

E. E. LAWRENCE AND K. D. LOOSE.

PNEUMATIC MECHANISM FOR CONVEYING AND STACKING FOOD PRODUCTS.

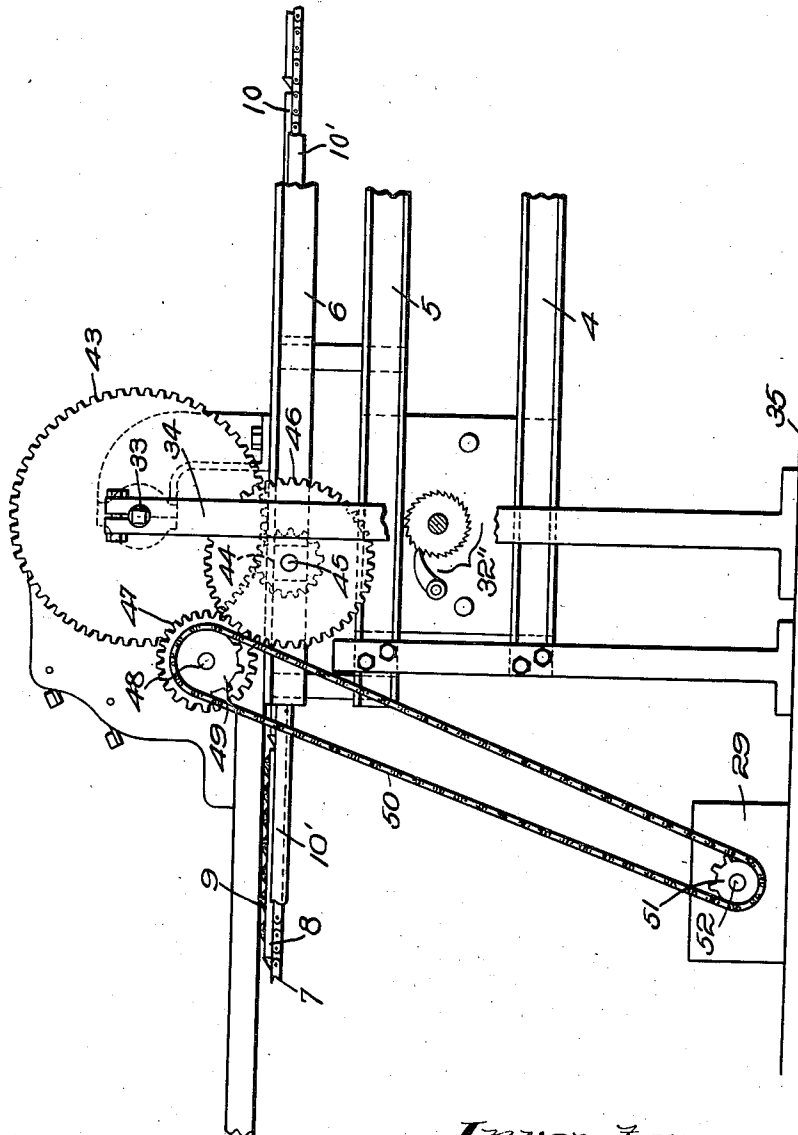
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Patented May 3, 1921.

4 SHEETS—SHEET 1.

Fig. 1.



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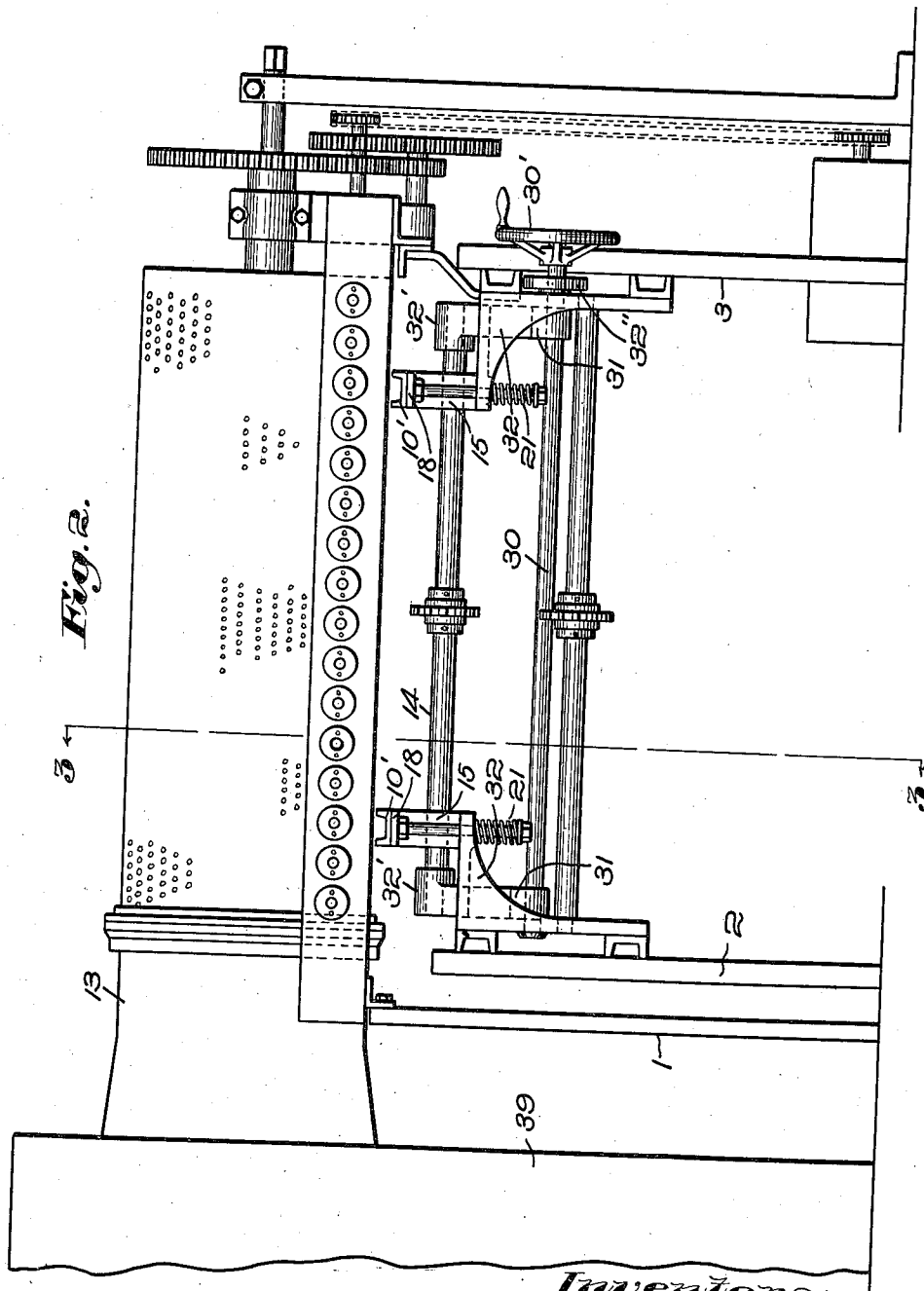
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4 SHEETS—SHEET 3.

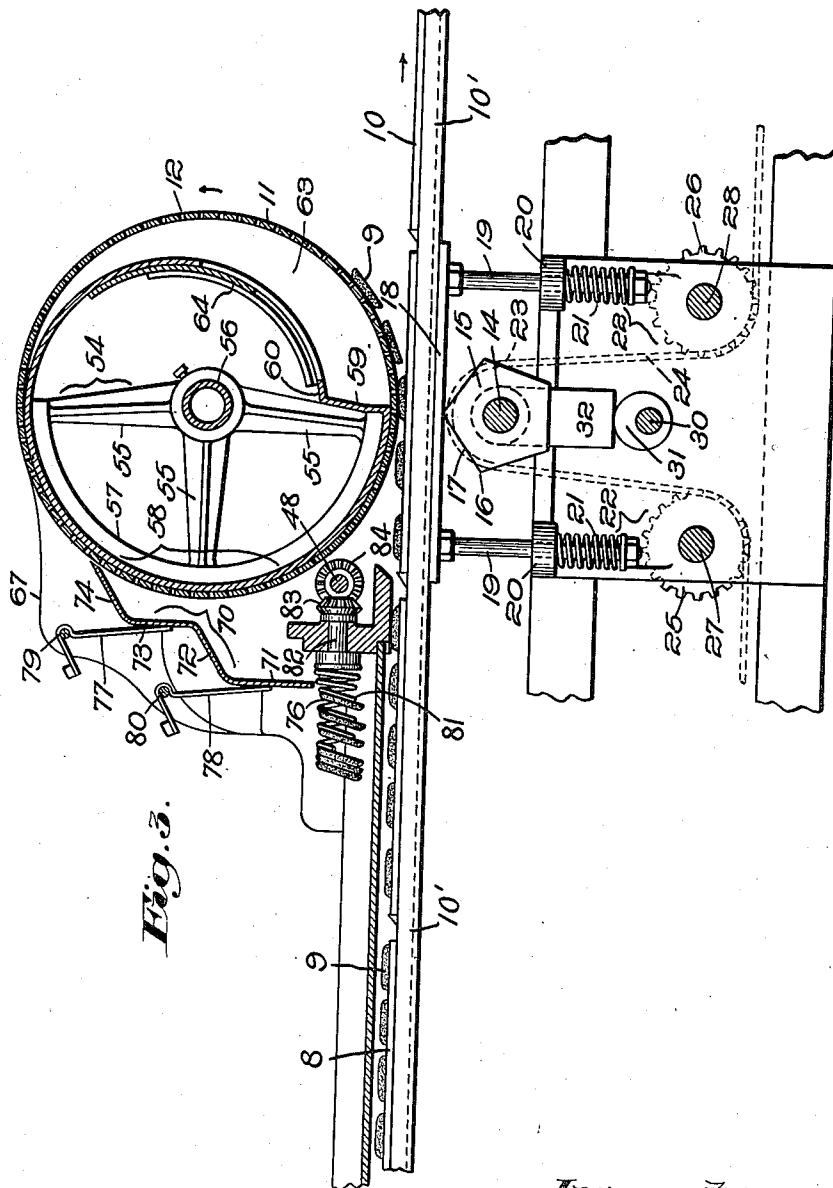


Fig. 3.

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4 SHEETS—SHEET 4.

Fig. 4.

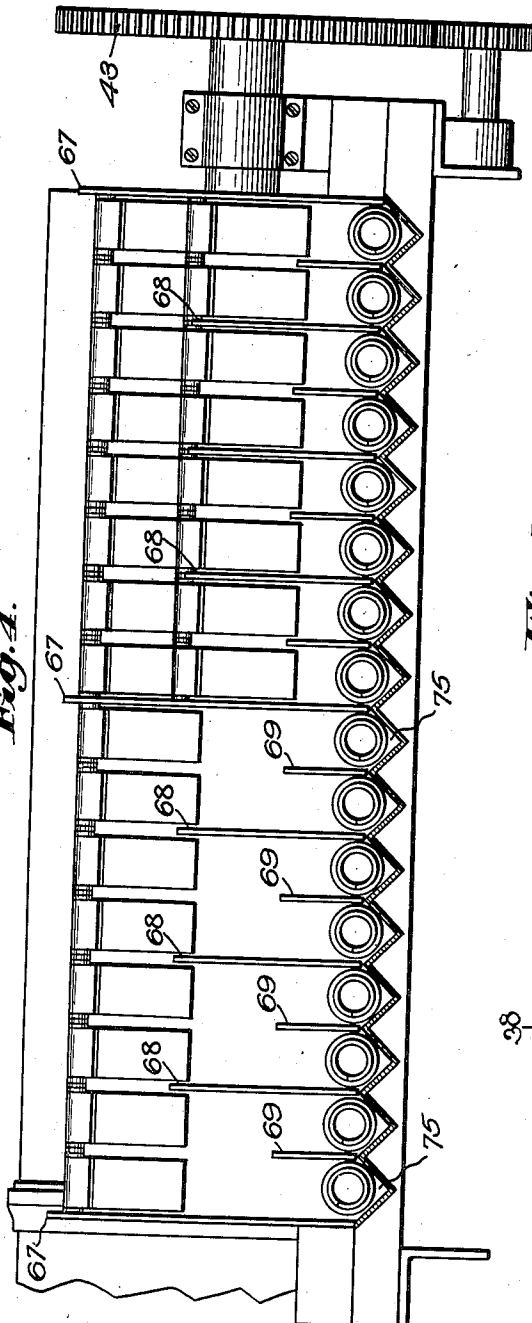
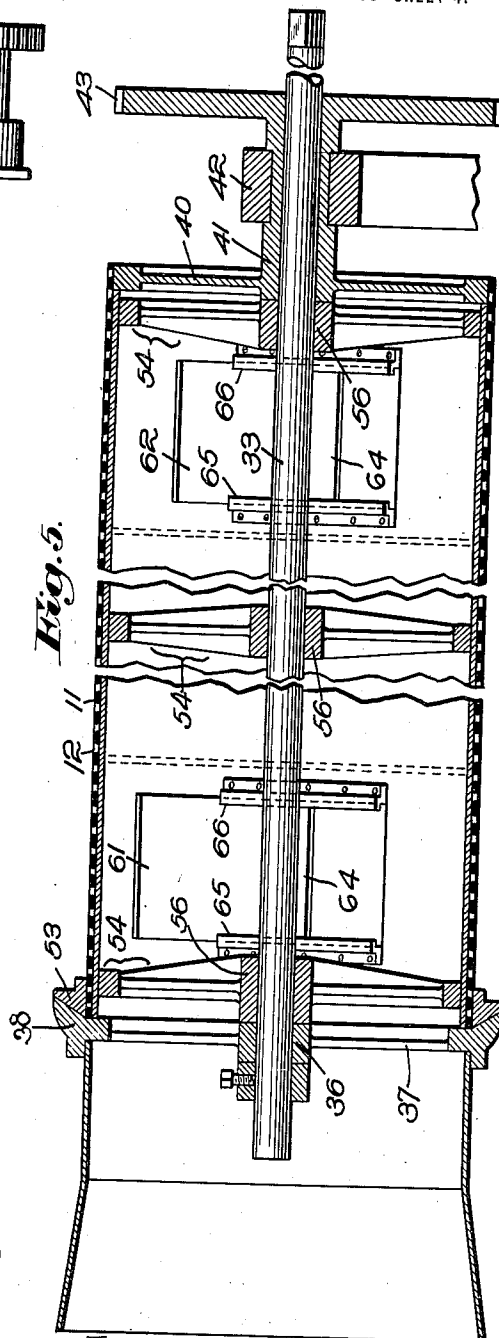


Fig. 5.



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UNITED STATES PATENT OFFICE.

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PNEUMATIC MECHANISM FOR CONVEYING AND STACKING FOOD PRODUCTS.

1,377,136.

Specification of Letters Patent.

Patented May 3, 1921.

Application filed October 1, 1920. Serial No. 414,034.

To all whom it may concern:

Be it known that we, EDWARD E. LAWRENCE and KENNETH D. LOOSE, citizens of the United States, and residents, respectively, of Jamaica and New York, in the counties, respectively, of Queens and New York, State of New York, have invented an Improvement in Pneumatic Mechanism for Conveying and Stacking Food Products, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to pneumatic mechanism for conveying and stacking articles, the disclosed example of which is food products.

In order that the principles of the invention may be readily understood, we have disclosed a single embodiment thereof in the accompanying drawings, wherein—

Figure 1 is a side elevation of the main parts of a pneumatic conveying and stacking mechanism embodying the invention;

Fig. 2 is a front elevation of the structure shown in Fig. 1;

Fig. 3 is a vertical longitudinal section taken through the structure represented in Figs. 1 and 2;

Fig. 4 is a transverse section taken through the structure represented in Fig. 3; and

Fig. 5 is a vertical transverse section taken through the pneumatic drum or conveyor shown in Figs. 1 and 3.

We will disclose our invention with reference to the conveying and stacking of food products, without, however, limiting our invention thereto.

In a companion application, Serial No. 411,403, we have represented wholly mechanical means for conveying and for stacking articles, the represented type whereof is food products. The stacking mechanism proper represented in this case is substantially that shown and claimed in said companion application.

We are aware that heretofore it has been proposed to arrange or stack crackers for packing, but so far as we are aware, no satisfactory apparatus for this purpose has been placed upon the market, although numerous attempts have been made to provide apparatus for this purpose. The de-

sirability of satisfactory facing, conveying and stacking apparatus for articles of a disk like form and particularly for crackers and like food products is manifest, since the latter articles are now packed in small cartons or receptacles usually of the width and depth of a cracker and of a length sufficient to receive or accommodate a stack of substantial length. In satisfactorily stacking crackers or like food products, it is important that they all face the same way, that is, that they be face to back, and that the stacks or rows of the assembled crackers be accurately arranged and in face to back relation, so that a sufficient number to constitute a stack that will fill a single carton may be quickly taken by an operator or by suitable mechanism from a row in the conveying and stacking mechanism and be inserted with a minimum loss of time into the carton or receptacle.

The mechanism herein disclosed constitutes the preferred pneumatic embodiment of the broad invention that is more generally and generically claimed in said companion application, and accomplishes the desirable results that we have above indicated.

Referring more particularly to the drawings, we have at 1, 2, 3, 4, 5 and 6 indicated a framing preferably in the nature of an elongated table-like structure partly broken away in Fig. 1 and desirably adapted to support certain conveyer chains indicated at 7 in Fig. 1, and by which filled pans 8 of crackers 9 or other like food products, or if desired articles of any nature but desirably of a disk like form, may be conveyed from any suitable source. At 10 in Figs. 1 and 3, we have represented the empty pans that have passed in operative relation to the mechanism of our invention and from which the crackers or the like have been removed pneumatically. Desirably the empty pans are returned in any suitable manner and not herein disclosed to the place where they are to be re-filled. Within the scope of the invention the pans may be fed either from the left or from the right viewing Fig. 1 toward the pneumatic mechanism herein disclosed. Viewing Fig. 3, it will be observed that the filled pans 8 are conveyed by the chains 7 along channel irons 10 directly beneath a rotating drum 11 that extends across the entire

width of the conveyer chains and pans thereon, is provided throughout its surface with a very large number of small, closely positioned perforations 12 and is at one end connected with a conduit 13 that is itself in communication with a blower or suction device of any approved type, but preferably one by which a strong suction may be created sufficient to lift the crackers or other articles from the filled pans 8 and to cause them to cling to the rotating surface of the drum 11 until released therefrom as herein-after set forth.

It has been found in practice to be very desirable to agitate the crackers upon the pan 8 when beneath the drum 11. It has been found that such agitation very slightly separates or elevates the crackers from the pan 8 or at least permits a slight film or layer of air to enter beneath the crackers, with the result that such agitated crackers are more readily responsive to the suction created at the surface of the drum 11. While for this purpose any suitable means may be provided, we have herein represented the following means.

Upon a shaft 14 suitably supported in the framing are two cams 15 herein represented as pentagonal in shape. In the rotation of the said cams the points 16 and the flat faces 17 alternately are brought into contact with the under face of a vertically movable frame 18 upon which the channel irons 10' rest beneath the drum 11 with the result that at such point the channel irons, conveyer chains and the filled pans are sharply agitated so as to render the contents of said pans more susceptible to the suction existing at the surface of the drum 11. Desirably the agitation is in such a direction as slightly to lift the crackers or other articles, but within the scope of the invention agitation in any suitable direction may be resorted to for the purpose stated, as, for example, in a transverse direction.

The frame 18 is supported by a suitable number of upright rods or posts 19, preferably four, which at their lower ends pass through openings in parts 20 of the frame and therebeneath are surrounded by strong coiled springs 21 that are compressed between said part of the framing and nuts and washers 22 upon the lower ends of said posts or rods, the construction and arrangement being such that the frame 18 is intermittently and rapidly vibrated against the action of the coiled springs 21, the latter serving to return the frame 18 to its lower or normal position.

The shaft 14 may be rotated in any suitable manner. For the purpose we have represented it as provided with a sprocket 23 about which passes a sprocket chain 24, also passing about sprockets 25, 26 upon shafts 27, 28 suitably supported in the framing.

The sprocket chain 24 is endless and is driven in any suitable manner not herein necessary fully to disclose, but if desired from a variable speed device indicated generally at 29 in Fig. 1, and desirably driven as by a belt from an electric motor, not herein shown. The construction and relation of parts are such that through the said variable speed device any desired rate of speed may be imparted to the sprocket 51 and hence to the sprocket chain 50 and the parts driven thereby.

The shaft 14 is mounted in vertical, adjustable bearings, and to that end the sprocket chain 24 is so constructed and arranged as to permit of such adjustment of the shaft. In order to adjust the shaft 14 in a vertical direction, we have herein chosen to provide a shaft 30 adapted to be turned by a hand wheel 30'. Upon said shaft 30, at the opposite ends, we provide fiber cams or eccentrics 31, upon each of which rests a member 32 constituting a lower prolongation of a bearing 32' for said shaft. Said members 32 may be supported wholly upon said cams or eccentrics 31 or, if desired, we may provide said members with vertical slots to receive bolts tapped into the framing and carrying nuts to be slackened when it is desired to adjust the shaft 14 by the cams or eccentrics 31. The shaft 14 is adapted to be held in the desired position of rotative adjustment by ratchet and pawl 32''.

We provide for vertically adjusting the shaft 14 in order to permit the pans to be shaken harder or more gently as desired and also to permit the said pans to be brought closer to or kept from the drum 11 according as the biscuits, crackers or other articles thereon are thin or thick.

The drum 11 may be of any suitable length, but it is desirably several feet in length, and it has required very extensive experimentation so to construct the drum and the parts immediately co-acting there-with as to insure a substantially even suction action at the surface of the drum throughout the entire length thereof. Normally the suction is greatest at that end of the drum that is connected as at the conduit 13, Figs. 2 and 5, with the fan or blower. It is of great importance and particularly where the crackers or other articles are to be delivered from the drum in a comparatively large number of rows, each consisting of articles arranged edgewise, that there be a substantially uniform suction action throughout the length of the drum so that the crackers or other articles may be delivered into the several rows at a rate approaching uniformity. After much experimentation, we have provided the following mechanism interiorly supported with respect to the drum 11 and also constituting means whereby the suction is cut off at successive portions

of the surface of the drum when said successive portions reach a position where the crackers are to be dropped or otherwise discharged into the several rows above referred to.

A shaft or cross member 33 is stationarily mounted in any suitable manner and as for example at one end in a suitable upright 34 extending to the floor 35, and at the other end as shown in Fig. 5 in the hub 36 of a spider 37, the ring or annular member 38 whereof is supported upon the conduit 13 extending as stated from the framing 39 of the blower. The shaft 33 is preferably hollow to permit oiling of various parts of the mechanism. The drum 11 is itself mounted to rotate upon or about the stationary shaft 33 and for that purpose it is provided with an outer closed end 40 having a hub 41 through which the stationary shaft 33 passes. The hub 41 is supported upon a suitable part 42 of the framing and at its outer end is provided with a gear wheel 43 meshing with and driven by a pinion 44 upon a shaft 45, having fast thereon a gear wheel 46, itself meshing with and driven by a pinion 47 upon a shaft 48 having fast therewith a sprocket 49 about which passes a sprocket chain 50 driven by sprocket pinion 51 upon the shaft 52 of the variable speed device 29.

At its opposite or left hand end viewing Fig. 5, the drum 11 is provided with a ring 53 desirably beveled as indicated and rotating against the inner correspondingly beveled face of the stationary ring 38.

The construction and arrangement are such that the drum 11 is rotated at a suitable speed and conveys the crackers or other articles from a filled pan directly beneath the same and in contra clockwise direction viewing Fig. 3, to the upper ends of the chutes hereinafter described.

Fast upon the stationary shaft 33 are a suitable number of spider like members 54, three of which are represented in Fig. 5.

Desirably these said members are of a somewhat segmental form and are represented in Fig. 3 as having three radiating arms 55, extending from hubs 56 to segments 57 here shown as extending through substantially 180 degrees. Upon the said segments 57 is supported a stationary baffle drum 58 which is substantially of the length of the drum 11 and throughout about 180 degrees of its own surface is in contact with the inner surface of the drum 11 as clearly indicated in Fig. 3. The said baffle drum 58 is at one part provided with a substantially radial portion 59 of the full length of said baffle drum and extending inwardly at certain of the radial arms 55 a sufficient distance where it merges into a spiral surface 60 which, as represented in Fig. 3, gradually approaches the inner surface of the

drum 11 and finally merges into the surface 58 at the full diameter of the said baffle drum.

Because of the described construction there is more static pressure or suction at or in the vicinity of the radial portion 59 than at the succeeding parts, such static pressure or suction gradually decreasing as the point is approached where the surface 60 merges with the surface 58.

The surface of the said baffle drum composed of the surfaces 58, 59, 60 is imperforate excepting for the provision of a certain number of openings, two of which are indicated at 61, 62 in Fig. 5.

Desirably and in that type of the invention herein shown there are provided four of the openings 61, 62, and between adjacent openings spiral or semi-crescent shaped partitions 63 are provided integral with or rigid with the surfaces 59, 60, and filling at intervals the entire space between the spiral surface 60 and the inner face of the drum 11, it being understood that the said partitions are relatively thin and occupy comparatively little space lengthwise of the drum 11. The said partitions are provided merely to cut off communication between the several openings 61, 62, etc., between the spiral surface 60 and the inner surface of the drum 11.

Desirably each of the openings 61, 62, etc., is provided with a sliding damper or member 64 mounted in guides 65, 66 so that the relative areas of the several openings 61, 62, etc., may be such as are found best suited to secure uniform suction at the outer surface of the drum 11 from end to end thereof. We have found after a great deal of experimentation that the several openings 61, 62, etc., should be of different sizes according to their distance from the conduit 13. For this purpose we have provided adjustable means, herein typified by the dampers 64, whereby the areas of the said openings may be relatively proportioned to obtain the desired result, namely, substantial uniformity in the suction at the surface of the drum 11 throughout the entire length thereof.

Viewing Figs. 3 and 5, it will be evident that the air is drawn through the openings 12 of the drum 11 and through the several openings 61, 62, etc., and that as a consequence the crackers or other articles will be drawn forcibly against the rotating surface of the drum 11 immediately to the right viewing Fig. 3 of the radial portion 59 of the baffle drum and will be held thereagainst in the rotation of the drum 11 until the inner surface of the latter meets the surface 58 of the baffle drum, that is, along a longitudinal line of meeting of the surfaces 60, 58. At and contraclockwise beyond said meeting line the suction is cut off

from the surface of the drum 11, and therefore the crackers or other articles are released so that they may be discharged in any suitable manner and preferably to permit them to be stacked. In order to effect such stacking, to which, however, our invention is in no wise limited, but which constitutes a peculiarly cooperating feature of this invention, we preferably provide substantially the construction of chutes and stacking means represented in our said co-pending application Serial No. 411,403, and which construction is here shown in sufficient detail and will be described as follows:

To the left of the drum 11 viewing Figs. 1 and 3, there is provided a series of chutes formed by partitions 67, 67, 67 of full height as represented most clearly in Fig. 4, intermediate partitions 68 here shown as six in number and of lesser height than the partitions 67, and still other and intermediate partitions 69, here shown as eight in number, and still less in height than the partitions 68. In this or other suitable manner, we provide a number of chutes corresponding to the number of rows of food products that are to be formed, herein represented as sixteen. The said partitions 67, 68, 69 constitute the side members of the several chutes and the backing of the entire series of chutes is provided by an upright member 70 having as shown a lower vertical part 71, an inclined part 72 merging thereinto, a vertical part 73 merging into the inclined part 72 and an upper inclined part 74 merging into the vertical part 73, and at its free edge terminating in close proximity to the rotating drum 11 and in such manner that the released crackers or other articles slide down the inclined surface 74 between the several partitions 67, 68, 69, and finally enter a series of channels 75 represented most clearly in section in Fig. 4 and being of general V shape so that the crackers or other articles may be supported edgewise in face to back relation.

The series of chutes is preferably provided with yielding fronts which cooperate in causing the crackers or other articles to pass edgewise down the chutes so that at the bottom thereof they may be in a substantially upright or edgewise condition as indicated at 76 in Fig. 3. To this end we desirably provide one or more flappers between adjacent partitions. We have here represented a series of upper and lower flappers 77, 78, formed of sheet metal or other suitable material and mounted for swinging movement upon transversely arranged rods 79, 80, secured in the partitions 67. The said flappers are so mounted as to yield under the impact of the descending crackers or other articles but co-act to cause the latter to descend substantially vertically.

The partitions 67, 68, 69 are of different heights as indicated, so as to prevent binding, clogging or wedging of the crackers or other articles in two adjacent chutes, as would likely occur if the lateral walls thereof were the same height. It is desirable and important that the crackers or other articles be positioned substantially vertical in their descent, or in a major or substantial part thereof, rather than at an incline, so as to insure the falling thereof to one side or the other of the proper partition. If the food products or other articles strike the top of the partition while descending at an incline, they are apt to lodge there, but when fed, as herein disclosed, they do not lodge at the top of an incline. The downward movement of each cracker or other article is substantially uninterrupted and continuous but the fall thereof is broken or eased by the flappers and by the bends or forwardly extending portions 74, 72, so that by the successive action of the several series of flappers, the crackers or other articles are safely delivered in an edgewise vertical position to the stacking spirals and desirably singly.

Any suitable means may be provided to feed the crackers or other articles along the channels 75. For that purpose we have herein represented spirals 81 each carried by a shaft 82 having fast thereon a miter gear 83 meshing with and driven by a series of miter gears 84 upon the shaft 48.

The descending crackers enter between the spires of the spirals and in the rotation of the latter are fed forward at a suitable rate along the channels 75.

It will be understood that the crackers or other articles are placed in any suitable manner upon the pans and mechanically or manually with the faces of the crackers all down or all up, so that when they are received at the stacking devices, they may be in face to back relation. Obviously, however, where the articles acted upon have no distinguished marks or characteristics upon either face or back, they may be placed upon the pans or other supports in a haphazard or promiscuous manner.

It is of great importance that the crackers or other articles be caused to adhere with substantial uniformity to the active surface of the drum 11, so that in each of the several channels 75, the rows of articles may be built up or formed at substantially the same rate. If the suction is not caused to act with substantial uniformity throughout the longitudinal extent of the drum 11, it is evident that the rows of articles will be built up or formed in various channels in an irregular or uneven manner. This interferes with the efficiency with which the articles are removed from the channels either manually or by mechanism. Although we have 13

represented the filled pans as fed from the left, viewing Fig. 1, toward and under the drum 11, it will be understood that the articles of whatever nature may be fed in any desired manner and either from the right or left viewing said figure toward the drum.

Having thus described one illustrative embodiment of our invention, we desire it to be understood that although specific terms are employed, they are used in a generic and descriptive sense and not for purposes of limitation, the scope of the invention being set forth in the following claims:

1. Mechanism for conveying and stacking disk-like articles comprising a movable member, means to create suction at the surface thereof, means to stack the articles edgewise in a series of rows, and means cooperating with the surface of said member whereby the articles are caused to adhere through suction to said surface substantially evenly throughout the active area of said member, so that the articles are conveyed with substantial uniformity by the movable member to all of said rows.

2. Mechanism for conveying and stacking disk-like articles comprising a movable member, means to create suction at the surface of said member, means beyond said member to stack the articles edgewise in a series of parallel longitudinal rows, and means cooperating with said surface whereby the articles are caused to adhere through suction to said surface substantially evenly throughout the active area of said member, so that the articles are conveyed with substantial uniformity to all of said rows.

3. Mechanism for conveying and stacking disk-like articles comprising a movable member, means to create suction at the surface of said member, means beyond said member to stack the articles edgewise in a series of parallel longitudinal rows, and a baffle cooperating with said movable member and having means to effect the substantially even application of the suction throughout the longitudinal extent of said member, so that the articles are caused to adhere with substantial evenness through-

out the longitudinal extent of said member and are conveyed with substantial uniformity to all of said rows.

4. Mechanism for conveying and stacking disk-like articles comprising a rotatable suction drum having a perforated surface, means to create suction at said surface, means to stack the articles edgewise in a series of substantially parallel rows, and a baffle located within said member and having means to effect the substantial evenness of adhesion of the articles to the suction surface throughout the active area of said drum, so that the articles are conveyed with substantial uniformity to all of said rows.

5. Mechanism for conveying and stacking disk-like articles comprising a rotatable suction drum having a perforated surface, means to create suction at said surface, a series of chutes to which the articles are released from said drum, a series of stacking devices to which the articles are delivered from said chutes and by which the articles are assembled in an edgewise condition in a series of rows, and baffle means within said drum having provisions to cause the articles to adhere through suction to the surface of the drum substantially evenly throughout the active area of said drum, so that the articles are conveyed with substantial uniformity to all of said chutes and stacking devices.

6. Mechanism for conveying and stacking articles comprising a movable member, means to create suction at the surface thereof, means to stack the articles in a series of rows, and means cooperating with the surface of said member, whereby the articles are caused to adhere through suction to said surface with substantial uniformity throughout the active area of said member, so that the said articles are conveyed with substantial uniformity by the said movable member to all of said rows.

In testimony whereof, we have signed our names to this specification.

EDWARD E. LAWRENCE.
KENNETH D. LOOSE.