

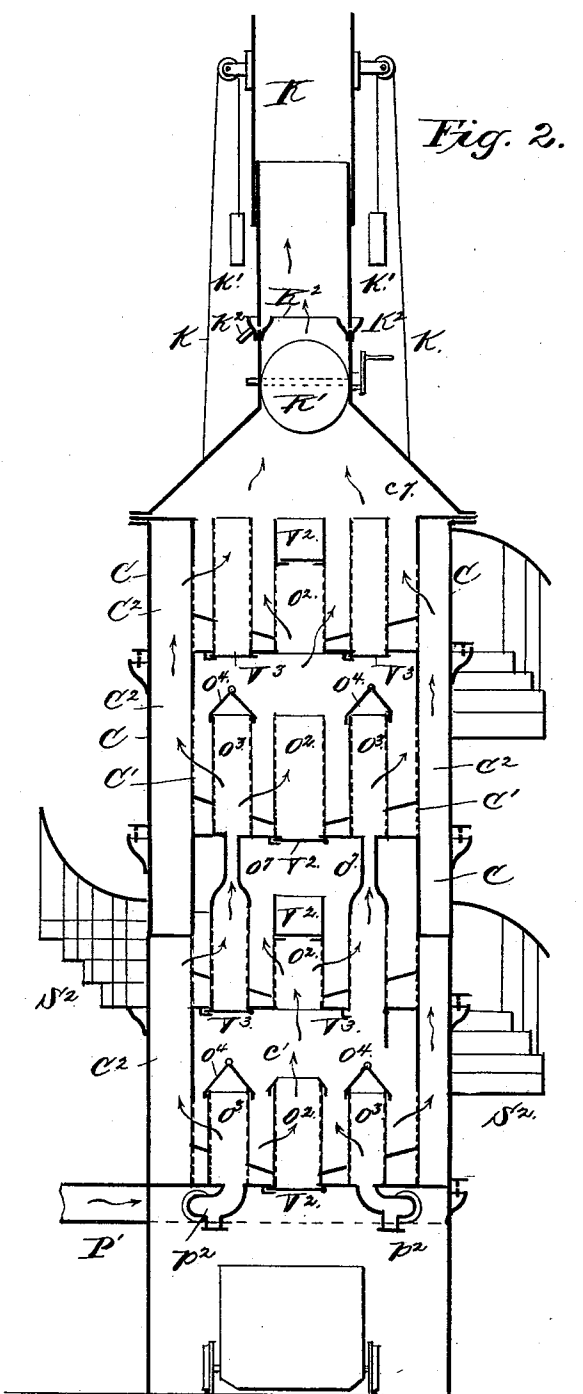
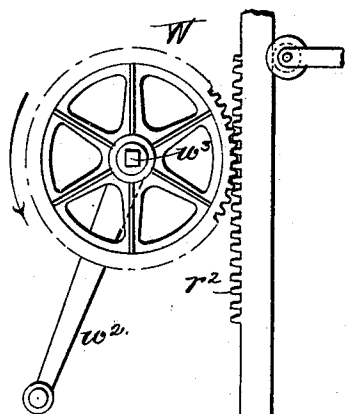
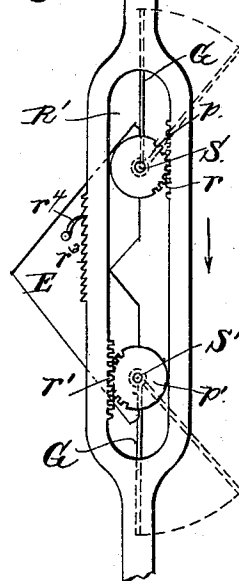
(No Model.)

4 Sheets—Sheet 2

P. LAUTH.
MALT KILN.

No. 400,229.

Patented Mar. 26, 1889.



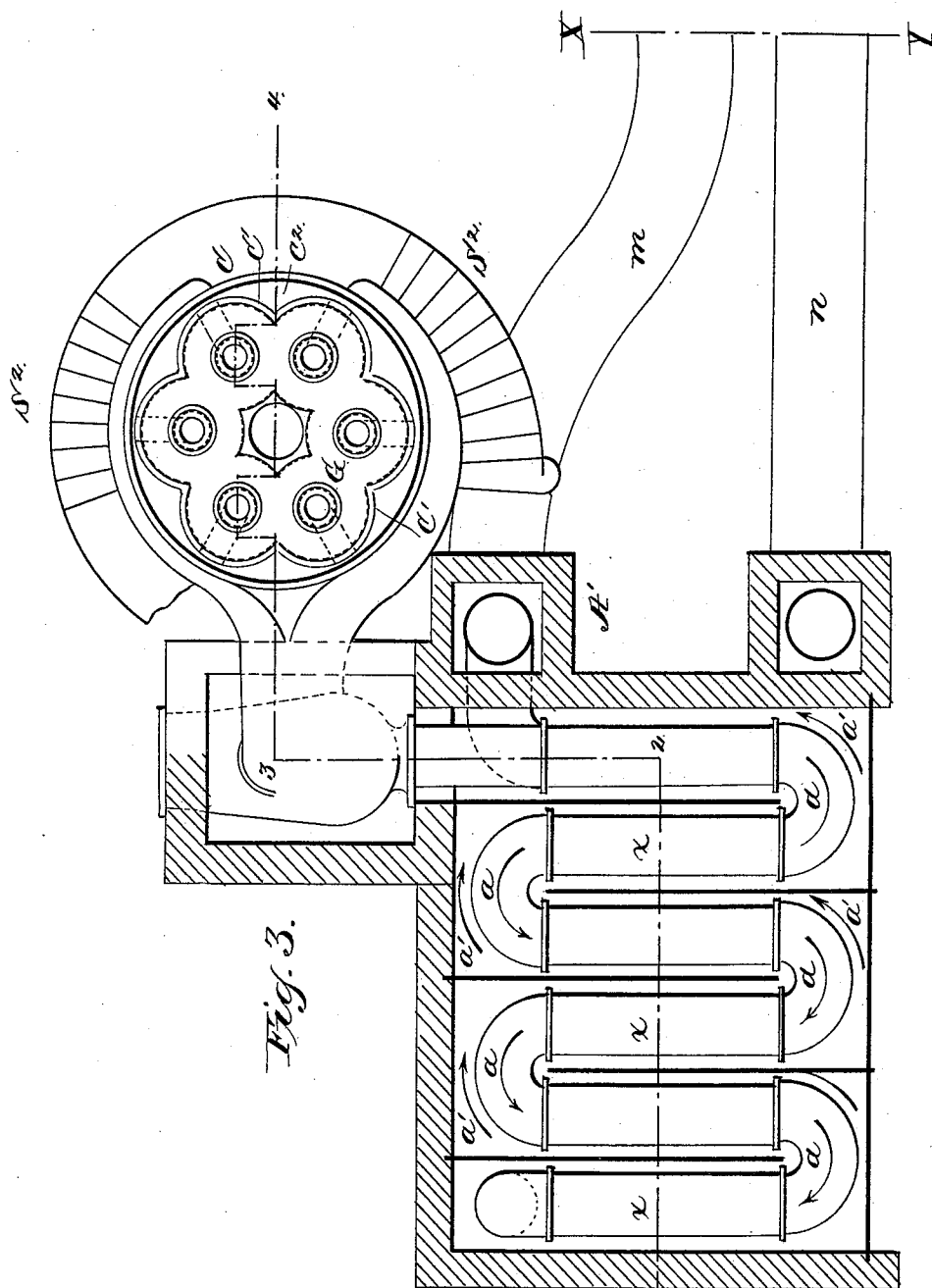
Witnesses:
J. Thomson Cross
Mill. E. Rouze.

Inventor:
Philippe Lauth
per *Henry Oth*
att'y.

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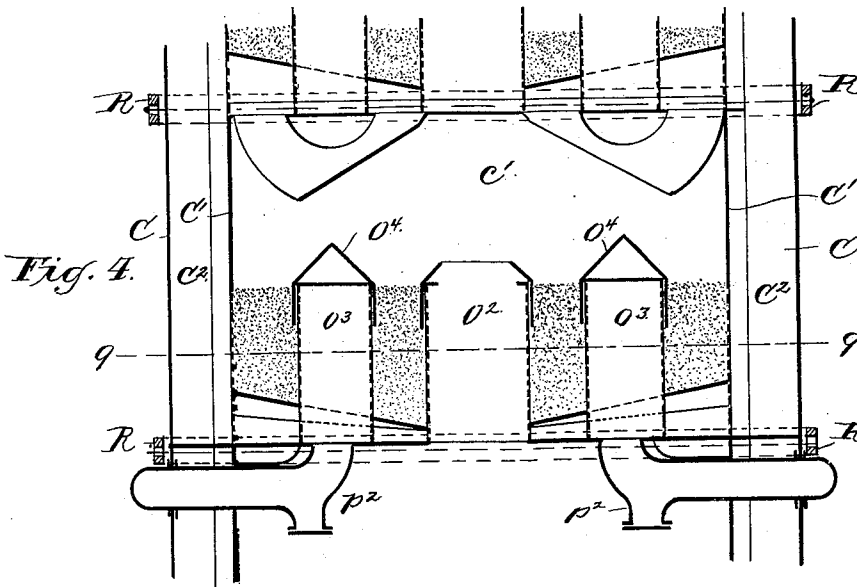
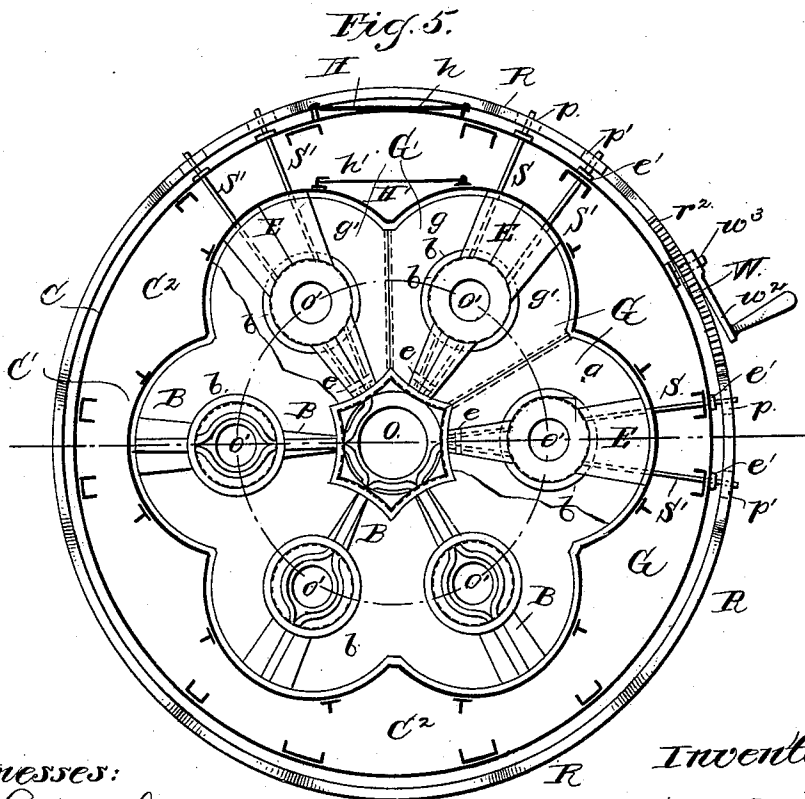
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4 Sheets—Sheet 4.

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UNITED STATES PATENT OFFICE.

PHILIPPE LAUTH, OF CARCASSONNE, FRANCE.

MALT-KILN.

SPECIFICATION forming part of Letters Patent No. 400,229, dated March 26, 1889.

Application filed August 20, 1888. Serial No. 283,231. (No model.)

To all whom it may concern:

Be it known that I, PHILIPPE LAUTH, a citizen of the French Republic, residing at Carcassonne, in the French Republic, have invented certain new and useful Improvements in Malt-Kilns; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a vertical transverse section taken on line 1 2 3 4 of Fig. 3 of a malt-kiln embodying my improvements. Fig. 2 is a like view of a kiln of a modified construction so far as the distribution of air is concerned. Fig. 3 is a transverse section on or about on the interrupted line 5, 6, 7, and 8 of Fig. 1. Fig. 4 is a vertical section of a portion of the kiln, drawn to a larger scale. Fig. 5 is a transverse section on line 9 9 of Fig. 4, a part of the floor and some of the distributing-pipes being removed; and Figs. 6 and 7 are detail views.

The invention relates more particularly to that class of apparatus known as "malt-kilns," though it may be applied to the desiccation of other materials, and is an improvement on a similar apparatus for which I obtained Letters Patent of the United States, dated May 4, 1886, No. 341,256.

The invention consists in structural features and combinations of parts, substantially as hereinafter more fully described, and set forth in the claims.

Referring more particularly to Figs. 1, 3, 4, 5, 6, and 7, X Y, Fig. 3, indicates the line of the axis of the two blast-fans that force air into the ducts *m* and *n*.

The course of the products of combustion through the heater-pipes *x* to the chimney *A'* is indicated by arrows *a*, the course of the more highly heated or hot air by arrows *a'*, and that of the more temperate or less highly heated air by the arrows *a''*, while the combined air-currents and moisture are indicated by dotted arrows.

P is the pipe for the less heated air, which is connected to the upper drying-chambers, and P' the pipe for the hot air, which is con-

nected to the lowermost of the drying-chambers, as more fully explained hereinafter.

The kiln, when two blast-fans are provided, may have as many as seven or more superposed drying-chambers, and such a kiln I have shown in Figs. 1 and 3, some of the chambers being, however, omitted, as they would only be a repetition of what is shown.

The kiln comprises an outer shell or inclosing-casing, C, of cylindrical form in cross-section, and an inner casing, C', that consists of alternate perforate and imperforate sections, so divided by cross-partitions that each chamber formed by said cross-partitions will have a lower perforate and an upper imperforate portion. The cross-sectional configuration of the inner casing, C', is substantially the same as that described in my patent above referred to—that is to say, the casing C' and its partitions or floors G have their peripheries formed by six arcs of circles, whose centers are equidistant from one another and on a common circle, as shown. The imperforate portions of the casing should be of such area as to extend below the level of the charge of malt in each chamber, while the height of the series of chambers decreases downwardly in proportion to the reduction in the bulk of the charge, as it is more or less desiccated in its passage from the higher to the lower chambers—that is to say, the upper chamber of the series, which receives the green malt, is of greatest capacity vertically, while the lowermost chamber, where the final desiccation is effected, is of least capacity vertically, as is common in malt-kilns, with a view to economizing space and fuel, though all the chambers may be of substantially the same height.

As best shown in Fig. 5, the floors G of each chamber *c'* *c''* *c'''*, &c., has a central port or opening, *o*, and six ports or openings, *o'*, arranged concentrically around said central port or opening, *o*, and concentrically to the six peripheral arcs of circles of said floors G and casing C', said openings serving for the distribution of the heated air through the charge of malt in the chambers, as hereinafter described. A flight of stairs, S², winds around the outer casing, a landing being provided at each drying-chamber, the outer casing, C, being provided with a man-hole, H,

normally closed by a suitable gate, h , the inner casing, C' , being provided with a like man-hole, h' , closed by a suitable gate, h' , to afford access to each of the drying-chambers, as shown more plainly in Fig. 5.

To the central port or opening, o , as well as to the six ports or openings, o' , of each drying-chamber, is secured a pipe, o^2 o^3 , respectively. The pipes o^2 for the central openings are of substantially the same form in cross-section as the casing C' , the arcs of circles being drawn from the same centers as the arcs of the circles of said casing, thus forming a hexagon having projecting angles instead of re-entering angles, as is the case in the casing C' . Each port o' leads into a pipe, o^3 , cylindrical in cross-section, and said pipes o^2 o^3 are partly perforate and partly imperforate, these perforate and imperforate sections corresponding with the like sections of the casing C' . As the charge of malt is reduced in bulk by desiccation as it is transferred from one compartment to the other from the upper part of the kiln to the lower part thereof, and as the vertical diameter of each chamber varies in proportion to said variation in the bulk of the charge, so does the extent of the imperforate portions of the casing C' and the pipes o^2 o^3 vary, so that said imperforate portion will always extend below the level of the charge in each compartment, for purposes presently explained.

The floor G of the chambers c' c^2 c^3 , &c., is constructed as follows, referring more particularly to Figs. 5 and 7: B B are tie-beams, T-shaped in cross-section, radiating from the central port or opening, o' , to the arcs of the circles of the casing, the axis or median line of said beams intersecting the center of the circle from which said arcs of the casing C' are drawn, each beam having the opening or port o' above referred to, and said beams are so jointed at their inner ends as to form the central opening or port, o , above referred to, and in said Fig. 5 three of the beams B are shown. Around each of said ports is arranged a flange, b , for the reception of the pipes o^2 o^3 , the flange around the central port, o , being of hexagonal shape, the sides whereof are arcs of circles drawn from the center of the ports o' to conform to the sectional configuration of the pipe o^2 , above described. To each of these tie-beams is secured a V-shaped covering-plate, E , that has at its inner end bearings e (shown in dotted lines in Fig. 5) for the inner ends of two shafts, S and S' , whose outer ends have their bearings in sleeves or eyes e' , secured to the outer casing, C , through which said shafts project, there being twelve such shafts—two for each of the six sectors or sections that divide said floors into six equal parts, the lines of division being the median lines of the beams B . To each shaft S S' of a pair is secured one-half or wing of a gate, G , the shaft S carrying the wing g , and the shaft S' the wing g' , said gates constituting the remaining portion of the

floor of each chamber, by the opening of which the malt may be dumped from one chamber into the next below it, said wings overlapping each other slightly, as shown in Fig. 5 in dotted lines, in which figure two of the gates are shown. These gates are simultaneously operated to open or close by means of the following instrumentalities. R is a ring that is preferably made of sections bolted together and encircling the outer casing, C . The ring is provided in its upper face for a small portion of its circumference with teeth r^2 , with which meshes a toothed wheel, W , revoluble on a stud secured to said outer casing, said wheel being revolved by means of crank or a handle, w^2 , Fig. 7, in which latter case the wheel-axle is revoluble in its bearings on the outer casing, C , and the wheel rigidly secured to the axle w^3 . In the ring are formed longitudinal slots or eyes R' —one for each sector or section of the floor of the chambers—the upper and lower limbs being provided with a toothed portion, r and r' , on their opposite inner faces, with which mesh the pinions p and p' on the shafts S and S' , respectively. On the outer face of the upper limb of the eye R' are formed ratchet-teeth r^3 , with which engages a pawl, r^4 , pivoted to the outer casing. As shown in Fig. 7, the ring is in a position in which the gate G is closed. It is obvious that if the ring is rotated in the direction of the arrow the pawls r^4 , having previously been lifted out of the teeth r^3 of each eye or slotted portion R' , both pinions p and p' will rotate in a reverse direction, and with them their shafts S and S' and the gate-wings g and g' , thus carrying said wings downwardly to open all the gates G simultaneously. The pawls may now be brought into engagement with the ratchet-teeth, and when the charge is dumped a partial rotation of the ring R in a reverse direction will close all the gates G again, as will be readily understood.

The object of providing the inclined planes or covering-plates E is not only to prevent the malt from coming in contact with the shaft-bearings, but also to provide means for completely emptying each chamber, said plates serving as directing-chutes to direct the malt into the openings when the gates are thrown open, the wings of the gates forming a continuation of said chutes to guide the charge into the chamber below. The distribution of the hot and temperate air in a kiln in which two blast-fans are employed, as in Figs. 1 and 3, is as follows: The hot air is conducted by pipe P' and suitable couplings, p^2 , into distributing-pipes o^2 and o^3 of the lowermost chamber, c' , the pipes o^3 being closed at top by a removable conical hood, o^1 , while the axial pipe o^2 is open at top. The hot air admitted to the axial pipe o^2 ascends freely through it and into chamber c' , while all the hot air admitted to pipes o^3 passes through the perforate portions thereof and through the charge of malt surrounding the same. The axial pipe o^2 in the next or sec-

ond chamber is closed at top by a removable hood, o^5 , while the pipes o^3 are connected directly with the like pipes in the third chamber, but are closed at bottom by valves or dampers V^3 . The effect of this is that all the air that enters into the axial pipe is compelled to pass through the malt in chamber c^2 , the remaining air from chamber c' passing through the perforate portion of the inclosing-casing C' into the annular chamber, C^2 , formed between the inner and outer casings C' and C , respectively. This annular chamber is, however, partitioned off by a partition, L , at the point of junction between the perforate and imperforate portions of the inner casing of chamber c^2 , as shown in Fig. 1, thus compelling the air to pass inwardly through the perforate portion of the inner casing and through the malt in chamber c^2 . The object of this arrangement is to force the air coming from the lower chamber in opposite directions through the malt in the chamber c^2 , and thence through the pipes o^3 into chamber c^3 and the malt therein, said pipes o^3 being closed at top, while the axial pipe o^2 is closed at bottom by a valve or damper, V^2 . Here again a portion of the air from chamber c^2 passes through the perforate portion of the inner casing, C' , into an annular chamber, C^4 , which also is partitioned off at L' , whereby the air is compelled to flow from C^4 through the malt in chamber c^4 . The pipes o^2 and o^3 in this fourth chamber are connected to the pipe P , through which the less heated air flows, the pipe o^3 being open at top, and that o^2 closed, the flow of air being the same as in chamber c' , except that the now almost cool air from the lower chambers, and arriving through chamber C^4 , mingles with the less heated gases in chamber c^4 . Here, also, the air flows in opposite directions through the malt, the more temperate air-currents meeting the now nearly-cool and moisture-laden air from the chambers below, adding an increment of heat to such cooled moisture-laden air to prevent condensation and to effect the partial drying of the malt in the chambers above.

The arrangement of the distributing-pipes in fifth and sixth chambers is the same as in chambers c^2 and c^3 . In the upper or green-malt chamber, c^1 , the pipes o^2 and o^3 are closed by valves V^2 and V^3 , the valve V^2 being here located at the point of junction of the perforate and imperforate sections of pipe o^2 , while the pipes o^3 are open at top to allow the moisture-laden air to escape to the chimney K . The roof of the upper chamber is removable, and is suspended by ropes or chains k from a fixed part of the chimney K , said ropes or chains having counter-weights k' , as shown in Fig. 2. The object of this construction is to afford means whereby the air may be more readily exhausted from the upper chambers, and also to afford more ready access to said chambers for repairs or cleaning.

In the chimney is arranged a damper, K' , for regulating the draft, and above said damper is arranged an inner and outer gutter, K^2 , communicating with each other by ports formed in the chimney-wall, the outer gutter having a spout, k^2 . The object of this arrangement is to collect the condensed vapors and prevent their flowing into the upper chamber.

Each drying-chamber should be or is provided with a thermometer, so that the workman may at all times ascertain the temperature therein, and regulate thereby that of the air admitted to said chamber.

To afford ample room for the removal of the axial distributing-pipes o^2 , which seat loosely within their retaining-flanges, the pipes o^3 on opposite sides of the man-holes are constructed as shown in Fig. 6, where such pipes are directly connected with the like pipes above, as in the second drying-chamber Fig. 1, thus affording an increased space between the bent portions o^6 of the connections o^1 .

Where it is found desirable or necessary to provide for a more direct passage of the air through the different drying-chambers, the valves or dampers V^3 of pipes o^3 in the second, fifth, and upper chambers may be opened, and if it is desired or necessary to reduce the volume of air passing through the malt in the various chambers the valves V^2 of the axial pipes o^2 in the third, sixth, and upper chambers may be opened, thus affording an almost direct outlet to the air, except at the fourth drying-chamber, through which the entire body of air from the chambers below, as well as the greater portion of the air supplied by pipe P , must pass.

In practice a charge of green malt introduced into the upper drying-chamber is subjected to the action of the air about three hours, when it is transferred to the next lower chamber, and so on from chamber to chamber until it reaches the lowermost, remaining about the same time in each chamber. As soon as the first charge is transferred from the uppermost chamber to the next below it, a fresh charge of green malt is introduced, and this is transferred to the next drying-chamber as soon as the first charge is removed therefrom until all the chambers are charged, when the operation of desiccation becomes, so to speak, a continuous one, the removal of a charge from the lowermost chamber involving a transfer of all the charges in the intermediate chambers and a fresh charge of green malt for the upper chamber.

From the above description the flow of air in a kiln that is provided with but one blast-fan, as in Fig. 2, will be readily understood, and will need no further description. In such an apparatus but a limited number of drying-chambers can be used. In fact I have found that when more than four such chambers are used the result is unsatisfactory, for the reason that the air reaches the upper chamber in a

comparatively cool state, unless air too hot for the charge in the lower chamber is made use of.

In either form of kiln the charge from the lower chamber may be dumped into a wagon and removed, as shown in said Fig. 2.

Having described my invention, what I claim is—

1. In a malt-kiln, a drying-chamber having its floor formed of sectors, each sector being composed of two movable wings forming a gate, substantially as and for the purposes specified.

2. In a malt-kiln, a drying-chamber having its floor formed of sectors, each sector being composed of two movable wings forming a gate, in combination with covering-plates arranged along the lines of division of the sectors, substantially as and for the purposes set forth.

3. In a malt-kiln, a drying-chamber having its floor formed of sectors, each sector being composed of two movable wings forming a gate, in combination with covering-plates E, having the form of an inverted V, arranged along the lines of division of the sectors, the said plates forming chutes, whereby the entire contents of the chamber are discharged when the gates are thrown open, substantially as and for the purposes specified.

4. In a malt-kiln, a drying-chamber having its floor formed of sectors, each sector being composed of two movable wings, a shaft for each of said wings, and gearing for imparting a partial revolution to all of the shafts simultaneously, substantially as and for the purposes specified.

5. In a malt-kiln, a drying-chamber having its floor formed of sectors, each sector being composed of two movable wings, a shaft for each of said wings, and gearing for imparting a partial revolution to all of the shafts simul-

taneously, and a locking device, substantially as described, to lock the shafts against backward motion when rotated in a given direction, substantially as and for the purposes specified.

6. In a malt-kiln, a drying-chamber having its floor formed of sectors, each sector being composed of two movable wings, a shaft for each of said wings, and a pinion on each of said shafts, and in combination therewith, the operating-ring R, provided with the toothed portions r r' r^2 , and the ratchet-teeth r^3 , the pawl r^4 , and the gear-wheel W' , substantially as and for the purposes specified.

7. The herein-described malt-kiln, consisting of a plurality of superposed drying-chambers having partly perforate and partly imperforate walls, heat-distributing-pipes o^2 o^3 for each chamber, having likewise partly perforate and partly imperforate walls, valves or dampers for said pipes o^2 , arranged alternately at the inlet and outlet thereof, valves or dampers for the pipes o^3 , arranged alternately at the inlet and outlet thereof, a connection between the upper open end of the pipes o^3 of one chamber and the like lower ends of the same pipes in the chambers next above, an imperforate inclosing-casing of greater diameter than the drying-chambers divided horizontally into annular air-ducts, and a heating-furnace connected with the heat-distributing pipes of the lower chamber, substantially as and for the purposes specified.

In testimony that I claim the foregoing I have hereunto set my hand this 28th day of July, 1888.

PHILIPPE LAUTH.

Witnesses:

CAMILLE CHARROPPIN,
H. ED. HUNT.