J. M. HUSSEY.

METHOD OF DESICCATING EGG BATTER.

APPLICATION FILED AUG. 25, 1909.

957,061.

Patented May 3, 1910.

2 SHEETS—SHEET 1.

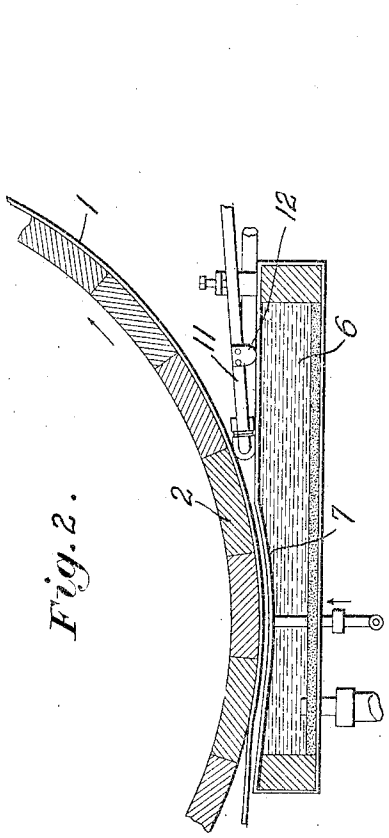


Fig. 2.

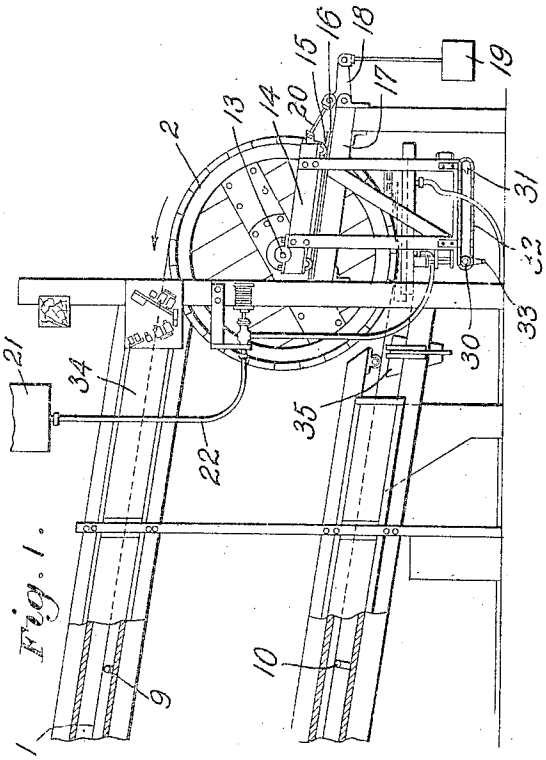
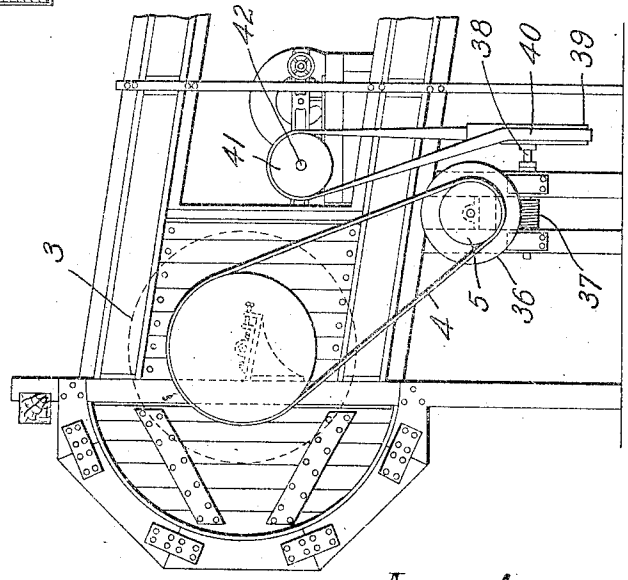


Fig. 1.



Witnesses:

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Carl L. Choate.

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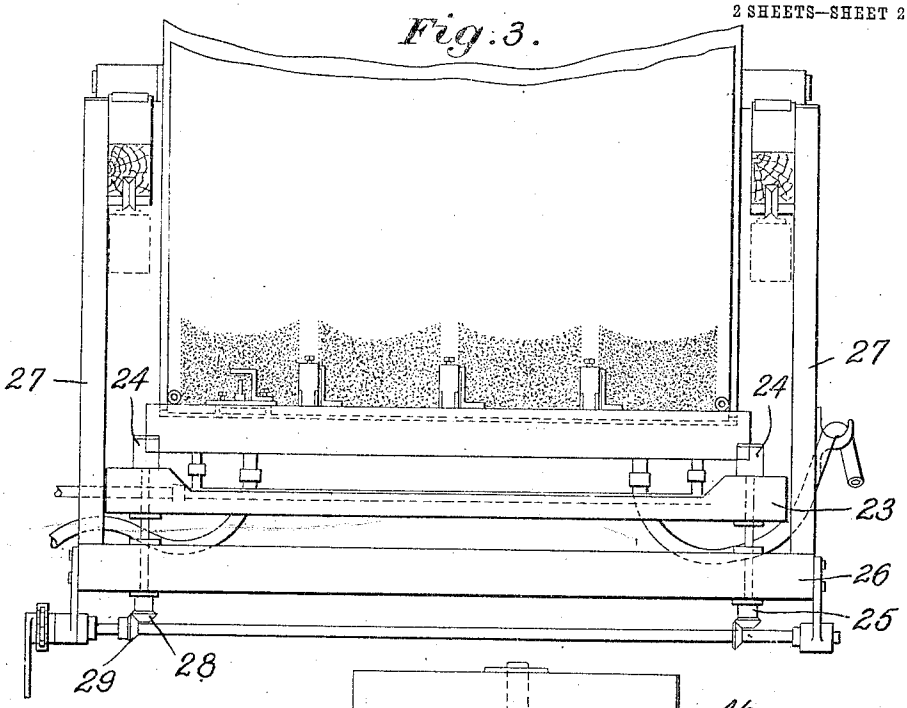
2 SHEETS—SHEET 2.

Fig. 3.



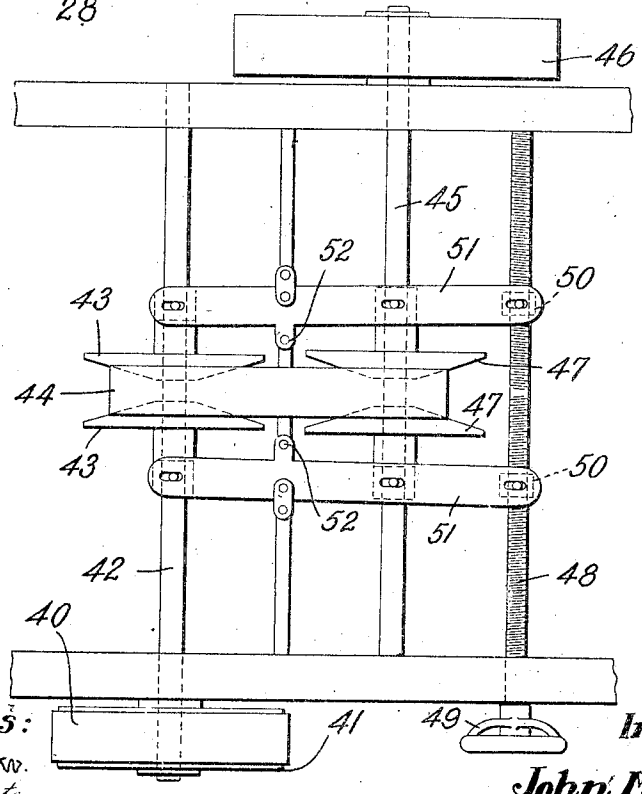


Fig. 4.

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UNITED STATES PATENT OFFICE.

JOHN M. HUSSEY, OF WICHITA, KANSAS

METHOD OF DESICCATING EGG-BATTER.

957,061. Specification of Letters Patent. Patented May 3, 1910.

Application filed August 25, 1909. Serial No. 514,545.

To all whom it may concern:

Be it known that I, JOHN M. HUSSEY, a citizen of the United States, and a resident of Wichita, in the county of Sedgwick and State of Kansas, have invented an Improvement in Methods of Desiccating Egg-Batter, of which the following description, in connection with the accompanying drawings, is a specification, like numerals on the drawings representing like parts.

This invention relates to an improved method of desiccating egg batter.

In order that the principles of the invention may be readily understood, I have disclosed in the accompanying drawings a type of apparatus by which the method may be carried out.

In said drawings; Figure 1 is a side elevation, partly broken away, of an egg desiccating apparatus for practicing my invention; Fig. 2 is a vertical longitudinal section of a portion of the apparatus represented in Fig. 1; Fig. 3 is an end elevation of the apparatus shown in Fig. 1 looking from the right in said figure; and Fig. 4 is a plan view of a type of speed changing mechanism that may be employed in the practice of my invention.

In my Patent No. 865,342, dated September 3, 1907, I have disclosed an apparatus for desiccating eggs, including a traveling belt or carrier adapted to receive a thin film of egg batter, the belt or carrier thereupon entering a heated drying medium. In the operation of the said apparatus, a plurality of succeeding films were successively superposed upon the first film, each of said succeeding films being subjected to the action of the heated drying medium, the several superposed layers being removed from the carrier in flake form. In the course of my experiments with an apparatus containing the features and operating in the manner described, I have ascertained that it is essential to the production of an acceptable product to vary the speed of the carrier at relatively brief intervals to meet the conditions of humidity and temperature of the drying medium and to vary, control or fix the amount or degree of moisture which shall remain in a previously deposited film at the time of the application of a succeeding film thereto. In order to accomplish this result I have so constructed and arranged the apparatus by which my method is carried out that I obtain a rate of travel of the belt or carrier generally approximating that required during certain conditions of temperature and humidity, and I introduce into the power transmission system a variable speed transmission device so that the speed of the belt or carrier may at brief intervals of time be varied so as to obtain the necessary speed or velocity in order to return the egg film to the point where a succeeding film is to be deposited thereon in such condition that the first film is neither too dry nor too moist when it receives the superposed film, by which deposition of a second film the total amount of evaporation from the previously deposited film is largely controlled and fixed. I have found that the rate of travel of the belt or carrier cannot be maintained constant if an acceptable product is to be obtained. I have ascertained that it is impossible to dry eggs successfully unless the speed of the belt be changed or varied frequently as hereinafter more fully described. While, of course, in carrying out my process I am not restricted to any particular length or extent of the drying surface or carrier, yet in order to make clear that the variations in speed are material in controlling the nature of the product, I would state that in certain machines constructed by me and in which I have carried out my process the egg carrier or belt is mounted upon drums which are spaced from eighty to one hundred feet between centers, so that the belts are themselves from one hundred and seventy five to two hundred and twenty-five feet in length, these sizes varying under different conditions. In other machines or apparatus of the type herein described, the egg carrier or belt has been of materially less length, but the speed variations thereof are material in controlling the nature of the product, as herein set forth.

In building up a complete egg layer consisting of superposed films, I preferably de-

posit from twelve to fifteen films depending upon the kind of egg that is being dried and upon other circumstances.

I am not, of course, to be limited to any particular speed of the carrier in effecting my process, but would state that the length of time required to complete a single revolution of the belt varies from about seven to about twelve minutes, and these extremes may be even greater under certain conditions, as, for example, with changes in steam pressure of the air heating apparatus. If the air be extremely dry or excessively humid, the extremes of speed may be even greater than above indicated. The time required to deposit the built up flake frequently varies from about one hour to about two hours, and within these extremes the belt or carrier may be varied in speed as required to obtain the necessary results. It is impracticable to employ a temperature higher than about 130° F. for drying the egg on account of the fact that the albumen is made insoluble at a higher temperature. When the air is cool, therefore, its temperature can safely be raised a great many degrees, and consequently its relative humidity is greatly reduced, thus materially increasing its drying and evaporating capacity. Under these conditions a higher rate of speed of the belt for the deposition of certain films is necessary. If, on the other hand, the air becomes warmer, as the noon hour approaches for example, the heating radiators will raise the temperature of the incoming air a fewer number of degrees, thus making a much less change in the relative humidity of the atmosphere so heated, which in consequence will not have the evaporating capacity present earlier in the day. It is, therefore, necessary under such conditions gradually to slow down the speed of the carrier. Frequent changes during the building up of a single layer composed of superposed films is usually necessary to carry out the process effectively. Furthermore in starting the building up of a completed or laminated layer, it is usually necessary to change the speed at frequent intervals, as the first two or three films do not give an unfailing indication of the dryness of the egg. The first films of a laminated layer frequently seem perfectly dry even when there is a considerable percentage of excess moisture therein. This excessive moisture may not become apparent until the third or fourth film has been applied and the egg will then begin to look too dark. The speed of the carrier must then be slackened and varied from time to time during the building up of the complete laminated layer. In other words, the effective carrying out of the process requires the constant attention of an operator during the building up of a completed layer. Furthermore I have ascertained in the course of my investigations that I may control the amount of moisture that may be left in the "dried" or completed product. I have ascertained after much experimentation that it is not necessary to remove all the water from the films of egg batter. By properly controlling and regulating the speed of the egg carrier, I can, without in any way injuring the product, increase the percentage of moisture therein, thus obtaining a larger yield. In other words, by varying the period of application for one or more of the succeeding films, I may preserve the residue of moisture in a previously deposited film at the time of such application of a succeeding film. Otherwise stated, with a given humidity and a given temperature of the heated drying medium, the rate of travel of the egg carrier may be considerably varied between the points of maximum dryness and maximum moisture, the resultant product within such extremes being readily and perfectly soluble. I have ascertained that the appearance of the "dried" film varies with the amount of contained moisture not evaporated, and in the carrying out of my process I vary the speed of the carrier in accordance with the appearance of the egg film.

Referring to a selected form of apparatus by which my process may be practiced the belt or carrier whereto the egg film is applied is indicated at 1, it being suitably guided about supporting drums 2 and 3, one of said drums, and herein the drum 3, being positively driven in any suitable manner, as by a band 4 passing about a pulley 5, to which power is supplied in a manner to be more fully described. While the belt 1 may be arranged with one or both runs thereof truly horizontal, preferably it is inclined upward from drum 2 as indicated to permit the proper application to the belt of the egg film, as will be more clearly understood by reference to Fig. 2, wherein an egg receiving tray of suitable form and structure is represented at 6. The upper surface 7 of said tray is represented as concaved or recessed to conform substantially to the surface of the drum 2, which preferably is located at a very slight distance above the said recessed portion 7 of the tray. By the described upward trend of the belt or carrier, I am enabled to apply the egg batter to the under run of the belt while at the same time confining the egg to such recessed portion of the tray. As indicated, the egg batter is supplied directly to the surface of the belt.

Viewing Fig. 2, it will be observed that the egg batter is applied in a film to the belt or carrier by reason of the travel of such belt in contact with the batter, a preferably shallow supply of which is maintained in or upon the egg tray 6. The egg supply should receive a minimum extent of ex-

posure to the air to prevent souring, hence the egg tray is made shallow to maintain the least possible amount of egg therein. The exposed surface of egg should likewise be reduced to a minimum. Moreover, it is desirable that the length of time of exposure of the film upon the belt to the egg supply, thereby to receive the second and succeeding films thereon, should be reduced to a minimum, because the exposure of a dried film to the egg supply tends to soften such film, thus injuring the product. Hence I reduce to a desired minimum the zone of contact or arc of exposure of the drum 2, or rather of the belt 1 supported thereon, to the egg batter or supply. The egg batter or supply, when exposed to the air, should for the best results be maintained as near the freezing point as possible; that is to say, the supply of egg batter is preferably maintained at a temperature approximating that of freezing water. By the described construction, a minimum amount of egg will be taken up by the belt, thus forming a film like application. The belt 1 travels in the direction of the arrow upon Figs. 1 and 2, that portion of the belt which is passing about the lower portion of the drum 2 being considered as the egg receiving portion of the belt or carrier. When properly operated, the belt receives successive applications of a film-like character. In practice, when merely the first film has been applied to the belt or carrier, the latter has the appearance of being merely wetted without appreciable egg color. The more nearly such film approximates, for example, the thickness of a soap bubble film, the better the obtained results.

An egg contains about 72% of water, the greater part of which, in the preparation of my food product, is removed therefrom. This is accomplished most efficiently by the application of heat, and this is specifically effected by the drying action of a current of heated air passing in contact with the belt containing the egg thereon.

While the belt 1 may be of any suitable material, I preferably construct it of zinc, as such substance has no deleterious action upon the egg. Between the drums 2 and 3, the runs of the belt may be supported by guide rolls or disks 9 and 10, any suitable number thereof being provided both laterally and longitudinally of the belt to prevent contact thereof with other portions of the mechanism. Preferably I provide cleared tracks extending longitudinally of the belt, in which tracks run the guide disks 10. Herein for the purpose, I have represented in Fig. 2 a series of clearing devices 11, each constructed as a lever which has a depending portion 12 serving to fulcrum the same upon the upper surface of the tray 6, the forward end of the device 11 being suitably formed to clear a narrow portion of the drum. It is desirable that the belt be so supported that it may run truly and evenly on the drums 2 and 3 without lateral creep. Moreover, the belt should be so supported that all slack therein may be taken out, which from time to time may vary in accordance with the temperature. To this end, I preferably mount the bearings 13 of the drum 2 upon a movable frame 14, preferably provided with grooved rollers 15 received upon suitable tracks 16 of the frame work 17, whereby the frame 14 may be moved toward and from the drum 3, as found desirable. In order that slack may be taken up automatically, I preferably mount upon the frame work 17 a plurality of bell crank levers 18, from one arm whereof are suspended weights 19, the other arm 20 of each lever being connected to the frame 14.

Viewing Fig. 1, a suitable supply or charge of egg batter is contained in the receptacle 21, wherein it is maintained from exposure to the air and is at a temperature at or near the freezing point, being maintained thereat by proper insulating material in or upon the receptacle, for which purpose hair felt may be employed. From this receptacle, the egg is delivered by a preferably flexible pipe or tubing 22 to the concaved or recessed portion 7 of the upper surface of the egg tray 6. Preferably only a shallow supply of egg is maintained upon the tray 6, and this supply may be maintained at a fixed level by the employment of suitable automatic mechanism. As indicated in Fig. 3, the egg batter is preferably introduced near opposite edges of the egg tray, as thereby a more uniform drying of the film or layer as received upon the belt results. Preferably the egg tray 6 is mounted so as to be vertically adjustable; that is, toward and from the drum 2 and belt 1. Herein for the purpose, the tray 6 is represented as supported upon a frame 23 having thereon shouldered supporting bars 24, upon which shouldered portions the tray 6 is adapted to rest. The frame 23 is adapted to be raised and lowered by means of four threaded shafts 25 received in threaded portions of the frame 23, said shafts passing through bearings in a frame 26 suspended from the frame 14 by hangers 27, as shown most clearly in Fig. 3. Each shaft 25 is provided at its lower end with a beveled gear 28 meshing with a similar gear 29 upon shafts 30 and 31 preferably connected by sprocket gearing 32 to turn in unison when power is applied to either of said shafts, as by means of handle 33. In this manner, the tray may be raised or lowered while maintaining the same truly level. By reason of the fact that the frame 26 is supported by the frame 14 carrying the drum 2, the said tray and drum move in unison, thus maintaining a fixed relation.

In order suitably and rapidly to dry the

egg film upon the belt 1, I preferably employ a current of heated air passing in contact therewith and introduced in any suitable manner at 34, as indicated in Fig. 1. While air may be heated to any suitable temperature to dry the egg film upon the belt 1, preferably I maintain it at a temperature ranging from 120° F. to 130° F., and most desirably at about 122° F. I am enabled to bring air at this temperature in contact with the egg film without injuring the latter, because the film is so thinly deposited upon the belt that all or the necessary proportion of the moisture is quickly dried or removed therefrom, the solids of the egg remaining at a relatively low temperature throughout the process, as has been stated. Thus, the undesirable combination of moisture in the egg in the presence of heated air is not long maintained. Preferably the heated air while in contact with the egg film upon the belt 1 travels in the direction of movement of the belt, and hence is admitted directly to the upper run of the belt. I have found it preferable to feed the air in the direction of travel of the belt 1, because the highly heated air acts at once upon the film of egg as received upon the egg tray, the air gradually dropping in temperature from about 120° F. to about 100° F. during its travel in contact with the film upon the belt. I have found that in this manner evaporation of the moisture of the egg film is so rapid that the belt and egg are actually cold to the touch when the process is being carried out under the best conditions.

The superposed egg films may be removed from the belt 1 in any suitable manner. Preferably I employ a scraper 35 normally maintained out of contact with the belt, in order that the desired number of films may be superposed thereon.

Although I have thus described in detail one form of apparatus whereby my process may be practiced, I desire it to be understood that the process may be carried out by other forms or types of apparatus, that herein represented, however, being best adapted to the formation of the desired product.

As previously stated, I have, after much experimentation, demonstrated that the speed of travel of the belt or carrier 1 cannot be maintained constant if a satisfactory product is to be obtained. A speed of the belt or carrier 1, which during the deposition of a single film gives the desired result may upon the deposition of the next or quickly succeeding film give a product that is either too dry and hot or too sticky and moist. Moreover by controlling and regulating the speed of the egg carrier, I may, without in any manner injuring the product, increase the percentage of moisture therein, thus obtaining a larger yield. This I accomplish by varying the period of application for one or more of the succeeding films subsequent to the initial film, in order to preserve or vary the residue of moisture in a previously deposited film at the time of the application of a succeeding film or films. That is to say, I control the degree of moisture in a previously applied film at the time of superposition of a succeeding film by controlling the period for such superposition. Even during the period of constant humidity and temperature of the drying medium, I may vary the period of application of one of more of the films succeeding the initial film, thereby to vary the degree of moisture in a deposited film when the next succeeding film is deposited thereon. It is apparent that I may carry out this step of my process when utilizing that type of apparatus herein shown, by introducing a suitable speed changing device, whereby the movement of the belt or carrier may be varied from time to time.

As previously stated, the belt 1 is driven from the pulley 5, the said pulley being rotated by a worm wheel 36 co-axial therewith. Meshing with said worm wheel is a worm 37 upon a shaft 38 suitably mounted in the frame work and having thereon a pulley 39, about which passes a belt 40 driven by pulley 41 upon a shaft 42. As shown most clearly in Fig. 4, the shaft 42 has splined thereon opposed cones 43—43 adapted to be moved toward or from each other and to receive between and upon them a belt 44. Suitably journaled in the frame work is a main driving shaft 45 having a driving pulley 46, to which power is applied in any suitable manner, as, for example, by means of an electric motor. Upon the shaft 45 are suitably splined similar opposed cones 47, which are adapted to be moved toward and from each other and to receive upon and between them the belt 44. By moving one pair of cones toward each other, and the other pair from each other, the speed of the driven shaft 42 is increased or diminished. In order thus to move said cones, I have herein represented a right and left threaded shaft 48 suitably journaled in the frame work and having a hand wheel 49, by which it may be turned in either direction. Mounted upon the threaded shaft 48 are nuts 50—50 carried by levers 51—51 suitably pivoted at 52—52, said levers at their opposite ends being suitably connected to the cones 43—43. If the threaded shaft 48 be turned to bring the cones 47—47 closer together than shown in Fig. 4, the cones 43—43 are correspondingly and at the same time farther separated from each other. The effect of this is to force the belt 44 to assume a position between the cones 47—47 at a greater distance from the

shaft 45 than before such adjustment of the threaded shaft 48. In other words, said belt 44 is in effect carried and driven by superficial portions of said cones 47—47 at a greater distance from the center of rotation of said cones, and hence traveling at a greater surface speed. Correspondingly the belt 44 is supported by portions of the cones 43—43 at a less distance from the shaft 42 or center of rotation of said cones 43—43, and hence traveling at a less surface speed. It will, therefore, be apparent that when the cones 47—47 are moved as described into closer proximity to each other and the cones 43—43 are farther separated from each other, then the belt 44 will be driven by the shaft 45 at a greater speed, and accordingly the shaft 42, pulley 41 and belt 40 will be driven at a greater speed. This increased speed is imparted to the carrier 1. Conversely, if the threaded shaft 48 be turned in the opposite direction, then the cones 47—47 will be forced farther apart and the cones 43—43 nearer together, with the result that the belt 44 is supported by those portions of the cones 47—47 which are nearer the center of rotation of said cones 47—47 and hence moving at a less peripheral speed. Said belt 44 will be supported by the cones 43—43 at a greater distance from the center of rotation of said cones. Therefore, the belt 44 will be driven by the shaft 45 at a slower speed, and such slower speed will be imparted to the carrier 1.

It is apparent that from the foregoing description of my process I may vary from time to time the speed of travel of the belt or carrier 1, in order to return the deposited film thereon to the egg tray 6 for the reception of a succeeding film in a condition that is neither too hot and dry nor too wet and sticky, such condition being dependent upon and varying with the conditions of humidity and temperature of the drying medium. While it is possible that one film may not be substantially dried before the next is applied, this should not happen. When in the practice of my invention I observe that the film as returned for the application of a succeeding film is not dried as desired, I at once change the rate of speed of the belt or carrier 1, so as to effect the proper drying.

Having thus described my invention and one type only of apparatus by which the same may be carried out, I append the following claims wherein the scope of the invention is indicated.

Claims.

1. The method of desiccating egg batter which consists in applying a thin film thereof to a traveling carrier, subjecting said film while upon the carrier to the action of a heated drying medium, successively superimposing a plurality of films upon said first film and subjecting each of said succeeding films to the action of said heated drying medium, varying the period of application for a succeeding film in accordance with the temperature of the drying medium and the degree of moisture contained in a previously deposited film, and finally removing the superposed films.

2. The method of desiccating egg batter which consists in applying a thin film thereof to a traveling carrier, subjecting said film while upon the carrier to the action of a heated drying medium, successively superimposing a plurality of films upon said first film and subjecting each of said succeeding films to the action of said heated drying medium, controlling the degree of moisture in a previously applied film at the time of superposition of a succeeding film by controlling the period for such superposition, and finally removing the superposed films.

3. The method of desiccating egg batter, which consists in applying a thin film thereof to a traveling carrier, subjecting the film while upon said carrier to the action of a drying medium during a period of constant humidity and temperature of such medium, successively superimposing a plurality of films upon said first film, and subjecting each of said succeeding films to the action of said drying medium, varying the period of application for a succeeding film during such period of constant humidity and temperature of the drying medium, thereby to vary the degree of moisture in a deposited film when the next succeeding film is superposed thereon, and finally removing the superposed films.

4. The method of desiccating egg batter which consists in applying a thin film thereof to a traveling carrier, subjecting said film while upon the carrier to the action of a heated drying medium, superposing a series of such films, each in turn being subjected to the action of the heated drying medium before the next is superposed thereon, varying the period of application for said films in accordance with a variation either in temperature or humidity of the drying medium, and finally removing the series of superposed films.

5. The method of desiccating egg batter which consists in applying a thin film thereof to a traveling carrier, subjecting the film while upon said carrier to the action of a heated drying medium, superposing a series of such films, one upon another, each film in turn being subjected to the action of the heated drying medium before the next is superposed thereon, varying the period of application for said films to control the percentage of moisture in the superposed films, and finally removing the series of superposed films.

6. The process of desiccating egg batter

which consists in applying a thin film thereof to a traveling carrier, subjecting said film while upon said carrier to the action of a heated drying medium, superposing a second film upon that previously applied and previously subjected to the action of the heated drying medium, subjecting said second film to the action of the heated drying medium, repeating said steps as desired, varying the rate of speed of the traveling carrier to control the amount of moisture in the dried product during the superposition of the films, and finally removing the superposed films.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

JOHN M. HUSSEY.

Witnesses:
J. F. REESE,
V. B. STUTZMAN.