Jan. 7, 1930. R. DE REYTERE 1,742,586

DRYING KILN

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Fig. 1.

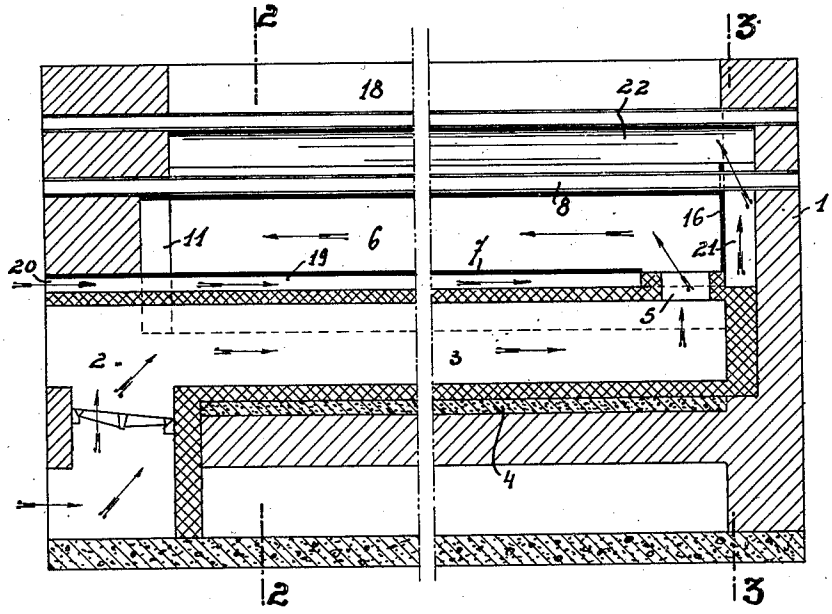
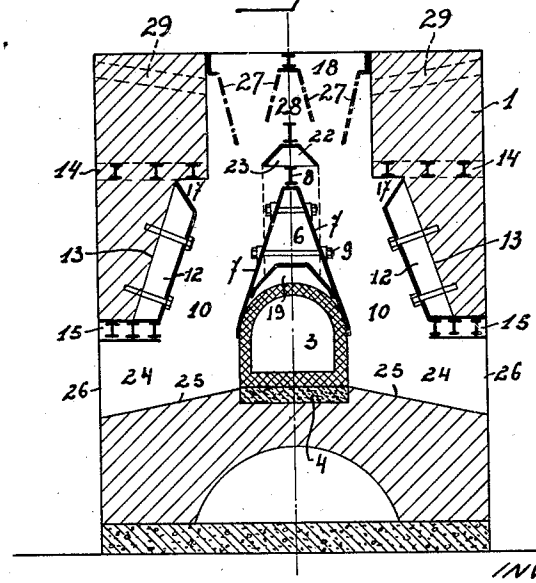


Fig. 2.



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Fig. 4.

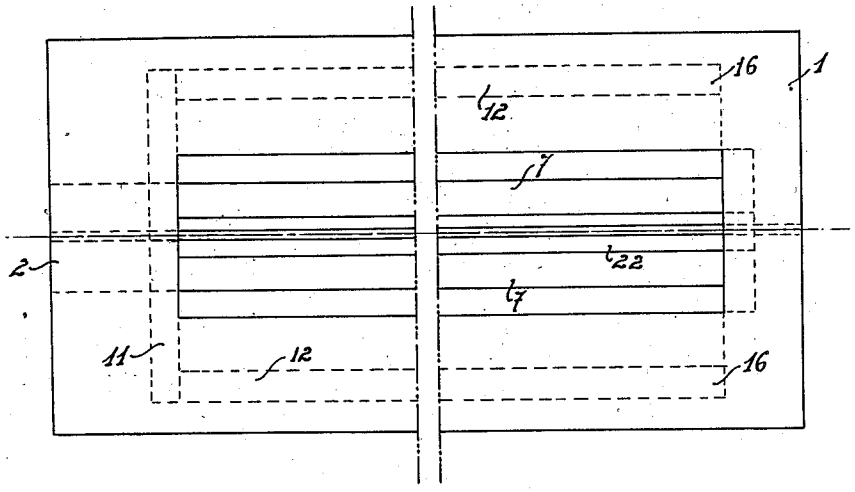
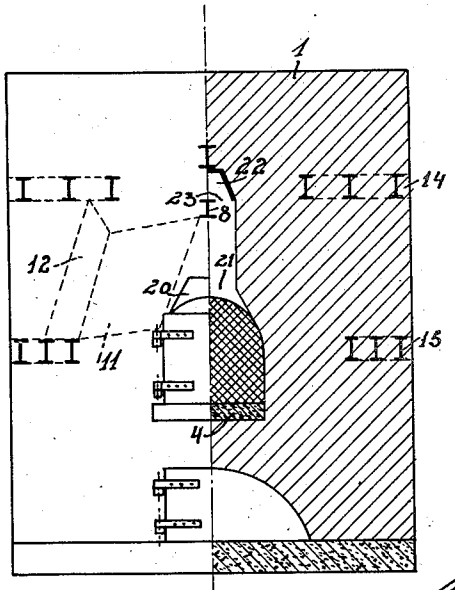


Fig. 3.



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UNITED STATES PATENT OFFICE

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DRYING KILN

Application filed July 5, 1928, Serial No. 290,578, and in Belgium July 11, 1927.

This invention relates to a drying kiln for various materials, especially for clay, sand, chalk and various earths. As is well known, materials of this kind have been dried until now in a general way, by means of cast iron plates on which the material is disposed and which are heated by a suitable source of heat. The result is that the drying operation takes place intermittently and under especially unfavourable conditions, from the point of view of the utilization of the heat.

The present invention has for object to obviate those inconveniences and to carry out the operation in a continuous and rational manner, in utilizing as completely as possible the heat contained in the gases of combustion from the furnace used to heat the drying kiln, and at the same time to avoid any calcination of the products treated.

With this object in view, the invention consists in the special arrangements and combinations of parts hereinafter fully described and pointed out in the appended claims.

On the annexed drawings:

Figure 1 is a longitudinal vertical section of the completed drying kiln.

Figure 2 is a cross section on the line 2—2 of Figure 1.

Figure 3 is a front elevation and a half view in section on the line 3—3 of Figure 1.

Figure 4 is a plan view of the drying kiln.

As shown in these drawings, the drying kiln consists of a block of masonry 1, in the front of which is disposed a furnace 2, communicating with a flue 3 in refractory material, extending the whole length of the kiln in the block 1, from which it is insulated by a layer of non-conducting material 4. This flue 3 communicates, at the end removed from the furnace, by an opening 5 with a flue 6, formed of cast iron plates 7, arranged in ridge shape on the flue 3 and supported by joists 8 and bolts 9 connecting the plates to each other. This flue 6, disposed in the interior cavity 10 of the kiln communicates, at the end adjacent the furnace 2, by transverse ducts 11 with two flues 12 disposed along the walls 13 of the drying kiln.

These flues 12, which for instance may be of sheet iron, and disposed between layers of joists 14 and 15, may be open at the end 16 so that the gases are directed into the space 17, to allow them to escape directly by a longitudinal opening 18 which extends above the flue 6 and serves for the feed opening.

In the example shown, above the flue 3 in refractory material, is disposed an auxiliary flue 19, communicating at the front of the kiln with the atmosphere by an opening 20. This flue communicates at the back end with passages 21 which communicate with a duct 22 formed of a bent or curved sheet disposed above the top of the flue 6 on a supporting joist, so that the air aspired by the opening 20 and having circulated in the flue 19 may escape from the duct 22 laterally by the longitudinal opening 23, into the feed opening 18.

As shown in the drawing, the feed opening 18 communicates for the whole length of the drying kiln, with the spaces 10 arranged on each side of the cast iron plates 7 which form the flue 6, and the walls of these spaces 10 are inclined owing to the inclination of the cast iron plates 7 and of the corresponding inclination of the iron sheets which form the longitudinal flues 12. These spaces 10 communicate at the bottom, with two lateral passages 24 having inclined bottoms 25 and opening from the side walls of the kiln by the openings 26.

When in operation, the material to be dried is introduced by the feed opening 18 and descends over the inclined walls 7 of the flue 6 and over the sheets forming the longitudinal flues 12, to slide on the inclined plane 25 and to escape, after drying, by the openings 26. During this passage of the material, the hot gases from the furnace 2 circulate first in the flue 3 and pass by the opening 5 into the flue 6, and then by the ducts 11 into the two side flues 12 and escape either into the chimney, or by the spaces 17 into the material under treatment which fills the spaces 10. Simultaneously the atmospheric air, drawn into the flue 19 is heated by contact with the arch of the flue in refractory material 3, and passes by the duct 21 into the longitudinal duct 22, from which it is spread uniformly in the material under treatment, by the open-

ing 23. Under these conditions, as may easily be understood, the material under treatment entering the kiln, is first subjected to the drying action of the hot air, which has recuperated the heat from the top of the flue 3. Then it is subjected to the action of the heat transmitted to the cast iron plates 7 by the gases circulating in this flue and to the action of the heat given up to the metallic walls of the flues 12 and finally to the action of the heat transmitted by the side walls of the flue 3. Further, as soon as it enters the spaces 10, it may be subjected to the action of the still hot gases which escape from the flues 12 by the openings 16 and pass through the relatively moist material which is descending through the feed opening 12. This drying kiln therefore realizes continuous operation and rational drying, the material being subjected to increasingly high temperatures as it descends in the spaces 10.

The device as described allows, in case the passage of the gases through the material in treatment is not of importance, to recuperate all the heat contained in these gases for drying the material. If the material may not come in contact with the gases, these are evacuated directly into a chimney at the end of the flues 12.

In case it is desired to dry fairly compact materials, for instance sand, there may be arranged, as shown in Figure 2 in broken lines, along the feed opening 18 and above the duct 22, plates 27 which form passages 28, into which open the escape ducts 29, so as to allow the moisture to escape, especially at the beginning of the drying process.

Claims:

1. In a drying kiln for various materials especially for clay, sand, chalk and other earths, in combination a block of masonry, a furnace at one end of the kiln, a longitudinal flue communicating with the said furnace and in which the gases produced in the furnace escape, a second longitudinal flue arranged above the said first longitudinal flue, means whereby the two said longitudinal flues communicate at the end removed from the furnace, two side flues means whereby the said side flues communicate with the second longitudinal flue at the end adjacent the furnace, the two side flues cooperating with the two longitudinal flues in order to form spaces with inclined walls for the passage of the material to be treated, and means whereby the hot gases are evacuated.

2. In a drying kiln for various materials especially for clay, sand, chalk and other earths, in combination, a block of masonry, a furnace at one end of the kiln, a longitudinal flue communicating with the said furnace and in which the gases produced in the furnace escape, a second longitudinal flue arranged above the said first longitudinal flue, means whereby the two said longitudinal flues communicate at the end removed from the furnace, two side flues, means whereby the said side flues communicate with the second longitudinal flue at the end adjacent the furnace, the two side flues cooperating with the two longitudinal flues in order to form spaces with inclined walls for the passage of the material to be treated and means whereby the material to be dried is traversed by the hot gases escaping from the side flues when entering the said spaces.

3. In a drying kiln for various materials especially for clay, sand, chalk and other earths, in combination, a block of masonry, a furnace at one end of the kiln, a longitudinal flue communicating with the said furnace and in which the gases produced in the furnace escape, a second longitudinal flue arranged above the said first longitudinal flue, means whereby the two said longitudinal flues communicate at the end removed from the furnace, two side flues, means whereby the said side flues communicate with the second longitudinal flue at the end adjacent the furnace, the two side flues cooperating with the two longitudinal flues in order to form spaces with inclined walls for the passage of the material to be treated, a longitudinal flue open at the atmosphere and extending between the two longitudinal flues for the gases, the air aspirated by the said flue being heated through the contact of the gases, means whereby the hot air is distributed in the material to be treated and means whereby the hot gases are evacuated.

4. In a drying kiln for various materials especially for clay, sand, chalk and other earths, in combination, a block of masonry, a furnace at one end of the kiln, a longitudinal flue communicating with the said furnace and in which the gases produced in the furnace escape, a second longitudinal flue arranged above the said first longitudinal flue, means whereby the two said longitudinal flues communicate at the end removed from the furnace, two side flues, means whereby the said side flues communicate with the second longitudinal flue at the end adjacent the furnace, the two side flues cooperating with the two longitudinal flues, in order to form spaces with inclined walls for the passage of the material to be treated, a longitudinal flue open at the atmosphere and extending between the two longitudinal flues for the gases, a longitudinal flue arranged above the said second longitudinal flue for the gases, and means whereby the air aspirated from the atmosphere and heated through the contact of the gases, is adapted to escape into the material to be treated and means whereby the material to be dried is traversed by the hot gases escaping from the side flues when entering the said spaces.

5. In a drying kiln for various materials especially for clay, sand, chalk and other

earths, in combination, a block of masonry, a furnace at one end of the kiln, a longitudinal flue communicating with the said furnace and in which the gases produced in the furnace escape, cast iron plates arranged in ridge shape above the said first flue whereby a second longitudinal flue is formed, said second longitudinal flue being in communication with the first mentioned longitudinal flue at a point remote from the furnace, a side flue on each side of and arranged in spaced relation to said longitudinal flues, said side flues being in communication with the second longitudinal flue at the end adjacent the furnace, the two side flues cooperating with the two longitudinal flues in order to form spaces with inclined walls for the passage of the material to be treated and means whereby the said material is traversed by the hot gases escaping from the said side flues, when entering the said spaces.

6. In a drying kiln for various materials especially for clay, sand, chalk and other earths, in combination, a block of masonry, a furnace at one end of the kiln, a longitudinal flue communicating with the said furnace and in which the gases produced in the furnace escape, a second longitudinal flue arranged above the said first longitudinal flue, means whereby the two said longitudinal flues communicate at the end removed from the furnace, two side flues, means whereby the said side flues communicate with the second longitudinal flue at the end adjacent the furnace, the two side flues cooperating with the two longitudinal flues in order to form spaces with inclined walls for the passage of the material to be treated, and means whereby the hot gases are evacuated, ducts formed along the feed opening of the said spaces for the material, whereby the discharge of the moisture is facilitated.

7. In a drying kiln for various materials especially for clay, sand, chalk and other earths, in combination, a block of masonry, a furnace at one end of the kiln, spaces in which the material to be dried is introduced, a longitudinal flue communicating with the said furnace and in which the gases produced in the furnace escape, cast iron plates arranged in ridge shape above the said flue whereby a second longitudinal flue is formed, means whereby the said second longitudinal flue communicates with the first longitudinal flue at the end removed from the furnace, two side flues, means whereby the said side flues communicate with the said second longitudinal flue at the end adjacent the furnace and means whereby the hot gases are evacuated.

8. A drying kiln including a furnace, superimposed longitudinal flues, one of said flues being directly open to the products of combustion from the furnace and said flues being in communication with each other at the end remote from the furnace, side flues arranged beyond and in spaced relation to the longitudinal flues, each side flue being in communication with one of the longitudinal flues at the end of the kiln adjacent the furnace, the uppermost longitudinal flue and the side flues presenting spaced parallel inclined walls of high heat conductivity defining a passage for the material to be dried.

9. A drying kiln including a furnace, superimposed longitudinal flues, one of said flues being directly open to the products of combustion from the furnace and said flues being in communication with each other at the end remote from the furnace, side flues arranged beyond and in spaced relation to the longitudinal flues, each side flue being in communication with one of the longitudinal flues at the end of the kiln adjacent the furnace, the uppermost longitudinal flue and the side flues presenting spaced parallel inclined walls of high heat conductivity defining a passage for the material to be dried, an inlet for the material from which the material is directed to the material passage between the flues by gravity, and means for directing the products of combustion from the ends of the side flues remote from the furnace through said material adjacent the inlet.

In testimony whereof I have affixed my signature.

ROBERT DE REYTERE.