweight 44 normally tending to hold the bottom closed, and hence restoring it to closed position when the measured product contained in the receptacle has been discharged below. Obviously, the cubical contents of the receptacle will be greater than the cubical contents of any package which is to be filled by the machine. A latch 45 engages with a keeper 46 on the side of the receptacle and holds the bottom latched, thus keeping the product in the receptacle until it is desired to dump the product in the package or can. Then a trip 47, actuated by mechanism to be described, disengages latch 45, the bottom 42 swings down, and the product falls into a

chute 48 whose lower end is directly over the open top of a package or can 49. There will be a chute 48 for each receptacle 41, and as many receptacles 41 as there are feed tubes 18. Thus 4, 8, 12, 16 or more packages may be filled during each cycle of the machine, the packages 49 being brought under the filling chutes 48 by a conveyor 50 which is actuated intermittently or step-by-step by known mechanism (not shown) to bring a row of packages under the battery of the filling chutes, and after they are filled, to transport them away for further operations well known in the art and hence unnecessary to describe. The conveyor 50 may have stationary guides 51 on either side to position the packages 49 and hold them from upsetting before, during or after filling.

As best shown in Figs. 6, 7 and 8, the measuring receptacle 41 is suspended at its upper end from a beam 55 pivotally supported on V-shaped bearings 56 carried on a stationary support, shown as a horizontal channel 57 secured to the frame F of the machine. The end of the beam 55 which supports the receptacle is bifurcated to provide a yoke 55a whose arms carry aligned, knife edged pivots 58 received within bearings 56, the extremities of said arms embracing the receptacle 41 and having knife edged pivots 59 entering V-shaped bearings 60 secured to and extending below lugs 60a on opposite sides of the receptacle. The other end of beam 55 carries a pin 61 with a knife edge on its upper face and a clevis 62 is pivoted on pin 61, straddling the end of the beam, an ordinary weight carrier 63 being suspended from the clevis 62 and holding standard weights 64, as in scales. A bracket 65 attached to channel 57 carries a U-shaped clip 66 with adjustable stops for the beam. Thus swinging of the beam in either direction so far as to fall off its pivots is obviated.

Because of the construction just described, the receptacle may reciprocate vertically as the beam swings on its bearings 56, the receptacle rising when empty because of the overbalancing effect of weights 64, and descending when its total weight, including the weight of the product fed into it, is more than that of weights 64 plus carrier 63, etc. Preferably the beam and the weight carrier are of such dimensions and proportions that the beam is perfectly balanced when the receptacle is empty, so that the total mass of weights 64 will give the exact weight of the product which will cause the receptacle to descend from its uppermost position in which it receives the first discharge of the product during that particular cycle of the machine. The first discharge is heavy or rapid because the gate 19 is wide open (Fig. 4), but as the mass of the product in the receptacle approaches the mass of weights 64, the receptacle descends and the gate closes part way (Figs. 3, 6 and 8), thus reducing the discharge to a "dribble," i. e., a very fine stream. When the mass of the product in the receptacle exceeds the mass of weights 64, the beam tilts, the receptacle descends, gate 19 closes (Fig. 5) and the bottom of the receptacle is then unlatched, as previously described, and opens to discharge the product into chute 48.

Referring to Figs. 3, 4 and 5, the gate 19 in all three positions is spaced from the reduced end 18a of the feed tube 18 so that it never comes in contact with the feed tube. In Figs. 6 and 8, the gate is shown as having two upright, parallel guide rods 70 fast to ears 71 projecting from opposite sides of the gate, said guide rods 70 being freely

slidable through perforated ears or lugs 72, 73 integral with feed tube 18 (which may be a casting) and on opposite sides. Thus the weight of the gate tends to drop it to closed position, Fig. 5. One of the guide rods may have its upper end provided with an adjustable collar 74 (Fig. 8) which serves as a stop, as said collar will strike the top of lug 73 when the gate drops to its lowermost position. There may be two of these adjustable stops 74, one on each guide rod, although only one is shown. The guide rod 70 shown in Fig. 8 carries a finger 75 which may be clamped thereto, as shown, so as to permit adjustment of its position, said finger being engaged from beneath by an arm 76 (see also Fig. 9) which is oscillated with its shaft 77 by a power impulse from the prime mover of the machine, as will be explained. Another perforated ear 78 (Fig. 8) may be provided for the guide rod which is lifted by arm 76, just above the reduced end 18a, said ear 78 serving as a stop to limit upward movement of the gate, as well as a guide for the guide rod. As arm 76 moves the adjacent guide rod upwardly, the gate rises and remains in this position (Fig. 4) for full discharge of the product, until released by the arm 76, when it will drop to the position shown in Figs. 3, 6 and 8 (the "dribble feed" position).

To catch the gate as it drops and to hold it in the position of Figs. 3 and 6, a latch 80 is pivoted at 81 on an extension 82 of ear 72, said latch having a counterweight 83 (or its equivalent, a spring, not shown) to hold it in engagement with a finger 84 which is clamped on guide rod 70, and hence is adjustable thereon. Obviously finger 84 will engage the latch 80 to stop closing of the gate, each time the gate is permitted to fall by the arm 76. Said latch 80 has a trip arm 85 adapted to be engaged by a bent end extension 86 of a latch tripping strap 87 adjustably secured by screws 88 to one side of the receptacle 41 and extending straight upwardly therefrom, see also Fig. 1. Thus when the receptacle descends due to the weight of the product discharged into it, latch 80 is swung to release the gate, which in turn drops to closed position (Fig. 5) wherein none of the produce will be discharged from the feed tube 18. No further discharge will take place until the receptacle, after dumping its measured charge of the product, is restored by the weighted beam 55 to its uppermost position, at which instant the arm 76 lifts the gate to its fully open position (Fig. 4).

Nearly all of the foregoing description applies to a single feed tube 18 and associated measuring receptacle, gate and controlling mechanisms. It will be clear from Figs. 1 and 2 that if the maximum filling capacity of the machine is to be realized, all the receptacles must be filled simultaneously; hence the gates should be opened fully at the same instant, must partly close independently of each other and yet approximately together, and must fully close also independently of each other though approximately at the same time. Independent closing of the several gates is essential if the containers 49 are to be given their full weight of the product, which is usually required by law. Then, after a brief pause, only long enough to insure the complete filling of all the receptacles of the battery, there will be simultaneous tripping of the latches controlling the bottoms of the receptacles and the containers will be filled and conveyed away.

To accomplish the simultaneous raising of the gates to full discharge position, which may be

considered as the start of the cycle, and to trip the gate bottoms simultaneously, also to drive the agitator or feeding pins 30, 40, the mechanisms best shown in Fig. 9 may be employed. A motor 90, mounted anywhere on frame F, has a pulley 91 driving a belt 92 passed around a larger pulley 93 fast to a shaft 94 supported on a frame-attached bracket 95. A counter-shaft 96 is driven from shaft 94 by a belt 97 passing around pulley 98, and is supported by bearings carried on a bracket 99, which may be secured to channel 27 as shown. Countershaft 96 drives shaft 39 (which in turn drives the pins 30, 40 as previously described), by means of belt 100 and pulley 101. Each of the pulleys 28, which rotate individually the disks 20, is driven by a belt 102 and a pulley (not shown) fast to countershaft 96.

Countershaft 96 also drives a belt 103 passed around a pulley 104 secured to a shaft 105 supported on frame F. A pulley 106 on shaft 105 drives a belt 107 passing around a cam disk 108 rotatably supported on the frame. On cam disk 108 is a cam 109 with which a cam follower arm 110 co-operates, a roller 111 being on the outer end of said arm 110 for rolling contact with cam 109. Arm 110 is secured to shaft 77, which actuates the several arms 76 (Fig. 8) as previously explained, to hold the several gates 19 in upper or full discharge position, and hence the cam 109 is shaped to cause merely a slight oscillation of shaft 77 during one revolution of the cam disk 108. A spring 112 holds the cam follower in contact with the cam; and as will be understood from the drawings, the gates 19 will be held in upper position (Fig. 4) during more than half of a revolution of the cam disk, affording ample time for complete or "full measure" filling of the several receptacles 41.

Cam disk 108 also has a cam 113 for tripping the bottoms 42 of the measuring receptacles. A rod 114 pivoted as at 115 on frame F has one end in the path of cam 113, as shown, the other end of said rod being held by spring 116 in proper position and having a pin-and-slot connection 117, 118 with one end of a lever 119 rockable in a vertical plane on pivot 120 carried by the frame. The other end of lever 119 is pivotally connected to a rod 121 threaded into a turnbuckle 122 also threaded on rod 123 which is pivotally connected at its lower end to an arm 124 fast to shaft 125. See also Figs. 6, 7 and 8. Thus the latch-tripping arms 47 are actuated simultaneously, at the desired point in the cycle, to dump the receptacles. The angular positions of arms 47 may be changed by turning turnbuckle 122 to vary the effective length of the rods 121, 123, so that the tripping operation may be positive and dependable.

The present invention provides a completely automatic machine which, with slight modifications and changes in proportion, may handle almost any dry powdered, granular, flaky or similar product; which will feed any such product in accurately measured quantities into packages, and convey the packages away; which may have a high capacity, handling a large number of packages in an hour; and which will not choke up, so as to spill the product and delay production. These are the principal objects of the invention.

From the foregoing, it will be clear that if the product chokes the gates, all sorts of trouble and expensive delays would ensue. A special object of this invention is to make such choking prac-

tically impossible. In the first place, the gates are so designed that the product cannot clog their action by "working in" between the gates and the feed tubes, there being a space all around the gates when in their uppermost or full discharge positions (Fig. 4). In the second place, there is a constant centrifugal force throwing the granules, flakes or other dry particles of the product out from the lower end of each feed tube, because of the rapid rotating disk 20. Thirdly, because of the relative positions and dimensions of the gate, the disk and the discharge end of the feed tube, the angle of repose of the product will discharge the product very rapidly as soon as the gate is raised to the position of Fig. 4, but when the gate is lowered to the position of Fig. 3, there will be, for certain products, a modified discharge action as the angle of repose will no longer be effective to force out large quantities of the product, and the product will then be discharged only under the influence of gravity and centrifugal force originating from the spinning disk, which will throw a very fine conical stream of particles against the inner walls of receptacle 41 until the latter trips the latch 80, causing the gate to close completely, as described above. (However, when the gates are closed, there will be a very slight clearance, too small to illustrate in Fig. 5, between the lower edge of each gate and the spinning disk, as actual contact between these parts would generate frictional heat which might injure some products. The clearance is too small to allow any of the product to fall below.) It will be clear that the dribble feed position of Fig. 3 is only suitable for certain products of a rather coarse, flaky nature, which have a high angle of repose. For finer, easier flowing products, the gate must be adjusted to a lower position to feed in a dribble; such an adjustment is easily made by merely shifting finger 84 upwardly on rod 70 (Fig. 6). As the feed into the packages is a "bottle neck," it is highly important that the gate and associated parts be designed, adjusted and operated to obviate choking. This result the described machine achieves.

Many changes may be made in the described machine within the scope of the present invention, and obviously, it is not indispensable that all the features of the invention be used conjointly, since they may be employed advantageously in various combinations and subcombinations.

Having described a preferred embodiment of my invention, what I claim as new and desire to secure by Letters Patent is:

1. A package filling machine comprising, in combination, a measuring receptacle adapted to dump its contents; a tube for conveying the product which is to fill the packages to the measuring receptacle; a gate mounted on the lower end of the tube for vertical movement and having a larger perimeter than the tube so that there is a space between the tube and the gate; a power-driven revolving disk rotatable below the tube on an axis which coincides with the axis of the lower end of the tube, said disk having a diameter larger than that of the tube end; said gate, when closed, being below the tube end and nearly in contact with the revolving disk so that none of the product may pass therebetween; power-actuated means to hold the gate in upper, discharging position and permitting the gate to lower by gravity to check flow of the product; and means to dump the contents of the measuring receptacle when a predetermined amount of the product is received in the measuring receptacle.

2. A package filling machine in accordance with claim 1, wherein the gate is held in a position intermediate the fully open and fully closed positions by a latch mounted on the tube; said receptacle being counterbalanced and being vertically movable relative to the tube responsive to the weight of the product discharged past the gate, and means being provided on the receptacle for tripping said latch when the weight of the product exceeds a predetermined minimum, thereby to permit the gate to close completely.
3. In the package filling machine, the combination of a counterbalanced measuring device; means to deliver a dry product to the measuring device; a gate controlling flow of the dry product into the measuring device; means to delivery by gravity measured amounts of the dry product to a package; means positively actuated by power to open said gate at the beginning of the cycle of the machine, the gate partly closing after a predetermined time interval thereby to reduce the feed of the product to a dribble; means positively locking said gate in the partly closed position; means actuated by movement of said measuring device to cause the gate to close; and means actuated by power to dump the contents of the measuring device into said means to deliver by gravity.
4. In a package filling machine, in combination, a measuring receptacle which is movable freely upwardly and downwardly responsive to the balancing of its weight against weights of known mass; a vertically movable gate adapted to close by gravity; a feed tube whose lower end discharges into the measuring receptacle; said gate surrounding said lower end; means to hold said gate elevated for full discharge, said means releasing the gate after a predetermined time interval; a latch to hold the gate in a position wherein feed is greatly reduced; and means attached to the receptacle and tripping said latch whenever the receptacle descends responsive to a predetermined weight.
5. The invention according to claim 4, wherein there are means to limit both upward and down-

ward movements of the gate, and means to guide the gate and prevent turning or tilting thereof.

6. The invention according to claim 4, wherein the latch is pivoted on the feed tube; and a rod, fast to the gate, has a finger adjustably secured along the length of the rod; said latch engaging said finger to hold the gate in partly closed position, means being provided to move the latch into the path of the finger to insure unfailing engagement of said parts.

7. A package filling machine comprising, in combination, a plurality of feeding tube; a conveyor for bringing a plurality of empty packages to positions under said feeding tubes and for carrying the filled packages away; means for measuring the product delivered to each package; means for dumping the product by gravity from the measuring means; a gate controlling the flow from each feeding tube; power-actuated means to raise and thereby open the gates simultaneously; means to hold the gates in partly closed positions; the gates assuming said partly closed positions automatically upon being released by said power-actuated gate-raising means; and means actuated by movement of the individual measuring means to release the gate-holding means to permit the gates to close completely but independently of each other.

8. In a package filling machine, the combination of a movable measuring device; means to delivery a dry product to the measuring device; a single, unitary gate controlling flow of the dry product into the measuring device; means to open the gate at the beginning of the cycle of the machine, said means permitting the gate partly to close after a predetermined time interval to reduce the feed of the dry product to a dribble; an automatic latch acting to lock the gate in the partly closed position; means directly connected to and actuated by movement of the measuring device to trip said latch thereby to permit said gate completely to close by gravity; and means to dump the contents of the measuring device after complete closing of the gate.

JOHN LEE FERGUSON.

CERTIFICATE OF CORRECTION.

Patent No. 2,227,640.

January 7, 1941.

JOHN LEE FERGUSON.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 4, first column, line 16, claim 3, for the word "delivery" read --deliver--; same page, second column, line 12, claim 7, for "tube" read --tubes--; line 31, claim 8, for "delivery" read --deliver--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 28th day of October, A. D. 1941.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.

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