

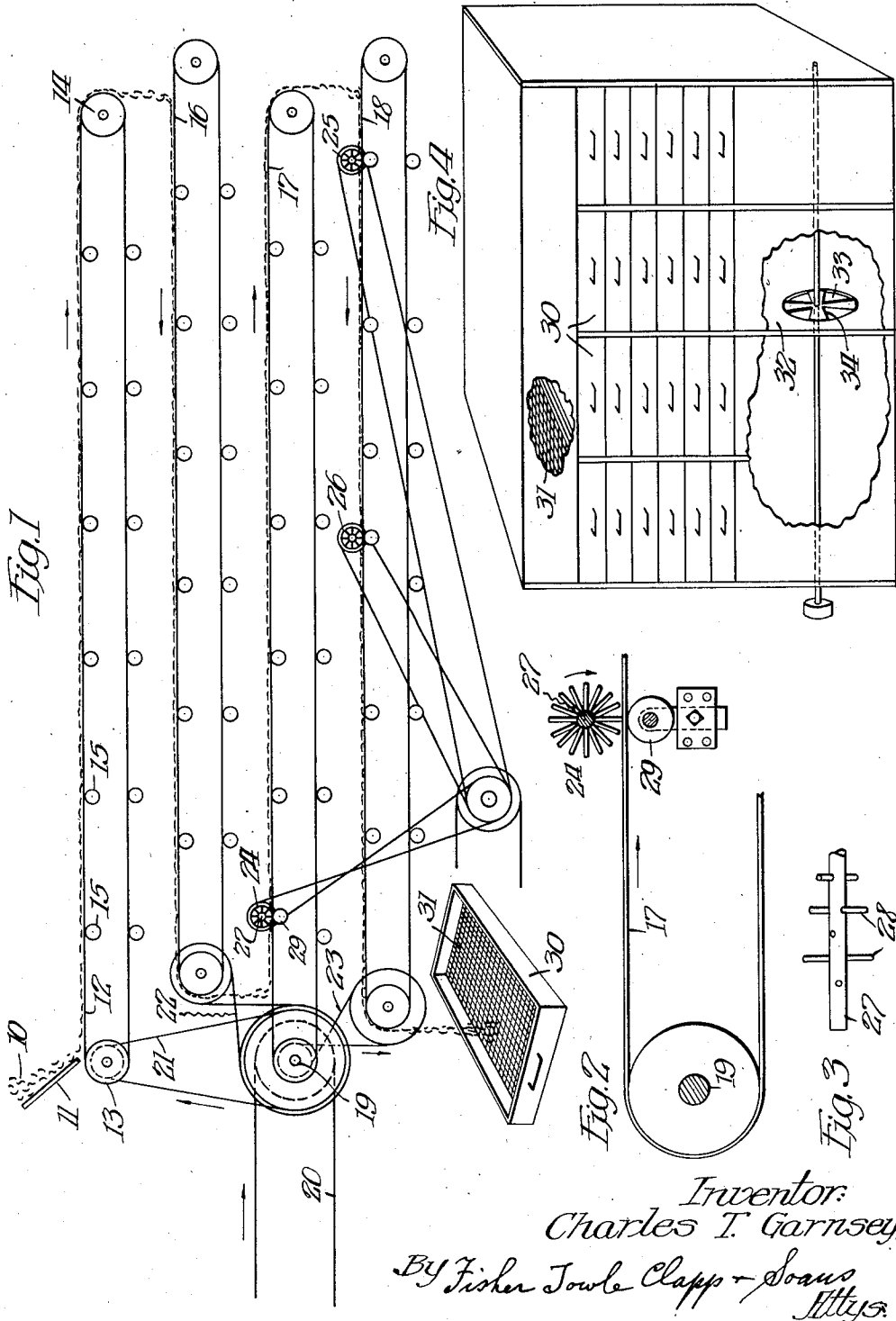
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ART OF DRYING MACARONI

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UNITED STATES PATENT OFFICE.

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ART OF DRYING MACARONI.

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To all whom it may concern:

Be it known that I, CHARLES T. GARNSEY, a citizen of the United States, residing in the city of Joliet, county of Will, and State of Illinois, have invented certain new and useful Improvements in the Art of Drying Macaroni, of which the following is a specification.

My invention relates to improvements in the art of drying macaroni, which term I employ in a generic sense as including not only ordinary macaroni sold in the form of sticks or elbows, but also any analogous food stock made from flour and water, for example, noodles, spaghetti or vermicelli. The particular details of the invention, however, are of especial value in connection with the drying of ordinary macaroni and particularly that of the "elbow" type.

The object of the invention is to provide an improved sanitary process and apparatus for rapidly and economically effecting the drying of the goods subsequent to the formation thereof, while producing a superior article which shall not be baked or chalky or have other undesirable characteristics.

In the drawings which illustrate in a somewhat diagrammatic manner one form of such apparatus as applied to the drying of elbow goods,

Fig. 1 is a side elevation of the progressive dryer for effecting the initial drying of the goods.

Fig. 2 is an enlargement of a portion of Fig. 1.

Fig. 3 is a front elevation of a portion of one of the agitators, and,

Fig. 4 is an elevation, partly broken out, of one of the cabinets for completing the drying.

In making the better class of goods of this character, it has heretofore been customary to remove the majority of the moisture to be removed, and to complete the drying, in cabinets provided with superposed trays with perforated bottoms in which the goods are contained, air being circulated through the cabinets in order to remove the moisture. With this system it has been customary, so far as I am advised, to place the goods in the trays in a practically wet or very soft condition, so that it was necessary to stir or agitate the goods in the trays at frequent inter-

vals, as often as hourly in order to prevent the goods from sticking together or caking. In view of the fact that the cabinet stage of drying ordinarily required many hours, it will readily be understood that the expense of the ordinary process is quite considerable.

After making extensive tests and experiments, I have determined that agitation of the goods in the cabinet stage of the drying is not essential, provided that the cabinet drying is carried on at the proper rate and provided further that before the goods are placed in the cabinet a sufficient percentage of the removable moisture has been eliminated in a preliminary drying stage.

I have also determined that in order to remove the required percentage of moisture from the freshly pressed goods in order to permit of the final drying stage in the cabinets to be carried on without agitation, it is advisable, from the standpoint of economy to perform the preliminary drying step at a progressively descending rate. These various theories or discoveries have been applied by me in the development of apparatus for drying elbow macaroni, which will now be described.

Referring to the drawings, 10 represents a continuous stream or shower of the elbows as they are delivered from the presses on which they are formed. From the sloping apron 11, or other suitable distributing device, the goods are deposited in a substantially uniform layer on a constantly traveling belt 12. Preferably the thickness of such layer is such that if the goods were perfectly distributed, the layer would be one stick in thickness. Said belt 12 may be four feet or more in width and is preferably made of canvas, the length of said belt which is trained around the drums 13 and 14 being such as to provide a top surface about 85 feet in length. Suitable rollers 15 are employed to sustain the belt 12 which is positioned substantially longitudinally. Below the belt 12 there is a second belt 16 of similar construction and mounting. Below the belt 16 there is a similar third belt 17 and below the belt 17 there is a fourth or final belt 18. Belts 12 and 17 run in the same direction, while belts 16 and 18 run in a direction opposite to the direction of belts 12 and 17 and furthermore are set slightly stag-

gered relative to belts 12 and 17 respectively so that the droppings from belt 12 are received by belt 16, the droppings from belt 16 are received by belt 17, and the droppings
5 from belt 17 are received by belt 18.

The belts 12, 16, 17 and 18 are all driven from a main shaft 19 which is constantly rotated by belt 20. A straight belt 21 drives the conveyor belt 12 at relatively high speed
10 for example 17 feet per minute, said shaft 19 driving belt 17 at about $4\frac{1}{2}$ feet a minute, while cross belts 22 and 23 drive the belts 16 and 18 in the reverse direction at approximately $8\frac{1}{2}$ and 2 feet per minute respectively.
15 All of said belts are mounted in a chamber in which the atmosphere is ordinarily maintained about 100° F. or possibly somewhat higher, under certain atmospheric conditions. The air in said chamber is constantly circulated by fans or other suitable
20 devices.

It will be observed that the movement of the goods is progressively retarded as the drying continues until, when the goods are
25 being carried on belt 18 they are moving at approximately one-fourth of the speed of belt 12. All of said belts being of the same width, this results in a progressive piling up or thickening of the layer so that the layer
30 of goods on belt 18 is four times as thick as the layer of goods on the first belt 12. This results in a progressive retarding of the rate of drying as the goods descend from one belt to the next for the reason that
35 there is a relatively less percentage of the surface of the goods exposed to the air which is being circulated.

It will be observed that the goods are agitated or stirred up and fresh surfaces are exposed to the air whenever they are transferred by gravity from an upper belt to a lower belt of the series, and in the case of the relatively thin layers of goods on the two upper belts, this is ordinarily all the
45 agitation and stirring which is required in order to prevent the goods from marking or sticking together. However, in the case of the lower two belts of the series, where the layer of goods is of considerable thickness, and where because of the relatively slower travel, the goods would otherwise remain in one position on the belt for a considerable period before dropping therefrom, it is advisable to install additional or auxiliary
50 stirrers or agitators, for instance as indicated at 24, 25 and 26. Each of said stirrers 24, 25 and 26 comprises a stout rod or shaft 27 having set therein in spiral position a series of comb fingers or rake teeth as at 28.
60 Preferably each of the rake shafts 27 is located immediately above one of the supporting rollers 29, the bracket supporting roller 29 being preferably mounted in such a manner as to be vertically adjustable.

65 The shafts 27 which carry the agitator

teeth 28 are preferably driven in a direction contrary to that in which the belts travel, thereby securing a more efficient agitation.

The goods upon dropping off the end of the final or lowest belt 18 are received in
70 trays as indicated at 30, each of said trays having a wire mesh bottom 31 and imperforate sides so that it will fit into a drying cabinet such as indicated in Fig. 4. Said drying cabinet, in the present instance, com-
75 prises a rack of four tiers of trays, the portion of the cabinet beneath said trays being divided by a partition 32 having a circular aperture 33 for receiving the impeller of a reversible circulating fan 34. Suitable ar-
80 rangements are provided for heating the air circulated by said fan 34, which is reversed every hour or so, in order to effect proper distribution of the drying air. It will be understood that suitable vents for the moist
85 air and openings for the dry air may be provided in order to prevent air in said cabinet from becoming too saturated. This also applies to the air which is circulated around and between the belts for effecting the pre-
90 liminary drying step. In the particular installation herein described, the preliminary belt drying requires a period of approximately one hour twenty minutes and during this preliminary stage, approximately
95 40% of the removable moisture is eliminated. In the cabinet stage, which is effected at a somewhat lower temperature, for example 90° F., the remainder of the removable moisture is eliminated in from 12
10 to 15 hours. Agitation of the goods in the cabinets is not essential, when the preliminary drying has been properly effected and when the final stage of drying is carried on at the proper rate.

My improvements and tests indicate that in order to eliminate the necessity of stirring the goods in the trays of the cabinets, it is advisable to remove not less than 25% of the total removable moisture. As to the
110 rate of drying in the preliminary belt stage of the process, I find it advisable not to attempt to remove more than 50% of the removable moisture within the first hour. If
115 dried rapidly, the goods are inclined to bake or become chalky. However, for the sake of economy, it is desirable to effect the drying at such a rate that at least 25% of the removable moisture may be eliminated within
120 two hours.

The described details of construction and operation being illustrative of one phase only of my invention, the scope of same should be determined by reference to the appended claims, said claims being construed
125 as broadly as possible, consistent with the state of the art.

I claim as my invention:

1. The improvement in the art of drying macaroni which consists in depositing the
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freshly formed goods in a thin layer, effecting movement of said layer in contact with a drying atmosphere while progressively reducing the rate of drying and completing the drying by subjecting the partly dried material to the drying action of an atmosphere at a lower temperature than that at which the first stage of the drying was effected.

2. The improvement in the art of drying macaroni which consists in depositing the freshly formed goods in a thin layer, effecting movement of said layer in contact with a drying atmosphere while progressively reducing the rate of drying, agitating the goods during such movement and finally completing the drying by subjecting the partly dried material to the drying action of an atmosphere at a lower temperature than that at which the first stage of the drying was effected.

3. The improvement in the art of drying macaroni which consists in depositing the freshly formed goods in a thin layer, and effecting movement of said layer in contact with a warm drying atmosphere while progressively reducing the speed of travel of said layer, thereby increasing the thickness of said layer and thus retarding the rate of drying.

4. The improvement in the art of drying macaroni which consists in depositing the freshly formed goods in a thin layer, and effecting movement of said layer in contact with a warm drying atmosphere while progressively reducing the speed of travel of said layer, thereby increasing the thickness of said layer and thus retarding the rate of drying while agitating the goods during said speed reduction.

5. The improvement in the art of drying macaroni which consists in depositing the freshly formed goods in a thin layer, effecting movement of said layer in contact with a warm drying atmosphere while progressively reducing the speed of travel of said layer, thereby increasing the thickness of said layer and thus retarding the rate of drying while agitating the goods during said speed reduction and completing the

drying by subjecting the partly dried material while arranged in relative stationary layers to the drying action of an atmosphere at a somewhat lower temperature than that at which the first stage of drying was effected.

6. The improvement in the art of drying macaroni which consists in exposing the green goods for at least thirty minutes to a drying atmosphere at a temperature high enough to remove at least twenty-five percent of the removable moisture within two hours, agitating the goods during the said treatment and subsequently continuing the drying at such temperature and under such conditions that the rate of evaporation is reduced to less than one-half of the initial rate.

7. The improvement in the art of drying macaroni which consists in exposing the green goods to a drying atmosphere at a temperature at least high enough to be capable of removing at least twenty-five percent of the removable moisture within two hours, and until at least twenty-five percent of the total removable moisture is extracted, agitating the said goods during the said treatment and subsequently continuing the drying at a rate of less than one-third of the initial rate.

8. The improvement in the art of drying macaroni which consists in depositing the freshly formed goods in a thin layer, effecting movement of said goods in contact with a drying atmosphere at a temperature high enough to remove at least twenty-five percent of the total removable moisture within two hours and until at least twenty-five percent of the total removable moisture is removed, while progressively reducing the speed of travel of said layer and thereby increasing the thickness of said layer and thus reducing the rate of drying, while agitating the goods during said speed reduction and completing the drying by subjecting the preliminary dried material to the drying action of an atmosphere at a lower temperature so as to reduce the rate of drying to at least one-third of the initial rate.

CHARLES T. GARNSEY.