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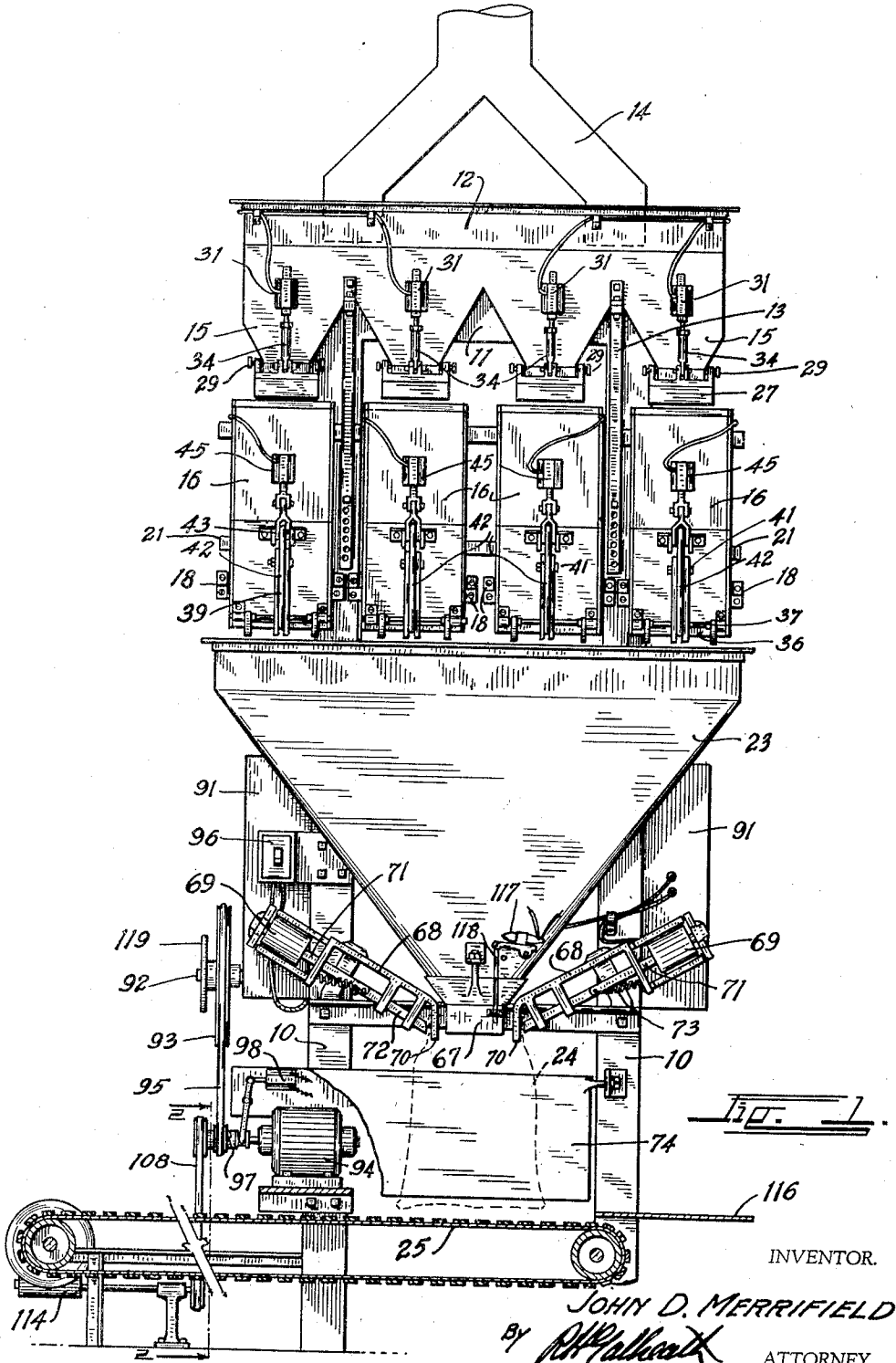
J. D. MERRIFIELD

2,260,718

WEIGHING AND PACKAGING MACHINE

Filed April 13, 1939

5 Sheets-Sheet 1



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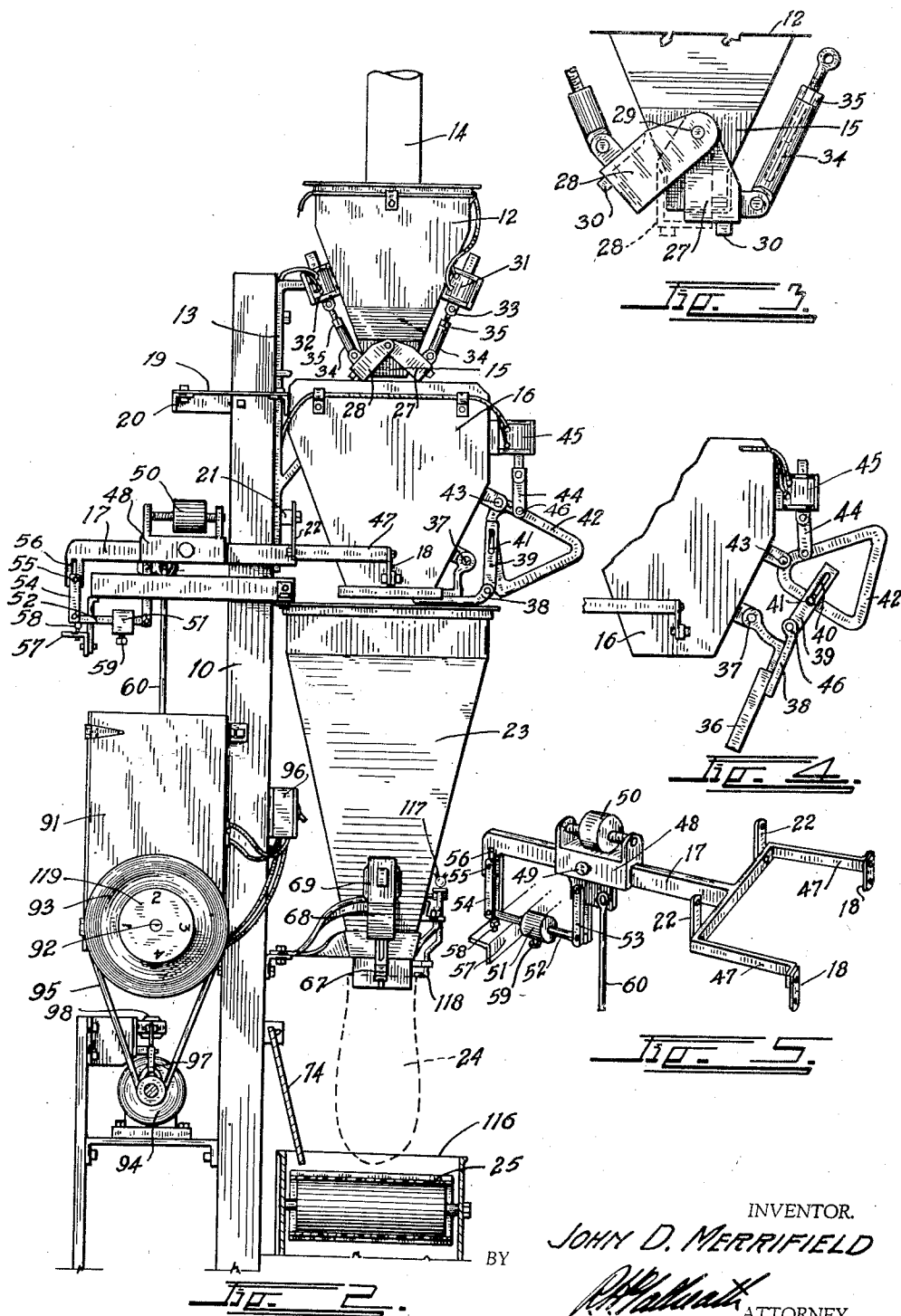
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WEIGHING AND PACKAGING MACHINE

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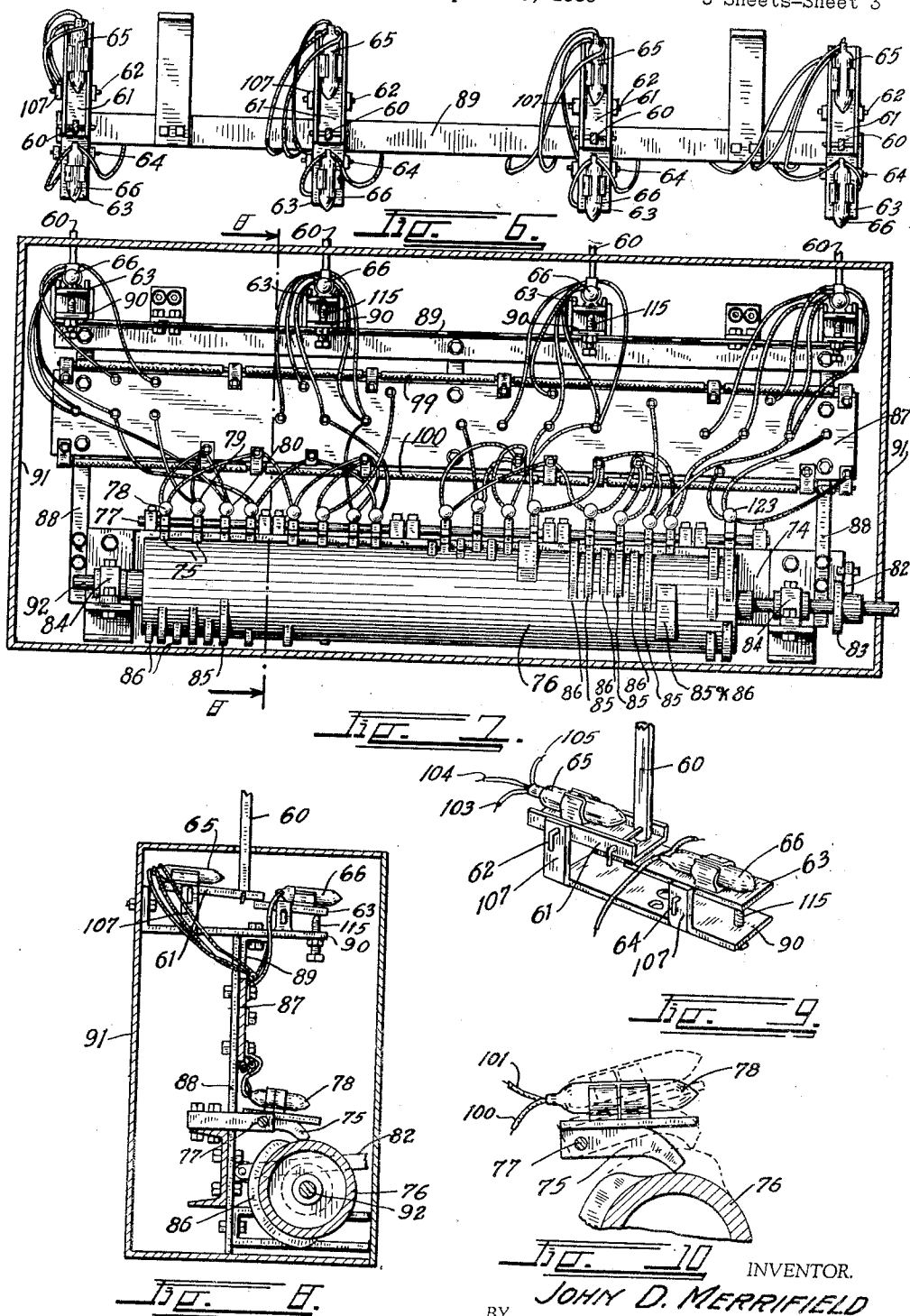
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WEIGHING AND PACKAGING MACHINE

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5 Sheets-Sheet 3



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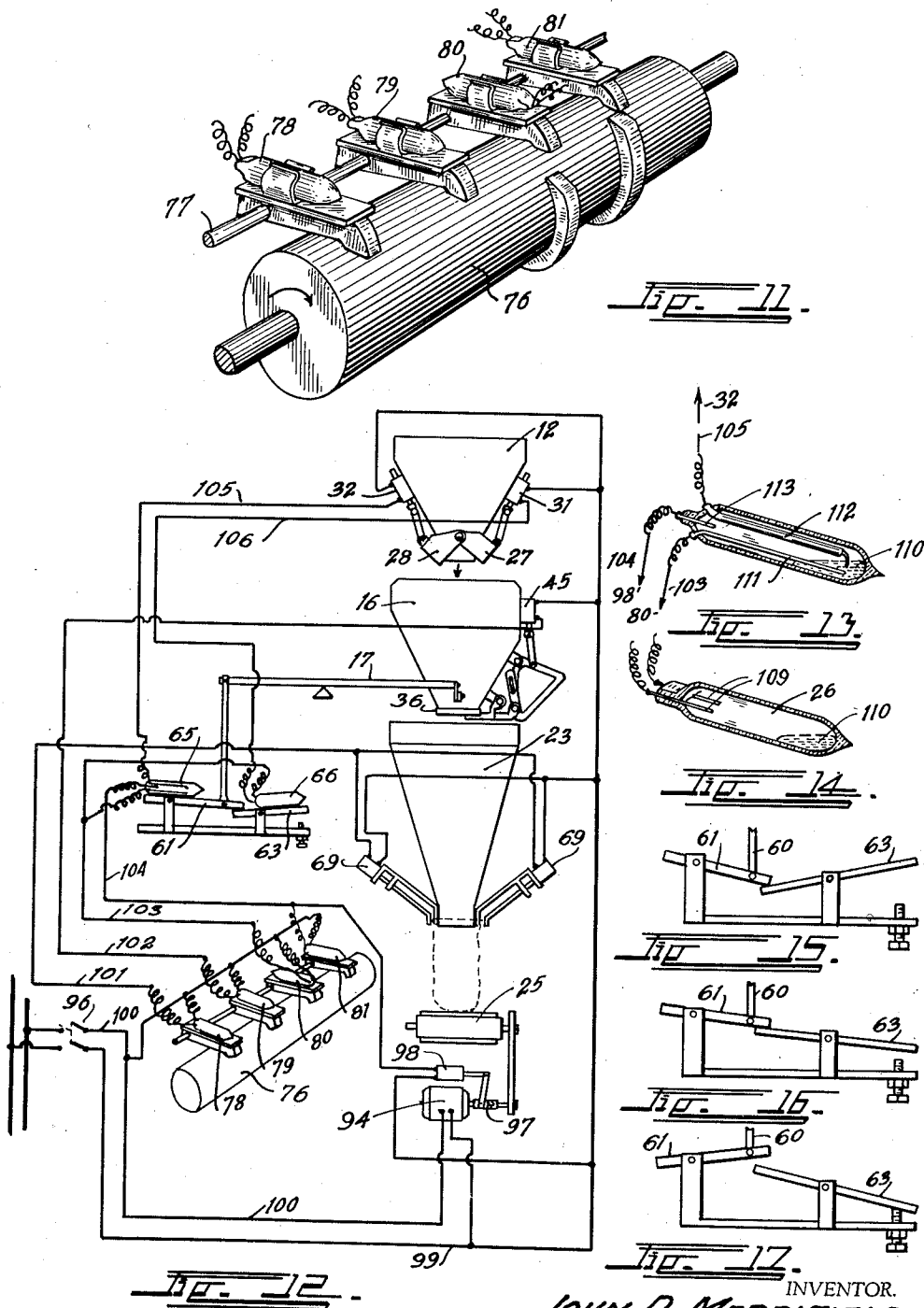
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WEIGHING AND PACKAGING MACHINE

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5 Sheets-Sheet 4



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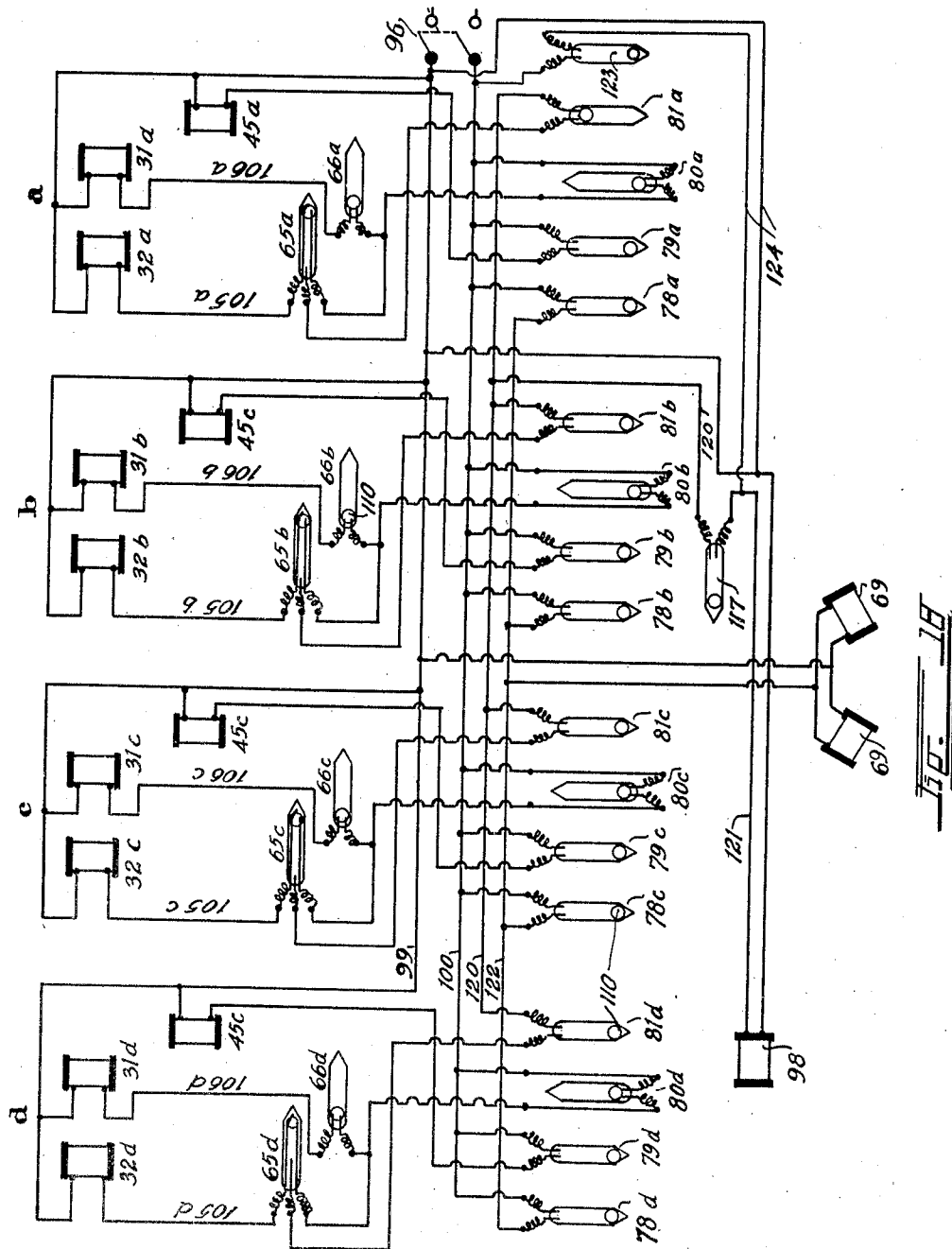
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WEIGHING AND PACKAGING MACHINE

Filed April 13, 1939

5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

2,260,718

WEIGHING AND PACKAGING MACHINE

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Application April 13, 1939, Serial No. 267,599

12 Claims. (Cl. 249—26)

This invention relates to an electrically controlled weighing and packaging machine and more particularly to a device of this character for use in weighing and sacking sugar, salt, grain, rice and similar free flowing granular materials.

The principal object of the invention is to provide a device of this character which can be pre-set to accurately and continuously weigh out desired amounts of material and deliver the same to bagging or packaging devices at rapid, regular intervals, and in which, the entire operation will be automatic.

Other objects of the invention are to provide means for preventing the bags or packages from being removed from the filling devices until the filling operation has been completed; to provide accurate and instantly adjustable means for controlling the amount of material delivered to each package; to provide a construction which can be expanded to any desired size or any desired multiples without changing or interfering with the construction thereof; to prevent the loss of material that is on the way to the weighing step at the time the supply gate closes; to provide an electrically controlled device of this character in which all sparks or open flashes will be eliminated to prevent fires or explosions in dust laden plants; and to provide a machine which can be instantly changed by the operator to double or quadruple the amount being delivered to the packaging mechanism so that it can be used without changing the weighing mechanism to deliver material for single, double or quadruple sized packages.

Other objects and advantages reside in the detail construction of the invention, which is designed for simplicity, economy, and efficiency. These will become more apparent from the following description.

In the following detailed description of the invention reference is had to the accompanying drawings which form a part hereof. Like numerals refer to like parts in all views of the drawings and throughout the description.

In the drawings:

Fig. 1 is a front elevation of a "four-bucket" machine.

Fig. 2 is a side elevation thereof.

Fig. 3 is a detail view of the feed gates in the "dribble" position.

Fig. 4 is a detail view of the dump gate in the open position.

Fig. 5 is a detail perspective view of a scale beam.

Fig. 6 is a detail plan view of the scale beam tilting switches.

Fig. 7 is a vertical face view of the master switch mechanism.

Fig. 8 is a vertical section through the master switch box, taken on the line 8—8, Fig. 7.

Fig. 9 is a detail perspective view of one of the tilting switch mechanisms.

Fig. 10 is a detail side elevation of one of the cam drum switches.

Fig. 11 is a perspective view of a cam drum and switches for a simple single weighing bucket machine.

Fig. 12 is a circuit diagram showing the circuits for a single weighing bucket.

Fig. 13 is a detail view illustrating one form of mercury switch employed in the machine.

Fig. 14 is a similar detail view illustrating a second form of mercury switch.

Figs. 15, 16 and 17 illustrate respectively three different operating positions of the tilting switches.

Fig. 18 is a complete circuit diagram for a four bucket machine.

The machine may be built with one or more weighing buckets, depending upon the capacity desired. The machine illustrated is a four bucket machine.

The entire machine is supported from a pair of vertical columns 10 joined at their tops by means of a cross beam 11. A multiple receiving hopper 12 is supported on adjustable brackets 13 from the columns 10 so that the height of the hopper may be adjusted as desired. The material to be weighed and packaged is fed into the hopper 12 from a usual factory delivery chute 14. The multiple hopper 12, as illustrated, terminates at its bottom in four boots 15, each of which is positioned above a weighing bucket 16.

Each of the weighing buckets is supported in a U-shaped yoke 47 formed upon the forward extremity of a scale beam 17. The buckets are suspended from the extremities of the yoke through the medium of flexible straps 18 and are maintained in their vertical positions by means of flexible steel spring braces 19 extending from a horizontal frame member 20 across the posts 10. The spring braces 19 are sufficiently flexible to allow the buckets 16 to float freely on the extremities of the scale beams 17. The scale beams are tiltably supported from a fixed cross bar 21 upon flexible steel straps 22 so that they may swing or tilt freely.

Each of the buckets 16 opens to a bagging hopper 23 below which the bags to be filled, indicated at 24, are supported. The filled bags drop to a belt conveyor 25, which carries them to the stitch-

ing or packing operations. The conveyor is provided with an inclined back board 74 for supporting the bags 24 thereon and with a bag platform 116 for the empty bags.

The flow of material from each of the four boots 15 is controlled by a pair of swinging U-shaped feed gates; each pair consisting of a main gate 27 and a dribble gate 28. The gates of each pair are suspended from hinge pins 29 at each side of each boot. The gates are preferably weighted, as shown at 30, so that they will swing by gravity to their closed positions. In operation, the main gate 27 closes first to almost completely close the discharge from the boot 15, the dribble gate 28 then closes by underlapping the main gate as shown in broken line in Fig. 3.

The gates 27 are opened by means of a series of solenoids 31 and the gates 28 are similarly opened by means of a second series of similar solenoids 32. The solenoids are of a standard type available on the market which act to attract armature plungers 33. The armature plungers 33 are hingedly connected to the gates by means of adjustable-length connecting rods 34, each of which consists of two parts (see Fig. 3) threaded to each other and locked in their proper adjusted position by means of suitable lock nuts 35.

Each of the buckets 16 is closed at its bottom by means of a dump valve plate 36, each of which is hinged at the front of a bucket upon a hinge rod 37. A closing arm 38 is secured to and extends forwardly from each valve plate 36 and is hinged to a pair of toggle links 39 extending upwardly at each side of each closing arm. The toggle links contain elongated slots 40 for slidably receiving a pin 41 which extends outwardly from each side of a triangular counter-weight lever 42. The triangular levers 42 are hinged on hinge pins 43 at the front of the buckets. The particular triangular shape of the lever 42 is not important, but it is important that the lever be so positioned and weighted as to constantly tend to swing its lower extremity inwardly to close the dump valve and the triangular shape is particularly well adapted for this purpose. Connecting links 44 are secured to the levers 42 by means of hinge pins 45 and hingedly connect the levers with the armature plungers of a third series of solenoids 45.

When the gates are closed, the pin 41 is in the lower extremity of the slot 40 and in alignment between the hinge pin 43 and the hinge between the arm 38 and the toggle links 39, as shown in Fig. 2. This forms a locked toggle joint so that no amount of weight upon the valve plate can force it open since the pin 41 cannot move further toward the bucket. When the solenoid 45 is energized, however, the triangular lever is swung outwardly to swing the pin 41 out of alignment. This releases the toggle joint and allows the gate to drop to the vertical open position so that the contents of the bucket will be instantly discharged or dumped into the bagging hopper 23.

It is desired to call attention to the fact that the solenoids 45 do not pull the valve plates 36 open. They simply snap the triangular levers upward, the pins 41 traveling upward in the slots 40, and allow the gates to fall by gravity.

A weight carriage 48 is slidably mounted on each of the scale beams 17 and may be set in any desired position thereon by means of a set screw 49. Each weight carriage carries a weight 50 which is also adjustable on the carriage 48. This

enables a rough adjustment to be made by moving the carriage to approximately the correct position after which, a correct adjustment can be made by moving the weight 50 on the carriage.

Each scale beam is provided with a secondary weight 51 which is slidably mounted on a secondary beam 52, one extremity of which is hingedly connected to a vertical leg 53 extending downwardly from the beam 17. The free extremity of each of the secondary beams 52 is normally supported upon a set screw 58 which is threaded into a stationary cross frame member 57. A pair of links 54 extend upwardly from the free extremity and are joined at their tops by means of a stop pin 55. The stop pin 55 rides in a vertical slot 56 in a downwardly depending ear on the rear extremity of the scale beam 17.

By this arrangement, as the weight increases in a bucket 16, the rearward extremity of the scale beam moves upwardly the length of the slot 56 to pick up the weight of the secondary weight 51. The upward movement is thereby temporarily stopped until the weight of material in the bucket increases sufficiently to lift the secondary weight 51. The secondary weight may be adjusted along its beam 52, and set in any desired position thereon by means of a set screw 59, to allow an exceedingly fine final adjustment of the beam to be made.

Immediately below the rear extremities of the scale beams 17 is a master switch housing 91 containing a cam drum 76 and an electric terminal panel 87. The latter is supported from a terminal frame 88 on an upper cross member 89 on which a series of carrier frame members 90 are mounted. Each carrier frame member is provided with a series of hinge pin posts 107 supporting an upper hinge pin 62 and a lower hinge pin 64. An upper tilting plate 61 is mounted on the hinge pin 62, and a lower tilting plate 63 is mounted on the hinge pin 64. The inner extremity of each upper tilting plate 61, overlies the inner extremities of one of the lower tilting plates 63. The outer extremities of the lower plates overbalance the inner extremities thereof so that these plates tend to tilt downwardly at their outer extremities when released by the upper plates. The degree of tilt thereof can be set by means of support screws 115.

Each scale beam 17 is hingedly connected by means of a vertical connecting rod 60 to the inner extremity of one of the upper tilting plates 61 so that the latter will be tilted in consequence of the movements of the scale beam.

Each of the tilting plates 61 carries a mercury switch 65 of the type illustrated in Fig. 13. Each of the tilting plates 63 carries a mercury switch 66 of the type illustrated in Fig. 14. The switches 65 and 66 are in circuit with the solenoids 32 and 31, respectively, as will be later described.

The bag hopper 23 terminates in a bag outlet sleeve 67 at its bottom. A bag clamp frame 68 is secured at each side of the bag outlet sleeve 67. The frames are turned downwardly at their inner extremities to form bag fingers 70 for entering the bag 24. The outer extremity of each frame 68 supports a solenoid 69 of the propelling type arranged when energized to thrust solenoid plungers 71 outwardly. The plungers 71 are connected with slidably mounted gripping jaws 72 which coact with the fingers 70 to clamp the upper edge of the bag 24 to hold the bag suspended below the outlet sleeve 67. Tension springs 73 return the clamping jaws when the

solenoids are de-energized to allow the bags 70 to drop to the conveyor 25.

The electrical current to all of the solenoids is controlled from a series of tilting mercury switches, of the type illustrated in Fig. 14, which are mounted on riders 75, the extremities of which, ride on a cam drum 76. The riders 75 are hingedly mounted on a rider shaft 77 extending parallel to the length of the drum 76. There is a set of four riders and switches for each one of the four buckets 16. The four riders of each set support four mercury switches, designated 78, 79, 80 and 81; respectively.

All of the mercury switches, with the exception of switches 65, are of the type shown in Fig. 14 consisting of a sealed glass tube 26 into one end of which a pair of electrodes 109 project. A quantity of mercury 110 is enclosed in the tube and, when the latter is tilted toward the electrodes, the mercury will flow to that end to close a circuit between the two electrodes. The switches 65 are of the three electrode type shown in Fig. 13 having a common electrode 111 exposed to the mercury the full length of the tube; an insulated electrode 112, exposed to the mercury at the far end of the tube only; and a middle electrode 113 exposed to the mercury at the near end of the tube. When the mercury runs to the far end it closes electrode 111 to 112 and in the near end it closes electrode 111 to 113.

The cam drum is mounted on a drum shaft 92 supported in journal bearings 84. The drum and its shaft are longitudinally shiftable to two positions. In Fig. 7 it is shown in the extreme "left" position. By lifting a holding bar 82 from one side of a sleeve flange 83 the entire drum can be shifted to the right until its right extremity contacts the right supporting bearing 84, in which position it may be locked by dropping the bar 82 on the other side of the flange 83. A series of raised cams 85 is placed on the drum in the path of each rider 75 when the drum is in one shifted position and a second series of raised cams 86 is placed on the drum 76 to be in the paths of the riders when the drum 76 is shifted to its other position. Therefore, by shifting the drum cam we can cause the switches to be operated by two different sets of cams in two different sequences. As the cams pass beneath the forward extremities of the riders, the latter will be tilted upwardly so as to cause the mercury in the switches to run to the lower extremities thereof.

The mercury switches 78, 79 and 81 are positioned on their riders so that when the latter are on the low points of the cam drum the mercury will be in the dead end of the tube and the circuit will be open. The switch 80 however is reversed so that when its rider is on the low point, the mercury will be closing the circuit between the electrodes therein. All of the electrical conductors from the switches on the riders 75 and from the switches 65 and 66 lead to convenient terminals on the terminal board 87.

The drum shaft 92 extends beyond the housing 91 to support a pulley 93, which is connected by means of a belt 95 to a pulley on a clutch 97 on the shaft of a drive motor 94. The clutch is shifted by means of a solenoid 98. The conveyor 25 is also driven from a pulley on the clutch 97 through the medium of a belt 108 and any suitable transmission means 114, so that both the cam drum 76 and the conveyor 25 can be stopped and started while the motor 94 is running, by operation of the solenoid 98.

The operating current is fed to the panel board 87 from the power lines through a master switch 96. The main ground lead from the master switch, indicated at 99, leads directly to the drive motor 94 and to all of the solenoids. The other main lead 100 leads to each of the cam drum mercury switches, 78, 79, 80 and 81, and to the motor 94.

For each set of four switches for a one of the buckets 16, the circuits are as shown in Fig. 12. That is, from the first mercury switch 78, a conductor 101 leads to the two bag clamping solenoids 69. A conductor 102 leads from the second mercury switch 79 to the bucket gate solenoids 45. A third conductor 103 leads from the third mercury switch 80 to the common electrode 111 in the mercury switch 65 and also to the mercury switch 66, and a fourth conductor 104 leads from the fourth mercury switch 81 to the clutch solenoid 98 and also to the middle electrode 113 of the mercury switch 65. A conductor 105 leads from insulated electrode 112 of the mercury switch 65 to the solenoid 32 and a conductor 106 leads from the mercury switch 66 to the solenoid 31. For each of the additional buckets and for the additional sets of riders on the drum 76 the above circuit system is repeated as shown in Fig. 18.

Operation (single bucket)

The operation of the machine can best be understood by first following through the operation of a single bucket. In describing the operation we will assume that the receiving hopper is being kept filled with sugar by the chute 14 and that the machine is being used to bag sugar in ten pound bags. The weight 50 is set so that the scale beam 17 will move upward to cause the extremity of the slot 56 to engage the pin 55 when approximately nine pounds of sugar are in the bucket 16 and the secondary weight 51 is adjusted so that the beam 52 will be lifted when ten pounds of sugar are in the bucket.

Let us assume that the cam drum is in the position diagrammatically shown in Fig. 12 with all of the riders on the low points between their cams so that the switches 78, 79 and 81 are open and switch 80 is closed and is supplying current to the tilting switch 66 and to the long electrode in tilting switch 65 both of which are in the position shown in Figs. 12 and 15. The gates 27 and 28 are being held open by the solenoids 31 and 32. The clutch 97 is "out" and the conveyor 25 and the cam drum are at rest.

The sugar rapidly flows into the bucket 16 and the rear extremity of the scale beam rises. When the weight of sugar in the bucket reaches approximately nine pounds, the rear extremity of the scale beam 17 will have risen to the point where it will be temporarily stopped by the pin 55. This first upward movement of the beam has caused the bar 60 to lift the inner extremity of the upper tilting plate 61 sufficiently to allow the outer extremity of the lower plate to tilt downwardly as shown in Fig. 16 to cause the mercury in switch 66 to flow away from the electrodes therein. This breaks the circuit through the conductor 106 to the solenoid 31 and allows the main feed gate 27 to drop closed. Sugar continues to dribble through the small remaining gate opening however, allowing a time interval for the scale beam to steady itself. The bucket 16 now more slowly fills until the ten pound point is reached at which time secondary weight 51 will be lifted sufficiently to allow the rod 60

to tilt the tilting plate 61 to the position of Fig. 17 causing the mercury in the switch 65 to flow away from the electrode 112 to break the circuit through the conductor 105 to the dribble gate solenoid 32. This allows the dribble gate 28 to fall closed and stop the flow of sugar.

The weights 50 and 51 are so adjusted that the amount of sugar in the air between the dribble gate and the bucket will be included in the final ten pounds.

The mercury in switch 65 in rolling to the low end of the tube closes the circuit between the electrodes 111 and 113 thus completing a circuit through conductors 103 and 104 from the closed switch 30 and the clutch solenoid 98. This throws in clutch 97, the conveyor starts to travel, the cam drum 76 starts to rotate, and the cams 85 approach their switch riders 75.

The cam of switch 81 is the first to contact and tilts its switch to the closed position. This closes a second circuit to the clutch solenoid, through conductor 104 so that the clutch 97 must now remain "in" for one complete revolution of the cam drum. The cam of switch 30 is the next to operate to open the circuit to the tilting switches 35 and 66 so that the latter may return to their former positions without opening the feed gates. The cam of switch 78 next tilts the latter to close a circuit through conductor 101 to the bag gripping solenoids 69 to lock a bag positioned by the operator beneath the filling hopper 23. The cam of switch 79 now tilts the latter to close a circuit through the conductor 102 to the dump gate tripping solenoid 45 to release the gate and dump the sugar to the bag 24.

The released weight on the bucket allows it to rise, the rod 60 depresses the inner extremity of the plate 61 and the latter depresses the inner extremity of plate 63 to reset the switches 65 and 66 in their original positions of Figs. 12 and 15. The latter switches, however, do not complete circuits to the receiving hopper solenoids 31 and 32 since the switch 30 is still open.

The cam drum continues to rotate and the cam passes from under the rider of switch 79 to allow it to tilt downward to break the circuit to the dump gate tripping solenoid 45 to release the gate 36 and allow the latter to swing to the closed toggle-locked position of Fig. 2. The next cam then releases switch 78 to break the circuit to the bag gripping solenoids 69 to release the bag to the conveyor 25. The cam under switch 80 then tilts the latter back to its original closed circuit position to supply current to the switches 35 and 66 and through them to the solenoids 31 and 32 to open the gates of the feed hopper 12. And, finally, the cam under switch 81 releases the latter to its original open-circuit position to de-energize the clutch solenoid 98 and allow the cam drum and the conveyor to come to rest until the circuit to the clutch solenoid 98 is again closed by the weight of the filling bucket tilting the switch 65 to start another cycle of operation. It will be noted that the bag cannot be removed until after the dump gate 36 is closed to prevent any waste of material through the uncovered bag outlet sleeve.

A tilting bag switch 117 may be mounted on the filling hopper 23 with a tilting arm 118 extending downwardly into the path of the upper edge of the bag 24 so that as the bag is moved upward about the bag outlet sleeve 67 it will tilt the switch 117 to complete the clutch solenoid circuit. Thus, that the machine can be started only when a bag or package is in position to re-

ceive the discharge therefrom. The circuit of this switch will be described in connection with the circuits of the four bucket form of the machine.

The extremity of the cam drum shaft may be provided with an indicating disc 119 so positioned that the check weigher or inspector can note from which of the four buckets any given bag on the conveyor was filled in order that adjustment of scale beams of that bucket may be made if necessary.

The circuits for the complete four bucket machine are shown on the diagram of Fig. 18 with the four separate bucket circuits designated as a, b, c and d, respectively. Basically the circuits are but a multiplication of the single bucket circuit previously described. The circuits, switches, and associated parts which correspond to those of the single bucket circuits are designated in Fig. 18 by the same reference character as previously and are given an additional letter to designate the particular bucket or bucket flow line to which it refers, such as, 79a would refer to the mercury switch 79 which controls the solenoid in the bucket circuit a, while switch 79b would control the bucket b, etc.

The switches 81, in a four bucket circuit, act to select the order of operation of the buckets and to electrically interlock the circuits so that each bucket in succession must completely fill before the cam drum 76 can operate to close switch 79 to discharge the contents thereof. If any bucket should fail to fill because of failure of material supply or clogging of the feed hopper, these switches break the circuit to the clutch solenoid 98 and stop the machine.

This is important since if the next bucket should fill, it would start the machine and cause a short weight bag to be delivered by the clogged bucket.

In the four bucket machine the switches 65 and 66 of each bucket continue to operate the gates 27 and 28 and the switches 79 continue to operate the dump gates 36 of their buckets as in the single bucket circuit previously described.

The bag clamping switches 78 of all buckets are connected in parallel by means of a bag clamp conductor 122 leading to the bag clamping solenoids 69. So that each bucket can operate the latter solenoids independently.

Each of the switches 81 is in series with the middle electrode 113 of its switch 65 as in the one bucket circuit, and a common conductor 120 connects the other terminal of each switch 81 with a terminal of the bag switch 117. A second conductor 121 connects the other terminal of the bag switch 117 with the clutch solenoid 98. The other side of the solenoid 98 is connected to the power lead 99 as in the single bucket circuit.

It can be seen from the above that the circuit to the clutch solenoid cannot be completed until the bag switch 117 is closed and that the upper tilting switch of any bucket cannot close a circuit to the clutch solenoid unless its particular clutch switch 81 is previously closed. The clutch switches 81 close in sequence 81a, 81b, 81c, and 81d, and each switch opens after the next successive one closes. All will have opened and closed during one revolution of the cam drum and each bucket will have filled and dumped in its proper order.

It will be noted that it is necessary to open each switch 80 before closing its companion switch 79 so that the feed gates cannot be opened by the emptying bucket until the dump gate is

again closed. It will also be noted that the current to the lower electrode 111 is received through switch 80 to energize the clutch solenoid 98. Therefore, some means must be provided for shunting the current to the clutch solenoid 98 while switch 80 is open or the cam drum will stop. This is accomplished for all buckets by means of shunting switch 123 at one end of the cam drum. This switch is in a direct circuit 124 from the supply leads 99 and 100 and the clutch solenoid 98 and after the cam drum starts to rotate it bridges out the switches 117 and 80, and maintains the clutch solenoid energized until the switch 80 is again closed. The cam drum carries a series of four cams beneath the switch 123, one cam for each bucket. The length and position of these cams is such that switch 123 will be lifted to the closed position before each of the successive switches 80 is lifted to the open position; and, so that switch 123 will be lowered to the open position immediately after each switch 80 is closed.

Operation of four bucket machine

Let us assume that the machine and its switches are in the positions indicated in Fig. 18, in which the position of the mercury is indicated by the small circles 110 in each switch.

At the assumed instant clutch switch 81a, is the only clutch switch which is elevated by its cam on the drum. Therefore the circuits to the middle electrode of the switches 65b, 65c, and 65d are open and bucket a is the only one that can start the machine.

All of the feed gates 27 and 28 are open, since all the switches 65 and 66 are closed, and all buckets are filling with sugar. The operator places a bag in position thereby closing bag switch 117. The increasing weight in each bucket eventually tilts the switches 65 and 66 to the position of Fig. 17 to close the feed gates 27 and 28. When the latter has occurred with bucket a, a circuit is completed through switches 80a, 65a, 81a, and 117 to the solenoid 98 starting the conveyor and the cam drum to carry the switches 78a, 79a, 80a through their cycles to bag the sugar and reset the tilting switches of bucket a. Then the cam drum raises clutch switch 81b to close the circuit to the middle electrode of switch 65b and switch 81a is lowered to break the circuit to switch 65a.

Now if bucket b is full and a new bag is in position the circuit to the clutch solenoid will be held closed by switches 80b, 65b, 81b, and 117, and through conductors 120 and 121, so that the machine will continue to operate to fill the second bag from bucket b and reset the tilting switches thereof. Clutch switch 81c now closes and clutch switch 81b opens.

Now if bucket c is full and a third bag is in position the circuit to the clutch solenoid will be maintained closed by switches 80c, 65c, 81c and 117; the third bag will fill; and the tilting switches 65c and 66c will reset.

Now if bucket d is full, the same operation would continue through clutch switch 81d.

If however, the supply to bucket d has not filled the bucket, because of clogging, lack of supply or any other reason, switch 65d will remain down and the circuit to the middle electrode will be open. This breaks the circuit from the main lead 100, through switch 80d, and the circuit from conductor 120 through switch 81d. Therefore, when the preceding clutch switch 81c opens, the solenoid 98 will be de-energized and

the machine will stop until the filling of bucket d has been accomplished.

Thus, the machine continues in operation until the supply of sugar or the supply of bags fails or until the master switch 96 is opened.

The above relates to the operation of the machine when the first set of cams 85 is positioned beneath the riders 15. If the drum 76 be now shifted to the right, after releasing the holding bar 82, the second set of cams will be brought beneath the riders. The second set of cams is arranged to operate the buckets in pairs, that is, the cams under the bag clamping switches 78a and 78c are elongated so as to hold each of their switches closed until the adjacent bag clamping switches 78b and 78d, respectively, open. This prevents the bag from being removed until both buckets of each pair, a and b, or c and d have discharged.

If the setting of the scale weights remains the same as before the machines will now deliver twenty pounds of sugar to each bag with two bags to each revolution of the cam drum. The weights may be changed to deliver any desired quantity, such as twelve and one-half pounds per bucket or twenty-five pounds per bag, as desired.

If the machine is to be used only for small amounts, the adjustable brackets 13 can be arranged to lower the receiving hopper until the feed gates are within the buckets close to the full level of the sugar therein so that the falling distance is decreased and the speed and accuracy of the machine is increased.

While a specific form of the improvement has been described and illustrated herein, it is desired to be understood that the same may be varied, within the scope of the appended claims, without departing from the spirit of the invention.

Having thus described the invention, what is claimed and desired secured by Letters Patent is:

1. A device for weighing free flowing, dry materials comprising: a supply container; a discharge boot in said container; a main gate closing the major portion of said discharge boot; a dribble gate closing the remainder of said discharge boot; a scale beam; a bucket supported by said scale beam below said boot; a solenoid for controlling each of said gates; a first mercury tilting switch in circuit with the solenoid of the main gate; a second mercury tilting switch in circuit with the solenoid of the dribble gate; a first tilting support for said first switch; a second tilting support for said second switch; connecting means between said second support and said scale beam to tilt the former in consequence of movement of the latter, said second support being positioned in the path of gravitational movement of said first support so that the former's initial movement will allow said first support to tilt to close said main gate in advance of said dribble gate.

2. A device for weighing free flowing, dry materials comprising: a supply container; a discharge boot in said container; a main gate closing the major portion of said discharge boot; a dribble gate closing the remainder of said discharge boot; a scale beam; a bucket supported by said scale beam below said boot; a solenoid for controlling each of said gates; a first mercury tilting switch in circuit with the solenoid of the main gate; a second mercury tilting switch in circuit with the solenoid of the dribble gate; and means connecting said switches to said scale beam so that said switches will be tilted in con-

sequence with the increasing weight of said bucket to close said feed gates; a dump gate on said bucket; a solenoid for opening said dump gate; a motor actuated switch for controlling said latter solenoid so that the latter will be energized to open said dump gate after said tilting switches have closed said feed gates.

3. A device for automatically weighing and delivering free-flowing, dry materials comprising: a feed container; feed gates closing the bottom of said feed container; a receiving bucket below said gates; a scale beam fulcrumed intermediate its extremities and carrying said bucket at its forward extremity; a counter-weight on said beam; a dump gate closing the bottom of said bucket; a receiving hopper for receiving the discharge from said dump gate; a motor driven multiple circuit closing device; means for closing said feed gates and starting said circuit closing device in consequence of the upward movement of the rearward extremity of said scale beam; a first circuit controlled by said device for opening said dump gate at a preset time interval after the closing of said feed gates; and a second circuit controlled by said device for opening said feed gates after said dump gate and said bucket have returned to their former positions.

4. A device for automatically weighing and delivering flowing material comprising: a feed hopper; a solenoid-controlled feed gate closing the discharge from said hopper; a weighing bucket below said hopper; a solenoid-controlled dump gate closing the discharge from said bucket; a weighing scale supporting said bucket; a scale switch operated from said scale, said switch closing a first set of contacts when said bucket is empty and a second set of contacts when said bucket is filled a predetermined amount; a motor; a switch operating device; an electrically controlled clutch for connecting said motor to the latter device; a clutch switch in circuit with said clutch; a supply switch in circuit with said second set of contacts; a dump gate switch in circuit with the dump gate solenoid said switch operating device being arranged to operate said clutch switch, said supply switch and said dump gate switch, said first set of contacts being in circuit with the solenoid of the feed gate to control the operation of said feed gate, said second series of contacts controlling said clutch so that when said bucket is sufficiently filled, said first set of contacts will close said feed gate and said second set will cause said clutch to connect said switch operating device with said motor to cause the former to close said clutch switch to cause said switch operating device to continue to operate for a complete cycle of operation, during which it will open said supply switch to break the circuit to said second set of contacts, and actuate said dump gate switch to open said dump gate.

5. A device for automatically weighing and delivering flowing material comprising: a feed hopper; a solenoid-controlled feed gate closing the discharge from said hopper; a weighing bucket below said hopper; a solenoid-controlled dump gate closing the discharge from said bucket; a weighing scale supporting said bucket; a scale switch operated from said scale, said switch closing a first set of contacts when said bucket is empty and a second set of contacts when said bucket is filled a predetermined amount; a motor; a switch operating device; an electrically controlled clutch for connecting said motor to the latter device; a clutch switch in circuit with said clutch; a supply switch in circuit with said sec-

ond set of contacts; a dump gate switch in circuit with the dump gate solenoid said switch operating device being arranged to operate said clutch switch, said supply switch and said dump gate switch, said first set of contacts being in circuit with the solenoid of the feed gate to control the operation of said feed gate, said second series of contacts controlling said clutch so that when said bucket is sufficiently filled, said first set of contacts will close said feed gate and said second set will cause said clutch to connect said switch operating device with said motor to cause the former to close said clutch switch to cause said switch operating device to continue to operate for a complete cycle of operation, during which it will open said supply switch to break the circuit to said second set of contacts, and actuate said dump gate switch to open said dump gate, said switches consisting of mercury containing tubes, said switch operating device consisting of a rotating series of eccentric cams supporting one extremity of each of said tubes to tilt the latter in consequence of the eccentricity of the cams.

6. A device for automatically weighing and delivering flowing material comprising: a feed hopper; a solenoid-controlled feed gate closing the discharge from said hopper; a weighing bucket below said hopper; a solenoid-controlled dump gate closing the discharge from said bucket; a weighing scale supporting said bucket; a scale switch operated from said scale, said switch closing a first set of contacts when said bucket is empty and a second set of contacts when said bucket is filled a predetermined amount; a motor; a switch operating device; an electrically controlled clutch for connecting said motor to the latter device; a clutch switch in circuit with said clutch; a supply switch in circuit with said second set of contacts; a dump gate switch in circuit with the dump gate solenoid said switch operating device being arranged to operate said clutch switch, said supply switch and said dump gate switch, said first set of contacts being in circuit with the solenoid of the feed gate to control the operation of said feed gate, said second series of contacts controlling said clutch so that when said bucket is sufficiently filled, said first set of contacts will close said feed gate and said second set will cause said clutch to connect said switch operating device with said motor to cause the former to close said clutch switch to cause said switch operating device to continue to operate for a complete cycle of operation, during which it will open said supply switch to break the circuit to said second set of contacts, and actuate said dump gate switch to open said dump gate, said switches consisting of mercury containing tubes, said switch operating device consisting of a rotating series of eccentric cams supporting one extremity of each of said tubes to tilt the latter in consequence of the eccentricity of the cams; a second series of cams alternating with said first series; and means for axially shifting said cams to bring either series beneath said switches.

7. A device for automatically weighing and delivering flowing material comprising: a supply container; a plurality of discharge boots opening from said container; a pair of solenoid-operated feed gates closing each boot; a bucket positioned below each boot; a scale beam supporting each bucket; switches operated by each scale beam for controlling the feed gates of that bucket; a solenoid-operated dump gate on each bucket closing the bottom thereof; a receiving hopper receiving the discharge from all of said buckets;

and a rotary switching device controlling the circuits to said dump gates to successively open the latter after each of its feed gates have closed; solenoid-operated package supporting means for holding a receiving package at the discharge of said receiving hopper, said rotary switching device acting to close a circuit to said package supporting means to prevent removal of the package while any of the dump gates are open.

8. A device for automatically weighing and delivering flowing material comprising: a supply container; a plurality of discharge boots opening from said container; a pair of solenoid-operated feed gates closing each boot; a bucket positioned below each boot; a scale beam supporting each bucket; switches operated by each scale beam for controlling the feed gates of that bucket; a solenoid-operated dump gate on each bucket closing the bottom thereof; a receiving hopper for receiving the discharge from all of said buckets; a rotary switching device controlling the circuits to said dump gates to successively open the latter after each of its feed gates have closed; and an electrical contact means operable by each scale beam for placing said rotary switching means in operation.

9. In an automatic weighing and delivering machine of the type having a scale supported receiving bucket to which material flows from feed gates and from which material is discharged by a dump gate, means for controlling the sequence of operation of said gates comprising: a solenoid controlling each gate; a switch in circuit with each solenoid; a cam drum operating all of said switches in a predetermined sequence; a starting switch operable by a preset weight in said bucket for initially starting the operation of said drum; and a holding switch bridged over the starting switch and operable by said drum for maintaining the latter in operation until said drum has operated all of said switches in their programmed sequence.

10. An automatic weighing and bagging machine comprising: a series of feed hopper boots; a pair of gates consisting of a main gate and a dribble gate closing each boot; a weighing bucket below each pair of gates; a counter-balanced scale beam supporting each bucket; a dump gate closing each bucket; a receiving hopper for receiving the discharge from said dump gates; a bag conveyor below said receiving hopper to convey bags therefrom; a clutch controlling the operation of said conveyor; an individual solenoid for operating each of said gates, and said clutch; a program switch for controlling the circuits to all of said solenoids in a predetermined sequence; means operable from said scale beams for plac-

ing said switch in operation; and means operable by said program switch for stopping its own operation after said sequence is completed.

11. An automatic weighing and bagging machine comprising: a series of feed hopper boots; a pair of gates consisting of a main gate and a dribble gate closing each boot; a weighing bucket below each pair of gates; a counter-balanced scale beam supporting each bucket; a dump gate closing each bucket; a receiving hopper for receiving the discharge from said dump gates; a bag conveyor below said receiving hopper to convey bags therefrom; a clutch controlling the operation of said conveyor; an individual solenoid for operating each of said gates, and said clutch; a program switch for controlling the circuits to all of said solenoids in a predetermined sequence, said program switch being also driven by said clutch; and contact means operable by said scale beams for initially closing said clutch to place said program switch and said conveyor in operation.

12. In an automatic weighing and delivering machine of the type having a series of scale beams; a receiving bucket supported by each scale beam to each of which material flows through a main gate and a dribble gate and from each of which material is discharged by a dump gate, means for controlling the sequence of operation of said gates comprising: an electro-magnetic means for controlling each gate; a motor driven circuit control device controlling the circuits to said magnetic means in a predetermined sequence; starting means for said control device; a series of first tilting members; means for supporting one extremity of each of said first members from one of said scale beams; a series of second tilting members, one extremity of each of said first members being positioned in the path of movement of one of the second members so that the former prevent the latter from tilting until the former are tilted by said scale beams; a mercury tilting switch carried by each member, the switches on the second tilting members being in circuit with the magnetic means of the main gates and operating in advance of the switches on the first tilting members, the switches on the first tilting members being in circuit with the magnetic means on the dribble gates and in circuit with said starting means, so that initial movement of a scale beam will close its main gate and continued movement thereof will close its dribble gate and start said circuit control device in operation to control the opening and closing of the dump gates and the reopening of the main and dribble gates.

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