Feb. 27, 1923. 1,446,863.

S. E. TOWNLEY ET AL.

GYPSUM CALCINING APPARATUS.

FILED MAY 26, 1921. 2 SHEETS—SHEET 1.

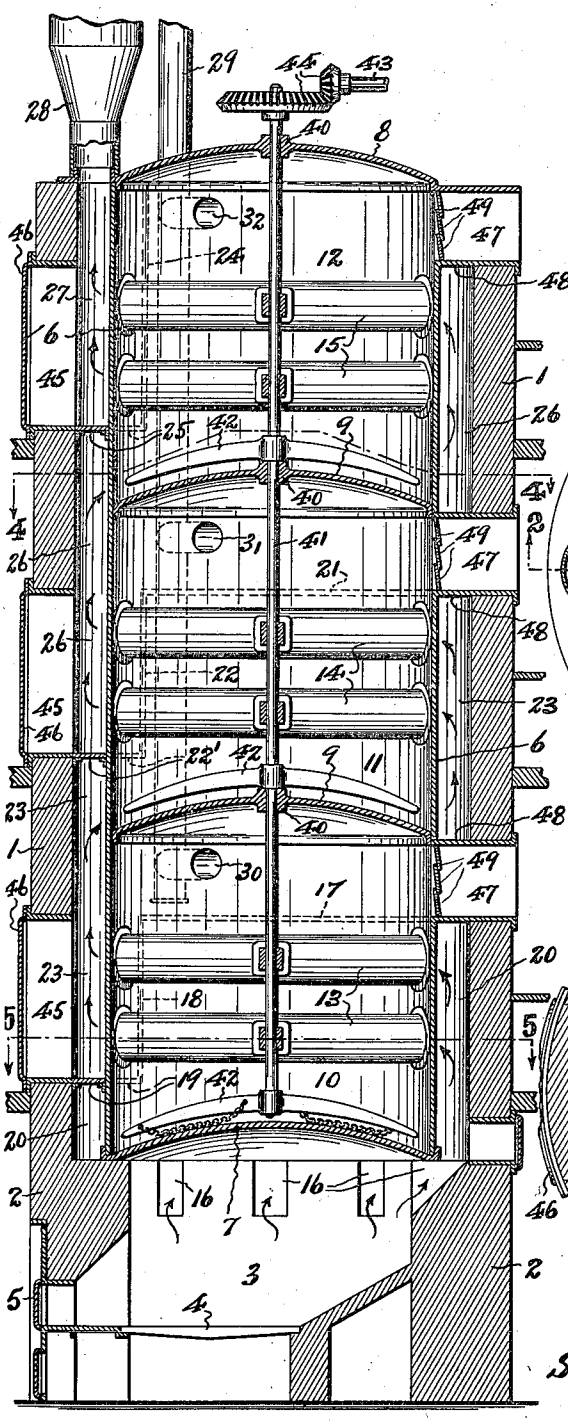

Fig. 2.

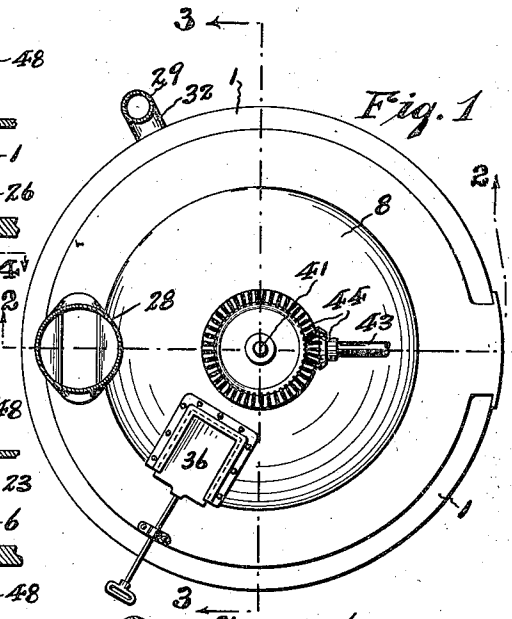

Fig. 1.

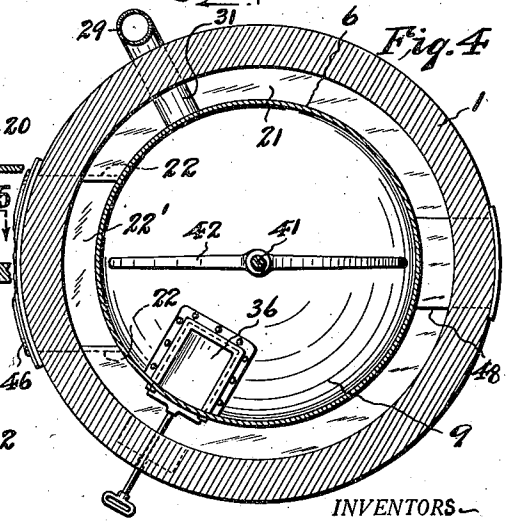

Fig. 4.

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GYPSUM CALCINING APPARATUS.

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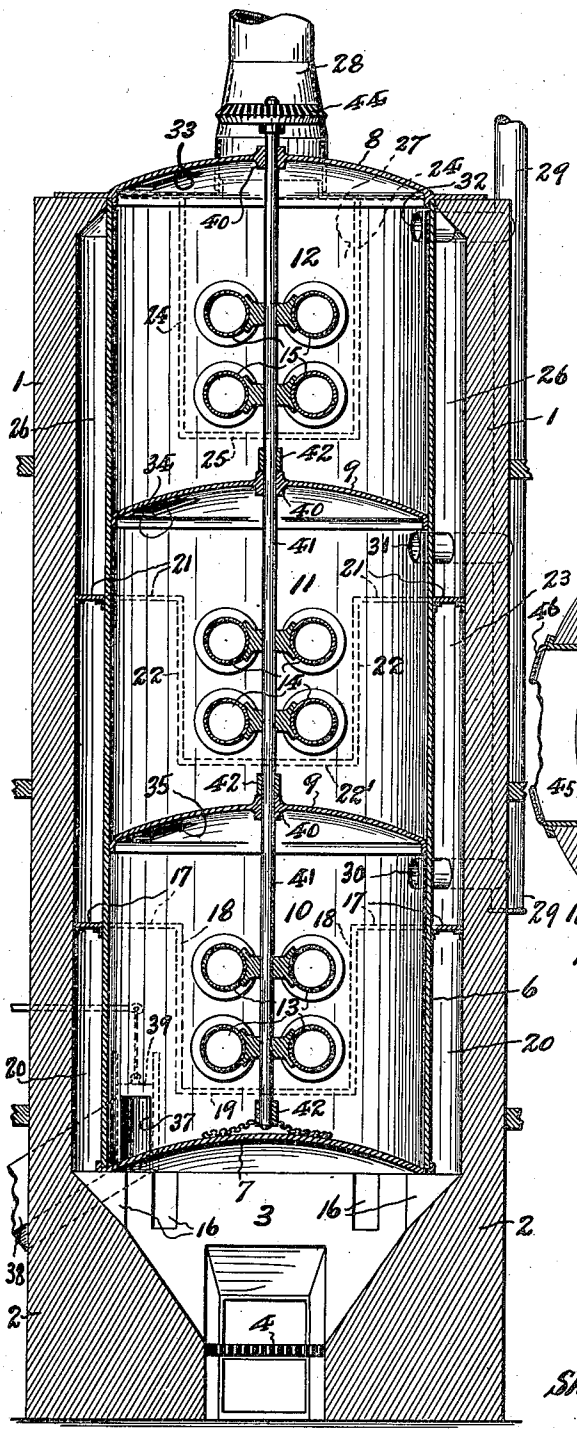

Fig. 3

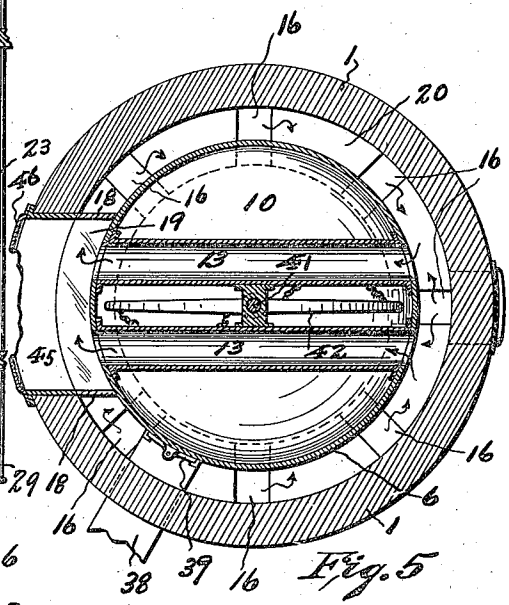

Fig. 5

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UNITED STATES PATENT OFFICE.

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GYPSUM CALCINING APPARATUS.

Application filed May 26, 1921. Serial No. 472,638.

To all whom it may concern:

Be it known that we, SHELDON E. TOWNLEY and FREDERICK E. TOWNLEY, citizens of the United States, residing at East Orange and Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Gypsum Calcining Apparatus; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to characters of reference marked thereon, which form a part of this specification.

This invention relates, generally, to improvements in gypsum calcining apparatus; and the invention has reference, more particularly, to a novel construction of multiple kettle gypsum calciner for economically and efficiently producing plaster of Paris and similar products.

The invention has for its principal object to provide a construction of multiple kettle calciner, in which there is a novel association and combination with the main calcining kettle of one or more preheating kettles arranged for intercommunication at proper times; said arrangement of kettles being further combined with a furnace structure provided with means whereby the products of combustion, after operatively passing through the main calcining kettle, are conducted successively through the preheating kettles; all to the end that a more rapid handling and treatment of the raw material in larger quantities per given time period may be accomplished with a minimum of fuel consumption; the apparatus utilizing the heat of waste products of combustion, which in the ordinary single calcining kettle is lost by discharge through the furnace stack.

Other objects of the present invention, not at this time more particularly enumerated, will be clearly understood from the following detailed description of the same.

The invention is clearly illustrated in the accompanying drawings, in which:—

Figure 1 is a top view of the novel gypsum calcining apparatus, made according to and embodying the principles of this invention; Figure 2 is a vertical longitudinal section through the same, taken on line 2—2 in said Figure 1; Figure 3 is a transverse vertical longitudinal section through the same, taken on line 3—3 in said Figure 1; Figure 4 is a horizontal cross section, taken on line 4—4 in said Figure 2; and Figure 5 is another horizontal cross section, taken on line 5—5 in said Figure 2.

Similar characters of reference are employed in all of the hereinabove described views, to indicate corresponding parts.

Referring now to said drawings, the reference-character 1 indicates a housing, preferably built of brick, and generally of upright cylindrical form. Provided in the base 2 of said housing 1 is a fire-box 3, having arranged therein any suitable construction of grate 4, access to which is had through the fire-door 5.

Supported upon the base 2 of said housing 1, so as to extend upwardly through the interior of said housing, is a kettle shell 6, the same being smaller in diameter than the inside diameter of the housing so as to provide an annular passage or space between said kettle shell 6 and the walls of said housing. Said kettle shell 6 is provided with a bottom plate 7 which extends over said fire-box 3, and at its upper end the kettle shell is provided with a top or cover plate 8. Arranged intermediate the said bottom plate 7 and cover plate 8 are one or more partition plates 9. As shown in the drawings, two such partition plates 9 are employed to divide the kettle shell into three compartments; the bottom compartment 10 providing a main calcining kettle, the intermediate compartment 11 and top compartment 12 providing preheating kettles. Extending transversely across or through the interior of said main calcining kettle 10 are a plurality of flue pipes 13, the ends of which open into the annular space between the kettle shell 6 and the walls of the housing 2. Similarly the preheating kettle 11 is provided with a plurality of flue pipes 14, and the preheating kettle 12 with a plurality of flue pipes 15.

The walls of said fire-box 3 are provided with a plurality of radiating flue-ports 16 which lead beneath the bottom of said main calcining kettle 10 into the space interme-

diate the kettle shell 6 and the walls of said housing 2.

Extending transversely across said annular space intermediate the kettle shell 6 and the walls of the said housing 2 adjacent to the upper end of said main calcining kettle 10, and above the level of the flue pipes 13 thereof, is a horizontal upper baffle plate 17 which closes the said annular space at a point above the receiving ends of said flue pipes 13. Said upper horizontal baffle plate 17 terminates at points adjacent to the opposite sides of the discharge ends of said flue pipes 13 in downwardly extending vertical baffle plates 18, the lower ends of which are connected by a lower horizontal baffle plate 19, thus forming in said space intermediate the kettle shell 6 and the walls of the housing 2 an annular flue passage 20 which intercommunicates only with the flue-ports 16 and the receiving ends of the flue pipes 13 of the main calcining kettle 10. In like manner, extending transversely across said annular space intermediate the kettle shell 6 and the walls of said housing 2 adjacent to the upper end of said preheating kettle 11, and above the level of the flue pipes 14 thereof, is a horizontal upper baffle plate 21, terminating at points adjacent to the opposite sides of the discharge ends of said flue pipes 14 in downwardly extending vertical baffle plates 22, the lower ends of which are connected by a lower horizontal baffle plate 22′, thus forming an annular flue passage 23 which intercommunicates only with the discharge ends of said calcining kettle flue pipes 13 and the receiving ends of said preheating kettle flue pipes 14. Similarly there are provided adjacent to the opposite sides of the discharge ends of said flue pipes 15 downwardly extending vertical baffle plates 24, the lower ends of which are connected by a horizontal baffle plate 25, thus forming at the outer sides of said plates 24 and 25 an annular flue passage 26 which intercommunicates only with the discharge ends of said preheating kettle flue pipes 14 and the receiving ends of the preheating kettle flue pipes 15. The space confined within the inner boundaries of said baffle plates 24 and 25 forms a discharge flue passage 27 which intercommunicates only with the discharge ends of said flue pipes 15 and the vent stack 28 mounted in connection with said housing 2.

The reference character 29 indicates a steam or vapor vent pipe, which is connected in communication with the interiors of the respective main calcining kettle 10 and preheating kettles 11 and 12 by the respective branch pipes 30, 31 and 32.

The top or cover plate 8 is provided with a material admission opening 33 leading into the preheating kettle 12; the upper partition plate 9 is also provided with a material admission opening 34 affording access of material from said preheating kettle 12 into said preheating kettle 11; and the lower partition plate 9 is likewise provided with a material admission opening 35 affording access of the material from said preheating kettle 12 into said main calcining kettle 10. Said material admission openings 33, 34 and 35 are each furnished with closing gates 36, as shown more particularly in Figures 1 and 4.

The main calcining kettle 10 is provided in its side, adjacent to the bottom thereof, with a material discharge opening 37 which communicates with a suitable discharge chute 38 for conveying away the calcined material. Said discharge opening is furnished with a closing gate 39, as shown more particularly in Figures 3 and 5.

Journaled in bearings 40 provided in said cover plate 8 and in said partition plates 9, is a centrally disposed vertical longitudinal shaft 41, which extends downwardly through said preheating kettles 12 and 11 and into said calcining kettle 10. Fixed on said shaft 41 so as to respectively operate in the lower portion of each preheating kettle 12 and 11 and in said main calcining kettle 10, are rotatable agitator members or stirring bars 42. Said shaft 41 may be driven by a drive shaft 43 through gearing 44, or in any other manner found convenient or desirable.

The walls of said housing 2 are pierced, at points opposite the discharge ends of the respective sets of flue pipes 13, 14 and 15 with ports 45 normally closed by doors 46. When uncovered, tools for cleaning said flue pipes 13, 14 and 15 may be given access to the latter through said ports 45.

Each preheating kettle 12 and 11, and also the main calcining kettle 10 is provided with an observation opening or port 47, formed by suitable extensions 48 which project through the walls of the housing 2 to open exteriorly thereof. Said ports 47 are normally closed by doors or other suitable closure members 49. The said observation ports 47 may be used by the operators to observe the progress of the calcining of the gypsum, and also give access to the interiors of the respective kettles for the purpose of taking temperatures.

Having thus described the construction of the novel calcining apparatus, we will now briefly set forth the functioning of the same, and the manner of using the same.

The hot gases or products of combustion from the fire on the grate 4 rise in the fire-box 3 and directly contact with the bottom of the main calcining kettle 10, flowing thence through the flue ports 16 into the flue passage 20 so as to surround the greater part of the main calcining kettle 10, thence passing through the flue pipes 13 into the flue passage 23 around the preheating kettle 11,

escaping through the flue pipes 14 into the flue passage 26 around the preheating kettle 12, and thence passing through the flue pipes 15 to the flue passage 27 to finally escape through the stack 28.

The kettles are charged with material to be treated, (e. g. raw ground gypsum) which is fed from bins into the preheating kettle 12 through the opened admission opening 33. The openings 34 and 35 are uncovered to permit intercommunication between the kettles, so the material will flow downwardly through the preheating kettles into the main calcining kettle 10; the rotation of the agitator members or stirring bars 42 assisting the delivery of the material from one kettle to another. After a proper initial amount of material is collected in the main calcining kettle 10, the opening 35 is closed to allow the preheating kettle 11 to partially fill, and then the opening 34 is closed to allow the preheating kettle 12 to fill to the desired degree. After the material in the main calcining kettle has been sufficiently livened up by the heat so that the agitator members 42 will not jam, the openings 35, 34 and 33 are again opened so as to allow additional material from the preheating kettle 11 to run into the main calcining kettle; additional material from the preheating kettle 12 to run into the preheating kettle 11, and more raw material to be fed into the preheating kettle 12. This operation is repeated a sufficient number of times to permit the main calcining kettle to become fully charged. After the main calcining and preheating kettles are completely charged, the material in the former undergoes the boiling operation and is brought up to the requisite degree of temperature. In the meantime the products of combustion utilized for heating the material in the main calcining kettle, are successively passed around the preheating kettles and through the pipe flues thereof, so as to preheat the contents thereof preparatory to delivery thereof into the main calcining kettle. This preheating is accomplished by the products of combustion usually wasted by direct discharge through a stack, and consequently the apparatus not only saves fuel, since the material is preheated before entering the main calcining kettle and consequentlv is brought up to the required temperature much more quickly after delivery thereinto, but also the apparatus handles a greater volume of material in a given time period with a consequent saving of labor cost per given volume. A comparative estimate indicates, for example, that 44 tons per twelve hour day produced in the heretofore used single calcining kettle, is increased to 77 tons per twelve hour day when treated in the apparatus made according to this invention and possessing a main calcining kettle of equal size, the fuel consumption in each case being the same, to wit, about 4800 lbs. of coal per twelve hour day.

When the material in the main calcining kettle 10 reaches a certain degree F. in temperature, the same is ready for discharge into the cooling bins, this being accomplished by opening the gate 39 and running off the product through the discharge opening 37 and discharge chute 38. The operations of recharging the apparatus is then repeated, as above described.

We are aware that some changes may be made in the construction of the apparatus as above described and as illustrated in the drawings, without departing from the scope of and while still retaining the general principles of our invention. Hence, we do not limit our invention to the exact arrangements and construction of parts, as described in the foregoing specification, nor do we confine ourselves to the exact details of the construction of the various parts as illustrated in the accompanying drawings.

We claim:—

1. In an apparatus of the kind described, an upright cylindrical housing provided with a fire-box in its base and a flue-stack at its upper end, a kettle shell mounted within said housing above said fire-box, the sides of said kettle shell being spaced from the walls of said housing to provide an intermediate annular space, means dividing said kettle shell into a plurality of compartments one above the other, the lowermost compartment providing a main calcining kettle, the next compartment above providing an intermediate preheating kettle, and the uppermost compartment providing a top preheating kettle, transverse flue pipes extending through each kettle, said fire-box having flue-ports communicating with the lower end of said annular space, baffle plates in said annular space to divide the same into successive flue passages whereby the products of combustion are successively delivered around each kettle and thence through the flue pipes thereof and finally discharged into said flue-stack, each kettle having a material admission opening, closing means for each material admission opening, said main calcining kettle having a discharge opening, a discharge chute connected with said discharge opening, closing means for said discharge opening, a central longitudinal shaft extending through said compartments, an agitator member for each compartment mounted on said shaft, means for rotating said shaft.

2. In an apparatus of the kind described, an upright cylindrical housing provided with a fire-box in its base and a flue-stack at its upper end, a kettle shell mounted within said housing above said fire-box, the sides of said kettle shell being spaced from the walls of said housing to provide an inter-

mediate annular space, means dividing said kettle shell into a plurality of compartments one above the other, the lowermost compartment providing a main calcining kettle, the next compartment above providing an intermediate preheating kettle, and the uppermost compartment providing a top preheating kettle, transverse flue pipes extending through each kettle, said fire-box having flue-ports communicating with the lower end of said annular space, baffle plates in said annular space to divide the same into successive flue passages whereby the products of combustion are successively delivered around each kettle and thence through the flue pipes thereof and finally discharged into said flue-stack, each kettle having a material admission opening, closing means for each material admission opening, said main calcining kettle having a discharge opening, a discharge chute connected with said discharge opening, closing means for said discharge opening, a central longitudinal shaft extending through said compartments, an agitator member for each compartment mounted on said shaft, means for rotating said shaft, a vapor vent pipe, and intercommunicating means between said vent pipe and each compartment.

3. In an apparatus of the kind described, an upright cylindrical housing provided with a fire-box in its base and a flue-stack at its upper end, a kettle shell mounted within said housing above said fire-box, the sides of said kettle shell being spaced from the walls of said housing to provide an intermediate annular space, means dividing said kettle shell into a plurality of compartments one above the other, the lowermost compartment providing a main calcining kettle, the next compartment above providing an intermediate preheating kettle, and the uppermost compartment providing a top preheating kettle, transverse flue pipes extending through each kettle, said fire-box having flue-ports communicating with the lower end of said annular space, baffle plates in said annular space to divide the same into successive flue passages whereby the products of combustion are successively delivered around each kettle and thence through the flue pipes thereof and finally discharged into said flue-stack, each kettle having a material admission opening, closing means for each material admission opening, said main calcining kettle having a discharge opening, a discharge chute connected with said discharge opening, closing means for said discharge opening, a central longitudinal shaft extending through said compartments, an agitator member for each compartment mounted on said shaft, means for rotating said shaft, a vapor vent pipe, and intercommunicating means between said vent pipe and each compartment, observation port members for each compartment, and means for closing said observation port members.

In testimony that we claim the invention set forth above we have hereunto set our hands this 20th day of May, 1921.

SHELDON E. TOWNLEY.
FREDERICK E. TOWNLEY.

Witnesses:
FLORA MILLER,
EVA E. DESCH.