

T. SUZUKI.
AUTOMATICALLY ACTING HORIZONTAL DRYING MACHINE.
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1,126,587.

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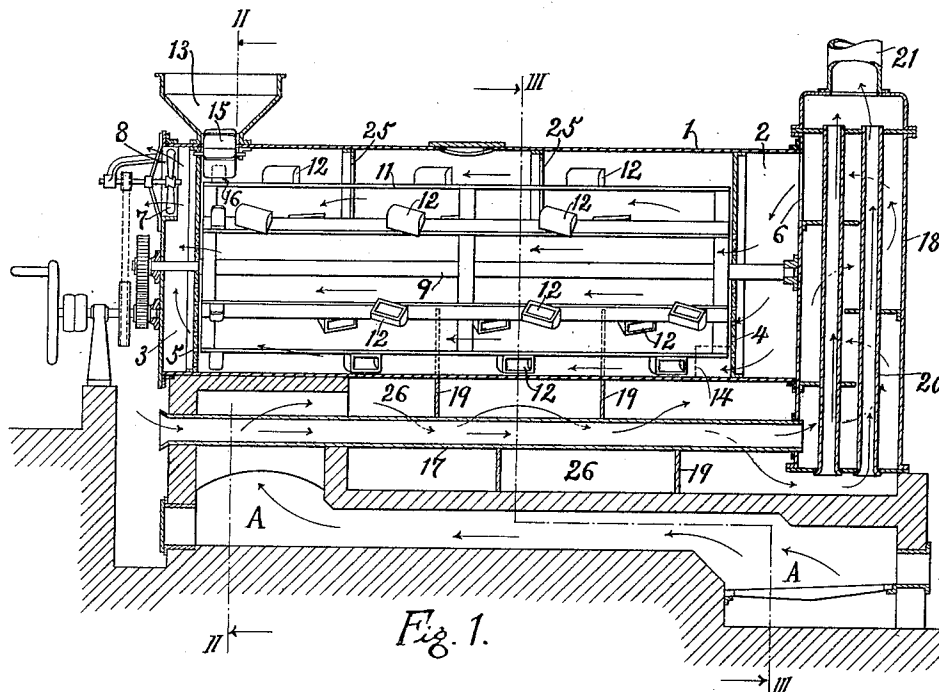


Fig. 1.

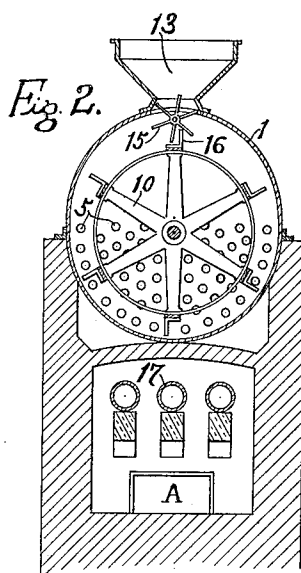


Fig. 2.

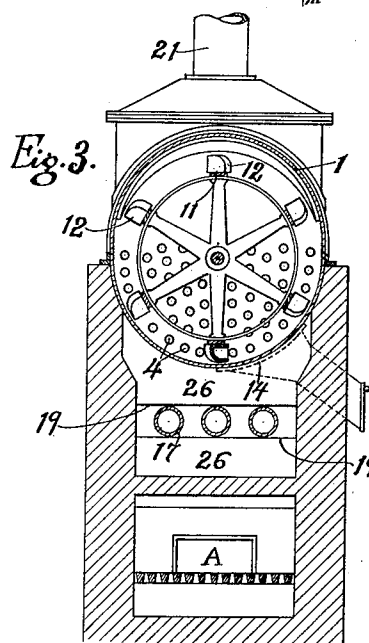


Fig. 3.

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AUTOMATICALLY-ACTING HORIZONTAL DRYING-MACHINE.

1,126,587.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, TOZABURO SUZUKI, engineer and machine manufacturer, subject of the Emperor of Japan, residing at No. 401 Jibeishinden, Sunamura, Minami-Kat-sushiha, Tokyo, Japan, have invented new and useful Improvements in and Relating to Automatically-Acting Horizontal Drying-Machines, of which the following is a specification.

This invention relates to improvements in automatically acting drying machines of a horizontal type. In the drying machine of this invention, a cylinder constituting a drying chamber, and air heating pipes are horizontally arranged over a furnace or its flue. A hot air supplying chamber is provided at one end of the horizontal cylinder, and an exhaust chamber at the other end of the same. These two chambers, one at each end of the horizontal cylinder, are connected with the cylinder through air distributing holes and exhaust holes respectively. A feed hopper, for material to be dried, is provided at the upper side of one end of the cylinder, and an outlet for the dried material at the under side of the other end of the same. A horizontal driving shaft carrying a series of bars in the form of a crate is longitudinally mounted in the center of the drying cylinder, and the material to be dried is supplied to the cylinder from a feed hopper and stirred and scattered, by means of dippers supported on the crate bars around the horizontal shaft, and gradually forced toward the outlet, while the hot air, produced in the air heating chamber, flows into the cylinder through the air supplying chamber, whereby the hot air plays upon all parts of the material uniformly and the material is fully and uniformly dried.

This invention has for its object to contrive a new and improved drying machine in which the material to be dried is automatically scattered in the cylinder, while hot air flows through all parts of the material which is fully and uniformly dried; further at the same time the material being heated from the bottom of the cylinder, the drying operation is quickly performed, and large quantities of the material may be fully and uniformly dried in a short time in a most effective and convenient manner.

In the accompanying drawings: Figure 1 is a longitudinal sectional elevation of a drying machine constructed according to this

invention, Fig. 2 is a cross section of the same on the line II—II in Fig. 1, looking toward the exhaust chamber, Fig. 3 is another cross section of the same on the line III—III in Fig. 1, looking toward the hot air chamber.

In these drawings, the same symbols denote the same or corresponding parts.

As shown in the accompanying drawings, a horizontal cylinder 1, constituting the drying chamber of this machine, is provided with an air supplying chamber 2 at one end and an exhaust chamber 3 at the other end; and hot air is introduced into the horizontal cylinder 1 through air distributing holes 4 formed in a side wall of the air supplying chamber 2 and withdrawn from the cylinder 1 through exhaust holes 5 formed in a side wall of the exhaust chamber 3. Further an opening 6 is provided in another side wall of the air supplying chamber 2 and hot air is supplied through this opening 6 into the chamber 2, and on the other hand, by means of a fan 7, the hot moist air is drawn through cylinder 1 in to exhaust chamber 3 and discharged into the outer air through hole 8.

A horizontal driving shaft 9 passing through the ends of the cylinder 1 and along the longitudinal axis thereof, is supported at each end so as to be rotated by some suitable driving means. It has firmly attached to it a crate composed of a plurality of radially projecting spokes 10 fixed to the shaft 9 at intervals within the drying cylinder 1, to the ends of which spokes are attached bars 11 longitudinally, carrying dippers 12 arranged spirally.

A feed hopper 13, for the material to be dried, is mounted on the upper side at one end, of the drying cylinder 1, near the exhaust chamber 3, and an outlet 14 for the material treated is formed on the under side at the other end of the cylinder 1. A feed valve 15, consisting of vane-like plates radially arranged on a horizontal shaft, is so mounted in bottom of the feed hopper 13, that it may be intermittently operated, when fingers 16, attached to the crate bars 11 at their adjacent ends, engage the vane-like plates. Thus the material to be dried is automatically fed into the drying cylinder 1 from the feed hopper 13 through its bottom opening. In such construction, the fingers 16 operate the feed valve 15, according to the rotation of the horizontal driving shaft

9, and the material to be dried is fed automatically, falling down into the drying cylinder 1, and gradually forced toward the outlet 14 being stirred and scattered and pushed forward by means of the dippers 12, arranged spirally on the bars 11 of the crate. At the same time, the hot air, which flows into the air supplying chamber 2 through the opening 6, is drawn into the drying cylinder 1 through the distributing holes 4 and passes through there uniformly distributed, and is brought into perfect contact with every part of the material to be dried. The hot air, having absorbed moisture from the material, is led into the exhaust chamber 3 through the holes 5, and then discharged from the hole 8 as before described. Thus the material treated, being fully dried, is finally received into a suitable vessel at the outlet 14.

In this invention, baffle plates 25, are vertically provided in the upper part and inside of the drying cylinder 1, so that the hot air may be prevented from passing ineffectually along the upper wall in the cylinder 1.

According to this invention, the drying chamber 1 is horizontally mounted over the flue 26 of a furnace A, and heated by flame passing along and in contact with the lower outside of the cylinder 1. Air heating pipes 17 are arranged in the flue 26, and their inner ends are connected with the lower part of a hot air chamber 18 which is in turn connected with the air supplying chamber 2 at its upper part, through the opening 6; the other ends of the pipes 17 open to the atmosphere whereby air will be sucked into the pipes 17 from those ends.

In the flue 26, baffle plates 19 are so projected from top as well as bottom sides alternately, that the flame may be deflected up and down, thus the flame will heat the bottom side of the cylinder 1 and at the same time will keep good contact with the external surface of the air heating pipes 17. Smoke pipes 20, the lower ends of which are connected to the end of the flue 26, are vertically provided within the hot air chamber 18, and the upper ends of the smoke pipes 20 open into a chimney 21.

In the arrangement, as above described, air being fully heated, by passing through the air heating pipes 17 and then the hot air chamber 18, flows into the air supplying chamber 2.

In the drying machine of this invention, as the drying cylinder 1, as before described, is horizontally laid over the flue of the furnace, heat will be transmitted to the cylinder from its bottom side. Further, as air heating pipes are arranged in the said flue, and the air, flowing into them becomes highly heated therein, and as this hot air is drawn into the drying cylinder and brought

into thorough contact with the material to be dried, the drying operation will be very quickly performed. When the main shaft 9 is rotated, the feed valve is operated and the material to be dried automatically falls down into the drying cylinder through the feeding hole. As the material is stirred and scattered in the cylinder by means of the dippers, while the hot air flows through the cylinder, the hot air plays upon all parts of the material and thus a large quantity of material may be uniformly and quickly dried.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. Drying apparatus of the class described comprising a drying cylinder, a feed hopper connected therewith, a valve in said hopper, and a rotatable member in said cylinder for stirring the material fed from the hopper and adapted to operate the valve aforesaid to admit the material into the cylinder.

2. Drying apparatus of the class described comprising a drying cylinder, a feed hopper connected therewith, a valve disposed in said hopper for checking the flow of material to be fed into the cylinder, a rotatable member mounted in said cylinder and adapted to cooperate with the valve to cause intermittent flow of the material from the hopper to said cylinder, and means on said rotatable member for stirring the material fed thereinto and causing flow of said material through the cylinder.

3. Drying apparatus of the class described comprising a cylinder provided with a drying chamber, an air supply chamber adjacent one end of said drying chamber, an exhaust chamber adjacent the other end of said drying chamber, said exhaust and supply chambers having openings communicating with the drying chamber, a hopper carried by said cylinder, a valve disposed in said hopper, a rotatable stirring member mounted in the drying chamber and comprising a plurality of spaced bars, means on said bars adapted to cooperate with the valve in said hopper to cause intermittent flow of material from the hopper into the drying chamber, a source of heat adapted to act upon the drying chamber, air heating means disposed in said source of heat for generating a supply of heated air and conveying the same to the air supply chamber, and means for causing a circulation of said heated air through the drying chamber and into the exhaust chamber.

4. Drying apparatus of the class described comprising a cylinder provided with a drying chamber, an air supply chamber adjacent one end of said drying chamber, an exhaust chamber adjacent the other end of said drying chamber, said exhaust and sup-

ply chambers having openings communicating with the drying chamber, a hopper carried by said cylinder, a valve disposed in said hopper, a rotatable stirring member 5 mounted in the drying chamber and comprising a plurality of spaced bars, means on said bars adapted to cooperate with the valve in said hopper to cause intermittent flow of material from the hopper into the 10 drying chamber, a source of heat adapted to act upon the drying chamber, a conduit disposed in the source of heat through which air is adapted to pass for heating the same, 15 said conduit being arranged to convey the heated air into the air supply chamber aforesaid, and a fan disposed in the exhaust chamber and adapted to draw the heated air through the drying chamber into the exhaust chamber aforesaid.

20 5. Drying apparatus of the class described comprising a cylinder provided with a drying chamber, an air supply chamber disposed adjacent one end thereof, an exhaust chamber disposed adjacent the other 25 end thereof, said exhaust and supply chambers having openings communicating with the drying chamber, a hopper disposed at

one end of the drying chamber, a valve arranged in said hopper and comprising a plurality of vanes, a rotatable stirring member 30 mounted in the drying chamber and having a plurality of fingers projecting therefrom for cooperation with the vanes of the valve to cause intermittent operation of the same and feeding of material to be dried 35 into the drying chamber, spirally arranged dippers carried by said rotatable members for causing material fed therein to pass through the drying chamber, heating means 40 disposed beneath the drying chamber and adapted to act directly thereupon, an air conduit arranged in said heating means for supplying heated air to the air supply chamber, and a fan carried by said cylinder for causing a circulation of the heated air 45 through the drying chamber.

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

TOZABURO SUZUKI.

Witnesses:

S. Iro,

H. F. HAWLEY.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."