H. J. KEITH & S. C. KEITH, Jr.

DESICCATING APPARATUS.

APPLICATION FILED NOV. 11, 1907.

951,249.

Patented Mar. 8, 1910.

2 SHEETS—SHEET 1.

Fig. 2.

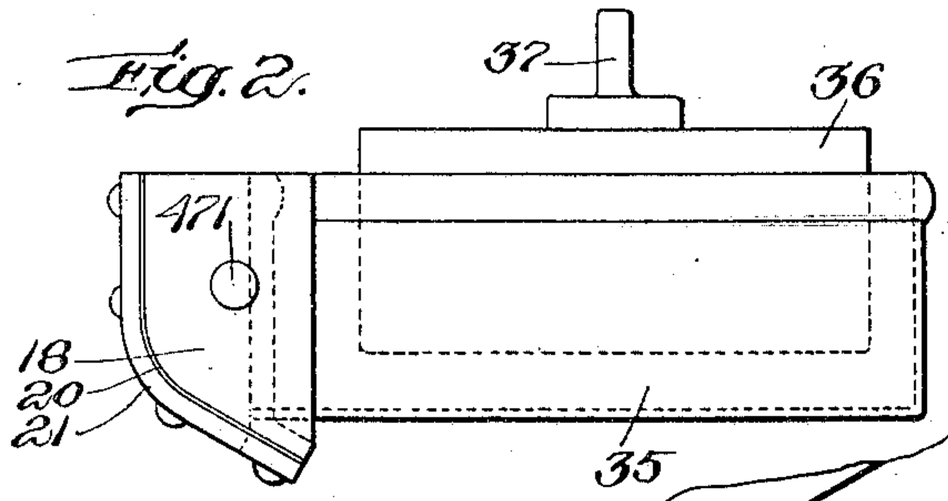

Fig. 1.

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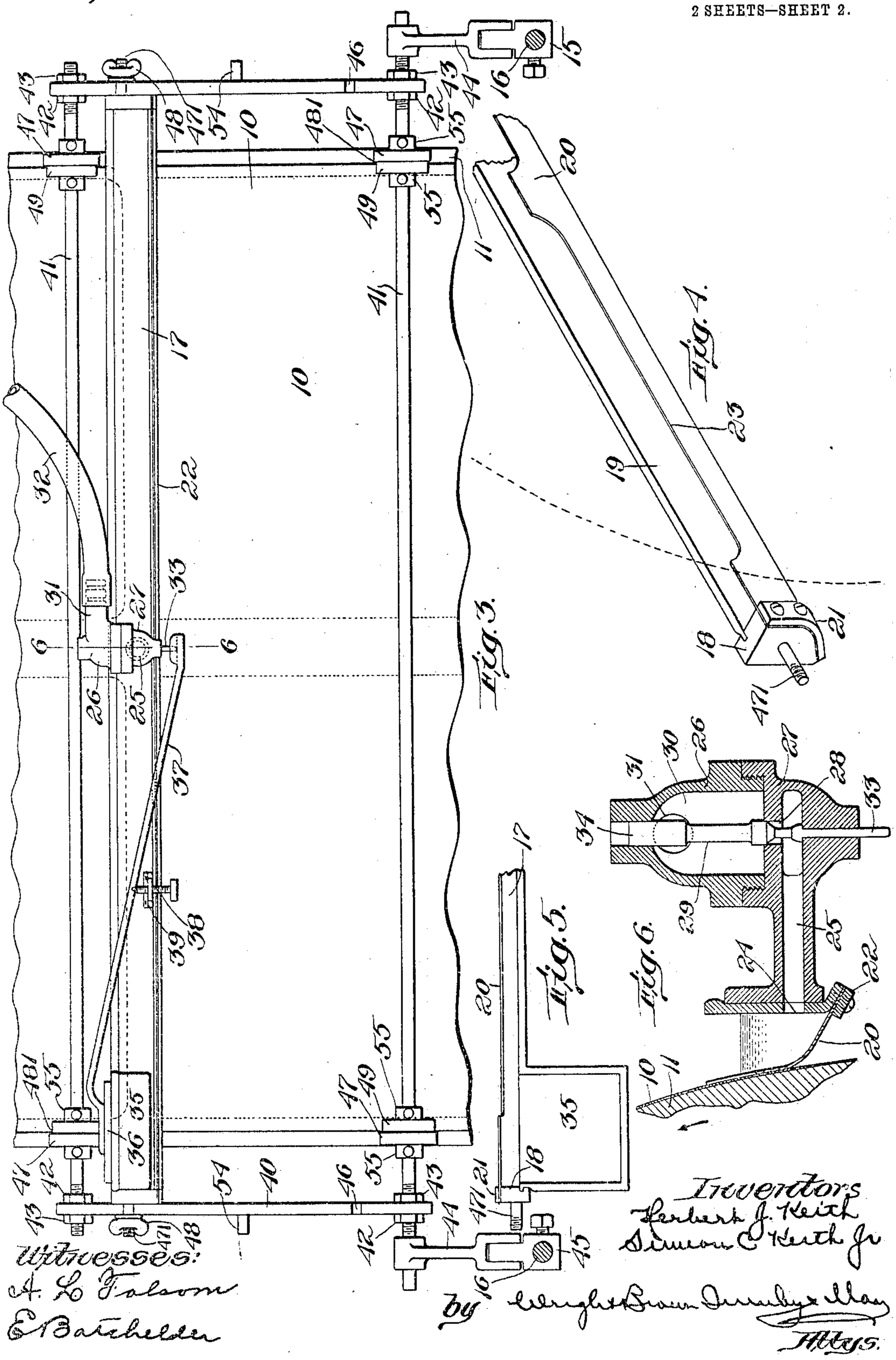

Fig. 1.

Fig. 3.

Fig. 5.

Fig. 6.

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UNITED STATES PATENT OFFICE.

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DESICCATING APPARATUS.

951,249. Specification of Letters Patent. **Patented Mar. 8, 1910.**

Application filed November 11, 1907. Serial No. 401,560.

To all whom it may concern:

Be it known that we, HERBERT J. KEITH and SIMEON C. KEITH, Jr., of Somerville, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Desiccating Apparatus, of which the following is a specification.

This invention has relation to machines which are employed for drying or desiccating liquid substances, such as egg, in which the liquid is spread upon a movable drying surface, such as a cylinder or belt.

The object of the present invention is to provide a feeding attachment or appliance by which the liquid substance may be spread in a coat or layer of proper thickness upon the drying surface, and to construct the same in such simple fashion that there will be no complication of parts.

To this end the invention consists of a feeding device, of the character of that illustrated upon the accompanying drawings, described in the following specification and pointed out in the claims, by which the substance to be dried may be applied to an upright or inclined plane surface, to the periphery of a cylinder, or to the curved or semi-cylindrical portion of an endless belt.

The illustrated embodiment of the invention comprises what may be termed a trough, which has an inner yielding or flexible metallic side wall making contact with the drying surface. The trough has a narrow space between the inner and outer or front and rear side walls which is adapted to receive a relatively small quantity of the substance to be dried. The inner or rear wall, being in whole or in part flexible, has what may be termed a flexible lip which extends practically from edge to edge of the drying surface which receives the coat or layer of the substance to be dried. This lip is pressed against the drying surface, and, being yielding or flexible, compensates for any inequalities in the drying surface. The substance is not dipped from the surface thereof in the trough but flows therefrom laterally so as to make contact with the drying surface, and to this end, the lip is cut away between its ends to form one or more overflow outlets for the substance, or to form a space below the level of the substance which is closed, as it were, by the drying surface, so that the substance may be taken thereon in a coat or layer, as the drying surface and the trough are moved, one relatively to the other. As stated, the lip of the trough is preferably made of thin sheet metal and is of such flexibility and elasticity that it conforms to the drying surface and prevents the substance from leaking or flowing downward or sidewise between said lip and the drying surface, and at the same time the engagement of the lip with said surface is such that it permits the passage of the dried layer or coat of the substance on the surface past the lip without breaking or removing it, in consequence of which a plurality of superimposed coats or layers of the substance may be applied to said surface to form a sheet of the desired thickness. By varying the length of the overflow outlets, or by providing a plurality of separated outlets, the width of the layer or coat on the drying surface may be varied, or the layer or coat may be laid in separated strips on the said surface. Preferably the supply of the substance is controlled by a float valve mechanism interposed between the trough and a supply tank from which latter the substance flows by gravity. This mechanism includes a balanced valve which is directly actuated by a float on the surface of the substance in the trough, thus providing a direct and simple control of the flow of the substance to the trough.

Where the drying surface is formed by an endless belt or conveyer, which is supported upon drums, the longitudinal movement of the belt causes it to move more or less laterally, and means are provided in the illustrated embodiment of the invention by which the feeding trough may be shifted laterally with the belt, so as to cause the layer or coat of substance to be laid upon the belt in a strip of which the edges are always the same distance from the edges of the belt. Not only is the feeding trough movable laterally with the belt, but it is also movable toward and from the belt. To these ends the trough is located on a frame or carriage which is movably supported, and which is provided with members, such as rolls, which are held by a tension mechanism in engagement with the drum around which the belt passes. Preferably these same members or rolls have shoulders and flanges which en-

gage and overlie the edges of the belt to effect the described lateral movement of the trough with the belt, and also to preserve a predetermined relation between the lip and the belt, irrespective of irregularities in either the belt or the drum.

When such substances as egg are being dried, it becomes necessary at times to cleanse the feeding device, and hence, to prevent a cessation of the operation of the machine, the frame or carriage is arranged to receive a plurality of such feeding devices, so that either may be used at will.

Referring to the drawings, above referred to,—Figure 1 represents in end elevation a portion of an egg-drying machine embodying the invention. Fig. 2 represents an end elevation of the feeding trough. Fig. 3 represents in front elevation, but on a smaller scale, the instrumentalities shown in Fig. 1. Fig. 4 represents in perspective view a portion of the feeding trough. Fig. 5 represents in plan view one end portion of the trough. Fig. 6 represents an enlarged section on the line 6—6 of Fig. 3.

The entire machine which is utilized for desiccating or drying the egg or other substance is not shown, a sufficient portion only of said machine being shown to enable the invention to be fully disclosed.

It should be understood that the invention is not limited to the particular embodiment thereof which is illustrated and hereinafter described, and that the phraseology which has been herein adopted is for the purpose of description and not of limitation.

Referring to said drawings, 10 indicates what is termed the drying surface. In the present case, it consists of an endless metallic belt or conveyer which is supported by drums, of which one is illustrated in part at 11. The stretches of this belt between the drums may be caused to travel substantially horizontally or vertically or at an angle both to the vertical and to the horizontal, as convenience may dictate. The drums will be suitably journaled, the one at 11 being journaled in bearings in a frame shown in part at 12. This frame is movable relatively to the main frame 13 of the machine, being provided with rollers similar to that at 14, running in tracks 15 on the main frame 13, and being connected by adjustable rods or links 16 to arms 17 (only one shown) which are acted upon by weights or springs (not shown) to keep the belt or conveyer substantially taut between the drums. Power is applied by any suitable means (not shown) to one of the drums to cause the belt to travel slowly in the direction of the arrow in Fig. 1. As shown in Fig. 3, the width of the belt is less than the length of the drum 11, so that the ends of the periphery of the drum are uncovered, this being for a purpose to be subsequently disclosed.

The feeding device comprises a trough indicated as a whole in Fig. 3 at 17. This trough, as previously stated, is substantially U-shaped or V-shaped in cross section. It consists of end walls 18, an upright front or outer wall 19, and a rear or inner wall 20. The outer front wall 19 and the end walls 20 may be solid and made of any suitable material such as will not affect the substance which is placed therein. The inner or rear wall 20, which also forms the bottom of the trough, is made of relatively thin flexible or resilient material, such as a thin sheet of phosphor-bronze, nickeled steel or aluminum, and it is secured to the end walls by binding strips 21 and to the forwardly bent lower end of the front wall by a binding strip 22. This trough is preferably placed with its front wall upright and with its rear wall resting against the drying surface, as shown in Fig. 6. The rear wall 20, being flexible and resilient, forms, as it were, a lip which, as previously stated, bears against the drying surface yieldingly and conforms to its variations and inequalities. The rear wall is provided with one or more cut-away portions or overflow outlets 23, the upper edges of which are below the normal level of the substance in the trough, as shown in Fig. 6 for instance, although the said level of the substance is below the normal upper edge of the said rear wall at its ends and, if desired, at various points between its ends. The trough itself is shown in Fig. 3 as being of a greater length than the width of the belt or drying surface 10, but the discharge recesses or outlets 23 of the trough are so formed and are of such length as to prevent the flow of the substance upon the side edges of the belt, and, if desired, upon one or more portions between its edges as indicated by dotted lines on said last-mentioned figure.

It is possible, as will be readily seen, by varying the length of the overflow outlets or by varying their number, to cause the substance in the trough to be spread upon the belt in as many strips as may be desired, and in one or more strips of any desired width. The weight of the substance in the trough doubtless assists in holding the flexible lip of the trough against the drying surface, or belt in the present case, and as the belt is caused to travel, as previously described, a layer or coat of the substance adheres to the belt. The belt and the lip are in such close proximity or contact and the movement of the belt is at such speed, as to prevent the substance from leaking down between them, the belt closing, as it were, the overflow outlets of the lip. This form of feeding device may be termed a "side-feed" in contradistinction to those feeding devices in which a cylinder or a belt thereon is caused to dip into an open vat or tray. Inasmuch as the material flows laterally or

sidewise from the trough so as to be deposited upon and taken up by the drying surface, it is inevitable that a device of this character possesses numerous features of advantage, among which is the necessity of maintaining in the vat only a relatively small quantity of the substance to be dried. In the case of egg, this is of great importance, since almost a constant flow of the egg through the trough may be maintained, so that there is a relatively small time lost between its discharge from its initial receiving tank to its application to the belt and its immediate desiccation.

One additional advantage secured by the use of a feeding device as herein described, is that the stream of the egg flowing over the edge or through the outlets of the retaining wall is very shallow, and thus the zone of contact of the egg with the surface of the belt or carrier is reduced to the minimum, and is much less than if the trough had no inner wall, and its open side were entirely closed by the carrier, so that the height of the zone of contact would be equal to the depth of the body of the egg in the trough. By thus reducing the height of the zone of contact, the egg already dried on the belt or carrier is not softened by long exposure to the liquid egg in the trough.

In operation it has been observed that the upward movement of the drying surface past the outlet or outlets causes an upward movement in the body of egg immediately adjacent. This in turn effects, as it were, a rolling action or circulation of the egg and creates an effective agitation of practically the entire body of the egg in the trough.

For the purpose of feeding the substance to the trough, a simple and effective mechanism is provided. Substantially midway between the ends of the trough, there is a port or aperture 24 with which connects the discharge conduit 25 of a valve mechanism. This mechanism comprises a casing which consists of two halves 26, 27 which have a screw-threaded connection. The lower part 27 of the casing has an aperture and valve seat 28 which may be closed by a balanced valve 29. The upper part 26 of the casing has an interior chamber 30 with which communicates a conduit 31 extending laterally therefrom, as shown in Fig. 3. To this conduit is connected, preferably by rubber or flexible tube 32, a tank or receptacle in which the supply of the substance to be dried is contained. The balanced valve 29 has a reduced stem 33 projecting through a guide aperture in the lower portion of the part 27 of the casing, and also a stem 34 which projects through an aperture in the upper part 26 of the casing. The valve is adapted to fit in the said aperture 28, as shown in Fig. 6, so as to prevent the flow of the substance through the port 25 into the trough. The balanced valve is of such character that it may be raised from its seat by a force sufficient only to overcome its gravity. This valve is controlled by a float which rests upon the substance contained in the trough. For this purpose, the trough is provided with a supplemental pool for the substance which is therein contained in a forward extension 35 of the trough at one end as shown in Figs. 3 and 5. Resting upon the substance in this extension, there is a float 36 with which is connected an arm 37 extending longitudinally of the trough, and having its end provided with a socket to receive the stem 33 of the valve. This arm 37 is fulcrumed upon an adjustable screw 38 passed through a bracket 39 affixed to the front wall of the trough. As the level of the substance in the trough, and consequently in the supplemental pool, is lowered, the arm 37 is rocked about its fulcrum so as to lift the valve 29 and permit the flow of the substance into the trough through the valve casing until the proper level is reached, the float rising so as to cut off the flow at the proper time.

As previously explained, where the drying surface consists of a belt which is mounted upon drums, there is apt to be a lateral movement of the belt relatively to the drums and hence the trough or feeding device is preferably so mounted that it will yield or move laterally with the belt. To this end, the trough is mounted upon a frame or carriage which is capable of such movement laterally of the belt. This frame consists of end bars 40 40 connected by parallel rods 41 41. The end bars are clamped between nuts 42 43 upon said rods. The frame is pivoted upon links 44, one of the rods 41 being extended loosely through bearings in the ends of said links. The other ends of the links are pivoted to collars or blocks 45 which are adjustably attached to the rods or links 16 hereinbefore referred to. The end bars 40, as shown in Fig. 1, are provided with slots 46 to receive trunnions 471 which project from the end walls of the trough. These trunnions are threaded to receive wing nuts 48 so that by means of said wing nuts, the ends of the trough may be securely clamped to the said end bars 40. It will be observed that each of the end bars is provided with two of the slots 46. This is to enable the employment of more than one feeding device, if desired, or to provide an additional feeding device which may be used when the other is removed to be cleaned.

Journaled on the rods 41 are rollers 47 which bear upon the drums just beyond the edges of the belt. Each roller has a shoulder 481 which engages the edge of the belt, and a reduced portion or flange 49 which bears upon that portion of the belt at the edge thereof, which is not coated with the

substance from the feeding device. These rollers are held against longitudinal movement on the rods 41 by collars 55 so that, when they are thrust axially by one edge or the other of the belt, the frame or carriage is caused to move with them so as to carry the feeding trough in one direction or the other, whereby the film of the substance to be dried will always be spread upon the belt at the proper distance from the edges thereof. The frame and trough are held yieldingly in operative position with reference to the drying surface by means of springs 50 of which one is shown in Fig. 1. Each of these springs has one end connected to a bracket 51 on the frame 12 and its other end connected to a turn-buckle 52 which is in threaded engagement with an eye bolt 53 connected to a pin 54 projecting laterally from the middle of one of the end bars 40. The springs serve to hold the rolls of the supporting frame against the drum and belt, and maintain the trough and its lip yieldingly in operative relation to the belt.

Having thus explained the nature of our said invention and described a way of constructing and using the same, although without attempting to set forth all of the forms in which it may be made, or all of the modes of its use, we declare that what we claim is:—

1. A desiccating apparatus, comprising a movable carrier having a drying surface, and a feeding device which are relatively movable, said feeding device comprising a receptacle having an outer wall and an inner flexible wall forming a space for the reception of the material to be dried, said flexible inner wall having along its upper edge an overflow outlet extending below the normal level of the substance contained in said receptacle to permit the lateral contact of the substance with said drying surface.

2. A desiccating apparatus comprising a movable carrier having a drying surface, and a feeding device which are relatively movable, said feeding device consisting of a trough extending across said carrier and having an upwardly projecting, flexible lip engaging said carrier, a portion of the edge of said lip being below the normal level of the substance in said receptacle, and the other portions of the edge of the lip being above said level, substantially as set forth.

3. A desiccating apparatus comprising a carrier having a drying surface, and an egg-feeding device which are relatively movable, said feeding device consisting of a trough having a lateral overflow outlet closed by said carrier, and means for maintaining the level of the egg in said trough above said outlet, the depth of the egg in said outlet being less than the depth of the body of the egg in said trough.

4. A desiccating apparatus, comprising a movable carrier having a drying surface and a feeding device for the material to be dried, said feeding device consisting of an elongated trough extending across the carrier and having an inner retaining wall for the material therein, said wall having its upper edge recessed below the normal level of the said material to form a lateral outlet for said material, and thereby permit the lateral contact of said material with the surface of the carrier, said wall being flexible whereby the pressure of the material in the trough against said wall causes the upper edge of said wall to be pressed yieldingly against the drying surface of the carrier.

5. A desiccating apparatus comprising a carrier having a drying surface and an egg-feeding device movable one relatively to the other, said feeding device consisting of a trough with an outer wall and a flexible inner wall resting against said carrier, said inner wall serving to confine a portion of the body of the egg in the trough, and having one or more overflow outlets to permit the remainder of the body of egg to contact with said carrier.

6. A desiccating apparatus comprising a carrier having a drying surface and an egg-feeding device which are movable one relatively to the other, said feeding device consisting of a trough having an outer wall and a flexible or resilient inner or rear wall in close proximity to said carrier, and said walls forming a narrow space for the reception of the egg, and said flexible wall having an overflow outlet at its upper edge less in length than the width of said carrier so as to prevent the feeding of the egg onto the side edges of said carrier, and less in height than the depth of the body of egg in the trough to provide a restricted zone of contact of the egg with the carrier.

7. A desiccating apparatus comprising a carrier, and an egg-feeding device, which are movable one relatively to the other, said feeding device consisting of a trough substantially U-shape in cross-section and having a lateral overflow outlet for the egg to permit the coating of said carrier, and yielding means for holding said feeding device in proper relation to said carrier.

8. A feeding device for desiccating machines, such as described, comprising a trough substantially U-shape in cross section with a flexible inner wall having a lateral overflow outlet, a valve and conduit for supplying the egg or other substance to said trough near the middle thereof, and a float at one end of the trough mechanically connected to said valve to operate it.

9. A desiccating apparatus, comprising a traveling carrier adapted to receive the material to be dried and from which the dried material is subsequently removed, a feeding device for the material to be dried, and means engaging said carrier for shifting

said feeding device laterally with said carrier.

10. A desiccating apparatus, comprising a movable carrier to receive the material to be dried and from which the dried material is subsequently removed, a feeding device for supplying a coating of the material to said carrier, a laterally movable frame or carriage having means for engaging the side edges of the carrier, and means for supporting said feeding device upon said frame or carriage.

11. A desiccating apparatus, comprising a traveling belt to receive the material to be dried and from which the dried material is subsequently removed, a drum therefor, a tensioned feeding device for said material, and rollers connected to said feeding device and movable therewith, said rollers engaging said drum and said belt.

12. A desiccating apparatus of the character described, a traveling belt to receive the material to be dried and from which the dried material is subsequently removed, a drum therefor, a tensioned feeding device for said material, and rollers connected to said feeding device and movable therewith, said rollers engaging said drum and said belt and having shoulders for engaging the edges of said belt.

13. In a desiccating machine, a traveling belt to receive the material to be dried and from which the dried material is subsequenty removed, and a frame or carriage supported in proper relation to said belt, said frame having means for the reception of a plurality of feeding devices for said material, whereby either of said feeding devices may be used when the other is stopped, and thus enable a continuous operation of the machine.

14. A feeding device of the character referred to, comprising a trough substantially U-shaped in cross section, for use in connection with a movable carrier having a surface to receive the substance to be dried, said trough having a rear or inner lip or wall wider than the carrier with a lateral overflow outlet or outlets, said lip or wall possessing elasticity of flexion sufficient to prevent the substance from flowing between it and the carrier, and having its said outlets so located that the substance may contact laterally with the carrier wherever desired, and means for causing said lip or wall to engage the carrier so as to permit the passage beneath, without removal or breakage, of a dried coat of the substance upon the drying carrier, thus enabling the application of several superimposed coats to form a sheet of the desired thickness, substantially as set forth.

In testimony whereof we have affixed our signatures, in presence of two witnesses.

HERBERT J. KEITH.
SIMEON C. KEITH, Jr.

Witnesses:
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Peter W. Pezzetti.