

1,303,348.

2 SHEETS-SHEET 1.



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SULFUR OXIDIZING PROCESS AND APPARATUS THEREFOR.
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2 SHEETS—SHEET 2.

Fig. 3.

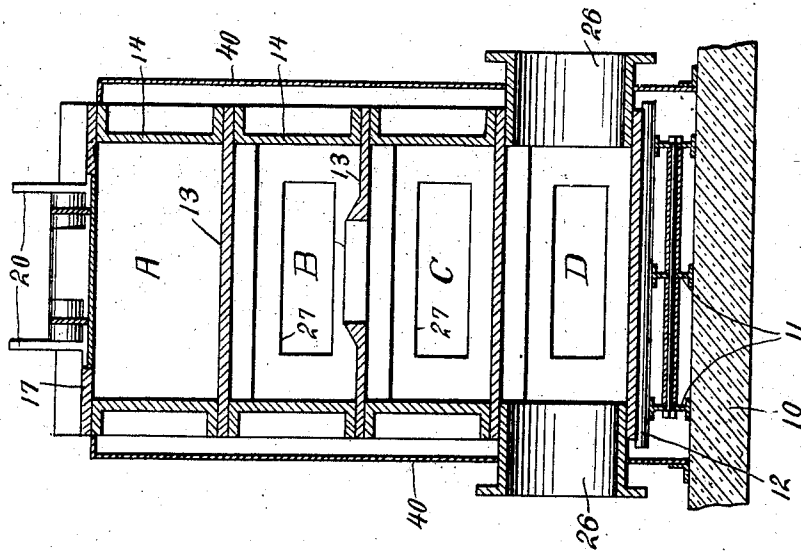
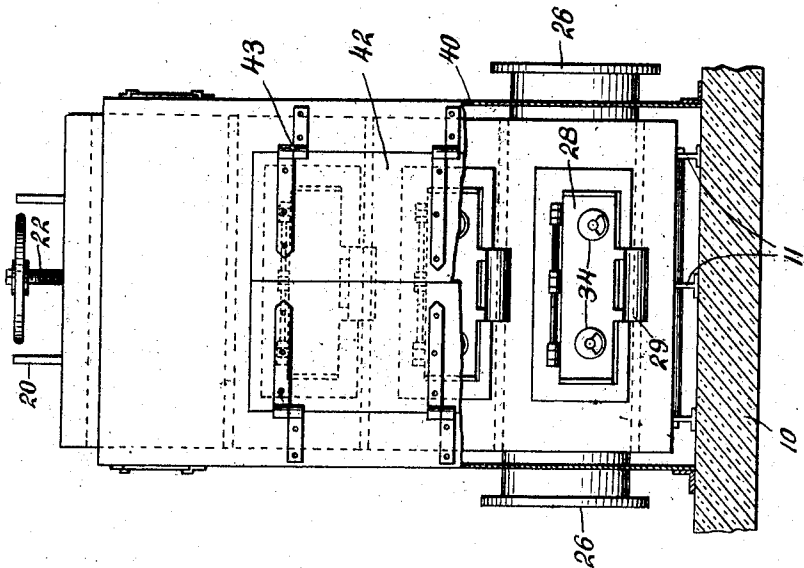


Fig. 2.



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UNITED STATES PATENT OFFICE.

AINWELL GORDON MCINTYRE, OF TORONTO, CANADA.

SULFUR-OXIDIZING PROCESS AND APPARATUS THEREFOR.

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Specification of Letters Patent.

Patented May 13, 1919.

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To all whom it may concern:

Be it known that I, AINWELL GORDON MCINTYRE, a citizen of the Dominion of Canada, residing in Toronto, Canada, have invented certain new and useful Improvements in Sulfur-Oxidizing Processes and Apparatus Therefor; and I 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.

The present invention relates to an improved process of producing sulfur dioxide by burning sulfur in air in an apparatus of novel construction.

Briefly described, the apparatus of the invention comprises a series of communicating sulfur burning chambers disposed vertically beneath a supply chamber. The outlet for the sulfur dioxide is in the bottom chamber so that the burner is a down-draft one. This construction takes advantage of the fact that sulfur dioxide is heavier than air and its course through the series of chambers is that which the gas of itself would take.

Sublimation, which is one of the most common sources of trouble with types of burners at present in use is also avoided by this construction. Sublimation is caused by the presence of sulfur in a liquid condition which has not received enough air to properly oxidize it, due to the fact that the furnace temperature is too low or the air and sulfur gas have insufficient time to thoroughly intermingle.

The details of construction of my improved burner will appear from a description of a preferred embodiment thereof.

In the drawings, Figure 1 is an elevation principally in section along a longitudinal medial plane.

Fig. 2 is an end view, with a portion of the inclosing casing broken away to show the construction of the interior parts of the apparatus.

Fig. 3 is a cross-section along the line 3-3 of Fig. 1.

Fig. 4 is a cross-section along the line 4-4 of Fig. 1.

Referring to the drawings, in which similar reference characters denote similar parts throughout the several views, 10 is a base of any convenient construction upon which are mounted rails 11 for supporting the burner. Between the rails and the burner are a series of rollers 12. This construction aids in level-

ing the burner as well as allows for expansion of the burner when heated.

The burner itself is made up of a plurality of shelves 13 maintained in spaced relationship by a series of channel plates 14 which form the sides of the burner as shown most clearly in Fig. 3. The ends of the shelves are bent at right angles as at 15 to form a means of attachment for the end plates 16. The top of the burner is formed by a cover plate 17 set upon the upper channel plates 14 and having its ends turned upwardly at 18 for attachment to the end plates 16.

The cover plate 17 is provided with apertures adapted to be closed by doors 19 which when open rest against stops 20. Through a boss 21 on the cover plate is screwed the stem 22 of a valve 23 which controls the size of an opening in the uppermost one of the shelves 13.

The construction above described forms a supply chamber A, and a series of combustion chambers B, C and D of which three are shown in the embodiment illustrated herein (although it will be understood that any other suitable number may be used).

Each of the shelves 13 except the upper one which forms the base of the supply chamber and the bottom one which forms the base of chamber D and rests upon the rollers 12 is provided with a circular opening 24, having at its upper edge a raised rim 25, the purpose of which is to retain a certain depth of melted sulfur upon each shelf. As shown in Fig. 1 the openings 24 are disposed at opposite ends of adjacent chambers, thereby providing for a circulation of air throughout the entire length of each chamber.

Attached to the side walls of chamber D in any convenient manner are two outlet pipes 26 (Fig. 3) adapted to be connected to any suitable apparatus (not shown) for withdrawing the sulfur dioxide from the burner. These outlet pipes are placed at the end of chamber D opposite to that at which is located the opening into chamber C, so that the products of combustion must pass throughout the length of chamber D before being withdrawn.

The end plates 16 are provided with series of apertures 27 forming openings into the ends of chambers B, C and D slightly above the bases thereof. These openings are governed by hinged doors 28 that can be swung to any position by means of a hook

or bar which may be inserted in the holes in the handle portions 29 of the doors. The doors can be held in any position of adjustment by means of pins 30 placed in adjusting holes 31 formed in the side portions of the frames 32 surrounding the apertures 27. When the doors are closed they rest against the bottom portions 33 of the frames. In order to observe the color of the flame within the burner without raising the doors more than is necessary for the entrance of air each door is provided with observation holes 34 covered by revoluble damper doors.

The ends and sides of the burner described above are surrounded by a metallic jacket 40. Near the top of this jacket and adjacent the two side walls of the burner are sliding dampers 41 of which one is shown in detail in Fig. 4. Through these dampers the air supply for the burner is drawn in. While the dampers may be located at the ends of jacket 40 the arrangement above described is preferable, as it causes the air drawn through the dampers to pass along the walls of the burner, thereby heating the air. In order to obtain access to the burner the jacket 40 is provided at each end with doors 42 hinged at 43 to the jacket.

Having shown the construction of one embodiment of the invention the operation thereof will be briefly described.

The supply chamber A is filled with any desired amount of sulfur. A little sulfur is thrown into chamber B and ignited in order to melt the sulfur in the supply chamber. Valve 23 is then raised to allow the melted sulfur to pass into chamber B. In this chamber the sulfur will drain over the rim 25 into the next chamber and some of it will finally reach the bottom of the burner. There will then be in chambers B and C, melted sulfur of a depth determined by the height of the rim 25 and in chamber D any excess sulfur will collect. The air enters through the dampers 41 which in general should be left wide open when the burner is in operation, in order to let the air enter at a low velocity. These dampers are only closed when the burner is shut off in order to retain the radiating heat and permit the burner to cool gradually.

The doors 28 at the end of each chamber are raised the proper distance to permit a certain amount of air to enter the interior of the chambers. By altering the position of these doors the air supply can be regulated to an amount just sufficient to cause complete oxidation of sulfur in the chambers. While the furnace is in operation the doors 42 are closed, as well as supply doors 19 at the top of the burner. Hence all of the air drawn through the burner must come in through dampers 41.

In general doors 28 should be opened to

let in enough air to cause the sulfur flames near the outlet of the gas pipes 26, to be of a light blue color. If the flame becomes dark, more air should be added, while if it becomes white, some of the air must be shut off. In any event, the air supply should be regulated by doors 28 and not by the sliding dampers 41 of the air jacket.

The draft in the burner is caused by the usual method of a blower or vacuum pump connected to the discharge pipes 26. On account of apertures 24 being disposed at alternate ends of the series of combustion chambers, some of the air will be drawn throughout the entire length of each chamber, and downward from one chamber to the next, thus following the same course as does the melted sulfur in its passage through the burner and descending in the natural direction due to sulfur dioxide being heavier than air. As has been previously explained, it is found that this down draft mode of operation is the most satisfactory way in which to properly oxidize the sulfur gas without causing sublimation which in other devices of this character is a source of continual trouble since the sulfur particles in the gas clog the pipes of the burner and discharge apparatus.

The construction described and illustrated herein is one in which the purest and richest sulfur dioxide gas may be formed in a comparatively small burner, which however, permits the burning of a maximum amount of sulfur. To accomplish this result, a sulfur melting compartment coextensive with the full length and width of the burner is provided. In this compartment the sulfur will be thoroughly dried and melted by the internal heat of the burner and the melted sulfur may be conveniently fed into the oxidizing chambers of the burner as required.

Various modifications or changes in the details of my invention may be made without departing from the principle thereof.

Having described my invention, what I claim as new and desire to secure by Letters Patent is as follows:

1. A sulfur burner, comprising in combination, a supply chamber, a plurality of combustion chambers below said supply chamber, supply controlling means between said supply chamber and the upper one of said combustion chambers, openings between adjacent combustion chambers, means for admitting air to said combustion chambers and means associated with the bottom one of said combustion chambers for withdrawing the products of combustion.

2. A sulfur burner, comprising in combination a supply chamber, doors at the top of said chamber, a plurality of combustion chambers below said supply chamber, a valve between said supply chamber and the upper

one of said combustion chambers, openings between adjacent combustion chambers, a rim surrounding the edge of each of said openings, means for admitting air to said combustion chambers and means associated with the bottom one of said combustion chambers for withdrawing the products of combustion.

3. A sulfur burner, comprising in combination, a supply chamber having an outlet opening, means for closing said opening, a plurality of superimposed combustion chambers beneath said supply chamber, apertures between and disposed at alternate ends of adjacent combustion chambers, a rim surrounding the upper end of each opening, air supply apertures in the walls of said combustion chambers and means associated with the bottom one of said combustion chambers for withdrawing the products of combustion.

4. A sulfur burner, comprising in combination, a series of super-imposed combustion chambers, a supply chamber above and co-extensive with the horizontal dimensions of the upper one of said combustion chambers, a valve between said supply chamber and the upper combustion chamber, apertures between the other combustion chambers of said series, means for admitting air to each of said combustion chambers and means associated with the bottom one of said combustion chambers for withdrawing the products of combustion.

5. A sulfur burner, comprising in combination, a supply chamber, a plurality of combustion chambers below said supply chamber, supply controlling means between said supply chamber and the upper one of said combustion chambers, openings between adjacent combustion chambers, means for admitting air to said combustion chambers, an outlet for the products of combustion connected to the bottom one of said combustion chambers, a jacket surrounding the walls of said chambers and apertures in the walls of said jacket.

6. A sulfur burner, comprising in combination, a casing formed with a supply chamber and a plurality of combustion chambers below said supply chamber, supply controlling means between said supply chamber and the upper one of said combustion chambers, openings between the adjacent combustion chambers, means permitting access to the interior of said combustion chambers, means for withdrawing the products of combustion connected to the bottom one of said combustion chambers, a jacket surrounding said casing, adjustable aper-

tures adjacent the top of said jacket and doors in the walls of said jacket adjacent the means for permitting access to the interior of said combustion chambers.

7. A sulfur burner, comprising in combination a base, a plurality of rails on said base, rollers upon said rails, a casing mounted upon said rollers and formed with a plurality of combustion chambers and a supply chamber above the combustion chamber, a valve between said supply chamber and the upper one of said combustion chambers, openings between adjacent combustion chambers, means for admitting air to said combustion chambers and means associated with the bottom one of said combustion chambers for withdrawing the products of combustion.

8. A sulfur burner, comprising in combination, a series of combustion chambers having an outlet opening at the bottom thereof, and comprising a plurality of shelves positioned one above the other in spaced relation, said shelves having apertures therethrough and rims about the upper edges of said apertures, inlet openings for the spaces between the shelves, means for controlling the extent of the openings, a supply chamber above said combustion chambers and supply controlling means between said supply chamber and one of said combustion chambers.

9. The herein-described process of producing sulfur dioxid, which consists in melting sulfur in a supply chamber, distributing said sulfur throughout a series of combustion chambers beneath said supply chamber, admitting air to each of said combustion chambers, maintaining a downward circulation of air throughout said combustion chambers and withdrawing the sulfur dioxid from the bottom one of said combustion chambers.

10. The herein-described process of producing sulfur dioxid, which consists in melting sulfur in a supply chamber, allowing said melted sulfur to flow by gravity throughout a series of combustion chambers beneath said supply chamber, maintaining a layer of melted sulfur of substantially uniform depth in each of said combustion chambers, admitting air to each of said combustion chambers, maintaining a circulation of air throughout the length of each combustion chamber and downward from one combustion chamber to the next, and withdrawing sulfur dioxid from the lowest one of said combustion chambers.

In testimony whereof I affix my signature.

AINWELL GORDON MCINTYRE.