

Aug. 22, 1939.

C. F. CARTER

2,170,469

METHOD OF AND APPARATUS FOR FILLING CONTAINERS
WITH POWDER OR OTHER COMMINUTED MATERIAL

Filed June 9, 1938

3 Sheets-Sheet 1

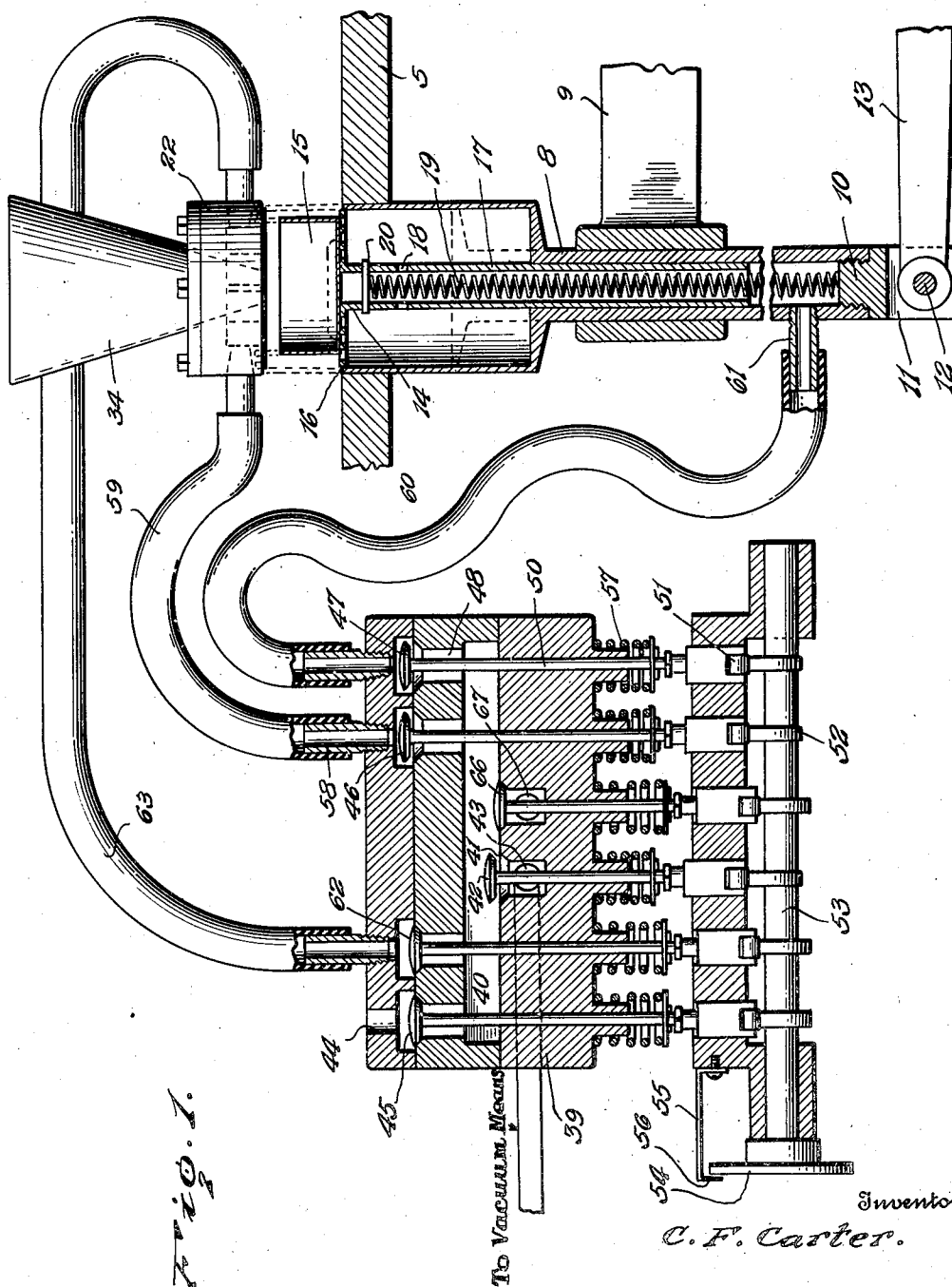


Fig. 1.

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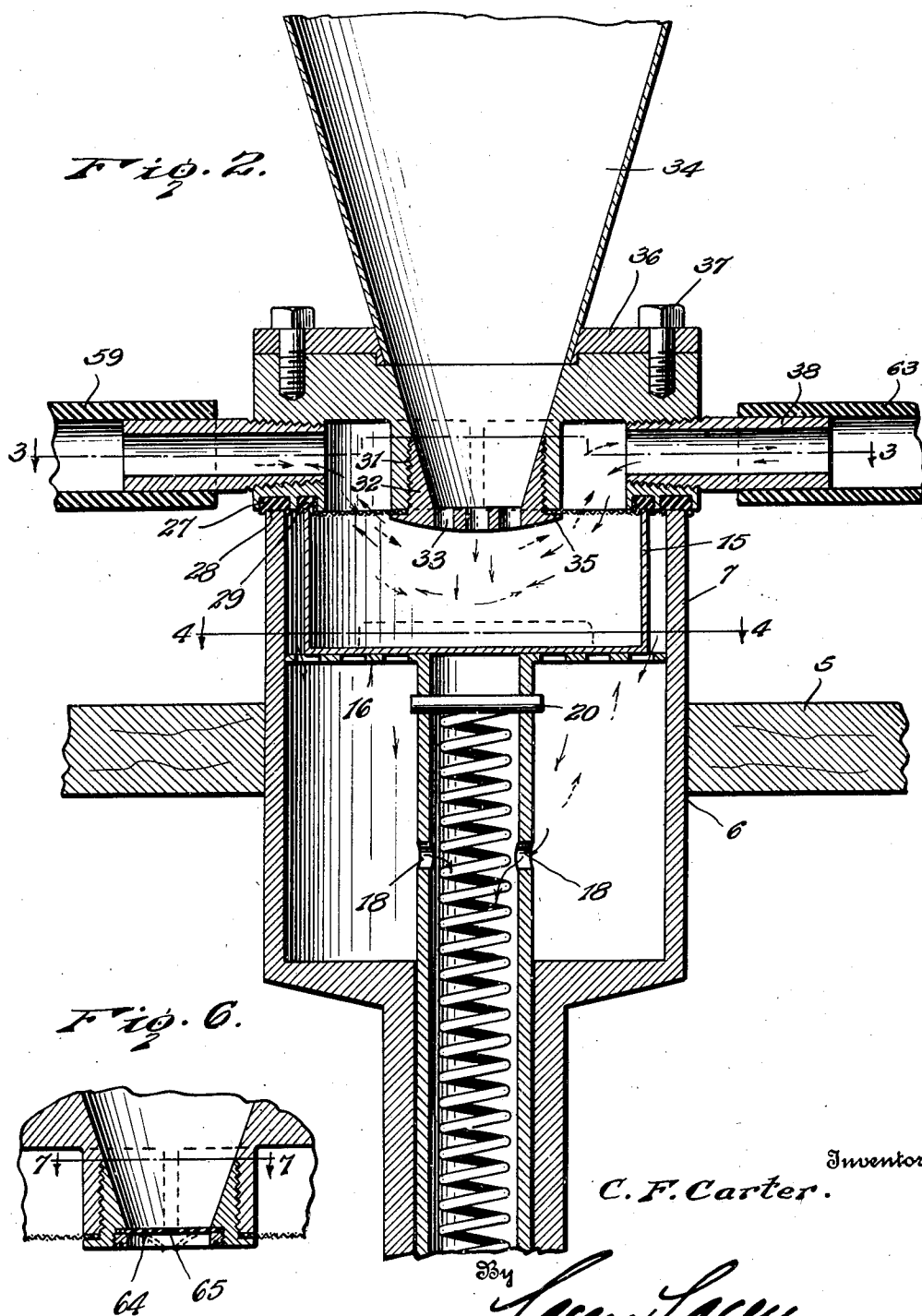
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3 Sheets-Sheet 2



Inventor
C. F. Carter.

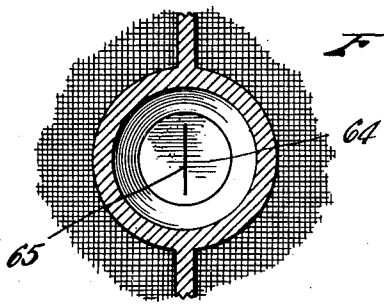
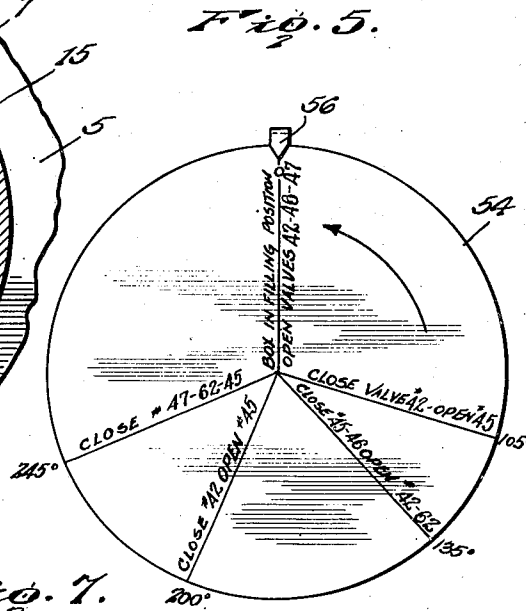
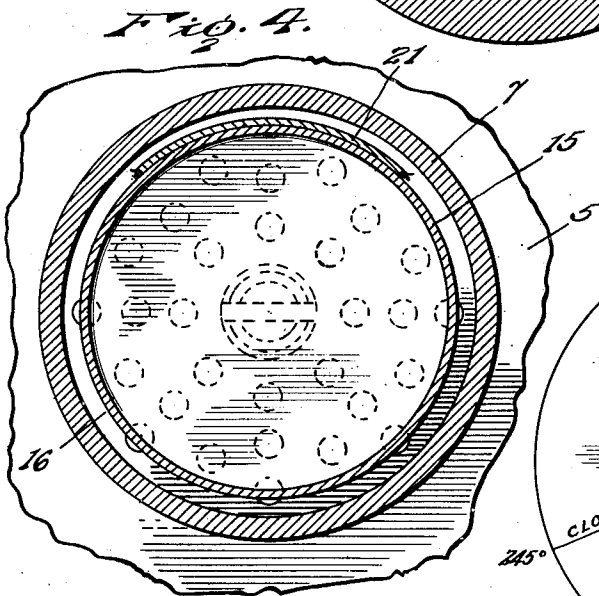
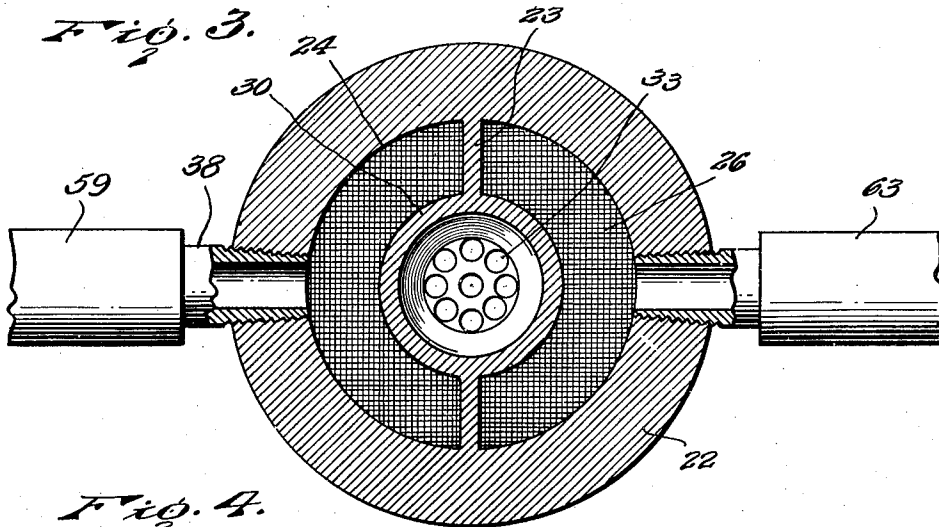
Lacey, Lacey,
Attorneys

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3 Sheets-Sheet 3



Inventor

C. F. Carter.

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Lacey Lacey, Attorneys

UNITED STATES PATENT OFFICE

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METHOD OF AND APPARATUS FOR FILLING
CONTAINERS WITH POWDER OR OTHER
COMMUNUTED MATERIAL

Clarence F. Carter, Danville, Ill.

Application June 9, 1938, Serial No. 212,841

20 Claims. (Cl. 226—116)

This invention relates to a vacuum method of an apparatus for filling boxes and similar containers with powder or other comminuted material.

5 The object of the invention is to provide a novel method and apparatus for filling powder containers in which a vacuum is employed for exhausting air from the box or container and simultaneously feeding the powder from a source
10 of supply into the box whereby to insure complete filling of the box and uniform density of the powder therein without any waste of the material or the formation of dust fumes during the filling operation.

15 A further object of the invention is to provide a filling apparatus in which packing of the powder within the box or container is effected by atmospheric pressure and in which the path of the air through the vacuum head is alternately
20 reversed two or more times during each cycle of operation of the machine to effect automatic cleaning of the screens of said vacuum head as the boxes are filled.

25 A further object is to provide a powder filling machine including a rotating shaft having a plurality of cams mounted thereon and timed to automatically open and close a series of valves at predetermined intervals for governing the flow
30 of air to and from the vacuum head during each cycle of operation of the machine.

35 The invention further provides a novel method or process of filling powder boxes which consists in first creating a vacuum within and around the box or container and through the screen on the left hand side of the filling head, thereby
40 causing atmospheric pressure to force the material from a source of supply into the box or container to partially fill and initially pack the material within the box, admitting air at atmospheric pressure to the filling head at said left
45 hand screen, creating a vacuum through the screen on the right hand side of the filling head to draw sufficient material from the source of supply to completely fill the box and effect a further packing of the material therein while at
50 the same time pulling fresh air through the screen on the left hand side of the head to clean said screen, admitting air at atmospheric pressure to the filling head at the right hand screen to supply fresh air to be subsequently drawn
55 through the right hand screen to clean the same when a vacuum is created through the left hand screen and cutting off the vacuum to the filling head to permit release of the filled box preparatory to starting a new cycle of operation.

Further objects and advantages will appear in the following description, in which—

Figure 1 is a vertical sectional view of an apparatus or machine used for carrying the method into effect,

Figure 2 is an enlarged vertical sectional view through the filling head and its associated parts,

Figure 3 is a horizontal sectional view taken on the line 3—3 of Figure 2,

Figure 4 is a similar view taken on the line 4—4 of Figure 2,

Figure 5 is a front elevation of the timing disk or dial,

Figure 6 is a detail vertical sectional view illustrating a modified form of the invention, and

Figure 7 is a horizontal sectional view taken on the line 7—7 of Figure 6.

The improved apparatus and method forming the subject-matter of the present invention is especially adapted for automatically filling
20 boxes, cans and other containers with any kind of comminuted material, such as tooth powder, corn starch, baking powder, dentifrice and the like, and in carrying the invention into effect, I provide a machine or apparatus comprising a
25 table or platform 5 having an opening 6 formed therein and in which is mounted for vertical reciprocatory movement a cylindrical casing or shroud, indicated at 7. The upper end of the casing 7 is normally open while the lower end
30 thereof is provided with a reduced tubular extension 8 which is slidably mounted in a supporting bracket 9 forming a part of the frame of the machine. The lower end of the tubular extension 8 is threaded for the reception of a
35 correspondingly threaded closure plug 10, there being spaced ears 11 formed on said closure plug and between which is pivotally mounted, at 12, a hand or foot lever 13 for elevating and retracting the casing or shroud 7. Slidably mounted
40 within the tubular extension 8 is a carrier or support 14 for the box or other container, indicated at 15. The box carrier 14 is provided with a flat perforated head 16 and a reduced tubular member or shank 17 which is slidably
45 mounted within the tubular member 8 of the shroud 7, as best shown in Figure 1 of the drawings. The tubular member or shank 17 is provided with one or more lateral openings 18 and fitted within said tubular member is a coiled
50 spring 19, the lower end of which rests against the closure plug 10 while the upper end thereof bears against a pin 20 extending transversely through the member 17 in spaced relation to the perforated head thereof. The perforated head
55

is provided with an upstanding segmental rest or support 21 against which the box or container 15 is adapted to bear for the purpose of centering said box immediately beneath the filling head, indicated at 22. The filling head 22 consists of a cylindrical box-like structure having its lower end normally open and divided by a transverse partition 23 to form independent compartments 24 and 25, each having its open end covered by a strip of very fine screening or other foraminous material, indicated at 26. The open side of the filling head is provided with a circumferential groove 27 in which is seated an outer yieldable gasket 28 for engagement with the adjacent upper edge of the casing or shroud 7 and spaced from the outer gasket is a smaller inner yieldable gasket or washer 29 fitted in a correspondingly shaped seating groove, as shown, and against which the upper edge of the box or container is adapted to rest so as to form an airtight joint between the parts when filling said container with powder or other comminuted material. The filling head 22 is provided with a central depending annular flange 30 formed integral with the partition 23 and having its inner wall threaded, at 31, for engagement with a correspondingly threaded closure cap 32. The closure cap 32 is formed with a series of openings or perforations 33 through which powder or other comminuted material is fed from a hopper 34 into the box or other container to be filled. The perforated closure cap 32 is provided with a circumscribing lateral lip 35 which serves to clamp the inner edges of the screens 26 against the lower face of the flange 30, the outer edges of the screens fitting within the seating groove of the inner gasket 29 and being held against accidental displacement by said inner gasket. By securing the screens 26 to the filling head in this manner they may be readily removed and replaced when necessary. The inner wall of the perforated closure cap 32 is inclined to conform to the inclination of the walls of the hopper 34, the latter being retained in position on the filling head by means of a clamping plate 36 secured to the top of the filling head by bolts or similar fastening devices 37. Threaded in the filling head at diametrically opposite points thereon are nipples 38 which communicate with the compartments 24 and 25 and through which air is exhausted from or introduced within said filling head during the filling operation, as will be more fully described hereinafter.

Disposed adjacent the table or platform 5 is the mechanism for automatically controlling the flow of air to and from the filling head and creating a vacuum in said filling head, said mechanism comprising an engine block or casting 39 provided with an intermediate horizontal passage 40 having a valve seat 41 for engagement with a valve 42 which latter controls a port 43 leading to a vacuum pump of any standard construction. An opening 44 leading to the atmosphere is formed in the top of the block or casting and the admission of air through said opening is controlled by a valve 45. Valves 46 and 47 are also mounted in the block or casting 39, said valves cooperating with ports 48 communicating with the passage 40, as best shown in Figure 1 of the drawings. The several valves are provided with depending stems 50 having terminal rollers or tappets 51 mounted on their lower ends for engagement with a plurality of timing cams 52 secured to a revolving shaft 53. The shaft 53 may be driven from an engine or

other suitable source of power and secured to the outer end of said shaft is a timing disk or indicator 54 having indicia represented thereon corresponding to the different cycles of operation of the machine, as best shown in Figure 5 of the drawings. An indicator rod 55 is secured to the block or casting 39 and is provided at its outer end with a depending pointer 56 which cooperates with the indicia on the dial 54 and indicates the positions of the different valves when the machine is in operation. Suitable springs 57 surround the valve stems to hold the valves against their seats.

Threaded in the block or casting 39 above the valve 46 is a nipple 58 to which is secured one end of a flexible hose or conductor 59, the other end of which is secured to the nipple 38 leading to the left hand compartment of the filling head. A similar air conductor or hose 60 has one end thereof connected with a nipple arranged above the valve 47 and its other end connected with a nipple 61 leading to the interior of the tubular member 8. A valve 62 is also provided, said valve controlling the flow of air from the passage 40 into a tube or conductor 63. One end of the conductor 63 is secured to a nipple arranged above the valve 62 while the other end thereof is connected with the nipple 38 leading to the compartment on the right hand side of the filling head.

In operation, an initial downward pressure on the lever or other mechanical means 13 will elevate the box carrier until the perforated head thereof is on a level with the upper surface of the table or platform and in which position the box to be filled is placed thereon with the wall of the box bearing against the rest or support 21. A further downward pressure on the lever 13 or other mechanical means will then elevate the casing or shroud 7 together with the box so as to cause the upper edge of the shroud 7 to contact with the outer gasket 28 and the upper edge of the box or container to contact with the inner gasket 29, thereby forming an airtight joint between the parts. When the box is in this position, the pointer 56 is on the zero mark on the timing device 54. Rotation of the shaft 53 then opens valve 42 and valves 46 and 47, thereby causing a suction through the conductors 59 and 60 around the outside of the box and within said box so as to exhaust the air and create a vacuum in the box. The difference in pressure produced by the vacuum thus created will cause the atmospheric pressure exerted on the material within the hopper to feed or force said material into the box or container 15 to partially fill the same and effect the initial packing of the material within the box, the air being pulled out through the screen 26 on the left hand side of the filling head during this operation. The valves remain in this position for one hundred and five degrees of the cycle and at this point the screen through which the air is being drawn becomes partially clogged with powder. The valve 42 is then closed and the valve 45 opened to the atmosphere which allows the conductors 59 and 60 to become filled with air at atmospheric pressure. This position is held for thirty degrees at which time valves 45 and 46 are closed and valves 42 and 62 opened, thus creating a vacuum through the conductor 63 and within the compartment on the right hand side of the filling head and within the conductor 60 which still communicates with the outside of the box, thereby drawing sufficient material from the hopper

to completely fill the box and effect a further packing of the material within said box. During this cycle of operation fresh air is pulled through the conductor 59 and the screen in the left hand compartment of the filling head so as to thoroughly clean said screen. This position is held for sixty-five degrees of the cycle at which time valve 42 is closed and valve 45 is opened allowing atmospheric pressure to rush in through the conductors 60 and 63, thereby equalizing the pressure and permitting the carrier to be lowered and the filled box removed. This position is held for forty-five degrees at which time valves 41, 62 and 45 are closed in preparation of starting the operation all over again at three hundred and sixty degrees. When the operation is started for filling the next box, the screen in the compartment on the right hand side of the filling head is cleaned when pulling the vacuum on the left hand side of the filling head, as will be readily understood. The admission of air under atmospheric pressure to the filling head supplies the necessary air for cleaning the screens by reversing the direction of flow of air through said screens. It will thus be seen that during the filling operation, the material is deposited within the container first on one side thereof and then on the other so that a progressive filling of said container is effected.

In Figures 6 and 7 of the drawings, there is illustrated a modified form of closure for the supply hopper, this form of the device being adapted for use when heavy or relatively coarse material is used. In the modified construction instead of providing the closure with perforations, said closure is in the form of an elastic diaphragm 64 having a horizontal slit 65 formed in the center thereof and which slit is normally closed but is movable to open position to allow the material to pass from the hopper into the filling head when air is exhausted from the interior of the box or container to be filled. If desired, however, instead of making the elastic diaphragm with a single slit, said diaphragm may be formed with a plurality of intersecting slits. The construction of the closure in Figure 6 is such that by removing the perforated closure 32 shown in Figure 2 of the drawings, the closure shown in Figure 6 may be readily threaded into the central depending flange of the filling head, as will be readily understood. In cases where the powder or other material is of a sticky or gummy nature, the valve 45 leading to the atmosphere is disconnected or otherwise rendered inoperative and a valve 66 is then brought into operation in place of the valve 45. This valve 66 controls the admission of air through a port 67 leading to an air compressor of any suitable construction so that, when the valve 66 is opened, the compressed air will thoroughly clean the screens in the compartments of the filling head. The valves 45 and 66 are both mounted in the block or casting 39 and are selectively used according to the nature of the material being fed into the containers.

When metal cans or containers of a non-porous nature are being filled, it is not necessary to exhaust the air from around the outside of the can during the filling operation, the vacuum created within the can being sufficient to exhaust the air therefrom and feed the material from the hopper in the manner previously stated.

While there is shown and described but a single filling head or unit, it will, of course, be understood that any desired number of filling heads

may be employed and mounted on either a stationary table or rotary dial and operated simultaneously or in sequence without departing from the spirit of the invention. It will also be understood that the filling head may be adjusted vertically with respect to the table or dial so as to accommodate boxes or containers of different heights. It will, furthermore, be understood that the mechanical construction of the apparatus may be changed or varied to suit different conditions of use, it being the intention to cover any mechanism capable of carrying into effect the new and novel method herein defined for filling boxes or containers with comminuted material.

Having thus described the invention, what is claimed as new is:

1. The method of filling containers with comminuted material which consists in placing a container in position to receive the material, exhausting air from within the container through a portion of a screening medium, and subjecting the material to the action of air at atmospheric pressure to feed and pack the material within said container and clean accumulated material from another portion of said screening medium.

2. The method of filling containers with powder which consists in placing a container in position to receive the powder, exhausting air from within the container through a portion of a screening medium and at the same time exhausting air from around said container, and simultaneously admitting air at atmospheric pressure to the powder to feed and pack the material within said container and clean accumulated powder from another portion of said screening medium.

3. The method of filling containers with comminuted material which consists in placing a container in position to receive the material from a filling head and alternately exhausting air from and admitting air at atmospheric pressure to the container through a screening medium at the opposite sides of the head to fill the container with said material and alternately clean different portions of the screening medium of any material adhering thereto.

4. The method of filling containers with comminuted material which consists in placing a container beneath a filling head having independent screened compartments, and successively exhausting air from and admitting air at atmospheric pressure to the container through the screen of one compartment and then through the screen of another compartment to fill the container with said material and alternately clean said screens of any material adhering thereto.

5. The method of filling containers with comminuted material which consists in placing an empty container beneath a filling head having independent screened compartments and a supply hopper, and successively exhausting air from and admitting air at atmospheric pressure alternately to the container through the screens of said compartments to fill the container with said material and effect alternate cleaning of the screens of said compartments.

6. The method of filling containers with comminuted material which consists in placing an empty container beneath a filling head having independent screened compartments and a supply hopper, exhausting air from the container through the screen of one compartment and around and within the container to feed the ma-

terial from the hopper into said container, admitting air at atmospheric pressure to the filling head at said screen to supply air for withdrawal through the screen for cleaning the same, and admitting air at atmospheric pressure through the screen of the other compartment in alternate relation to the action of the air in the first-mentioned compartment to clean said screen.

7. The method of filling containers with comminuted material which consists in placing a container in position to receive the material from a filling head, moving the container into air-tight engagement with said head, successively exhausting air from and admitting air at atmospheric pressure to the container through a screening medium at one side of the head and then at the other to fill the container with said material and alternately clean different portions of the screening medium of any material adhering thereto, and subsequently moving the container out of engagement with the head.

8. The method of filling containers with comminuted material which consists in placing an empty container beneath a filling head having independent screened compartments, moving the container into air-tight engagement with said head, successively exhausting air from the container and through the screen of one compartment to feed the material from the head into the container and then admitting air at atmospheric pressure to said screen to clean the same, successively exhausting air from the container through the screen of the other compartment and admitting air at atmospheric pressure through said screen to clean the same, and withdrawing the filled container from engagement with the head.

9. The method of filling containers with comminuted material which consists in placing an empty container beneath a filling head having independent screened compartments, exhausting air from within and around the container and through the screen of one compartment to partially fill the container with said material and effect an initial packing of the material therein, admitting air to the filling head at said screen, exhausting air from the container through the screen of the other compartment to completely fill the container with said material and effect a further packing of said material within the container and simultaneously pulling fresh air through the first-mentioned screen to clean the same, and admitting air to the last-mentioned compartment for the purpose of cleaning the screen thereof when a vacuum is created in the first-mentioned compartment.

10. A machine for filling containers with comminuted material including a support, a carrier mounted for reciprocation on the support and adapted to receive a container, a filling head in position to deliver material into the container, air conductors communicating with the interior of the filling head, valves controlling the passage of air through the conductors, means for producing a vacuum in the filling head, a revolving shaft, and means carried by the shaft for actuating the valves to successively create a vacuum in said filling head and admit air at atmospheric pressure thereto.

11. A machine for filling containers with comminuted material including a support, a carrier mounted for reciprocation on the support and adapted to receive a container, a filling head in position to deliver the material into the container and provided with independent compartments, a

screen in each compartment, air conductors communicating with said compartments, a supply hopper disposed between the compartments, valves controlling the passage of air through the conductors, means for producing a vacuum in the conductors, a valve for the vacuum producing means, a revolving shaft, and means carried by the shaft for actuating said valves in predetermined timed relation for successively creating a vacuum in and admitting air at atmospheric pressure to each compartment to alternately clean the screens of said compartments.

12. A machine for filling containers with comminuted material including a support, a carrier movably mounted on the support and adapted to receive a container, a filling head in position to deliver material into the container and provided with a screen, air conductors communicating with the interior of the filling head on opposite sides thereof, and means for producing a vacuum in the container through the filling head and subsequently admitting air to the head for clearing the screen.

13. A machine for filling containers with comminuted material including a support, a moveable carrier mounted on the support and adapted to receive a container, a filling head in position to deliver material into the container and provided with independent compartments each having a screen, means for moving the carrier to force the container in airtight engagement with the filling head, an air conductor communicating with each compartment, and means for controlling the air through said conductors to successively create a vacuum in the container through the screen of one compartment and admit air through said screen and then successively create a vacuum through the screen of the other compartment and admit air thereto.

14. A machine for filling containers with comminuted material including a support, a shroud mounted for reciprocation through the support, a carrier slidably mounted within the shroud and adapted to receive a container, a filling head having independent screened compartments, means for successively moving the container and shroud in air-tight engagement with the filling head, an air conductor communicating with each compartment, and means for reversing the path of air from the conductors alternately through said screens.

15. A machine for filling containers with comminuted material including a support, a filling head disposed adjacent the support and provided with independent screened compartments, inner and outer gaskets carried by the filling head, a shroud mounted for vertical movement within the support, a hollow carrier slidably mounted within the shroud and provided with a perforated head having a rest adapted to engage a container, said carrier being provided with an opening communicating with the interior of the shroud, an air conductor connected with each compartment, an air conductor connected with the interior of the carrier, means for successively elevating the container and shroud into airtight engagement with said gaskets, and means for controlling the flow of air through said conductors.

16. A machine for filling containers with comminuted material comprising a filling head having its lower end open and provided with a centrally disposed circumscribing flange, the interior walls of which are threaded, a partition connected with said flange and defining inde-

pendent compartments, screening material extending across said compartments, a threaded material-feeding closure engaging the threads on the flange and provided with a lateral lip bearing against the adjacent screening material, a hopper carried by the filling head and communicating with the feeding closure, means for supporting a container in air-tight engagement with the filling head, an air conductor communicating with each compartment, and means for controlling the flow of air through said conductors to said filling head.

17. A filling head for feeding comminuted material into containers comprising a body portion having independent screened compartments and a centrally disposed internally threaded flange, and a perforated closure head engaging the threaded walls of the flange.

18. A filling head for feeding comminuted material into containers comprising a body portion having independent compartments opening through the bottom thereof and provided with a centrally disposed interiorly threaded flange, there being seating grooves formed in the bottom of said body portion, inner and outer gaskets fitted in the seating grooves, screening material bearing against said flange and fitted into one of the seating grooves, and a perforated closure head detachably engaging the interior threads of

the flange and provided with a lateral lip adapted to engage the adjacent screens for clamping said screens against the flange.

19. A filling head for feeding comminuted material into containers comprising a body portion having independent compartments opening through the bottom thereof and provided with a centrally disposed interiorly threaded flange, screening material extending across said compartments, a closure head detachably engaging the threads on the flange and provided with a lateral lip for holding the screening material against said flange, and a resilient diaphragm extending across the closure head and having a slit formed therein, the walls of which are normally in contact with each other.

20. The method of filling containers with comminuted material which consists in placing an empty container in position to receive the material from a filling head, moving the container into air-tight engagement with said head, successively creating a vacuum and admitting air at atmospheric pressure to one side of the head and then to another side thereof to deposit the material in different portions of the container progressively fill said container, and subsequently moving the container out of engagement with said head.

CLARENCE F. CARTER.