No. 845,833. PATENTED MAR. 5, 1907.

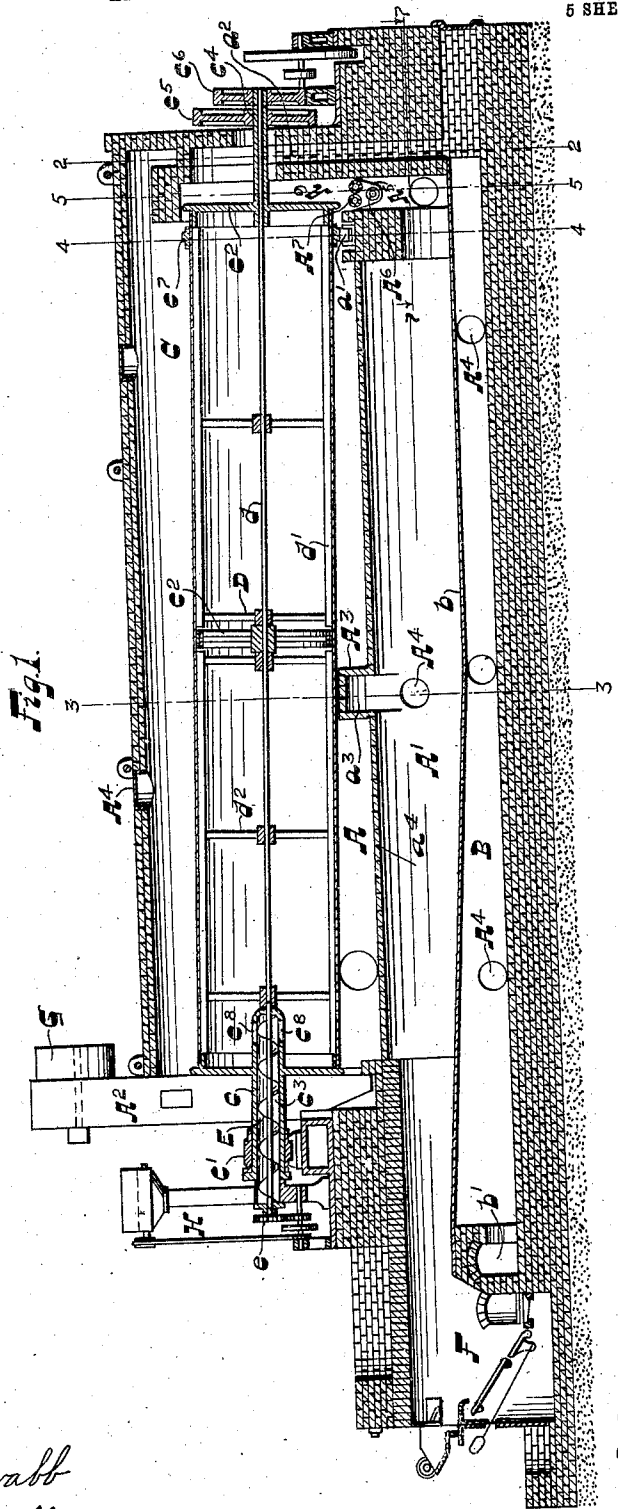
J. WEINTZ.

DRIER.

APPLICATION FILED APR. 30, 1906.

5 SHEETS—SHEET 1.

Fig. 1.



Witnesses:

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G. M. Saywell

Inventor;

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5 SHEETS—SHEET 2.

Fig. 2.

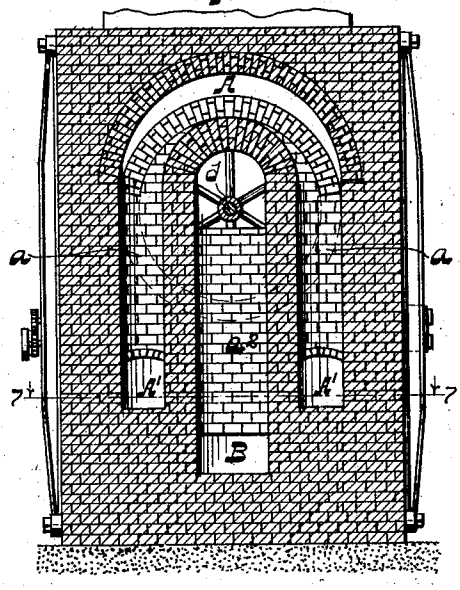


Fig. 7.

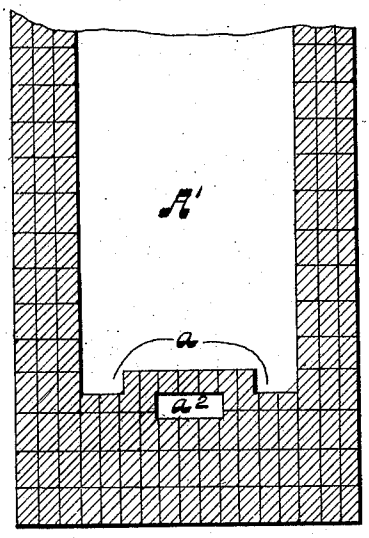


Fig. 3.

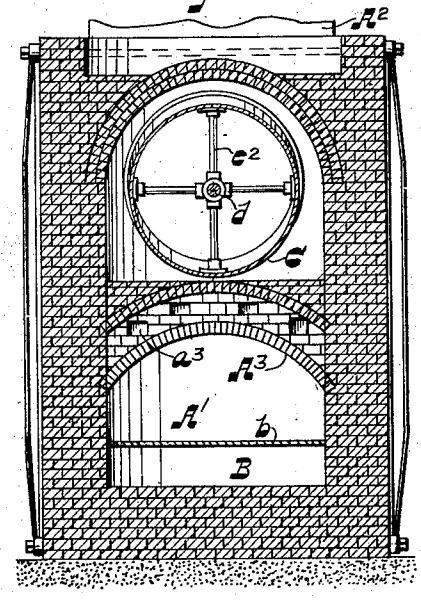
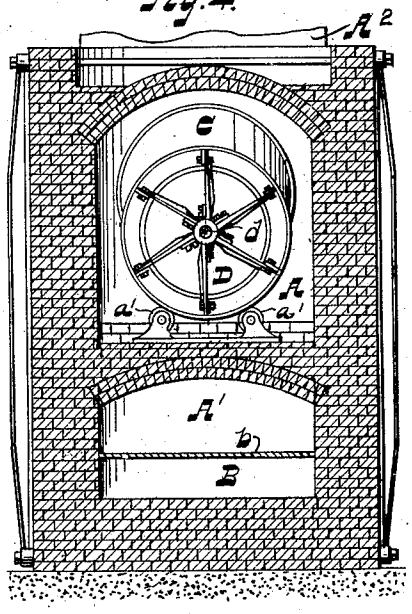


Fig. 4.



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5 SHEETS—SHEET 3.

Fig. 5.

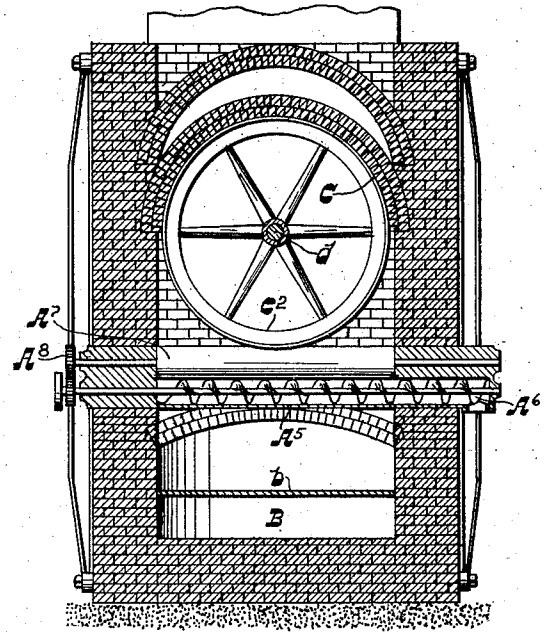


Fig. 6.

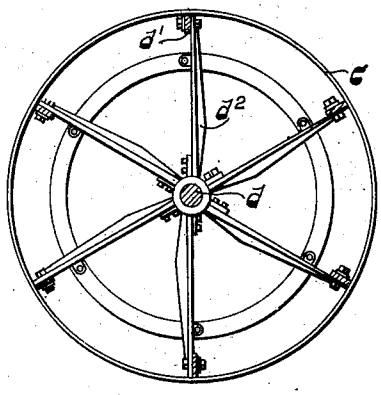
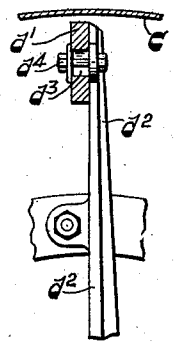


Fig. 8.



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5 SHEETS—SHEET 4.

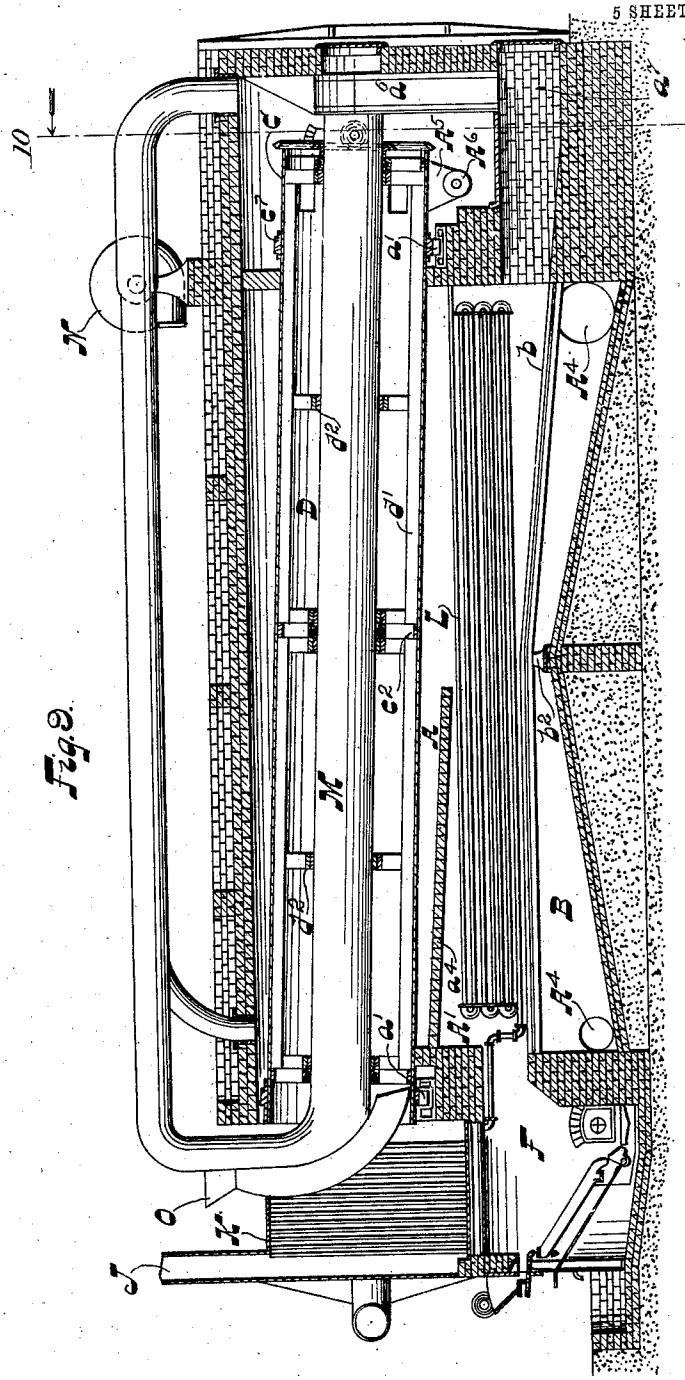

Fig. 2.

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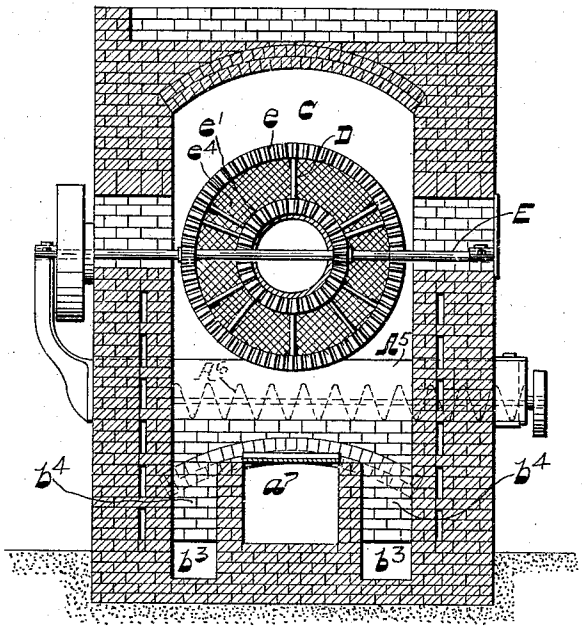
5 SHEETS—SHEET 5.

Fig. 10.



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UNITED STATES PATENT OFFICE.

JACOB WEINTZ, OF CLEVELAND, OHIO.

DRIER.

No. 845,833. Specification of Letters Patent. Patented March 5, 1907.

Application filed April 30, 1906. Serial No. 314,333.

To all whom it may concern:

Be it known that I, JACOB WEINTZ, a citizen of the United States, a resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Driers, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle so as to distinguish it from other inventions.

My invention relates to devices for drying substances containing liquid matter—such as garbage, products resulting from distillation of spirituous liquors, &c.—and has for its object economy of operation and prevention of contact of the gases of combustion of the fuel used to produce the required heat with the substance to be dried, whereby any deleterious effect to such substance which might result from such contact is eliminated.

Said invention consists of means hereinafter fully described, and specifically set forth in the claims.

The annexed drawings and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings, Figure 1 represents a vertical longitudinal section of drying apparatus embodying my invention. Figs. 2, 3, 4, and 5 represent enlarged vertical transverse sections taken upon the planes indicated by the lines 2 2, 3 3, 4 4, and 5 5, respectively, Fig. 1. Fig. 6 represents an enlarged transverse cross-section of the drying-drum. Fig. 7 represents an enlarged horizontal section taken upon the plane indicated by the lines 7 7, Figs. 1 and 2, showing the smoke-flues. Fig. 8 represents an enlarged detail section of a portion of one of the spiders forming a part of the agitator employed in my said invention. Fig. 9 represents a vertical longitudinal section of a modified form of drying apparatus. Fig. 10 is a vertical transverse cross-section of such modified form, taken on the line 10 10, Fig. 9.

Referring particularly to Fig. 1, the body or main outer portion of the structure is formed of brick or similar material, such as is usually employed in constructions of this character. Such structure is built to form a conduit for conducting gases of combustion, and consists of two parts—an upper part A and a lower part A′—separated from each other by a dividing wall or partition a^4, of checkwork. At one end of the lower part is a combustion-chamber or furnace F, in which the fuel is burned, the opposite or rear end being provided with upright flues a a, connecting the two parts of the conduit, as shown in Fig. 2. Below the gas-conduit A′ is an air-conduit B, separated from the gas-conduit by means of an iron wall b and having communication with the atmosphere by means of a lateral passage-way or flue b' at the front part of the air-conduit, Fig. 1.

In the upper conduit A is located a rotary drum C, forming a drying-chamber, such drum being open at both ends, the front end being supported upon a trunnion c, suitably journaled in a bearing c', and the rear end being supported upon rollers a' a', Fig. 4, suitably journaled and supported in the brickwork, a bearing-ring c', Fig. 1, being provided and secured upon the outer surface of the drum. Such rear end is surrounded by brickwork, so as to completely separate such end from and cut off communication of the interior of the drum with the gas-conduit A, an upright flue a^2 establishing communication between such interior and the air-conduit B, Figs. 1, 2, and 7. The front end of the conduit A and the drum are inclosed in a sheet-metal structure having a flue A^2 leading upwardly to the stack and provided with a suitable fan G for drawing the gases of combustion through the gas-conduits and the air through the drum. The drum inclines downwardly toward the rear, as is customary in these devices, and is provided upon its interior with a scraper or agitator D. This agitator is provided with a central shaft d, coaxial with the drum, which is journaled in spiders c^2 c^2, secured at the rear end and the middle of the drum, respectively, and in the rear end of the trunnion c. The trunnion c projects into the drum and is provided with an axial bore c^3, in which is located a feeding-screw E, whose shaft projects out of the front of the trunnion and is connected with suitable gearing e for rotating same, apertures c^8 being formed in the trunnion-walls for admitting the material to be dried into the drum. The drum is rotated by means of a gear-wheel c^5, secured to a hollow arbor c^4 at the back end of the structure, and the agitator is rotated by means of a gear c^6, secured

to the end of the agitator-shaft d, which projects through the arbor c^4, Fig. 1. The trunnion c projects some distance from the drum and adjacent structure, and a hopper and chute H are suitably placed, so as to deliver the material to be dried opposite the trunnion end from which the feeding-screw projects, so as to catch such material, feed same through the trunnion, and then discharge it into the drum. Longitudinal lifting-vanes d' of the agitator are loosely mounted upon the outer ends of spider-arms d^2, secured to the agitator-shaft, Figs. 6 and 8, so as to have a radial movement. This is preferably effected by providing elongated slots d^3 in such vanes and passing the securing-bolts d^4 through such slots. The bolts are left sufficiently loose to permit the vanes to be moved radially by gravity. Said slots are located so as to permit the vanes to scrape or contact the bottom portion of the drum and then upon being further revolved upwardly to drop down sufficiently to escape contact with the upper portion of the drum, as shown in Fig. 8. Where the drum is of considerable length, so as to necessitate the employment of a central spider for forming a bearing for the agitator-shaft, the agitator is made in two or more sections, as illustrated.

In the wall which divides the two gas-conduit parts A and A′ is formed a conduit consisting of an arch A^3, having openings a^3, Fig. 3, located in vertical planes intersecting the conduit A intermediately of its ends and permitting a limited portion of the gases of combustion to pass therethrough into the said conduit A from conduit A′. Suitable registers A^4 are provided in the sides of the structure communicating with the gas and air conduits for regulating the temperature of the interior of the drier. Below the rear end of the drum is a transverse opening A^9, in which is located a trough A^5, whose under surface projects into the gas-conduit A′ and which is provided with a screw A^6 for transporting and discharging the dried product laterally after it emerges from the drum. Above such screw are mounted parallel therewith two rollers A^7 A^7, upon which the material drops. These rollers are used to mash and grind the dried material into a condition of uniform consistency, as is sometimes required of dried material of this kind, and are rotated by suitable gearing A^8, Fig. 5.

In the operation of the above-described device the material to be dried is fed into the hopper, drops through the chute, and is thence discharged into the drying chamber or drum. The latter and the agitator are rotated in opposite directions, and the material travels gradually down the inclined bottom of the drum. The gases of combustion pass over the top of the air-conduit, heating the air within, and then pass up the flues a a into the conduit A, where they pass onward, circulating about the drum and imparting their heat to its contents, being finally drawn out by the fan and sent up the stack. A part of such gases, however, passes up through the arch A^3, through openings a^3, and circulates about the front part of the drum, which contains material having the greater proportion of moisture or liquid, and hence is capable of absorbing the most heat. These gases being of a considerably higher temperature than those which pass around through the flues at the back of the apparatus effect a greater amount of evaporation than do said last-named gases, thus more fully insuring absolute dryness of the material before leaving the drum. It is thus seen that the gases of combustion are not permitted to come into contact with the material to be dried and can hence have no deleterious or chemical action thereon. The heated air passes up the flue a^2 and through the drum, from the front end of which it is discharged into the flue A^2. The agitator agitates the material thoroughly, exposing it to the air-current and heated drum-surface. The vanes, being, as described, loosely mounted, yield when they strike hard or caked material adhering to the drum-surface and also displace material which may adhere to them, as a result of the jar effected when the vanes drop upon their supporting-bolts on reaching the upper position during their revolution. When the material is discharged from the drum, it drops upon the rollers A^7 and is discharged laterally from the device. The trough surrounding the screw A^6, being in the path of the heated gases of combustion, is kept continually hot, so that the material while being discharged is absorbing heat, thus insuring additional evaporation in case all the moisture shall not have been previously completely removed.

In the modified form of construction shown in Figs. 9 and 10 there are several changes in the construction, as follows: The brickwork underlying the apparatus inclines from a central point b^2 toward both ends, so that the air-chamber B is of restricted cross-section at said central point, whereby the air is choked at said point and heated more effectually. The air thus heated is conducted through two laterally-disposed horizontal passages b^3, Fig. 10, and connecting vertical flues b^4 to the chamber in the rear of the structure into which cylinder C opens. Thence it flows through the length of the cylinder, finally escaping at the forward end through a discharge-flue. (Not shown.) The air is drawn into the combustion-chamber F through an inlet-pipe J and receives a preliminary heating from a radiator K before reaching said combustion-chamber. Water is supplied to the radiator K from a coiled heating-surface L, located in the lower portion A′ of the gas-conduit. The upper

and lower portions A and A′ of the gas-conduit are in direct communication with each other at the right-hand ends instead, through intermediate flues *a*, being kept from such communication at their left-hand end by the dividing-walls a^4 of checkwork, which acts as a shield, preventing the burning of the cylinder C by gases of combustion which are too hot. The gases of combustion are caused to pass centrally through the cylinder C, but not in contact with the substance therein being dried, through the axial flue M, which forms a support for the agitator or scraper D similarly to that performed by the axial shaft *d* in the form of device shown in Fig. 1. Such gases of combustion reach axial flue M by a horizontal passage-way a^7 and a vertical flue a^6, the flow being maintained by a suction-fan N. The drum C and the agitator D are rotated in opposite directions from the right-hand end of the apparatus by means of bevel-gears *e e′*, meshing with pinions e^2 e^3 upon a common shaft E. In this form of device the trunnion *c* is dispensed with and the cylinder C is rotated upon rollers *a′* at both ends, the material to be dried being fed directly into the cylinder through a chute O. The discharge-outlet from the cylinder into the trough A^5 is not located at the end of the cylinder, as in Fig. 1, but is located in the lateral surface thereof some distance from the end, as plainly shown. In this form of device none of the fire is wasted in heating the brickwork over the combustion-chamber, and the air in the cylinder C is more effectually heated by the central flue and is enabled to dry the material more completely than is the case where the gas conduit or flue merely surrounds the cylinder, as shown in Fig. 1. Furthermore, the whole rear end of the cylinder C is open to the air with the exception of the part through which the central flue M projects, such end being covered with a network e^4 to prevent the material discharging therefrom and interfering with the meshing of the gears.

Having thus described my invention in detail, that which I particularly point out and distinctly claim is—

1. In a drying apparatus, the combination of a combustion-chamber; a conduit for conducting the gases of combustion formed in two sections one above the other; a drying-chamber associated with one of said sections, but cut off from communication with both of the latter; and an air-conduit associated with the other of said sections and communicating with the interior of said drying-chamber.

2. In a drying apparatus, the combination of a combustion-chamber; a conduit for conducting the gases of combustion formed in two sections one above the other; a drying-chamber associated with the upper of said sections, but cut off from communication with both of the latter; and an air-conduit lying below the lower section of said gas-conduit and forming one of the walls of the latter, said air-conduit communicating with the interior of said drying-chamber.

3. In a drying apparatus, the combination of a combustion-chamber at one end of the apparatus; a conduit for conducting the gases of combustion extending from the combustion-chamber to the opposite end of said apparatus; an air-chamber disposed below said conduit and having one of its walls forming one of the walls of said conduit throughout the length of the latter, whereby said air may become heated by the gases of combustion; and a drying-chamber connected with said air-chamber and cut off from communication with said conduit.

4. In a drying apparatus, the combination of a combustion-chamber; a conduit comprising two parts one above the other for conducting the gases of combustion; an air-chamber passing beneath the lower portion of said conduit so as to permit the air therein to be heated by the gases of combustion; a drying-chamber associated with the upper portion of said conduit; and separate independent upright flues connecting such upper and lower conduit portions and said air and drying chambers respectively.

5. In a drying apparatus, the combination of a combustion-chamber; a conduit for conducting the gases of combustion formed in two sections one above the other; a drying-chamber located in such upper section; and an air-conduit in proximity to said gas-conduit, whereby air passing therethrough may be heated by the gases of combustion, such air-conduit communicating with the interior of such drying-chamber, and the latter being cut off from communication with said gas-conduit.

6. In a drying apparatus, the combination of a combustion-chamber at one end of the apparatus; a conduit comprising two parts, one above the other, for conducting the gases of combustion; an air-chamber having one wall forming one of the walls of said conduit throughout the length of said lower portion of the latter; and a drying-chamber in said upper portion connected with said air-chamber, its interior having no communication with said upper portion of the conduit.

7. In a drying apparatus, the combination of a combustion-chamber; a conduit comprising two parts, one above the other, for conducting the gases of combustion; an air-chamber passing beneath the lower portion of said conduit so as to permit the air therein to be heated by the gases of combustion; a drying-chamber located in the upper portion of said conduit; and separate independent upright flues connecting such upper and lower conduit portions and said air and drying chambers respectively, whereby the

heated air may be caused to pass inside and through the combustion-gases which are outside and around said drying-chamber.

8. In a drying apparatus, the combination of a drying-chamber; an air-chamber for supplying heated air; a conduit for conducting gases of combustion and adapted to heat the air in such air-chamber, a flue connecting said air-chamber and the interior of the drying-chamber at one end of the latter; a flue connecting said conduit with the space around the drying-chamber, said drying-chamber end being inclosed so as to cut off communication of its interior from the said conduit; and a trough for receiving the contents of the drying-chamber, such trough forming a part of the means for inclosing said drying-chamber end.

Signed by me this 17th day of April, 1906.

JACOB WEINTZ.

Attest:
JNO. F. OBERLIN,
G. W. SAYWELL.