No. 885,719.

PATENTED APR. 28, 1908.

P. J. BUCKLEY.

LIMEKILN.

APPLICATION FILED MAY 11, 1907.

3 SHEETS—SHEET 1.

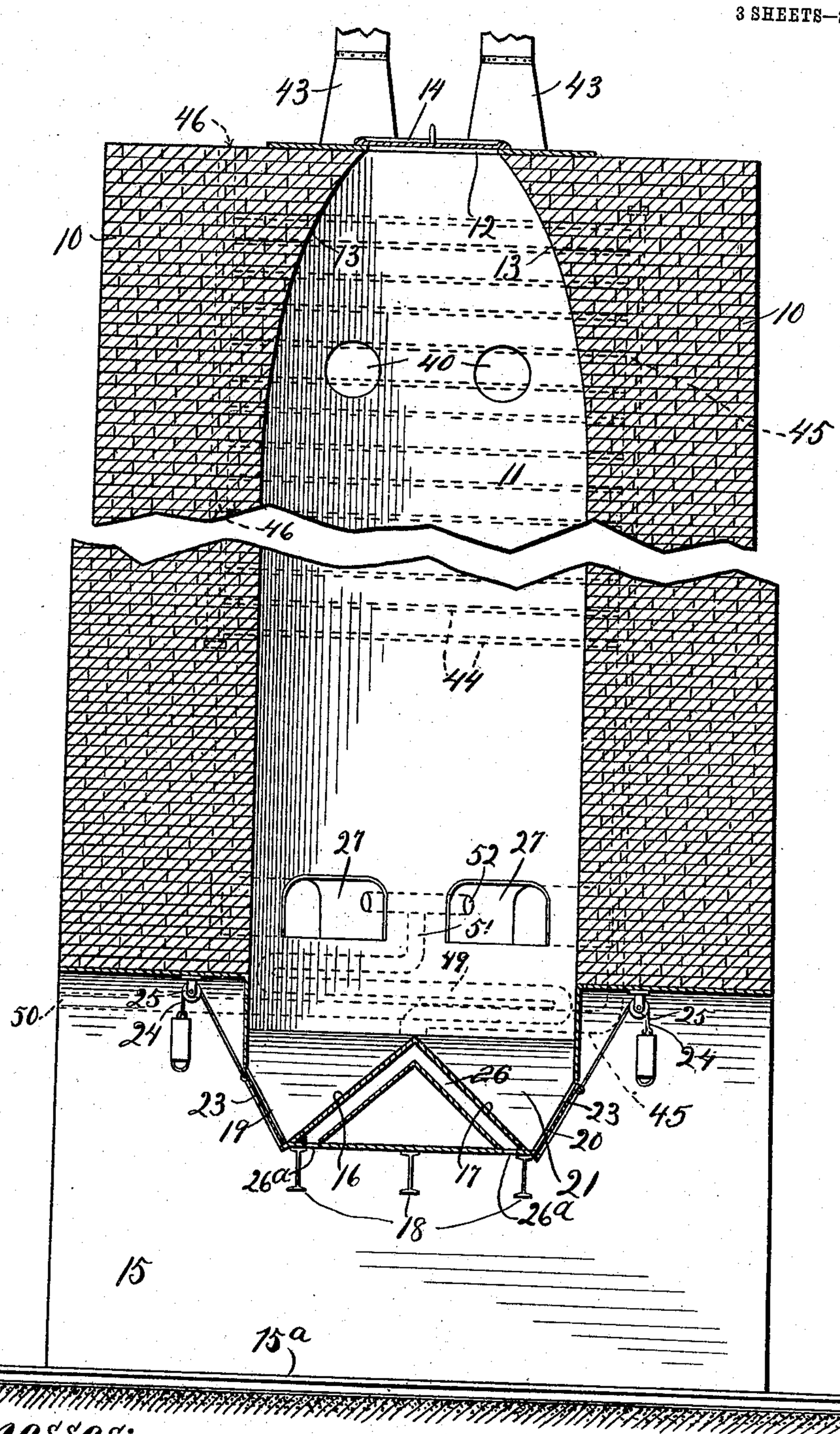

Fig. 1.

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Charles B. Gilleon

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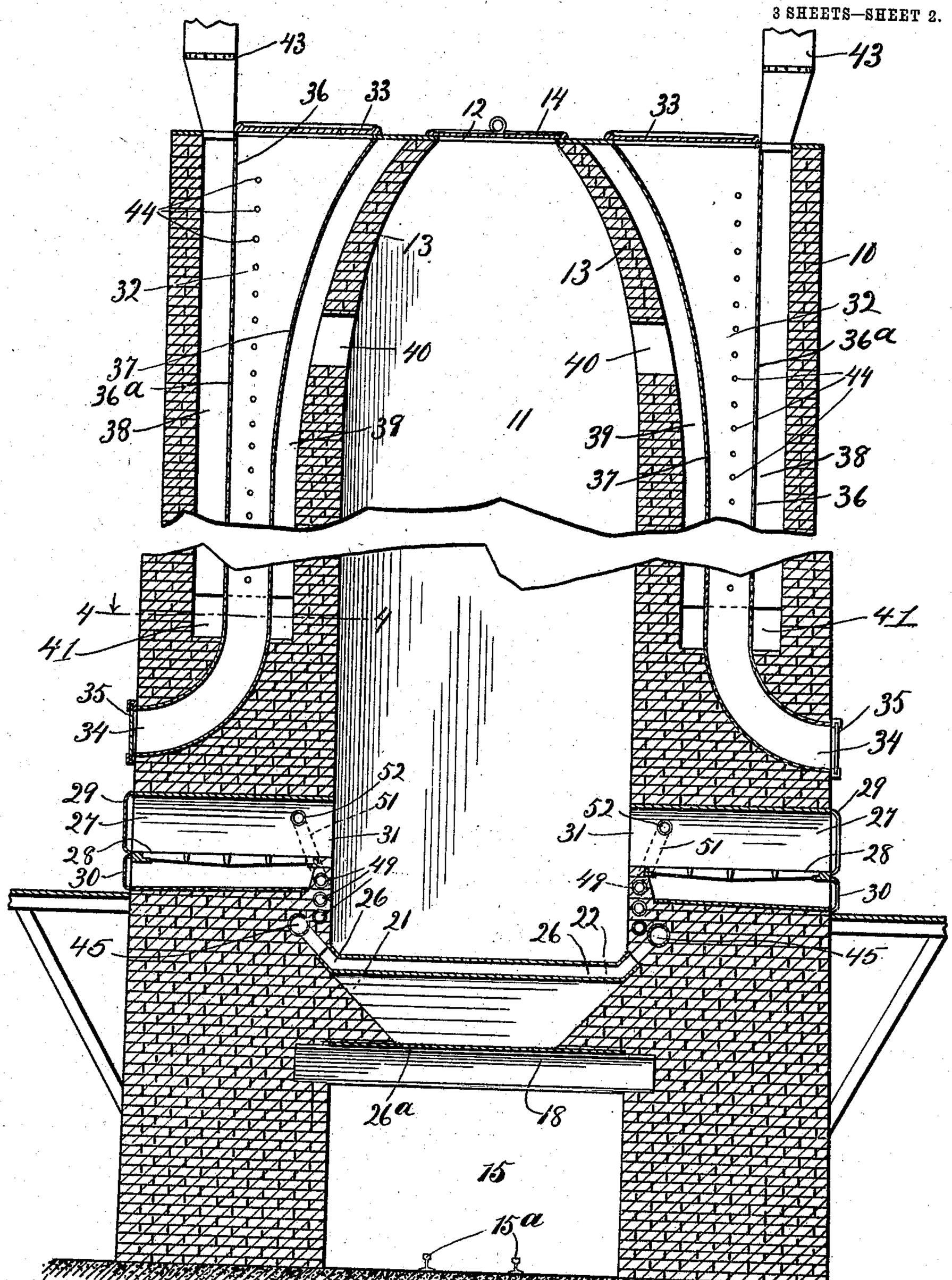

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Fig. 2.

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3 SHEETS—SHEET 3.

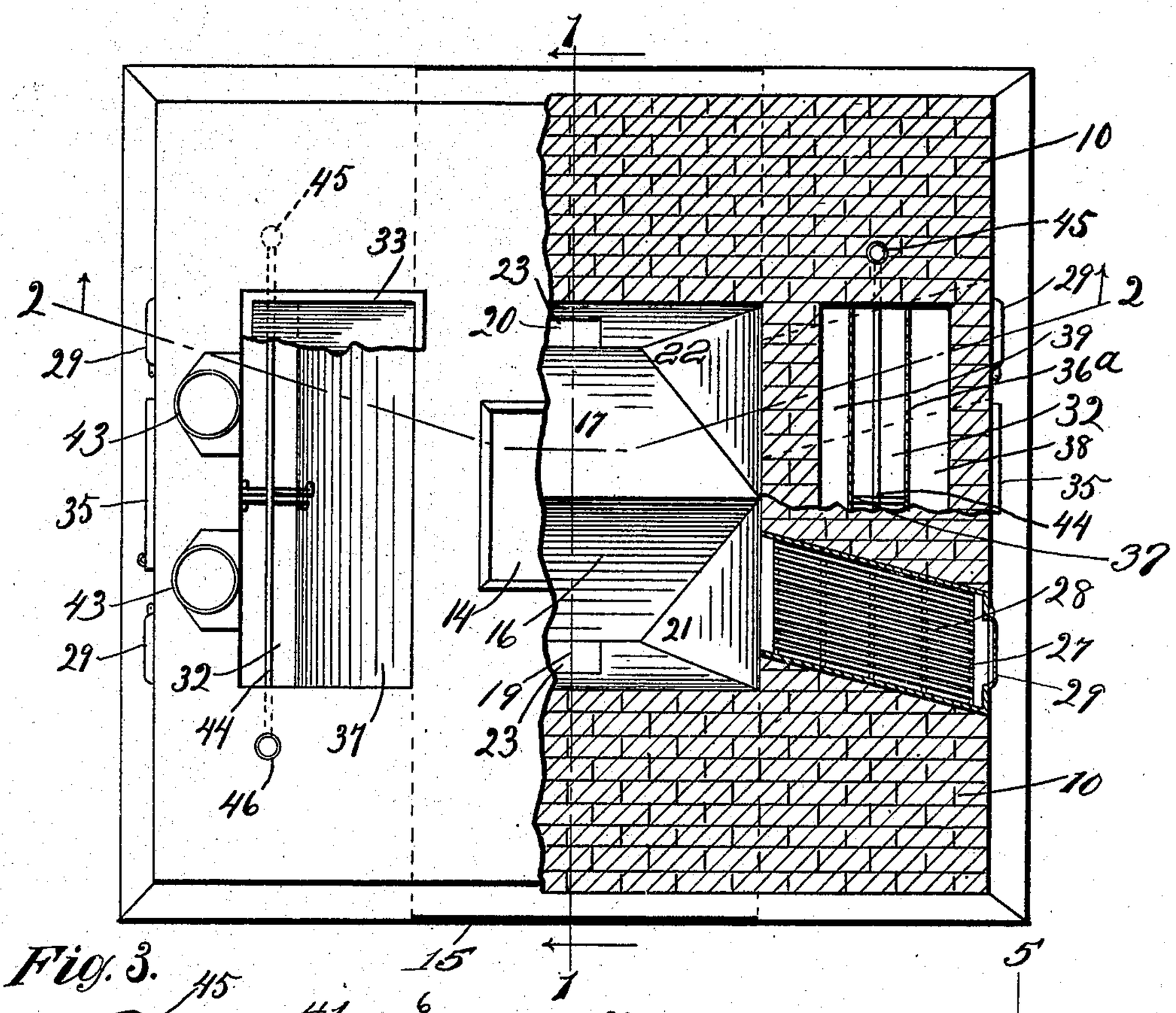

Fig. 3.

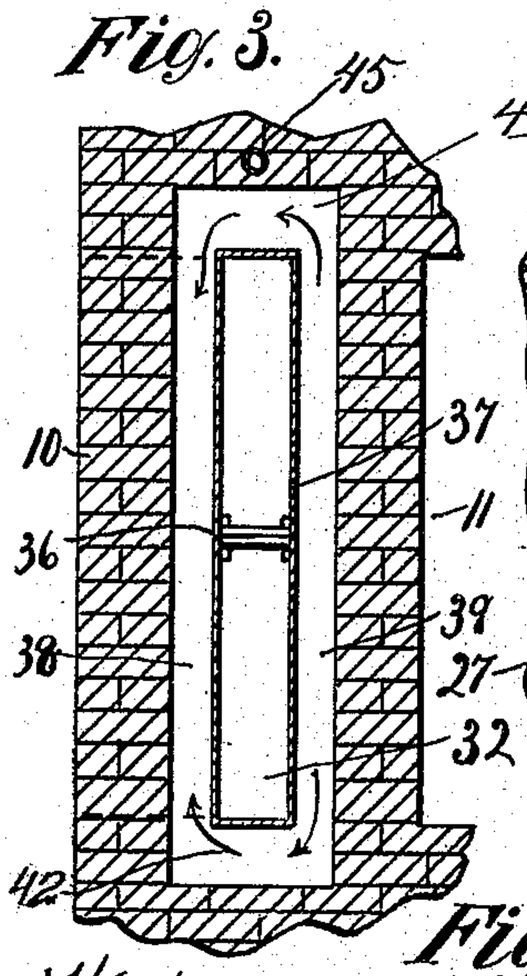

Fig. 4.

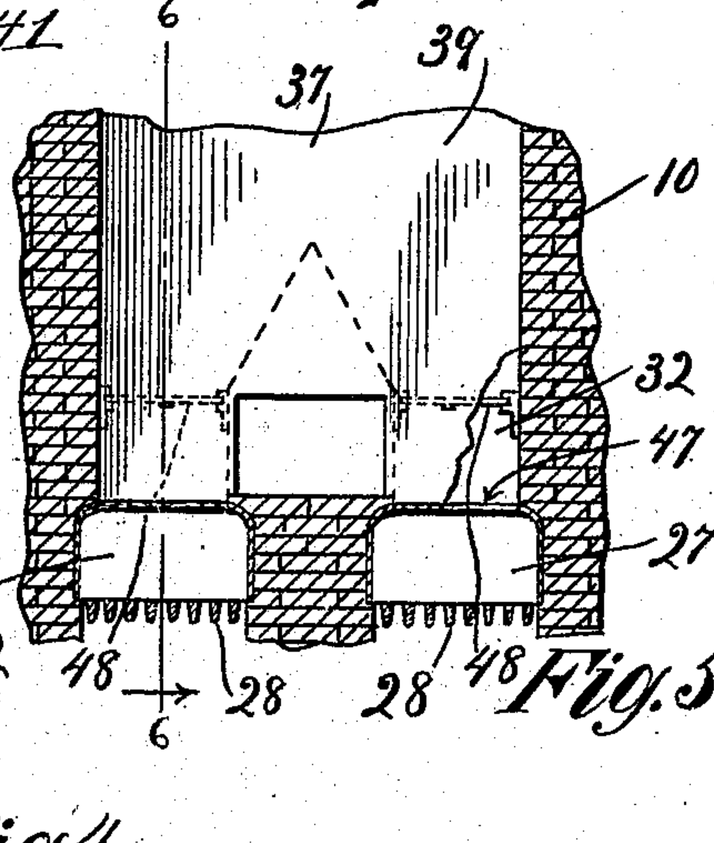

Fig. 5.

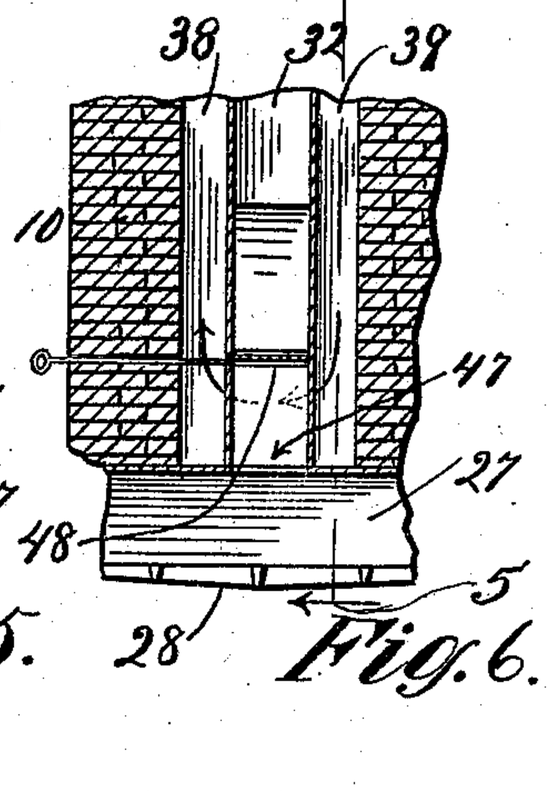

Fig. 6.

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UNITED STATES PATENT OFFICE.

PATRICK J. BUCKLEY, OF WAUKESHA, WISCONSIN.

LIMEKILN.

No. 885,719. Specification of Letters Patent. Patented April 28, 1908.

Application filed May 11, 1907. Serial No. 373,112.

To all whom it may concern:

Be it known that I, PATRICK J. BUCKLEY, a citizen of the United States, and resident of Waukesha, county of Waukesha, and State of Wisconsin, have invented certain new and useful Improvements in Limekilns, of which the following is a specification and which are illustrated in the accompanying drawings, forming a part thereof.

The invention relates to kilns for calcining limestone for the purpose of obtaining the so-called quick-lime, which, when slaked or hydrated, is much used in the arts.

More particularly, the invention relates to those kilns which are adapted for the use of peat as fuel; and the object of the invention is to provide a kiln having a cooling receptacle for receiving the highly-heated lime after it has been completely calcined, and having provision for making use of the heat given off by the calcining process, as, for example, that heat which is absorbed from the walls of the cooling receptacle and that which is carried out of the calcining chamber by the products of combustion, for drying peat preparatory to its use as a fuel in the kiln.

Other objects of the invention will be developed during the course of the following specification.

The invention contemplates a masonary structure in the form of a tower and having a central vertical calcining chamber, a cooling receptacle receiving therefrom, horizontally-disposed fire chambers communicating with the calcining chamber, and vertically-disposed peat-drying bins, together with the necessary flues for leading away the products of combustion and for carrying heat by the convection of air currents and by radiation, from the heated parts of the structure to the drying bins.

In the accompanying drawings, Figures 1 and 2 are vertical sectional views of a kiln constructed according to the invention, the plane of the sections being indicated by the lines 1—1 and 2—2 on Fig. 3; Fig. 3 is a plan view of the same, some of the parts being shown in horizontal section; Fig. 4 is a detail sectional view taken on the line 4—4 of Fig. 2; Figs. 5 and 6 are sectional details illustrating a modification of one feature of the invention, Fig. 5 showing the construction as viewed from the line 5—5 of Fig. 6, and Fig. 6 showing the same as viewed from the line 6—6 of Fig. 5.

A masonry structure of rectangular section and considerable height is shown in the drawings at 10. It is provided with a central vertical chamber 11, for containing the lime-stone to be treated, the filling opening 12 of the chamber being at the top of the structure and being made of somewhat less diameter than the body of the chamber by contracting the walls of the chamber adjacent the opening, as indicated at 13. A removable cover 14 is provided for the opening 12.

The finished product of the kiln is withdrawn from the chamber 11 at its foot, and to provide access to the chamber at that point, a passage 15 extends through the base of the structure 10, from front to rear. The floor of the chamber 11 is downwardly-inclined toward each end of the passageway 15, as indicated at 16, 17, and is supported by beams 18 which cross the passageway 15 and have their ends embedded in the walls of the structure 10 at each side of the passage. The beams 18 are placed a sufficient distance above the floor of the passage 15 to provide head-room for a truck or barrow (not shown) to be drawn through the passage, as on the rails 15[a].

Discharge openings 19, 20, are provided in the walls of the chamber 11 at the foot of each of the inclined portions 16, 17, of the floor of the chamber, and the adjacent portions of the walls of the chamber are inclined, as indicated at 21, 22, to form with the parts 16, 17, a chute directed toward each of such openings. A sliding door 23 normally closes each of the openings 19, 20, and, as shown, is controlled by a weighted cord 24, which passes over a pulley 25, secured to the roof of the passageway 15. Ducts 26 are formed in the walls and floor of the chamber 11 adjacent the discharge openings 19, 20, for the circulation of a cooling medium.

A plurality of furnace chambers 27, four of which are shown, open laterally into the calcining chamber 11 intermediate its ends, that part of the chamber below the furnaces being in effect a cooling receptacle for containing a quantity of the finished charge. As shown the furnace chambers 27 are horizontally-disposed in the walls of the structure 10, and two of these furnaces lead into the central chamber 11 from each side of the structure. Preferably each of the furnaces is slightly inclined to the walls of the struc-

ture, as most clearly shown in Fig. 3, in order that the outer ends of the furnaces at each side of the structure may be somewhat more widely separated than the inner ends of the same furnaces. Each of the furnace chambers 27 is provided with the usual grate-bars 28, and has its outer end normally closed by doors 29, 30, arranged above and below the grate-bars 28, respectively. The opening 31 through which the furnace chambers communicate with the central chamber 11, is only of sufficient depth to include that part of the furnace chamber which is above the grate-bars 28.

Bins 32 are formed in the walls of the structure 10 for containing a quantity of peat fuel for supplying the furnace chambers 27, and for maintaining this fuel in such a relation to other parts of the structure that it will be dried for use by heat which would otherwise be lost. As shown such a bin is provided at each side of the central chamber 11 and extends vertically from the top of the structure to a point slightly above the level of the furnace chambers 27. The top of each bin is normally closed by a removable cover 33, and the lower end of each bin is laterally directed and leads to an opening 34 provided in the side wall of the structure between the outer ends of two adjacent furnace chambers 27. The opening 34 is covered by a door 35, and is conveniently accessible for shoveling fuel into the furnace chambers. The bins 32 are preferably of the oblong rectangular section most clearly shown in Fig. 3, in order that the fuel contained therein will be disposed in a moderately thin vertical layer convenient for drying. The side walls 36, 37, of each of the bins are of sheet metal, and as shown are separated from the body of the structure 10 to provide vertical flue spaces, as 38, 39, at each side of the bins. The flue space 39 communicates by a passage 40 provided in the top of the structure, with the interior of the calcining chamber 11. The lower ends of the flues 38, 39, at each side of the structure are connected by passage 41, 42, formed about the inclined lower ends of the bins. Each of the flue spaces 38 communicates at its top with a chimney 43. Preferably a considerable portion 36[a] of the outside wall 36 of each of the bins 32 is freely perforated, as by being formed of the so-called expanded metal, to permit the escape of moisture from the contents of the bin into the flue passage 38.

As shown the drying of the contents of the bin by the walls 36, 37, of sheet metal, which are heated by the passage of the products of combustion from the kiln through the flues 38, 39, is supplemented by a heating coil or radiator 44, centrally disposed within each of the bins 32 and supplied with heated air from the ducts 26 provided in the walls and floor of the central chamber 11 adjacent its base and in its floor. Each of the heating coils 44 is connected with a part of the circulating ducts 26 by a passage 45 leading through the walls of the structure, and a circulation of air is maintained by means of an exhaust passage 46, leading through the walls of the structure from the top of each of the heating coils 44, air being supplied to the ducts 26 through a passage 26[a] leading through the walls of the structure from the passageway 15.

In use the central chamber 11 will be filled with broken lime-stone by the removal of the cover 14, and fires will be started in each of the furnace chambers 27. Each of the bins 32 will then be filled with moist peat, such, for example, as that from which a considerable portion of the water necessarily withdrawn from the bog in obtaining the peat has been permitted to evaporate by exposure to the air. By maintaining a hot fire in each of the furnace chambers 27, that portion of the lime-stone within the chamber 11 which is immediately in front of the furnace openings 31 will in time be completely calcined, the products of combustion escaping from the structure through the passages 38, 39, and the chimneys 43, whereby the contents of the bins 32 will be heated and dried for use. The operation will be continued in this way until the lime in front of the furnace openings 31 has attained such a temperature that the fusion of its impurities causes the mass to clinker sufficiently to support the weight of the material above it. That part of the central chamber 11 below the furnace openings 31 will then be emptied by withdrawing its contents through the discharge openings 19, 20, the fires within the furnace chambers 27 will be permitted to die down, and an attendant, by the use of a bar (not shown) inserted successively through each of the furnace chambers 27, will break up the contents of the kiln in front of the furnace openings 31, thus permitting the charge to descend to the foot of the chamber 11. Fresh material will now be added through the filling opening 14 and the fires rekindled, use being made of the peat withdrawn from the bins 32 through the lateral openings 34. That part of the charge contained within the chamber 11 which comes in contact with the walls and floor of the chamber cooled by the circulation of air through the ducts 26, is rapidly reduced to such temperature that it may be conveniently handled and is then withdrawn from the discharge openings 19, 20, by opening the doors 23 and permitting it to drop into barrows or trucks resting on the rails 15[a] within the passage 15. According to the usual practice the limestone will then be immediately slaked by treatment with water, while contained in the receiving trucks just referred to, after which it may be packed for shipment or storage.

If desired the bins 32 may be connected by

a passage 47 with each of the furnace chambers 27, as shown in Fig. 6. The peat from the bins may then be consumed within the furnaces after the manner of a base-burning stove, the direct passage of the draft from the furnace into the flue 38 being prevented by a cut-off damper 48 mounted in the passage 47.

Heated air for combustion may be supplied to each of the furnace chambers 27 from circulating passages 49 provided in the walls of the chamber 11 below the furnace openings 31. The passages 49 are preferably supplied with air from the exterior of the structure, as by means of ducts 50, and ducts 51, having port openings 52 in the crown of each of the furnace chambers 27, serve for conveying air, heated in the passages, to the fires.

I claim as my invention—

1. A limekiln comprising, in combination, a structure having a vertical chamber, the walls of the chamber adjacent its lower end being provided with cooling ducts, means for heating material contained in the upper portion of the chamber, fuel bins, and flues receiving from the cooling ducts and traversing the interior of the bins.

2. A limekiln comprising, in combination, a structure having a calcining chamber and a vertically-disposed chamber adjacent thereto, a fuel bin arranged within the last-named chamber to provide an up and a down flue at opposite sides of the bin, connection between the flues below the bin, and connection between the down flue and the calcining chamber.

3. A limekiln comprising, in combination, a structure having a vertical chamber, a horizontal fire chamber communicating therewith and a second vertical chamber above the fire chamber, a fuel bin arranged within the last-named chamber to provide an up and a down flue at opposite sides of the bin and having a discharge opening in the wall of the structure adjacent the mouth of the furnace chamber, connection between the up and down flue below the bin, and connection between the down flue and the higher end of the first-named vertical chamber.

4. A limekiln comprising, in combination, a structure having a calcining chamber and a vertically-disposed chamber adjacent thereto, a fuel bin arranged within the last-named chamber to provide an up and a down flue at opposite sides of the bin, the wall of the bin adjacent the up flue being freely perforated for the purpose set forth, connection between the flues below the bin, and connection between the down flue and the calcining chamber.

5. A limekiln comprising, in combination, a structure having a vertical chamber, a fire chamber communicating therewith intermediate its ends, and a second vertical chamber adjacent the first-named chamber, the walls of the first-named chamber below the furnace being provided with cooling ducts, a fuel bin arranged within the second-named vertical chamber to provide an up and a down flue, a radiator within the bin, connection between the cooling ducts and the radiator, connection between the up and the down flue below the bin, and connection between the first-named vertical chamber and the down flue.

6. A limekiln comprising, in combination, a structure having a vertical chamber and a second chamber adjacent thereto, the walls of the first-named chamber adjacent its lower end being provided with cooling ducts, means for calcining material contained in the upper part of such chamber, a fuel bin arranged within the second-named chamber to provide a flue between a wall of the bin and the adjacent wall of the chamber, such wall of the bin being foraminous, a radiator within the bin, connection between the cooling ducts and the radiator, and connection between the calcining chamber and the flue.

7. In a limekiln, in combination, a structure of tower form having a passage extending therethrough at its base and a vertical calcining chamber over the passage, a platform carried by the side walls of the passage and forming the floor of the chamber, and an openable door controlling the foot of the chamber at each side of the platform.

8. A limekiln comprising, in combination, a structure having a calcining chamber and a cooling chamber adapted to receive material from the calcining chamber, the walls of the cooling chamber being provided with ducts for the circulation of a cooling medium, a furnace communicating with the calcining chamber, a fuel bin, a radiator within the bin, and connection between the cooling ducts and the radiator.

9. In combination, a calcining chamber, a furnace for heating such chamber, a fuel bin supplying the furnace, a cooling chamber adapted to receive heated material from the calcining chamber, and means for delivering a fluid heated by the contents of the cooling chamber to the fuel bin.

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Witnesses:
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