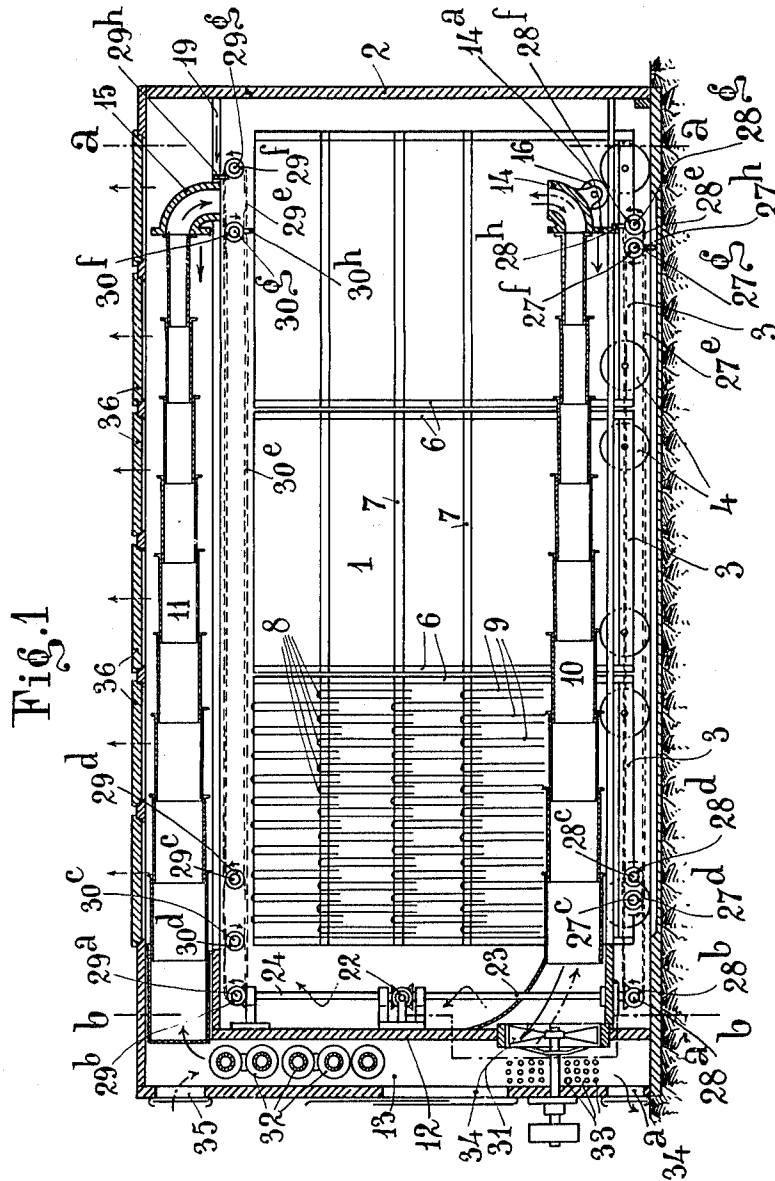


G. FALCHI.
 DRYING APPARATUS FOR ALIMENTARY PASTES.
 APPLICATION FILED JAN. 17, 1910.

989,137.

Patented Apr. 11, 1911.

3 SHEETS—SHEET 1.



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3 SHEETS-SHEET 2.

Fig. 5

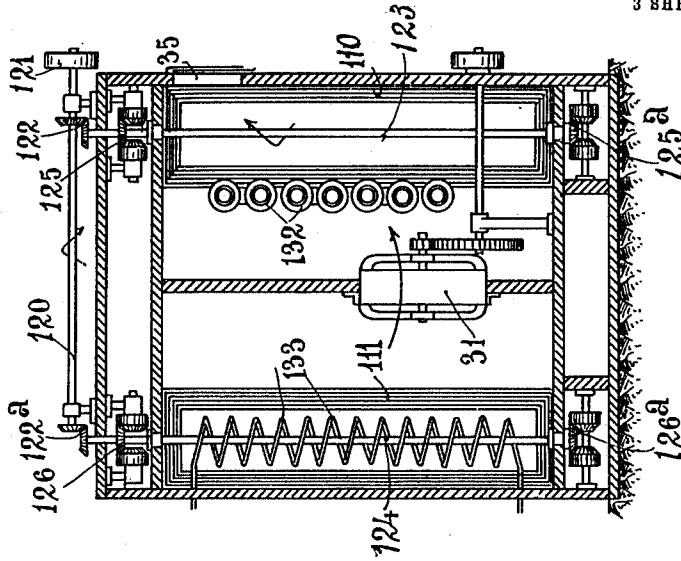


Fig. 3

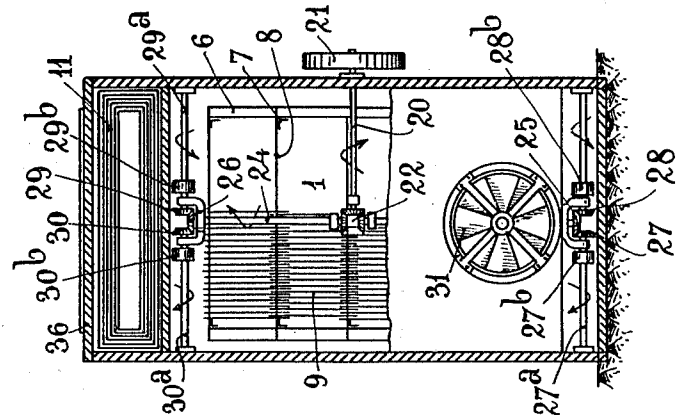
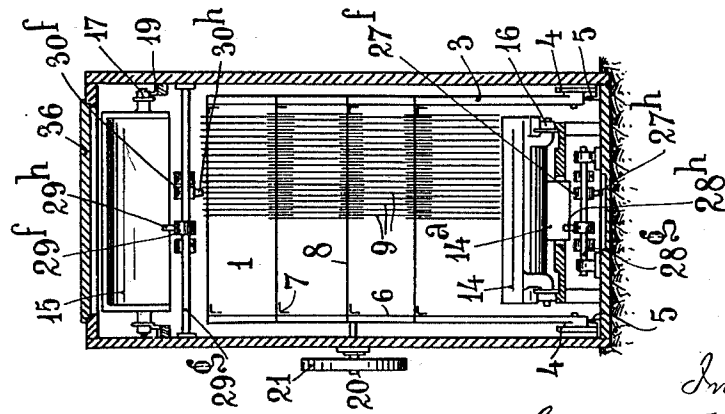


Fig. 2



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3 SHEETS-SHEET 3.

Fig. 6

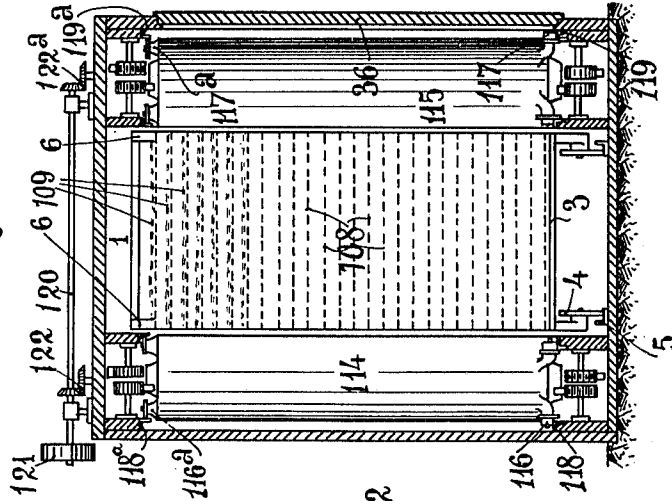
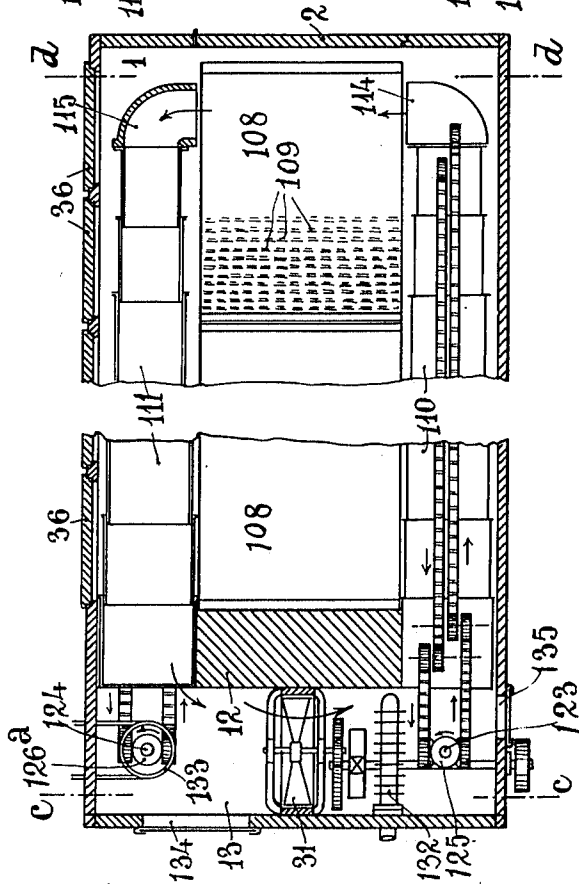


Fig. 4



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UNITED STATES PATENT OFFICE.

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DRYING APPARATUS FOR ALIMENTARY PASTES.

989,137.

Specification of Letters Patent. Patented Apr. 11, 1911.

Application filed January 17, 1910. Serial No. 538,522.

To all whom it may concern:

Be it known that I, GIOVANNI FALCHI, a subject of the King of Italy, and resident of Biella, Italy, have invented certain new and useful Improvements in Drying Apparatus for Alimentary Pastes; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

The present invention has for its object an improved drying apparatus for alimentary pastes, particularly adapted for treating large quantities of material, said apparatus insuring a regular and uniform drying of the whole mass to be treated.

The main feature of this improved drier consists in the fact that the pastes, suitably arranged and distributed within the drying chamber, are subjected intermittently to the action of the current of warm drying air, whereby a too energetic action is avoided, that would result in the cracking and contorting of the pastes. The intermittent action of the warm air on the material to be dried is obtained by imparting to the admission and discharging mouth pieces of the tubes conveying the warm air into the drying chamber a slow to and fro motion, so that only a part of the alimentary pastes arranged in a fixed position in said chamber will successively be subjected to the action of the current of air.

In the accompanying drawings Figure 1 is a vertical longitudinal section of one form of drying apparatus embodying my invention. Fig. 2 is a vertical transverse section on the line *a-a* of Fig. 1. Fig. 3 is a like view on the line *b-b* of Fig. 1. Fig. 4 is a horizontal longitudinal section of a modified form of apparatus. Fig. 5 is a vertical transverse section on the line *c-c* of Fig. 4, and Fig. 6 is a like view on the line *d-d* of Fig. 4.

According to the first constructional form, the drier, which is particularly adapted for drying the long bent pastes (Naples macaroni) is constituted by a chamber 1 of a suitable material (wood, metallic plate, brickwork, etc.) provided at its front part with a door 2 through which the carriages 3 carrying the alimentary pastes to be dried

are introduced into the chamber 1. Said carriages, mounted upon wheels 4 and traveling upon rails 5 placed on the chamber floor, are constituted by a frame consisting of four uprights 6 connected together by means of longitudinal cross bars 7 on which rest the canes 8 from which the pastes 9 are suspended. It must be noted that the spaces between the longitudinal cross bars 7 must be such that the free ends of the pastes of one series overpass a little the canes 8 of the next lower series of pastes and be consequently held between these latter thus preventing any contorting of said ends during the drying operation.

At the lower and upper part of the chamber 1 are arranged two telescopic tubes 10, 11, which are constituted by several parts entering each other. Said tubes are preferably of metallic plate and possess a rectangular section in order to occupy about the whole width of the chamber. Said tubes 10, 11 are attached by one end to the diaphragm 12 forming the compartment within the chamber 1; at the other end they are provided with ending mouth pieces 14, 15 respectively, preferably of cast iron, provided with wheels 16 and 17 respectively traveling on the longitudinal guides 18 and 19 respectively fixed in a suitable manner within the chamber.

The end mouth pieces 14, 15 which must always be opposite to each other, are caused to slide slowly forward and backward by means of the following arrangement: The motion is transmitted from a horizontal shaft 20 provided with a pulley 21 and by means of a system of bevel wheels 22 to the two vertical shafts 23, 24 at the ends of which are mounted the bevel wheels 25 and 26 respectively, which in their turn engage with two pairs of bevel wheels 27, 28 and 29, 30 respectively fastened on corresponding independent horizontal shafts 27^a, 28^a, 29^a, 30^a carrying also the chain wheels 27^b, 28^b and 29^b, 30^b respectively, from which, by means of chains and corresponding chain wheels the motion is transmitted to the horizontal shafts 27^c, 28^c, 29^c, 30^c. On these latter are mounted other chain wheels 27^d, 28^d and 29^d, 30^d respectively, which are engaged with the horizontal chains 27^e, 28^e and 29^e, 30^e, engaging in their turn with the chain wheels 27^f, 28^f and 29^f, 30^f loosely mounted on the end spindles 27^g, 28^g and 29^g, 30^g. It is obvious that owing to the system of bevel

wheels 25, 26 27, 28, 29, 30 the shafts 27^a 28^a as well as the shafts 29^a 30^a will rotate in inverse direction; therefore also the upper or lower sections of the chains 27^e 28^e and the corresponding sections of the chains 29^e 30^e will be displaced in inverse direction. To said chains, which may be of any desired form, are connected at a suitable point the stops 27^h 28^h and 29^h, 30^h respectively. The stops 27^h 28^h serve to operate the tube 10 and for this purpose they strike against the projecting piece 14^a of the mouth piece 14 of said tube. In the case of Fig. 1 the stop 28^h is in an operative condition and partaking of the motion, in the direction of the arrow, of the upper portion of the chain 28^e, pushes the tube 10 backward causing its elements to enter each other. Reaching the end of its travel the stop 28^h passes with its chain on the wheels 28^e and leaves the projecting piece 14^a; shortly afterward the stop 27^h of the other chain moving in inverse direction strikes against the opposite face of 14^a and the tube is again lengthened. The upper tube 11 is operated by means of the stops 29^h 30^h in an analogous manner, but in this case the stops strike directly against the walls of the mouth piece 15. It is obvious that if the linear speed of the wheels 27^e, 28^e and 29^e, 30^e are equal, once the mouth pieces 14, 15 are arranged opposite each other, they will remain in such position also during their forward and backward motion; said motion must be very slow and may be effected in any way different from the one above described.

The tubes 10, 11 serve, as it has been said, to convey the drying air, this latter is caused to circulate by means of the fan 31 that must be so constructed as to be capable of effecting either a suction or a compressing action according to the direction of its motion. The air moved by the fan in the direction of the arrow drawn in full lines becomes heated by coming in contact with the radiators (preferably steam radiators) 32 arranged in the compartment 13. Said air is conveyed through the tube 11 into the chamber 1 where it passes through the pastes 9 to be then sucked through the mouth piece 14 and returned through 10 to the fan 31, leaving this latter it comes in contact with the coils 33 in which cold water is caused to circulate and leaves owing to the ensuing condensation, the steam taken off the pastes. Then the cycle begins again. By this way of operating, always the same air is caused to work. When it is necessary to change a part of it, the registers 34, 34^a are opened more or less; from the first a certain quantity of moist air will come out, while through the register 34^a a corresponding quantity of fresh air will be admitted. If on the contrary it is desired to effect the circulation of the air in the inverse direction in order to

render the drying operation more uniform, the fan will be operated in the inverse direction, the registers 34, 34^a are closed and the upper register 35 is opened. By opening at the same time the movable doors 36 of the roof of the chamber, the circulation is effected in the manner shown by the arrow drawn in dotted lines, namely the air after having passed through the pastes leaves directly through 36. The tube 11 in this case is not used.

The drier shown in the second constructional form of Figs. 4, 5, 6 is more particularly adapted for drying the long straight pastes (macaroni) and other forms of pastes in the form of skeins or hanks of thread, etc. The construction however is quite similar to the construction of the first form. The pastes 109 in this case rest on perforated plates 108 having turned up edges, on which the pastes are automatically arranged when leaving the press. These plates with turned up edges are placed one above the other above the bottom of each carriage 3 in a suitable number in order to fill up each carriage to the top. The telescopic tubes 110, 111, are in this case arranged at the sides of the chamber 1 so that their end mouth pieces 114, 115 are vertical and the current of air traverses the pastes arranged with their hole in this direction. The to and fro motion of said telescopic tubes, the end mouth pieces of which travel by means of wheels 116, 116^a and 117, 117^a upon and against corresponding guides 118, 118^a and 119, 119^a, is imparted as in the preceding case, namely by means of chains, similar to the chains 27^e, 28^e and 29^e, 30^e. It will however be observed that in the present form, as the tubes 110, 111 are of a certain height, they are operated above as well as below in order to facilitate their motion. After the above said, it will be sufficient for the perfect understanding of the operating arrangement of the tubes 10, 11, to say that the two vertical shafts 123, 124 are operated from the horizontal shaft 120 provided with a pulley 121, by means of pairs of bevel wheels 122, 122^a. At the upper and lower part of each of said shafts 123, 124 are mounted the wheels 125, 125^a and 126, 126^a, which in an analogous manner to the wheels 25, 26 of the shafts 23, 24 of the constructional form first described operate above as well as below said acting chain mechanisms of the end mouth pieces 14, 15 of the tubes 10, 11 in order to effect their displacement. In this case too there is a fan 131 capable of working in both directions and producing the necessary current of air (for instance in the direction of the arrow shown in full lines) said current before entering the chamber becomes heated in contact with the radiators 132 and leaving these latter it loses the moisture that is condensed by the contact with the refrigerator

133. Also in this form of construction it is possible to use always the same air or to change a part thereof by causing the same to enter the adjustable aperture 34, or it is possible, by opening the adjustable aperture 35 and the movable doors 36 which in this form of construction are situated laterally to cause the air to leave directly through said doors, thus employing continually fresh air and not making use of the tube 111. In an analogous manner it is possible to invert the circulation of the air in order to render the drying operation more uniform:

Claims.

1. A drying apparatus comprising a chamber, supporting means therein to hold the material to be dried in a fixed position, a conduit to direct a drying medium onto the material, and means to impart a to and fro motion to the mouth end of the conduit.

2. A drying apparatus comprising a chamber, supporting means therein to hold the material to be dried in a fixed position, a conduit to direct a drying medium onto a limited portion of the material at one time, and means to impart a to and fro motion to the mouth end of the conduit.

3. A drying apparatus comprising a chamber, supporting means therein to hold the material to be dried in a fixed position, a conduit to direct a drying medium onto the material, and means to automatically impart a to and fro motion to the mouth end of the conduit.

4. A drying apparatus comprising a chamber, means therein to support the material to be dried, air conduits on opposite sides of the supporting means having oppositely directed mouths, and means to move the mouth ends of the conduits simultaneously in the same direction.

5. A drying apparatus comprising a chamber, means therein to support the material to be dried, air conduits on opposite sides of the supporting means having oppositely directed mouths, means to move the mouth ends of the conduits simultaneously in the same direction, and means to force air through one conduit and suck air from the other conduit.

6. A drying apparatus comprising a chamber, means therein to support the material to be dried in a fixed position, air conduits on two opposite sides of the support having oppositely directed mouths, means to impart a to and fro movement to the mouth ends of the conduits, and a fan to force air through one conduit and suck air from the other conduit.

7. A drying apparatus comprising a drying chamber, means therein to support the material to be dried, air conduits on opposite sides of the support having oppositely directed mouths, means to move the mouth ends of the conduits along the support,

means to force air through one conduit and suck air through the other conduit, air heating means situated in the path of the forced air, and air-cooling means situated in the path of the sucked air.

8. A drying apparatus comprising a drying chamber, means therein to support the material to be dried, telescoping air conduits on opposite sides of the support having oppositely directed mouths, means to move the mouth ends of the conduits along the support, means to force air through one conduit and suck air through the other conduit, air heating means situated in the path of the forced air, and air-cooling means situated in the path of the sucked air.

9. An apparatus for drying alimentary paste comprising a drying chamber, telescoping tubes mounted therein, having oppositely directed mouths positioned opposite each other, means to move simultaneously the mouth sections longitudinally of the chamber, and means to support the paste between the conduits so that the air current issuing from one conduit will pass longitudinally through the paste and into the other conduit.

10. An apparatus for drying alimentary paste comprising a drying chamber, telescoping tubes mounted therein, having oppositely directed mouths positioned opposite each other, means to move simultaneously the mouth sections longitudinally of the chamber, and means to support the paste between the conduits so that the air current issuing from one conduit will pass longitudinally through the paste and into the other conduit, a compartment at one end of the chamber, a fan in the compartment adapted to force air through one conduit and suck air from the other conduit, means in the compartment to heat the forced air before it enters the conduit, and means in the compartment to condense the moisture in the air drawn from the chamber.

11. An apparatus for drying alimentary paste comprising a drying chamber, telescoping tubes mounted therein, having oppositely directed mouths positioned opposite each other, means to move simultaneously the mouth sections longitudinally of the chamber, and means to support the paste between the conduits so that the air current issuing from one conduit will pass longitudinally through the paste and into the other conduit, a compartment at one end of the chamber having ports for the admission and emission of air, a fan in the compartment adapted to force air through one conduit and suck air from the other conduit, means in the compartment to heat the forced air before it enters the conduit, and means in the compartment to condense the moisture in the air drawn from the chamber.

12. An apparatus of the character de-

scribed comprising a drying chamber, means
therein to support the material to be dried,
telescoping conduits mounted in the cham-
ber on two opposite sides of the support and
5 having oppositely directed mouths situated
opposite each other, guides for the mouth
sections, rollers on the latter movable on the
guides, two traveling members moving in op-
posite directions adapted to alternately en-
10 gage each mouth section and move both sec-
tions simultaneously in the same direction, a
compartment communicating with the con-

duits, a reversible fan in the compartment
adapted to force air into one conduit and
simultaneously suck air from the other con- 15
duit, a heating device and a cooling device
in the compartment.

In testimony that I claim the foregoing
as my invention, I have signed my name in
presence of two subscribing witnesses.

GIOVANNI FALCHI.

Witnesses:

PIERO GIANOLIO,
EUGENIO J. B. CASSETTA.