

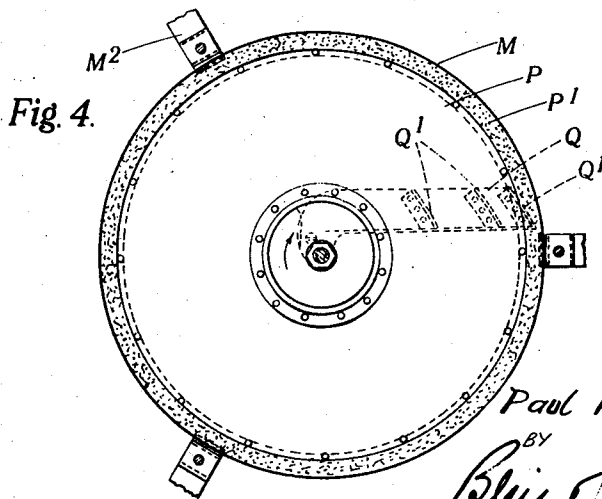
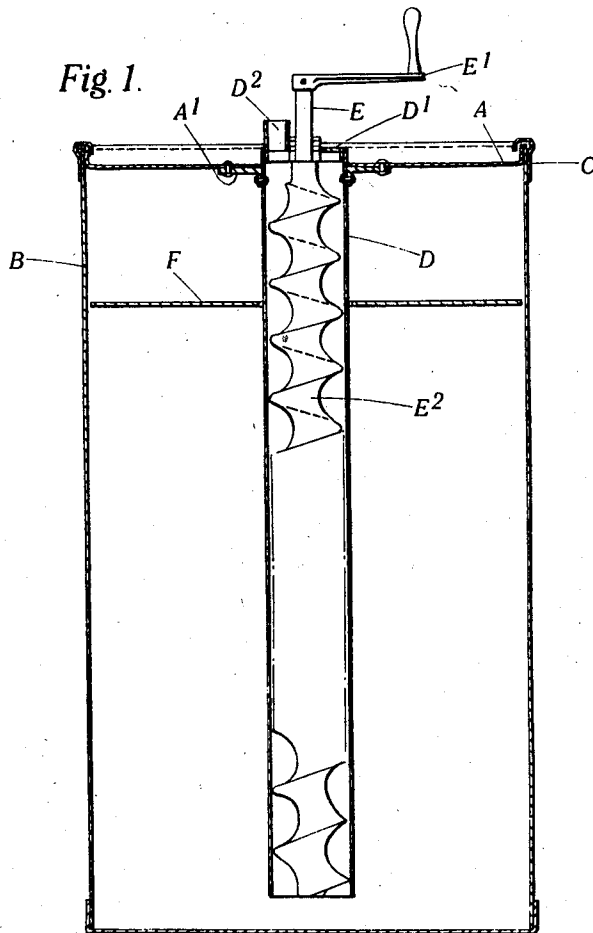
April 11, 1939.

P. F. CROTHERS  
APPARATUS FOR DELIVERING MATERIAL IN SOLID, PLASTIC,  
OR SEMILIQUID FORM FROM STORAGE CONTAINERS

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3 Sheets-Sheet 1



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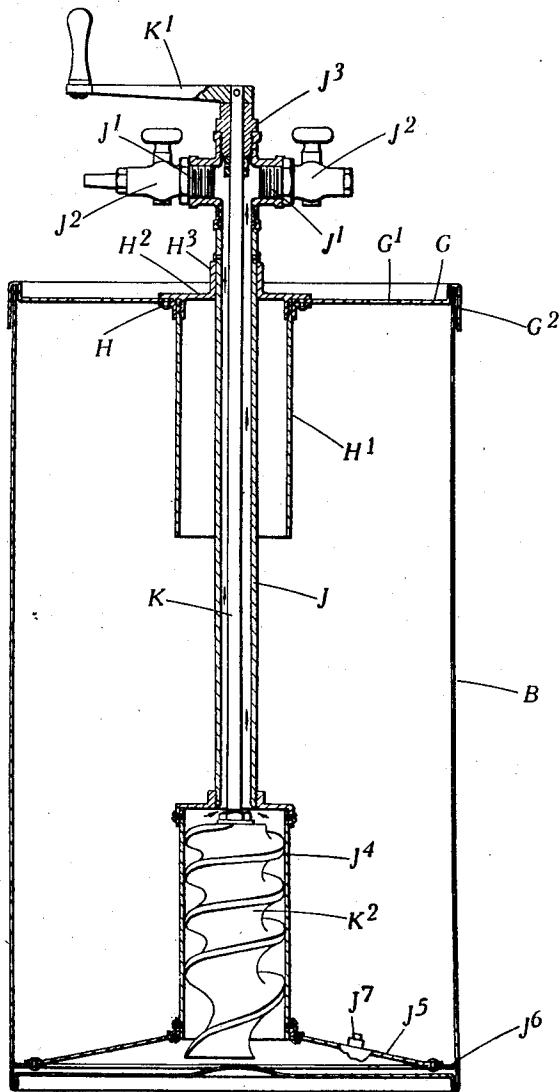
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3 Sheets-Sheet 2

Fig. 2.



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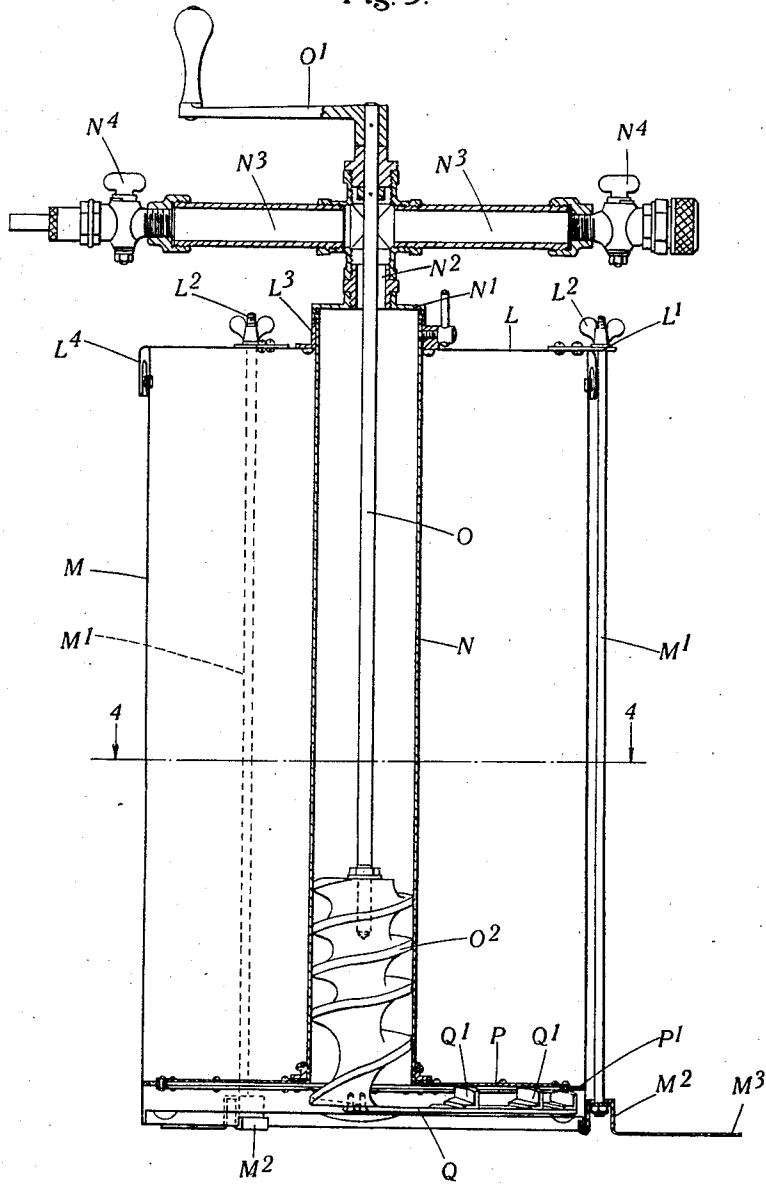
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Fig. 3.



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# UNITED STATES PATENT OFFICE

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## APPARATUS FOR DELIVERING MATERIAL IN SOLID, PLASTIC, OR SEMILIQUID FORM FROM STORAGE CONTAINERS

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In Great Britain September 1, 1937

13 Claims. (Cl. 221—85)

This invention relates to apparatus for delivering from storage drums or containers or the like material in plastic or semi-liquid form, and in particular to apparatus for conveying or delivering lubricants to the point needing lubrication or to a smaller storage container, grease gun or equivalent device by which the lubricant can be applied.

Owing to the difficulty experienced in delivering heavy lubricants in the plastic or so-called solid condition often best suited to the duty the lubricant has to perform, a softer lubricant which can readily be delivered under pressure as by means of a force pump or the like is often substituted, and the main object of the present invention is to provide an apparatus by which lubricants, even in solid form, can be discharged from the drum in which they are stored and be conveyed and delivered, if necessary, against back pressure.

According to this invention the apparatus comprises a helix mounted to rotate within a close-fitting tube or chamber open at its lower or inlet end, a piston surrounding the tube and adapted to bear upon the upper face of the material in the drum and a delivery or discharge outlet at the upper end of the tube.

When the apparatus is intended for use with solid or plastic material a comparatively short helix of varying pitch may be employed and mounted to rotate in a cylindrical chamber, which may be termed the "intake chamber", formed on the lower end of the delivery tube. This tube is then conveniently of smaller diameter than the intake chamber and contains the shaft by which the helix is rotated. In such an arrangement the inlet end of the intake chamber preferably carries and is surrounded by an annular piston the outer edge of which carries a resilient packing ring adapted to engage the inner walls of the drum or container. The lower end of the helix preferably extends through the inlet end of the intake chamber and constitutes a cutting auger which engages the surface of the material in the drum so as to transfer this material into the intake chamber and thence into the delivery tube. Preferably the annular piston secured to the inlet end of the intake chamber is coned so that its outer circumferential part is somewhat lower than its inner circumference where it is attached to the intake chamber. Further, this piston may be provided with a valve for the escape of any air which may be trapped between the piston and the surface of the material in the drum.

The parts above described are preferably car-

ried by a circular cover or other circular supporting member having a flange adapted to engage the open top of the drum after the usual lid has been removed, this cover being provided with a central guide in which the delivery tube and intake chamber can slide, the flange being of sufficient depth to house the coned annular piston when this is in its uppermost position so that the edges of the piston are protected from possible damage when the device is not in use.

In the arrangement above described, a scraper or skimmer may be connected to the lower end of the helix so as to extend laterally below the piston and adapted as it rotates with the helix to scrape or skim off a continuous layer from the upper surface of the substance in the container and thus effect or assist the passage of this substance to the helical conveyer and by it through the delivery tube.

In such case, the scraper or skimmer conveniently comprises a radially extending blade adapted to skim off a layer of the substance in the container and having formed or mounted on its upper face between this skimming blade and the piston one or more guide blades formed so as to feed the substance skimmed off towards the centre of the piston and hence to the helical conveyer.

For lubricant or other material in a less solidified form, for example grease in the soft or semiliquid state, the helix may be contained in a tube of approximately the full length of the drum, the upper end of the tube being carried by a cover or equivalent carrier furnished with a rim or flange to engage the open top of the drum after the usual lid has been removed. The tube then reaches almost the bottom of the drum and in this case instead of providing a piston secured to the bottom end of the tube, a piston is provided which is free to slide down the outside of the tube as the grease is drawn out by the helix and discharged through one or more suitable openings at the top of the tube.

In each of the above arrangements it will be appreciated that the pumping action of the helix tends to create a vacuum below the piston, thus causing the piston to exert on the lubricant in the container a pressure equal to the atmospheric pressure acting on its upper surface to assist delivery of the lubricant to the helix.

The invention may be carried into practice in various ways but three alternative constructions according to the invention are illustrated by way of example in the accompanying drawings, in which

Figure 1 is a sectional side elevation of a simple form according to the invention suitable for use with comparatively soft or semi-liquid grease,

Figure 2 is a similar view to Figure 1 showing a construction suitable for use with grease in harder or so-called solid form,

Figure 3 is a similar view to Figures 1 and 2 of an alternative construction according to the invention also suitable for use with grease in comparatively hard or so-called solid form, and

Figure 4 is a section on the line 4—4 of Figure 3.

In the construction illustrated in Figure 1, the apparatus comprises an annular lid or cover A adapted to engage and be secured to the upper end of a drum-like container B, for example by means of a clamping ring C. Rigidly secured as by rivets to the centre of the cover A is an annular flange A<sup>1</sup> passing through which is a tubular member D constituting a delivery passage for the lubricant and secured at its upper end to the flange A<sup>1</sup>, as shown.

The upper end of the tubular delivery passage D where it extends above the cover A is closed by a cap D<sup>1</sup> having a discharge opening D<sup>2</sup> adapted to be connected to a suitable discharge pipe. Passing through and mounted in a bearing in the cap D<sup>1</sup> is a shaft E carrying a handle E<sup>1</sup> at its upper end and rigidly secured to or formed integral at its lower end with a helix E<sup>2</sup> which extends throughout the length of and closely fits within the tube D.

As will be seen, the lower end of the tube D lies close to the bottom of the drum B and the arrangement is such that when the helix E<sup>2</sup> is rotated by the handle E<sup>1</sup> it draws lubricant from the drum B upward through the tubular delivery passage D and delivers it through the discharge passage D<sup>2</sup>. Surrounding and slidable freely on the tube D is a piston F adapted to bear on the upper surface of the lubricant in the drum B, this piston making a close but sliding fit both with the tube D and with the inner surface of the drum B. Openings A<sup>2</sup> in the cover A permit the entry of air so that as the pumping action of the helix tends to create a vacuum beneath the piston, the piston exerts on the upper surface of the lubricant a force equal to the atmospheric pressure on its upper face so as to assist the feeding of lubricant to the helix.

In the alternative construction illustrated in Figure 2, the apparatus comprises a lid or cover G adapted to be secured to the upper end of a drum B containing lubricant, for example, in the form of a hard grease, the cover being provided with openings G<sup>1</sup> to permit the entry of air to the upper end of the drum.

Secured to the centre of the lid or cover G is a flange H in which can slide a tubular guide member H<sup>1</sup> closed at its upper end by a cap H<sup>2</sup> which is formed at its centre with a hollow boss H<sup>3</sup> through which passes and can slide a tubular delivery passage J the upper end of which communicates with two branch delivery passages J<sup>1</sup> controlled by valves J<sup>2</sup>. The upper end of the delivery passage J is closed by a hollow screwthreaded plug J<sup>3</sup> constituting a bearing for the upper end of a shaft K having a handle K<sup>1</sup> at its upper end and extending down through the delivery passage J into a cylindrical intake chamber J<sup>4</sup> secured to the lower end of the tube J and containing a helical feeding member K<sup>2</sup> which fits closely within the intake chamber J<sup>4</sup> and the pitch of which varies at different points in its length. Secured to the lower open end of the intake chamber J<sup>4</sup> is an annular piston J<sup>5</sup> having secured to its outer

circumference a flexible packing ring J<sup>6</sup> which makes close but sliding contact with the inner surface of the wall of the drum B. The piston J<sup>5</sup> is, as shown, of frusto-conical shape and may be provided with a valve, indicated at J<sup>7</sup>, and of any desired construction which will permit air which may be trapped below the piston to escape but not to permit grease to escape.

With this arrangement, when the drum B is full, the tube J is in its uppermost position, that is to say with the intake chamber J<sup>4</sup> lying within the guide H<sup>1</sup> and the piston J<sup>5</sup> resting upon the upper surface of the grease or the like. The lower end of the helix K<sup>2</sup> is formed after the manner of an auger so that when the shaft K is rotated by the handle K<sup>1</sup> so as to rotate the helix K<sup>2</sup> this helix draws lubricant from below the piston and delivers it up through the intake chamber J<sup>4</sup> and the delivery passage J to the branch delivery passages J<sup>1</sup>, the piston J<sup>5</sup> at all times bearing on the upper surface of the grease in the container and by its concavity tending to force the upper part of this lubricant inwards towards the helix. Here again, since the upper face of the piston is subject to atmospheric pressure it will, as the pumping action of the helix tends to cause a vacuum below the piston, exert a force on the upper face of the lubricant equal to this pressure to assist the feeding of the lubricant to the helix.

In the alternative construction illustrated in Figures 3 and 4, the apparatus comprises a lid or cover L adapted to be secured to the upper end of a drum M containing lubricant, for example in the form of solid grease. The cover L is secured to the drum by means of two or more rods M<sup>1</sup> the lower ends of which are connected to clips M<sup>2</sup> which are adapted to engage a rim at the bottom of the drum and may be formed as shown to constitute feet M<sup>3</sup>, while the upper ends of the rods pass through lugs L<sup>1</sup> on the cover and are provided with butterfly nuts L<sup>2</sup>. Secured to the centre of the cover L is a short annular guide sleeve L<sup>3</sup> through which passes and can slide a tubular delivery passage N the upper end of which is closed by a cap N<sup>1</sup> through which passes a discharge passage N<sup>2</sup> leading to branch discharge passages N<sup>3</sup> controlled by valves N<sup>4</sup>. The upper end of the discharge passage N<sup>2</sup> is closed by a plug N<sup>5</sup> forming a bearing for a shaft O the upper end of which carries an operating handle O<sup>1</sup> while its lower end is rigidly secured to a feeding helix O<sup>2</sup> similar in general form to the helix K<sup>2</sup> in the construction shown in Figure 2.

Secured to the lower end of the delivery passage N is an annular piston P the circumferential edge of which carries a flexible packing ring P<sup>1</sup> engaging and slidable on the inner surface of the drum.

Secured to the lower end of the helix O<sup>2</sup> where it extends below the piston P and extending laterally from the end of the helix is a plate-like skimming blade Q the upper surface of which carries a series of guide blades Q<sup>1</sup> which thus lie between the skimming blade and the piston P and are formed so as to deliver towards the lower end of the delivery passage N the layer of substance which is skimmed from the upper surface of the substance in the drum when the helix and the skimming blade are rotated through the shaft O by the handle O<sup>1</sup>.

In this construction the cover L is provided with a flange L<sup>4</sup> of such depth that when the delivery passage N is drawn upwards to its fullest extent, the piston P<sup>1</sup> and skimming blade Q lie within this flange so as to be protected from

damage when the apparatus is removed from the drum.

In operation, when the drum is full the lid L is attached thereto with the delivery passage N in its uppermost position and the skimming blade in contact with the upper surface of the substance in the drum. If now the shaft O is rotated by the handle O<sup>1</sup> so as to rotate the helix O<sup>2</sup> and the skimming blade Q, the skimming blade will continually skim a layer off the surface of the substance in the drum and will deliver it to the helix which in turn will feed this substance up the delivery passage N and thence to the branch delivery passages N<sup>3</sup> which may be connected to apparatus to which the substance is to be fed. Further, as the pumping action of the helix tends to create a vacuum below the piston, the atmospheric pressure acting on the upper face of the piston will tend to press it into contact with the surface of the lubricant and thus assist the feeding of the lubricant to the helix.

It is to be understood that the constructions more particularly described above are given by way of example only and that details of construction may be modified without departing from this invention.

What I claim as my invention and desire to secure by Letters Patent is:

1. Apparatus for delivering from a container material in plastic or semi-liquid form comprising a cylindrical intake chamber, a delivery tube connected to the upper end of the intake chamber and leading therefrom to a point of discharge, a helix mounted to rotate within and closely fitting the cylindrical intake chamber, means for rotating the helix, means for supporting the intake chamber and delivery tube in a manner permitting the intake chamber and delivery tube to move vertically relatively to the container, and an annular piston mounted upon the lower end of the intake chamber and adapted to make a close sliding fit with the inner walls of the container and to bear down upon the surface of the material to be delivered therefrom.

2. Apparatus for delivering from a container material in plastic or semi-liquid form comprising a cylindrical intake chamber, a delivery tube connected to the upper end of the intake chamber and leading therefrom to a point of discharge, a helix mounted to rotate within and closely fitting the cylindrical intake chamber, means for rotating the helix, means for supporting the intake chamber and delivery tube in a manner permitting the intake chamber and delivery tube to move vertically relatively to the container, and an annular piston mounted upon the lower end of the intake chamber and adapted to make a close sliding fit with the inner walls of the container and to bear down upon the surface of the material to be delivered therefrom, the piston being of frusto-conical form so that its outer circumferential part lies below its inner circumferential part.

3. Apparatus for delivering from a container material in plastic or semi-liquid form comprising a cylindrical intake chamber, a delivery tube connected to the upper end of the intake chamber and leading therefrom to a point of discharge, a helix mounted to rotate within and closely fitting the cylindrical intake chamber, means for rotating the helix, means for supporting the intake chamber and delivery tube in a manner permitting the intake chamber and delivery tube to move vertically relatively to the

container, an annular piston mounted upon the lower end of the intake chamber and adapted to make a close sliding fit with the inner walls of the container and to bear down upon the surface of the material to be delivered therefrom, and a resilient packing ring carried by the circumferential part of the piston and engaging the walls of the container.

4. Apparatus for delivering from a container material in plastic or semi-liquid form comprising a cylindrical intake chamber, a delivery tube connected to the upper end of the intake chamber and leading therefrom to a point of discharge, a helix mounted to rotate within and closely fitting the cylindrical intake chamber, means for rotating the helix, means for supporting the intake chamber and delivery tube in a manner permitting the intake chamber and delivery tube to move vertically relatively to the container, an annular piston mounted upon the lower end of the intake chamber and adapted to make a close sliding fit with the inner walls of the container and to bear down upon the surface of the material to be delivered therefrom, and a scraper or skimmer secured to the lower end of the helix and extending laterally therefrom below the piston so that as it rotates with the helix it will scrape or skim off a layer from the upper surface of the substance in the container to assist the passage of this substance to the helix.

5. Apparatus for delivering from a container material in plastic or semi-liquid form comprising a cylindrical intake chamber, a delivery tube connected to the upper end of the intake chamber and leading therefrom to a point of discharge, a helix mounted to rotate within and closely fitting the cylindrical intake chamber, means for rotating the helix, means for supporting the intake chamber and delivery tube in a manner permitting the intake chamber and delivery tube to move vertically relatively to the container, an annular piston mounted upon the lower end of the intake chamber and adapted to make a close sliding fit with the inner walls of the container and to bear down upon the surface of the material to be delivered therefrom, a radially extending skimmer blade secured to the lower end of the helix and extending laterally therefrom below the piston so that as it rotates with the helix it will scrape or skim off a layer from the upper surface of the substance in the container, and at least one guide blade mounted on the upper face of the skimmer blade between this blade and the under face of the piston to feed the substance skimmed off towards the centre of the piston and hence to the helix.

6. Apparatus for delivering from a container material in plastic or semi-liquid form comprising a cylindrical intake chamber open at its lower end, a delivery tube connected to the upper end of the chamber and leading to a point of discharge, a helix mounted to rotate within and closely fitting the cylindrical intake chamber means for supporting the delivery tube and intake chamber in a manner permitting them to move vertically relatively to the container, a shaft carrying the helix and extending through the delivery tube, means for imparting rotation to the upper end of the shaft, and an annular piston mounted upon the lower end of the intake chamber to make a close sliding fit with the inner walls of the container and to bear down upon the surface of the material to be delivered therefrom.

7. Apparatus for delivering from a container material in plastic or semi-liquid form comprising a cylindrical intake chamber open at its lower end, a delivery tube connected to the upper end of the chamber and leading to a point of discharge, a helix mounted to rotate within and closely fitting the cylindrical intake chamber, means for supporting the delivery tube and intake chamber in a manner permitting them to move vertically relatively to the container, a shaft carrying the helix and extending through the delivery tube, means for imparting rotation to the upper end of the shaft, and an annular piston mounted upon the lower end of the intake chamber to make a close sliding fit with the inner walls of the container and to bear down upon the surface of the material to be delivered therefrom, the piston being of frusto-conical form so that its outer circumferential part lies below its inner circumferential part.

8. Apparatus for delivering from a container material in plastic or semi-liquid form comprising a cylindrical intake chamber open at its lower end, a delivery tube connected to the upper end of the chamber and leading to a point of discharge, a helix mounted to rotate within and closely fitting the cylindrical intake chamber, means for supporting the delivery tube and intake chamber in a manner permitting them to move vertically relatively to the container, a shaft carrying the helix and extending through the delivery tube, means for imparting rotation to the upper end of the shaft, an annular piston mounted upon the lower end of the intake chamber to make a close sliding fit with the inner walls of the container and to bear down upon the surface of the material to be delivered therefrom, and a scraper or skimmer secured to the lower end of the helix and extending laterally therefrom below the piston so that as it rotates with the helix it will scrape or skim off a layer from the upper surface of the substance in the container to assist the passage of this substance to the helix.

9. Apparatus for delivering from a container material in plastic or semi-liquid form comprising a cylindrical intake chamber open at its lower end, a delivery tube connected to the upper end of the chamber and leading to a point of discharge, a helix mounted to rotate within and

closely fitting the cylindrical intake chamber, means for supporting the delivery tube and intake chamber in a manner permitting them to move vertically relatively to the container, a shaft carrying the helix and extending through the delivery tube, means for imparting rotation to the upper end of the shaft, an annular piston mounted upon the lower end of the intake chamber to make a close sliding fit with the inner walls of the container and to bear down upon the surface of the material to be delivered therefrom, a radially extending skimmer blade secured to the lower end of the helix and extending laterally therefrom below the piston so that as it rotates with the helix it will scrape or skim off a layer from the upper surface of the substance in the container, and at least one guide blade mounted on the upper face of the skimmer blade between this blade and the under face of the piston to feed the substance skimmed off towards the centre of the piston and hence to the helix.

10. Apparatus for delivering from a container material in plastic or semi-liquid form including the combination of parts set forth in claim 1, wherein the support for the delivery tube comprises a carrier or cover adapted to take the place of the lid by which the container is initially closed.

11. Apparatus for delivering from a container material in plastic or semi-liquid form including the combination of parts set forth in claim 2, wherein the support for the delivery tube comprises a carrier or cover adapted to take the place of the lid by which the container is initially closed.

12. Apparatus for delivering from a container material in plastic or semi-liquid form including the combination of parts set forth in claim 4, wherein the support for the delivery tube comprises a carrier or cover adapted to take the place of the lid by which the container is initially closed.

13. Apparatus for delivering from a container material in plastic or semi-liquid form including the combination of parts set forth in claim 5, wherein the support for the delivery tube comprises a carrier or cover adapted to take the place of the lid by which the container is initially closed.

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