

A. M. BATES.
PROCESS OF FILLING PACKAGES.
APPLICATION FILED JAN. 27, 1913.

1,104,726.

Patented July 21, 1914.

2 SHEETS—SHEET 1.

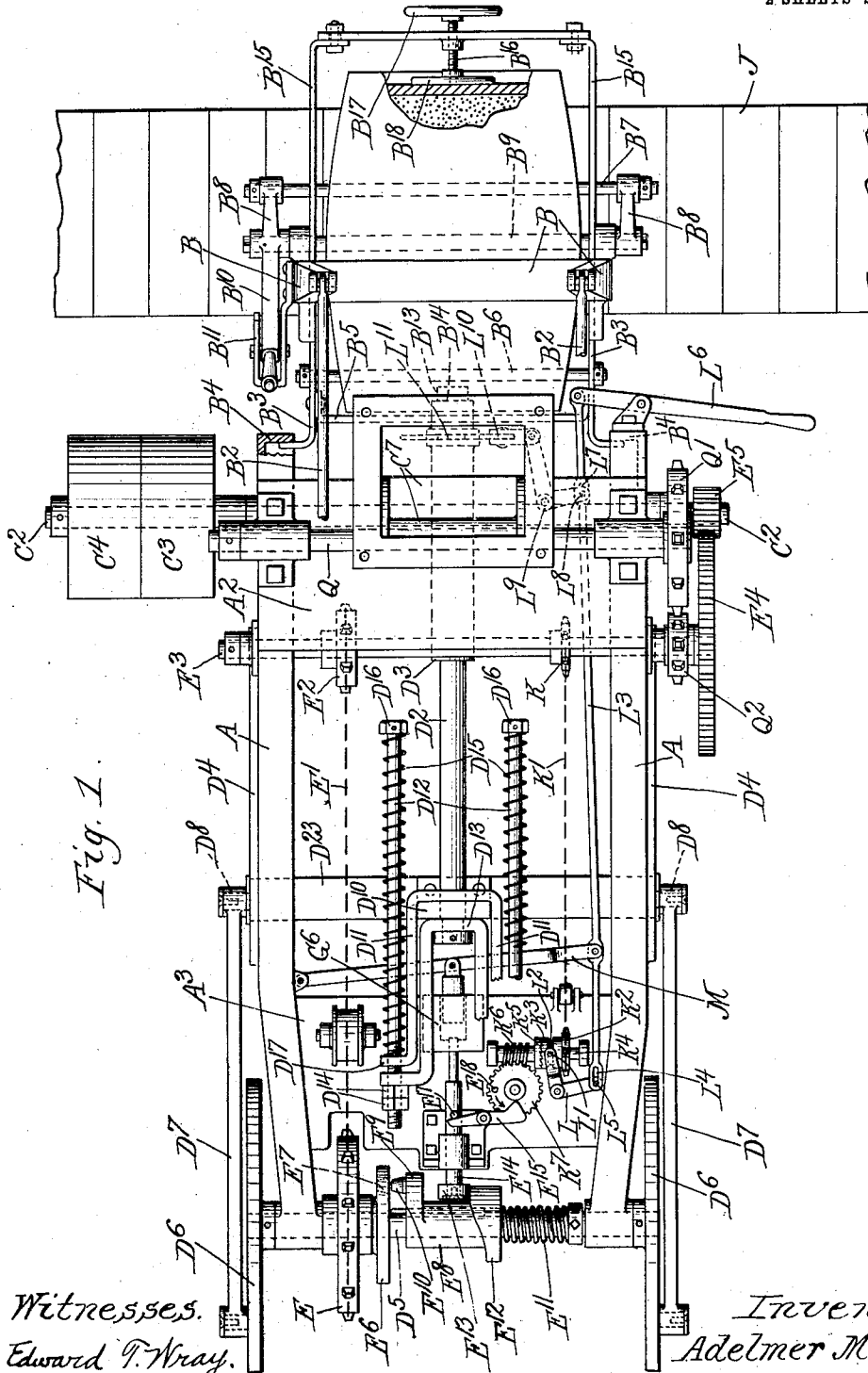


Fig. 1.

Witnesses.
Edward P. Wray.
Lamel Doernum.

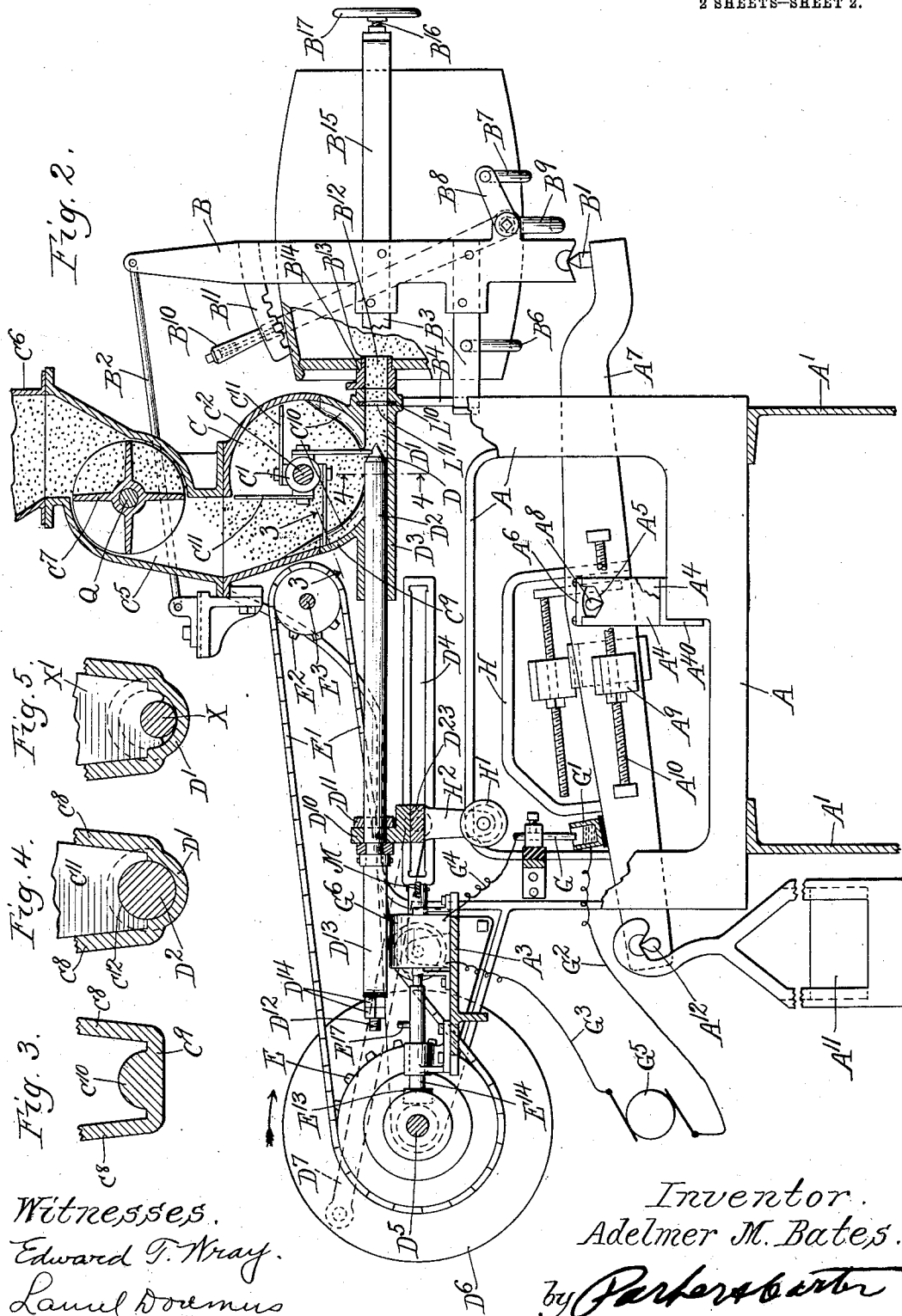
Inventor.
Adelmer M. Bates.
by *Barbara Carter*
Attorneys.

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2 SHEETS-SHEET 2.



UNITED STATES PATENT OFFICE.

ADELMER MARCUS BATES, OF CHICAGO, ILLINOIS, ASSIGNOR TO BATES VALVE BAG COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF WEST VIRGINIA.

PROCESS OF FILLING PACKAGES.

1,104,726.

Specification of Letters Patent.

Patented July 21, 1914.

Continuation of application Serial No. 683,667, filed March 14, 1912. This application filed January 27, 1913. Serial No. 744,283.

To all whom it may concern:

Be it known that I, ADELMER M. BATES, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Processes of Filling Packages, of which the following is a specification.

My invention relates to a process for filling packages, particularly large packages intended to hold a considerable amount of weight of material, and particularly such packages as are closed or finished and intended to be filled through a small opening. I have especially applied it to the filling of barrels through bung holes.

The process has particular reference to filling such packages by a relatively loose continuous swiftly moving current of material until the package is approximately full and then continuing the process by forcing in enough more material to bring the total contents up to the required amount. The object, of course, is to thoroughly compact and in most cases accurately fill the package with a certain predetermined amount of material and to do this rapidly and through a small opening. A great deal of difficulty is experienced in attempting to fill packages, for instance barrels, with exact predetermined quantities of material and compacting the same and securing the closure of the barrel in position after such filling and compacting.

Broadly speaking, the process may be said to consist in first inserting the major increment of the material into the package by a swiftly moving current and then inserting the remainder of the material and packing the material in the bag by means of a current moving more slowly but under much greater pressure. The process as I have actually employed it includes also the idea of successive minor charges of material being forced in during the second stage of the filling. These minor charges may be as here illustrated furnished by some means which feeds the swiftly moving current so that from another point of view the process may be said to consist in inserting the major increment of material by a continuous feeding and then inserting the remain-

der by the combined effect of the first stage method of feeding and the second stage method.

I have illustrated my invention or method of employing it in the accompanying drawings, which are to be taken as purely diagrammatic and intended to disclose not all of any given operating mechanism, but only so much of a hypothetical structure as might be necessary to a clear understanding of the process. The process should be carried out by various kinds of machines, or indeed more or less by hand, although in an application soon to be filed I shall disclose that particular machine or apparatus which I have designed for the purpose of carrying out this process.

In the filling of large packages, and sometimes, of course, in the filling of small ones it is necessary to supply to a given package a specific amount of material and in many cases it is desirable to inclose this specific amount of material in the smallest possible package. Now, in the effort to fill packages rapidly by means of relatively small feeding tubes or their relatively small apertures, such as the valved aperture of a valve bag or the bung hole or similar aperture, it is desirable to perform the first filling act or to insert in the package the major part of what it is to contain by rapidly operating devices or in other words to shoot a small but swiftly moving stream into the package, preferably through such small aperture. Such a method of filling, however, will not result ordinarily in compacting the material or compressing it within the package and therefore the package will be filled with less than the necessary quantity. The package may then be shaken so as to settle the material or this shaking process may be carried on from time to time while the filling is going on. I obviate all these and other difficulties by first inserting as suggested into the package by a rapidly moving small stream the major part of the material required until the package is substantially full. I then force a small stream of such material into the package by a relatively slow but powerful compressing movement. In actual experience a package containing say 375 pounds of material will

receive 350 pounds by a rapidly moving filling stream in say ten seconds and the remainder or 25 pounds will then be forced in under high pressure, say in 15 seconds. Of course, the process relates to the filling of such packages with pulverized, finely divided solid or approximately solid material and the second or slow filling step is, of course, preferably applied to a measured increment sufficient to give the package its desired content. It is preferable to insert the large increment by a continuous stream and the small increment by a discontinuous stream.

Having in mind the particular form of apparatus here illustrated, it will be observed that the continuously operating feeder operating alone fills the package with its major increment. Then the discontinuance feeder is thrown into operation and the two work simultaneously the first delivering a charge so to speak to the passageway in front of the plunger of the discontinuous feeder and the latter then forcing this charge with great pressure into the package. The plunger of the discontinuous feeder is preferably conical at its end so as to act as a wedge.

The actual operation presents interesting features. The continuously acting feeder rapidly feeds into the package the major increment by a small swiftly moving current and this operation is continued until the package is substantially filled with uncompacted material. The discontinuous feeder is now set into operation and its plunger moves forwardly at each stroke cutting off the inlet from the continuous feeder and forcing the material in the tube ahead of it into the package. This, of course, gives the discontinuous feeder an opportunity to apply any desired amount of pressure and in the actual filling of cement barrels the pressure is very considerable, and as the process continues toward completion the hole in the material left by the retreating plunger of the discontinuous feeder tends, of course, to contract so that it becomes harder and harder to force the charge of material into the package, and in the end a point is reached where the material in the package is thoroughly compacted and that, too, in an otherwise complete and finished package.

The particular mechanism which I have employed for the purpose is illustrated in the accompanying drawings and may be described as follows: I have used in my claims and description matter several terms which ought to be explained or defined. I have spoken of introducing material in a stream. I do not mean by that to confine myself to a continuously and uniformly moving body, as, of course, the rate of motion and density of the stream may be varied. By the term discontinuous I mean such a stream as is in-

terrupted or broken so that while it may be in a general sense called a stream, it is a series of separated portions successively moving. The material is powdery and, of course, the invention is particularly applicable to materials that are actually in a powdery condition. I mean by that term to indicate granular or other such materials as are adapted to be inclosed in packages. By the term package I mean either barrel, box or bag, although it is probable that my invention is particularly applicable to the filling of barrels. The terms major and minor increments are adopted as a convenient way of expressing the idea that there are two increments which are treated in different ways and that the first is relatively large. Of course, the relative sizes of these increments could greatly vary. The speed of operation, of course, can be varied through a wide range, the desirable point being to carry on the filling process proper or that portion of the process whereby the major increment is introduced loosely by a swiftly moving stream so as to get the material in a merely filling condition into the package as rapidly as possible. The preferred way of then compacting it is to operate by a series of plunger blows on relatively small masses or portions of the remaining increments.

The wedge action of the discontinuous feeder, which occurs owing to its conical point, results in transmitting the pressure through the body of the material rapidly in all directions from the line of the feeder as well as forwardly in line with the feeder. It will be understood, of course, that the area of greatest pressure will be in a cone projecting forwardly from the forward end of the feeder or plunger and that therefore, if this plunger always projected an equal distance into the package, you would have a cone-shaped area at the end removed from the filling hole very closely packed and the area between this cone and the filling end of the package would be not so closely packed. To prevent this differential packing I provide means whereby as the density from the pressure exerted upon it reaches a certain point the inward excursion of the plunger progressively decreases until this cone is carried clear back to the end of the barrel, thus giving a substantially uniform pressure or compactness throughout the entire barrel or package. It will be evident that this compacting must extend through the entire barrel or package because, otherwise, as the package is moved about, tipped over or rolled along, this tightly compacted mass will tend to separate from the loose material surrounding it and act as a kind of battering ram to compact the loose material which when done will leave the barrel filled with tightly compacted and separated groups which will then be free to move about with-

in the barrel and ruin the barrel or package, whereas, if the material is tightly packed throughout, such movement will be impossible.

5 My process may be embodied in and I have shown it by a device for filling barrels which is illustrated diagrammatically in one form in the accompanying drawings, where-
in—

10 Figure 1 is a plan view; Fig. 2 is a side elevation partly sectional, the section being taken in a plane axial in regard to the plunger; Fig. 3 a section along the line 3—3 of Fig. 2; Fig. 4 a section along the
15 line 4—4 of Fig. 2; Fig. 5 a section similar to Fig. 4 showing a slight modification.

A, A are side frame members mounted upon the channel base A¹, A¹.

20 A², A³ are tie members holding the frame members A, A together.

A⁴, A⁴ are brackets projecting upwardly from the cross piece A⁴⁰ of the frame members A, A and provided with the angular knife sockets A⁵, A⁵ covered by the protect-
25 ing caps A⁶, A⁶. The scale beam A⁷ is supported by the knife edges A⁸ resting within the knife sockets A⁵.

A⁹ is a counterbalancing weight adjustably mounted upon the screw A¹⁰ on the scale
30 beam.

A¹¹ is a weight supported from one end of the scale beam A⁷ by the knife edge A¹².

B is a package supporting frame resting upon the knife edge B¹ on the scale beam A⁷
35 and steadied and guided at its upper end by the links B² pivotally mounted on the tie piece A². The hooks B³, B³ project inwardly from the frame B toward the ends of the frames A, A and are in slidable contact with the flanges B⁴, B⁴ arranged along
40 the front edges of the frame members. The hooks B³ are tied together at a point adjacent their ends by the yoke B⁵. The downwardly curved cradle bar B⁶ is supported by the hooks B³ and supports one
45 end of the package or barrel to be filled. The package is supported at the other end by the downwardly curved cradle bar B⁷ supported pivotally upon the levers B⁸, B⁸
50 which are rigidly mounted on the curved shaft B⁹, which shaft is pivotally mounted and carries the controlling lever B¹⁰ working in the quadrant B¹¹. The filling throat
55 B¹² is supported on the frame B, and is provided with a part B¹³ in lieu of the bung of the barrel and the shoulder B¹⁴ to rest against the head of the barrel around the bung. The yoke B¹⁵ projects outwardly
60 from the frame B and has screw-threaded therein the adjusting screw B¹⁶ controlled by the hand wheel B¹⁷ by which the foot B¹⁸ may be pressed against one end of the barrel to seat it snugly against the shoulder B¹⁴.

65 The cylindrical propeller pocket C is

mounted upon the frame members A, A and contains the vane propeller C¹ on the shaft C² adapted to be driven by any suitable source of power applied through the tight and loose pulleys C³, C⁴. The passage C⁵
70 discharges into the propeller pocket C and is fed from the supply bin C⁶. The measuring wheel C⁷ is interposed between the bin C⁶ and the pocket C and controls the flow of material through the passage C⁵.
75 The measuring wheel C⁷ is adapted to be driven from the propeller shaft.

Referring to Figs. 3 and 4, it will be noted that the propeller pocket has opposed conical walls C⁸ joined by a cylindrical wall C⁹, which wall has, however, about the lower portion of its periphery the inwardly raised semi-circular projection C¹⁰. The vanes C¹¹ of the propeller X¹ have inclined sides to conform closely to the conical wall C⁸ and their ends are circularly raised as indicated at C¹² to engage the parts C¹⁰. The lower portion of the propeller pocket is cut away as indicated at D to form a discharge port discharging into the feed-
80 ing tube D¹. This feeding tube is circular in cross-section and is so arranged with respect to the propeller pocket C that an extension of the inner peripheral line of the propeller pocket wall is tangent to the cen-
85 ter line of the tube. In this tube is reciprocally mounted the conically pointed feeding or packing plunger D² which, as shown in Fig. 4, fits snugly into the semi-circular recesses in the ends of the propeller vanes.
90 The feeding tube D¹ is normally in register with the throat B¹². The plunger D² is slidable in the sleeve D³. The cross-head D²³ is slidably mounted at either end in the guideways D⁴ in the frame members A and carries the upwardly projecting lug D¹⁰ which supports and is slidable with respect to the plunger D² which passes through a perforation therein. From this lug pro-
95 ject rearwardly on either side the arms D¹¹ within which are slidably mounted the rods D¹². The yoke D¹³ is rigidly mounted on the plunger D² and carries adjustably screw-threaded therein the rods D¹² locked in position by the nuts D¹⁴. The springs D¹⁵ surround the rods D¹² and are adapted to be compressed between the heads D¹⁶ on the ends of the rods and the flange D¹⁷ projecting outwardly from the arms D¹¹
100 has the rods D¹² slidable with respect to said flanges and said arms. The shaft D⁵ is rotatably mounted in the frame A and carries on either end the crank disks D⁶ upon which are pivotally mounted the connecting rods D⁷ which are pivotally
105 mounted at the other end on the pins D⁸ on opposed ends of the cross-head D²³.

The shaft F³ carries the sprocket K which by means of the sprocket chain K¹ drives the sprocket K² rigidly attached to a clutch mem-
130

ber K³ which member is rotatably mounted on the worm shaft K⁴. The clutch member K⁵ is keyed to the worm shaft K⁴. The worm K⁶ is integral with the shaft K⁴ and in mesh with the worm wheel K⁷. The sprocket E is rotatably mounted on the shaft D⁵ adapted to be driven through the sprocket chain E¹ from a sprocket E² on a shaft E³, which shaft in turn is connected by means of the gears E⁴ and E⁵ with the propeller shaft. The sprocket E carries the clutch disk E⁶ provided with the conical hole E⁷ therein. The clutch sleeve E⁸ is splined on the shaft D⁵ and carries an arm E⁹ upon which is mounted a conical pin E¹⁰ adapted to enter the conical hole E⁷. The spring E¹¹ yieldingly presses the clutch sleeve E⁸ toward the disk E⁶. The sleeve E⁸ is provided with a cylindrical cam E¹² in opposition to a cam roller E¹³ on a sliding shaft E¹⁴. The lever E¹⁵ is pivoted on the member A³ and is in opposition at one end to the pin E¹⁷ on the shaft E¹⁴ and adapted to draw the cam roller thereon out of engagement with the cylindrical cam E¹², and at the other end of the pin E¹⁸ on the worm wheel K⁷.

The bell crank lever L is pivotally mounted on the member A³ and carries the pin L¹ at one end in engagement with the slot L² in the clutch member K³. The link L³ is provided at one end with the elongated eye L⁴ in slidable engagement with the pin L⁵ on the bell crank lever L and is at the other end in pivotal engagement with the hand-operated lever L⁶. The link L³ has adjacent its pivotal connection with the lever L⁶ a large slotted member L⁷ in slidable and pivotal engagement with the pin L⁸ on the bell crank lever L⁹ which lever is at its other end pivoted to the shutter L¹⁰ apertured at L¹¹ to control the feeding tube D¹. The lever M is pivotally mounted on one of the frames A at one end and at the other end is pivotally mounted on the link L³. Intermediate the two pivotal points it is pivoted to a solenoid G⁶.

It will be noted that when the operator pushes back on the lever L⁶ he will slide the shutter L¹⁰ inwardly to bring the aperture L¹¹ in register with the feeding tube and allow the feeding to take place. This manipulation, meanwhile, will throw the bell crank lever L around to bring the clutch members K³ K⁵ into engagement thus rotating the worm wheel K⁷. The rotation of the worm wheel K⁷ will finally bring the pin E¹⁸ about as indicated by the arrow until it strikes the lever E¹⁵ to contact the pin E¹⁷ and draw the roller E¹³ out of engagement with the cam E¹² thus bringing the clutch members E¹⁰ and E⁷ to engage and cause the cross head D²³ to reciprocate. The feeding and packing plunger will thus move back and forth in re-

sponse to the rotation of the shaft D⁵ until the package has been filled. When this occurs the weight will be overbalanced, the package and scale descend and the terminal G will dip into the mercury cup G¹ and close the circuit by means of the conductors G², G³ and G⁴ through a source of electric power G⁵ and the solenoid G⁶ to throw the shaft E¹⁴ and the cam roller E¹³ back against the sleeve E⁸, when the rotation of the sleeve will cause the cam E¹² to ride up along the roller E¹³, thus withdrawing the pin E¹⁰ against the pressure of the spring. This movement of the solenoid will at the same time throw the shutter L¹⁰ across the mouth of the feeding tube and stop the feed and will also disengage the clutch so as to stop the movement of the worm gear ready for the next cycle of operation.

The scale beam A⁷ is provided with a frame H located back of the fulcrum of the scale and so arranged with respect to the scale beam that when the feeding throat and feeding tube are in register the upper portion of this frame is in a horizontal position. The roller H¹, mounted on the brackets H² depending from the cross-head D²³ will ride along this frame H and the parts are so arranged that only when the feeding or packing plunger is completely withdrawn from the feeding throat is it possible for the scale beam to tip, being held as it is in the upper position by the pressure of the roller on the frame H.

In the modified form shown in Fig. 5 is a detail cross-section through the bottom of the feeding pocket and feeding tube along a line similar to the line 4-4 of Fig. 2 when showing the modified form. Here the plunger X is smaller in cross-sectional area than the tube D¹ and thus the power required to operate this plunger and the increments fed by vanes and by the plunger at each reciprocation of the plunger will be comparatively smaller thus permitting very accurate measurement. In such a condition as this, of course, the vane X will fit down almost completely around the plunger, as indicated, thus giving a better action of the vane than in the case of Fig. 4 where the vane has a comparatively large aperture therein to permit the passage of the plunger D².

While I have shown in my drawing an operative device, still many changes might be made in the size, shape and arrangement of parts without departing materially from the spirit of my invention. I wish, therefore, that my drawing be regarded as in a sense diagrammatic.

The shaft Q upon which the gear C⁷ is mounted, is provided with the sprocket Q¹ and is driven by means of a chain from the sprocket Q² on the shaft E³. A moving platform or carrier J is provided at the

front end of the machine to convey away the filled barrels which may be dropped upon it from the machine as soon as they have been filled.

5 The use and operation of my invention are as follows:—The operator first places the barrel in position in such manner that the feeding throat enters the bung-hole in the head of the barrel. He manipulates the
10 dumping lever so as to raise the rear end of the barrel until the barrel is in a substantially horizontal position. The lever is then locked by means of the segment and the hand wheel will be tightened up to seat the barrel
15 snugly against the shoulder of the feeding throat. The operator then presses back the hand lever to open the feeding tube and the material will then be discharged by the propeller vanes into the barrel or package in a
20 rapidly moving stream or jet which enters the barrel and fills it with a loosely compacted mass of material and this filling will continue until the pressure in the barrel or package has reached that point at which the
25 centrifugally discharged vanes are no longer able to pump the material against pressure. Meanwhile, however, since the movement of the lever will have thrown the clutch on the worm shaft, the worm gear will have been
30 rotating and, by a suitable proportion of parts which will have been discovered by experiment or which could be computed, the worm gear will rotate in the time it takes to fill the barrel by means of the loosely com-
35 pacted stream. The pin on the worm gear will then tip the cam roller and free the conical cam, thus permitting the clutch on the rear shaft D⁵ to be engaged and the reciprocation of the cross-head will then
40 commence. The plunger will project way into the barrel at each stroke, leaving a hole. The vanes will drive the material into the hole. The plunger will then pack this material tight. This process continues until
45 the pressure at the end of the plunger reaches a certain predetermined point depending on the compactness desired. When this point is reached the springs driving the plunger will be enabled to force it clear to
50 the end of its maximum length stroke and part of the stroke of the cross-heads and will continue without movement of the plunger, the springs being compressed. Thus, as the pressure increases the length of
55 the plunger will progressively diminish without any change in the length of the stroke of the cross head and finally, as the pressure is increased from the end of the package inwardly, the barrel will be progressively packed clear to the filling head.
60 The barrel by this time will have reached the desired weight, the weighing mechanism will operate, the scale will tip, the circuit will be completed through the mercury cup and the
65 solenoid will operate to throw the lever, dis-

engage the clutch, and stop the feed leaving the device in suitable position to commence filling the second package.

It will be noted that the frame on the scale beam and the roller on the cross-head
70 will unite to prevent any movement of the scale beam while the plunger is in the barrel. Thus all danger of catching, bending, twisting or warping the plunger is obviated. The packing plunger is pointed so that as it pene-
75 trates the material in the barrel the pressure will be distributed throughout the barrel and will not be concentrated in an axial line.

Some portions of this application are contained in a prior application, Serial Number
80 683,667, filed March 14, 1912.

I claim:

1. The process of filling packages with a compressed or compacted mass of powdery
85 material which consists in inserting the major increment by a filling stream and then the minor increment by a compacting stream.

2. The process of filling packages with a compressed or compacted mass of powdery
90 material which consists in inserting the major increment of such material by a small filling stream and then the minor increment by a compacting stream.

3. The process of filling packages with a compressed or compacted mass of powdery
95 material which consists in inserting the major increment of such material by a small filling stream and then the minor increment by a small compacting stream.

4. The process of filling packages with a
100 compressed or compacted mass of powdery material which consists in inserting the major increment of such material by a small swiftly moving stream and then the minor increment by a small compacting stream.
105

5. The process of filling packages with a compressed or compacted mass of powdery
110 material which consists in inserting the major increment of such material by a small swiftly moving stream and then the minor increment by a small slowly moving compacting stream.

6. The process of filling packages with a compressed or compacted mass of powdery
115 material which consists in inserting the major increment of such material quickly in a non-compacted condition and then the minor increment by a compacting stream or mass, both increments being inserted through the same filling opening.
120

7. The process of filling packages with a compressed or compacted mass of powdery
125 material which consists in inserting the major increment of such material by a small swiftly moving non-compacting stream and then the minor increment by a small compacting stream.

8. The process of filling packages with a compressed or compacted mass of powdery
130 material which consists in inserting the

major increment by a continuous filling stream and the minor increment by a compacting stream.

9. The process of filling packages with a compressed or compacted mass of powdery material which consists in inserting the major increment by a continuous filling stream and then the minor increment by a discontinuous compacting stream.

10. The process of filling packages with a compressed or compacted mass of powdery material which consists in inserting the major increment of such material by a small continuous filling stream and then the minor increment by a discontinuous compacting stream.

11. The process of filling packages with a compressed or compacted mass of powdery material which consists in inserting the major increment of such material by a small filling stream and then the minor increment by a small compacting stream.

12. The process of filling packages with a compressed or compacted mass of powdery material which consists in inserting the major increment of such material by a small swiftly moving stream and then the minor increment by a small compacting stream.

13. The process of filling packages with a compressed or compacted mass of powdery material which consists in inserting the major increment of such material by a small swiftly moving continuous stream and then the minor increment by a small slowly moving compacting stream.

14. The process of filling packages with a compressed or compacted mass of powdery material which consists in inserting the major increment of such material by a small continuous filling stream and then the minor increment by a small discontinuous compacting stream.

15. The process of filling packages with a compressed or compacted mass of powdery material which consists in inserting the major increment of such material by a small swiftly moving continuous stream and then the minor increment by a small discontinuous compacting stream.

16. The process of filling packages with a compressed or compacted mass of powdery material which consists in inserting the major increment of such material by a small swiftly moving continuous stream and then the minor increment by a small discontinuous slowly moving compacting stream.

17. The process of filling packages with compressed or compacted powdery material which consists in forcing by means of a

small but swiftly moving stream the major increment of the material into the package so as to substantially fill the same without compacting the material therein, then forcing the remaining increment of the measured amount by means of a forced compacting stream so as to fill and compact the material within the package.

18. The process of filling packages with a compressed or compacted mass of powdery material through a small or valved opening which consists in forcing a loose swiftly moving small stream of material through such opening to quickly fill the major part of the material into the package, then forcing the remainder of the measured quantity of material necessary to fill the package through such small opening under high pressure to compact the material within the package.

19. The process of filling packages with a compressed or compacted mass of a powdery material through a small or valved opening which consists in forcing a loose swiftly moving small stream of material through such opening to quickly fill the major part of the material into the package, then forcing the remainder of the measured quantity of material necessary to fill the package through such small opening under high pressure to compact the material within the package by successive increments separately forced into the package.

20. The process of filling packages with a compressed or compacted mass of a powdery material through a small opening which consists in inserting by a swift stream through such opening the major increment of such material and then inserting the minor increment through the same opening by successively forcing under high pressure a series of charges therethrough.

21. The process of filling packages with a compacted mass of finely divided material which consists in first loosely filling the package and then forcing increments of material in a compacting stream into the loosely filled package the distance through which the increments penetrate into the package progressively decreasing as the pressure in the package increases.

In testimony whereof, I affix my signature in the presence of two witnesses this 21st day of January 1913.

ADELMER MARCUS BATES.

Witnesses:

MINNIE M. LINDENAN,
LAUREL M. DOREMUS.