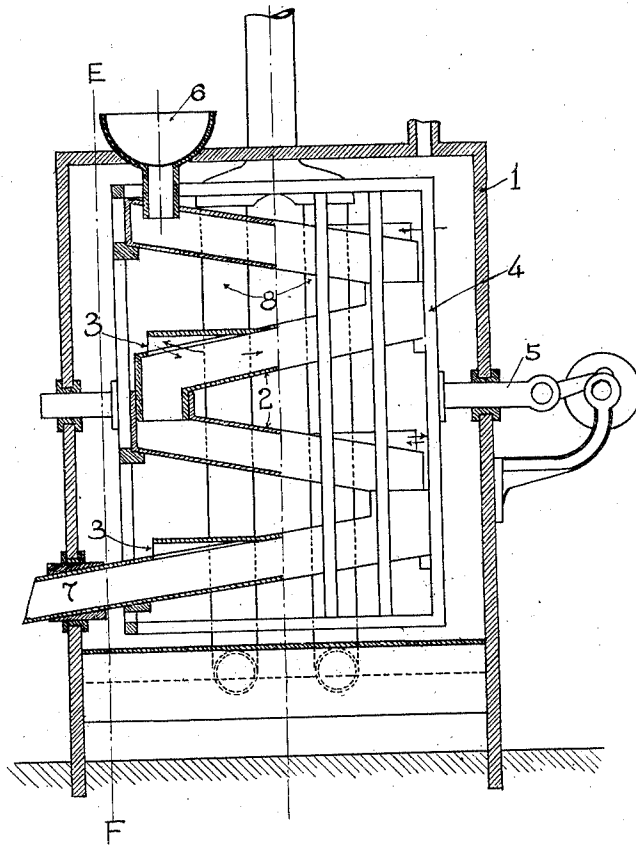


Z. YAMAMOTO.
DRYING APPARATUS.
APPLICATION FILED NOV, 28, 1919.

1,372,585.

Patented Mar. 22, 1921.
2 SHEETS—SHEET 1.

Fig. 1.



Witnesses K. Sakai.

Inventor

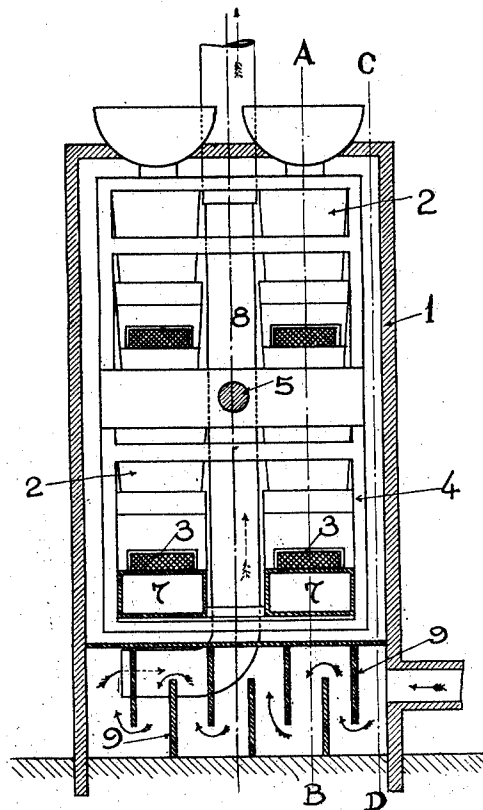
Zentichi Yamamoto

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Fig. 2.



Witness: *K. Sakai*

Inventor

Genkichi Yamamoto

UNITED STATES PATENT OFFICE.

ZENKICHI YAMAMOTO, OF TOKYO, JAPAN.

DRYING APPARATUS.

1,372,585.

Specification of Letters Patent. Patented Mar. 22, 1921.

Application filed November 28, 1919. Serial No. 341,315.

To all whom it may concern:

Be it known that I, ZENKICHI YAMAMOTO, a subject of the Emperor of Japan, residing at No. 1 Mitoshiro-cho Nichome, Kanda, Tokyo, Japan, have invented certain new and useful Improvements in Drying Apparatus, of which the following is a specification.

This invention relates to improvements in drying apparatus for various materials of granular form, such as corn, wheat, or other granular food materials, as well as sand, volcanic ash powder or other chemical or mineral powders. The invention has for its object to provide a uniform heating means of comparatively simple construction, which will rapidly heat the material undergoing treatment without permitting direct contact or intermixing of the heating gases and said material.

With the foregoing object outlined, the invention consists in the novel features described in connection with the accompanying drawings, and more particularly pointed out in the claims.

Referring to the drawings:—

Figure 1 is a longitudinal sectional view of my apparatus, a half of the section being taken on line AB in Fig. 2 and the other half being taken on line CD in Fig. 2; Fig. 2 is a transverse sectional view taken on line EF in Fig. 1.

In the drawings, 1 is a stationary casing or heating chamber; 2 are conveying receptacles for the material to be dried, and are arranged in two parallel flights, each of which is composed of a series of rectangular cross-sectioned boxes or drying trunks arranged in zig-zag form and connected together end to end.

Each of the receptacles is provided with mouth pieces 3 serving as inlet openings for hot air from the interior of the casing 1 and exhaust openings for moist air from the interior of the receptacles. These mouth pieces 3 are fitted with wire net in their outer ends so that material to be treated can not be discharged through the same. 4 is a reciprocating supporting frame which carries the receptacles or drying trunks 2, and the reciprocating frame is supported by the casing 1 through the medium of the shaft 5. The shaft is fixed to the supporting frame 4 and is reciprocated by any convenient means so that the receptacles are subjected

to the reciprocating or vibrating movement for a suitable period. 6 represents charging hoppers for material to be dried. 7 designates exhausts for the same. 8 are conduits for hot gas for introducing heating air within the casing 1.

These conduits are composed of tubes arranged between the two flights of receptacles 2, and the tubes are connected at their upper ends to a discharge funnel. 9 are baffle plates to deflect the hot gas at the bottom part of the drying chamber, to heat the bottom of the heating chamber.

In the working of the above described apparatus, the shaft 5 is moved reciprocally by a convenient means so that the receptacles 2 are vibrated. Hot gas from an outside furnace is supplied to the bottom part of the drying chamber to heat the air around the drying trunks and at the same time material to be treated is charged into the hopper 6. This material passes through the successive series of drying trunks downwardly and is heated gradually. As the drying trunks are vibrated, air inside thereof which is moistened by the steam coming from the material treated, is discharged from the mouth pieces at one side of the drying trunks, while dry hot air is admitted to the trunks through the mouth pieces at the other side, thus there being an exchange of moist and dry hot air in the drying trunk, so that the material will be dried very rapidly.

As the frame 4 reciprocates it will act as a pump or function as a piston for causing circulation of air through the trunks.

Thus according to this invention, the receptacles or drying trunks are arranged in two batteries within a fixed casing, and gas from a furnace is deflected at the lower part of the heating chamber to heat the base of the heating chamber 1. This gas then passes to the conduits arranged between the two rows of receptacles so that the combustion impurities such as smoke, etc. are prevented from directly contacting with the material under treatment. By this construction a more uniform heating is obtained. Moreover, by means of the mouth pieces 3, moist air inside the receptacle is discharged from one side while hot air is introduced from the other side so that there is always comparatively dry air inside the

receptacles, whereby the drying speed of the material to be treated is greatly increased.

What I claim and desire to secure by Letters Patent is:—

1. In a heating apparatus the combination with a fixed casing, of two rows of reciprocable drying trunks, arranged within the same, an inclosed gas passage between the two rows of drying trunks, deflecting plates at the lower part of the casing for deflecting the gas entering the casing and causing the same to heat the bottom of said casing, a funnel at the top of the passage, and mouth pieces fitted to both sides of the drying trunk, the said mouth pieces serving as discharging means for moist air as well as inlets for dry hot air from and to the receptacle.
2. A drying apparatus comprising an inclosing casing, a movable frame mounted in said casing and carrying a zig-zag chute having an inlet at its top and an outlet at its bottom, means for heating the interior of said casing, and openings in said chute to permit heated air within the casing to enter said chute.
3. A drying apparatus comprising a heating chamber, a reciprocating frame mounted in said chamber and supporting a zig-zag chute, means for heating the interior of said chamber, and openings provided in the chute for permitting heated air from the

chamber to enter the interior of the same and moist air from said chute to be discharged into the casing.

4. A drying apparatus comprising a stationary inclosing casing, a reciprocable frame mounted in said casing, and having a shaft mounted for sliding movement in said casing, a plurality of zig-zag chutes located within the casing and carried by the reciprocable frame, a heated passage located within the casing between said chutes for heating air within the casing, and openings provided in said chute for admitting heated air to the interior of the same when the reciprocable frame is moved in one direction and for discharging moist air from said chutes when the reciprocable frame is moved in the opposite direction.

5. An apparatus of the kind defined by claim 4, having a chamber at its lower portion provided with baffles forming a zig-zag passage for heated air, means connecting said passage with the passage which extends through said casing, and means for admitting heated air to said zig-zag passage.

In testimony whereof I affix my signature in the presence of two witnesses.

ZENKICHI YAMAMOTO. [L. s.]

Witnesses:

C. ARCILLAS,
T. KANENCH.