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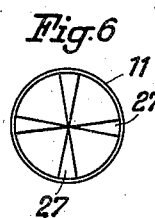
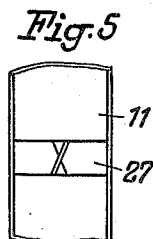
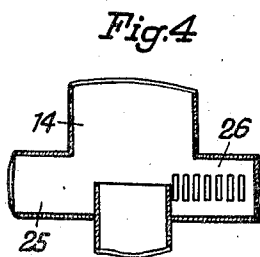
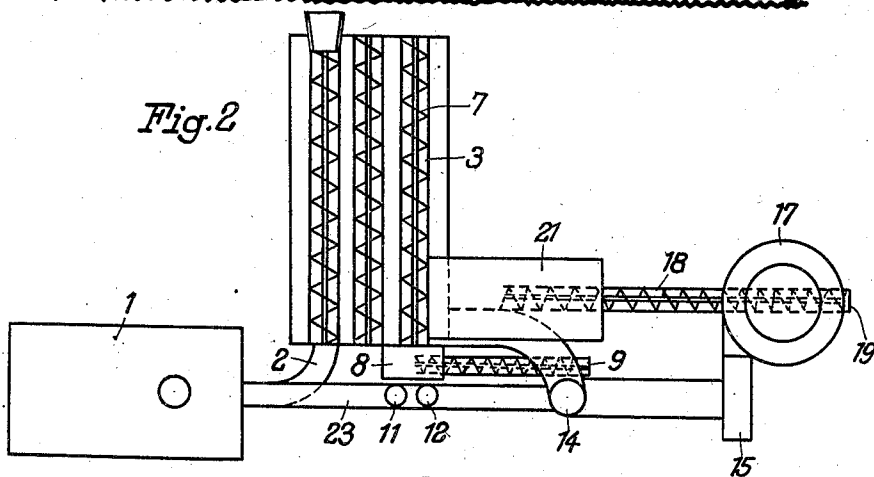
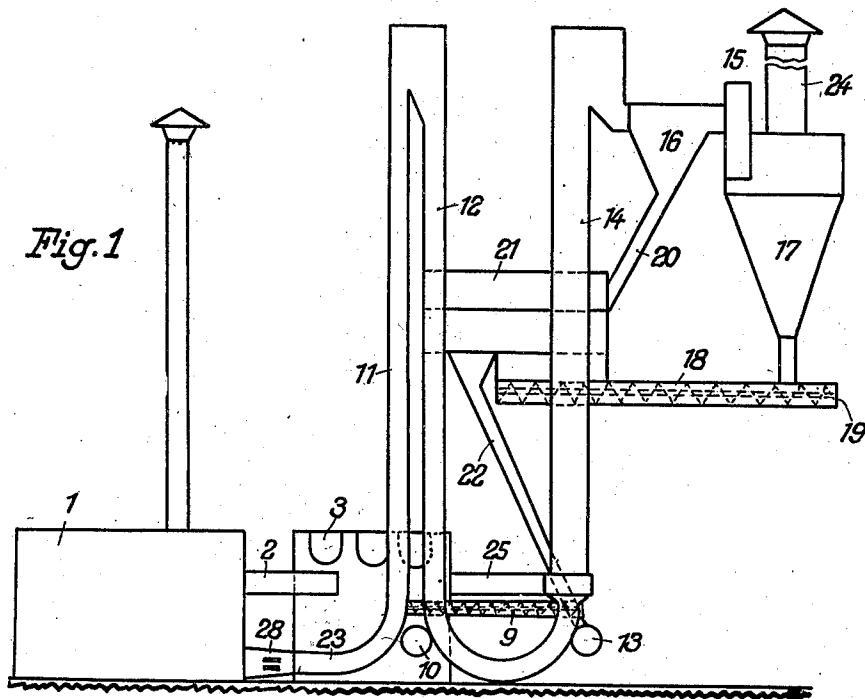
R. SCHULWITZ

1,973,270

PLANT FOR DRYING MOIST MATERIALS

Filed June 9, 1931

3 Sheets-Sheet 1



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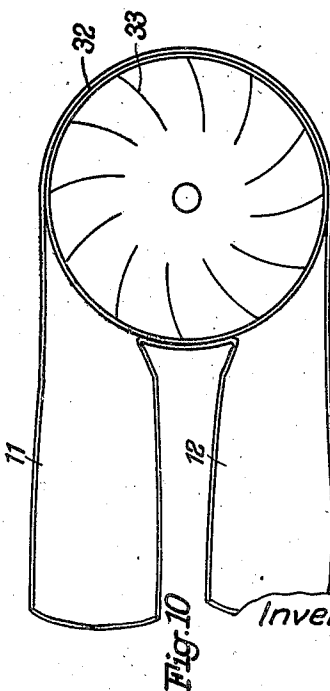
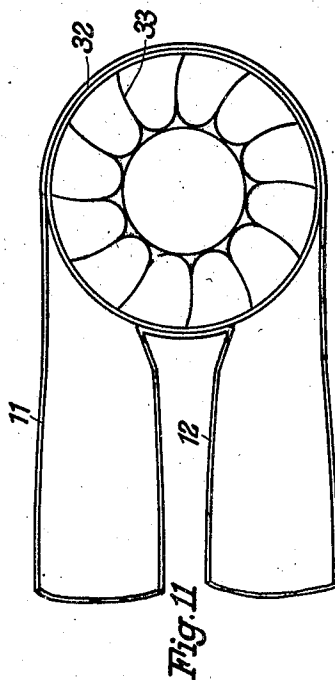
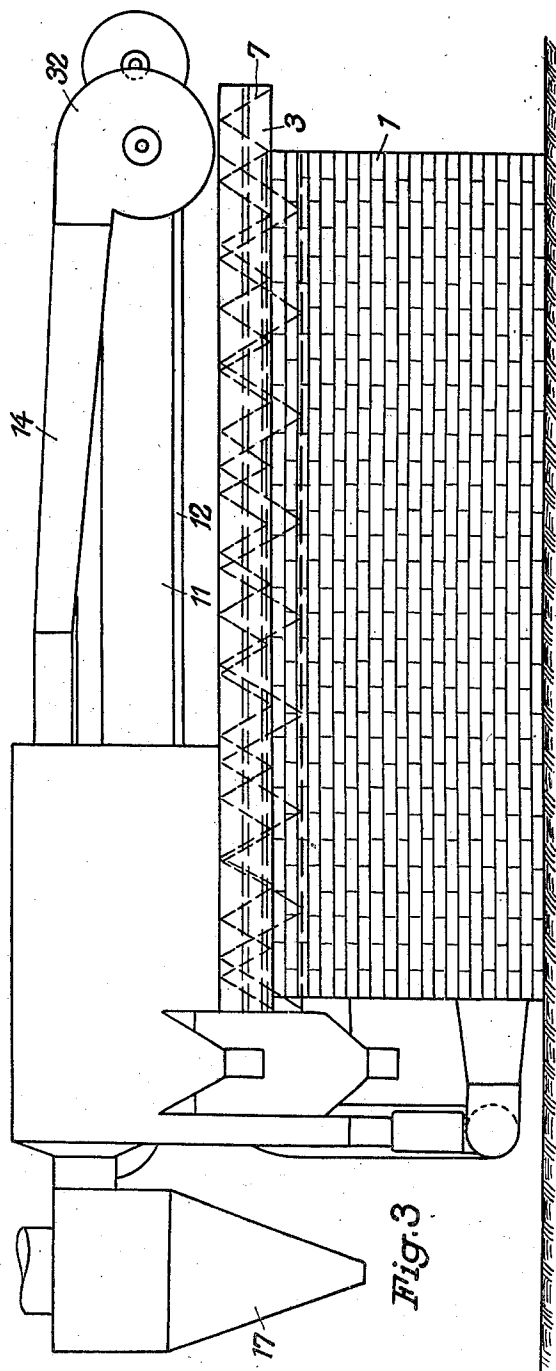
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PLANT FOR DRYING MOIST MATERIALS

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3 Sheets-Sheet 2



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Fig. 9

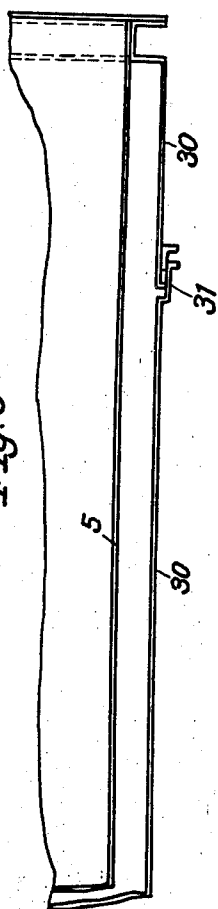


Fig. 7

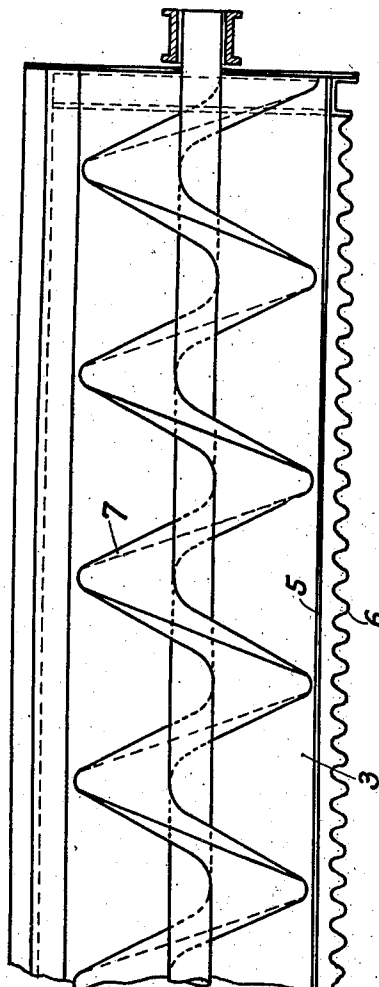
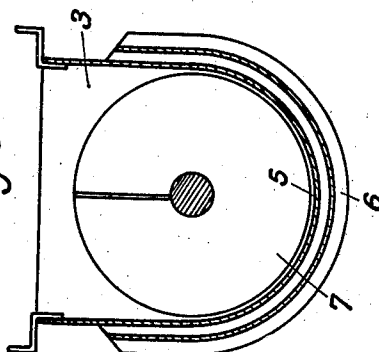


Fig. 8



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UNITED STATES PATENT OFFICE

1,973,270

PLANT FOR DRYING MOIST MATERIALS

Richard Schulwitz, Berlin, Germany

Application June 9, 1931, Serial No. 543,101
In Germany June 5, 1930

5 Claims. (Cl. 34—34)

My invention relates to drying plants, and more particularly to plants of the type in which a furnace and a pneumatic final drier are connected to a preliminary drier.

It is an object of my invention to so design a drier of this type that overheating of the material is prevented and the efficiency is a maximum.

To this end I provide means for conducting the gases from the furnace to the pneumatic final drier through the preliminary drier.

In the preliminary drier which may be of any suitable type, the gases give up a considerable percentage of their heat while flowing in indirect contact with the material so that in the final pneumatic drier in which the gases flow in direct contact with the material, their temperature is so low that the material is not overheated. Loss of heat is avoided as the gases flow in the final drier and so the efficiency is a maximum.

Drying is particularly important for agricultural products as it conserves the nutritious properties much better than acidulation.

Many driers have already been suggested and driers of the pneumatic type in which the material is conveyed through long tubes by a flow of heating gas, and dried as it moves in the tubes, have been preferred on account of their low weight, high output and consequently low initial cost, and their rapid operation. On the other hand, they are not suitable for too moist material because the heat transfer to the material is poor if in this condition, and the high temperature may be harmful to the particles and deteriorate the digestibility of the albumens.

It has also been proposed to combine with a pneumatic final drier a preliminary drier from which the gases were conducted to a heat exchanger for heating the cold air to the final drier. This prevents too high temperatures in the final drier but its efficiency is poor as only a small percentage of the heat in the gases is actually delivered to the air while the major portion is lost.

The preliminary drier is preferably of the trough type. In the preliminary drier the effective temperature must be lower than in the pneumatic drier to prevent premature formation of films on the cells which would interfere with the discharge of the moisture. The troughs have double walls and the heating gases are in contact only with the outer wall, the clearance between the inner and outer walls acting as a heat insulator.

In order to reduce to a minimum the overall size of the plant I may arrange the preliminary drier above the furnace, and the tubes of the

final or pneumatic drier above the preliminary drier in horizontal position.

The preliminary drier is preferably equipped with helical conveyers. As the volume of the material becomes less and less as it gets drier while the temperature in all troughs is constant, the velocity at which the material travels in the troughs, is reduced as the volume is reduced so that in all troughs the same amount of material per unit of time is conveyed and overheating of the partly dried material is prevented. I may reduce the rotational velocity of the helical conveyers with decreasing volume, or I may make the helix in each succeeding trough smaller than in the preceding one.

In order to prevent ejection of only partly dried material, I provide a classifier at the end of the final or pneumatic drier by which the material is selectively ejected or returned to the plant for finishing.

If desired, cold air may be admitted to the pneumatic drier in order to regulate the temperature in the several parts of the drier.

In the accompanying drawings two types of driers embodying my invention are illustrated diagrammatically by way of example.

In the drawings

Fig. 1 is an elevation of a plant in which the intermediate and final driers are arranged at the rear of the furnace, and the tubes of the final drier are vertical,

Fig. 2 is a plan view of Fig. 1,

Fig. 3 is an elevation of a plant in which the preliminary and final driers are arranged on the furnace, with the tubes of the final drier in horizontal position,

Fig. 4 shows an air inlet valve in one of the tubes of the final drier,

Fig. 5 is an elevation, and

Fig. 6 is a plan view of an agitator in one of the tubes,

Fig. 7 is a partly sectional elevation of one of the troughs in the preliminary drier, with its helix,

Fig. 8 is an end elevation of the trough,

Fig. 9 shows a modified trough,

Figs. 10 and 11 illustrate two types of impellers in the knees of the tubes.

Referring now to the drawings, and first to Figs. 1 and 2, 1 is a furnace, 3, 3 are the troughs of the preliminary drier, each with a helix 7, and 2 is a flue connecting one end of the preliminary drier to the furnace 1. The helixes 7 are operated at such a speed or their pitch is so determined that the velocity of the material steadily

decreases, as and for the purpose specified. 8
is a rotary screen at the end of the preliminary
drier for the reception of the material which is
sufficiently dry after passing through the pre-
liminary drier. This is particularly the finer por-
tion of the material. The finer material from the
screen 8 is delivered to a discharge pipe, not
shown, or to a conveyer 9, for further treatment.

11 and 12 are two vertical pipes of the final
drier, 14 being its third vertical pipe. Pipe 11
is connected to the furnace 1 by a flue 23, and is
supplied with the coarser material from the
screen 8 by a charging device 10. The material
rises in the pipe 11 and descends in the pipe 12
until finally it is delivered to the base of the
pipe 14 through a bend and by a charging device
13 which also entrains the material from the con-
veyer 9. The inside diameter of the third pipe
14 is larger than that of the pipes 11, 12, and
15 is a fan exerting suction on the tube 14 at its
upper end. 16 is an inertia separator between
the tube 14 and the fan 15. The fine material
which is dry, is conducted to a dust separator
17, 24 which delivers to a cooling conveyer 18.
The material may also be discharged directly
at the lower end of the separator, and filled into
bags. 20 is a chute at the lower end of the in-
ertia separator 16 and 21 is a classifier screen
to which the chute 20 delivers. The screen 21,
having a twofold layer of screening material,
classes the dried material into three classes.
Fine material is delivered to the cooling con-
veyer 18 to which air is admitted for accelerat-
ing the cooling and drying of the material. The
material of medium fineness is returned to the
charging device, and the coarse material is re-
turned to the first helix of the preliminary drier.

In order to reduce the temperature of the gas
delivered to tube 11, a slide 28 may be provided
for admitting cold air to the flue 23. The tem-
perature of the gas admitted to tube 14 is re-
duced already by giving up a portion of its heat
in the preliminary drier, but a valve 26, Fig. 4,
may be provided in this tube for regulating the
temperature.

Whirling wheels 27 may be arranged in the
tubes 11, 12, and 14, or in any other position in
order to agitate the gas in the tubes and to
bring the material into contact with fresh mole-
cules of gas. Wheels 27 are shown to a larger
scale in Figs. 5 and 6.

Referring to Fig. 3, the troughs 3 of the pre-
liminary drier are here arranged above the fur-
nace 1, and the tubes 11, 12, and 14 of the final
drier are arranged above them in horizontal po-
sition. This makes a particularly small plant.

Referring now to Figs. 7 and 8, the trough
3 has a double wall, its inner wall 5 being smooth,
and the outer wall 6 corrugated. This permits

the outer wall which is in direct contact with the
gases, to expand independently of the inner wall.
Instead of being corrugated, the outer wall may
be built up from overlapping members 30, with
stuffing boxes 31 at the joints, if desired, so that
the members are free to expand.

Obviously, with a view to reducing the overall
size of the plant, it is desirable that the bends
or knees at the ends of the tubes should be of
small radius while on the other hand the radius
should be large so that the material will flow
freely. This difficulty is overcome by providing
impellers in the bends or knees, as shown in
Figs. 10 and 11. The impeller 32 may have the
usual curved vanes 33, Fig. 10, or bucket-shaped
vanes 34, Fig. 11, in which latter case the mate-
rial is conveyed by suction and pressure.

I claim:

1. A device for drying moist materials, com-
prising an indirectly heated drier in which the
material is preheated and pre-dried, a second
and a final drier consisting each of a pneumatic
piping, and a classifier for sorting the material
coming out of the final drier, ejecting the dried
portions thereof and distributing the still moist
portions to the respective driers according to
their degree of dryness.

2. A device according to claim 1 in which the
preliminary drier comprises troughs, an extensi-
ble outer wall for each trough, a free air space
being formed between each trough and outer
wall, screw conveyors for conveying the material
to be dried through said troughs, a drive for said
conveyors, and a furnace whose heating gases
are passed along the outside of said outer wall
and deliver part of their heat indirectly to the
conveyed material.

3. In a device according to claim 1 a three-
part rotary screen connecting with the sorting
device of the final drier and classifying the ma-
terial three-fold, a discharge device connected to
a part of the screen for removing perfectly dried
material, a second discharge device connecting
another part of the screen with the inlet of the
final drier for returning thereto material not per-
fectly dried, and a third discharge device con-
necting the third part of the screen with the sec-
ond drier for returning thereto the remainder of
the material.

4. A device according to claim 1, in which the
preliminary drier is formed of a horizontal cham-
ber and the pneumatic conveying pipes of the
second and final driers are horizontally disposed
on said chamber side by side.

5. In a device according to claim 1, vane wheels
arranged at the bends of the conveying pipes for
passing the material from one pipe into the next
one.

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