C. B. CLARK.

SULFUR BURNER.

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952,100. Patented Mar. 15, 1910.

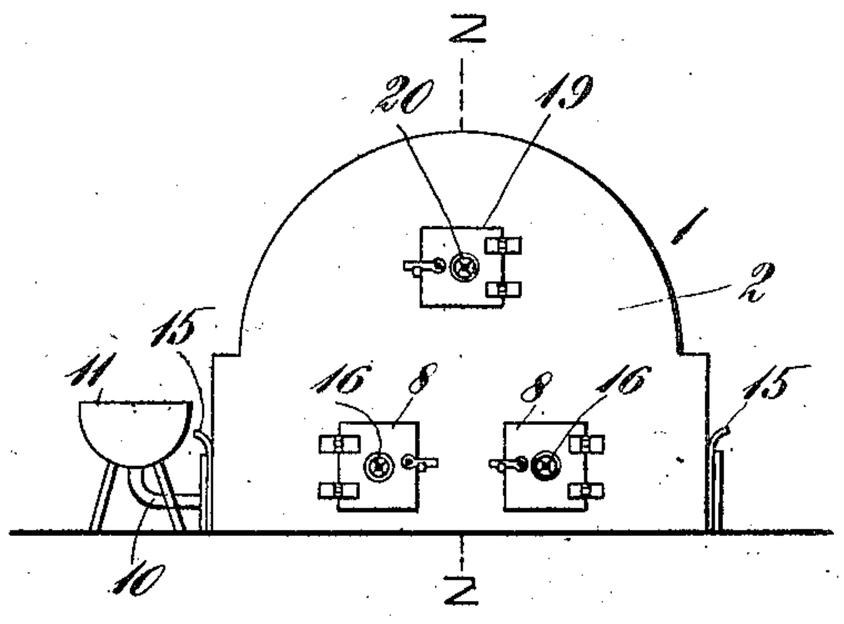

Fig. 1.

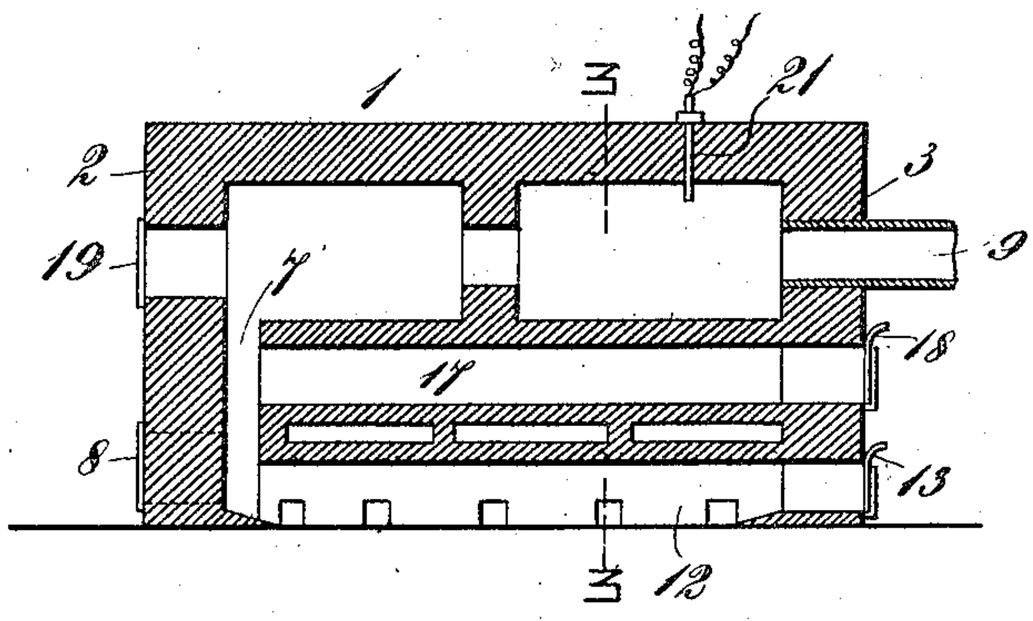

Fig. 2.

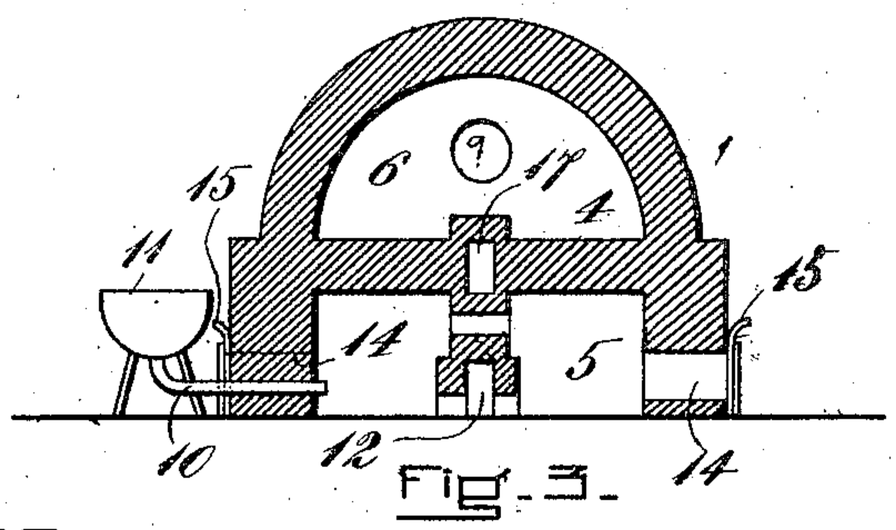

Fig. 3.

WITNESSES=

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CHARLES B. CLARK, OF BANGOR, MAINE.

SULFUR-BURNER.

952,100. Specification of Letters Patent. Patented Mar. 15, 1910.

Application filed September 29, 1909. Serial No. 520,073.

To all whom it may concern:

Be it known that I, CHARLES B. CLARK, of Bangor, in the county of Penobscot and State of Maine, a citizen of the United States, have invented a new and useful Improvement in Sulfur-Burning Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification, in explaining its nature.

The essential object of my invention is to provide a sulfur burning furnace especially adapted for burning sulfur and forming sulfur dioxid gas according to the process described in my co-pending application for Letters Patent of the United States, Serial No. 447,350, filed August 7, 1908. In said application the process as therein described consists essentially in burning the sulfur, admitting heated air to the gases and products of combustion of the burning sulfur for effecting a burning of the vaporized sulfur, and then maintaining the gases and products at such proper high degree of temperature that any sulfur trioxid therein may be decomposed or converted into sulfur dioxid.

Not only, as said before, in the present type of furnace especially adapted for practicing the process referred to, but it has further adaptation in that provision is made whereby the temperature of the air admitted within the chamber of the burner or chamber in which the sulfur is initially burned may be regulated as occasion may require. During the burning of sulfur sulfur trioxid cannot well be produced at a temperature varying from 420° to 1100° C. Accordingly in my present type of furnace it is my further object to burn the sulfur in heated air maintained within the limits aforementioned.

It is a further object of my invention to provide a furnace presenting a compact structure and one also which will not necessitate the employment of any auxiliary operating means; to provide, in other words, a stationary furnace as differentiated from a furnace having a movable or rotary part.

My invention can best be seen and understood by reference to the drawings, in which—

Figure 1 shows the furnace in front elevation. Fig. 2 is a section taken on line 2—2 of Fig. 1, and Fig. 3 is a section taken on line 3—3 of Fig. 2.

Referring to the drawings 1 represents the furnace of which 2 and 3 are the respective front and rear ends thereof. The furnace is preferably made of fire brick or other heat resisting substance, and consists of a stationary structure. On the inside the furnace is divided by a separating partition 4 into two apartments 5 and 6, respectively, one above the other. The lower apartment 5 is what may be termed the chamber of the burner, or, in other words, the chamber in which the sulfur is initially burned. The upper chamber 6 is what may be termed a combustion chamber inasmuch as the hot gases and products of combustion from the sulfur burning in the chamber 5 are adapted to pass out from this chamber into the chamber 6 where the combustion is completed. The gases pass from the chamber 5 into the chamber 6 by way of a connecting passage 7. This passage is arranged preferably at the front end of the furnace and is provided by foreshortening the dividing partition 4, the gases passing from the chamber 5 upwardly around the end of the partition 4 and thence into the combustion chamber. Entrance may be had into the chamber 5 of the burner at the front by way of doors 8.

9 represents the outlet pipe from the combustion chamber through which the gases pass out of the combustion chamber and into the pipes or connections of any system in connection with which the furnace is used.

The sulfur is burned upon the floor of the chamber 5. I prefer that the sulfur shall be admitted inside this chamber by way of an entering pipe 10, this pipe issuing from a receptacle or retort 11 in which the sulfur is melted in any suitable manner, the sulfur passing from this receptacle through the directing pipe 10 on to the floor of the chamber 5 of the burner.

Air is admitted for inducing an initial burning of the sulfur in the following manner. Passing through the chamber 5 is a conduit 12 having therein holes or openings into the chamber 5. The mouth of this conduit is preferably at the rear end of the furnace at which point the conduit is open to the atmosphere by which air may pass into the same. The open end of the conduit is controlled by a sliding gate 13 for regulating the amount of air entering the same. Air is also admitted into the chamber 5 of the burner by way of the ports or openings 14 extending through the walls of the cham-

ber, the outer ends thereof being open to the atmosphere. A number of these ports or openings are provided preferably on either side of the furnace, the openings being successively arranged. The outer end of each one of the openings is controlled by a sliding gate 15 for regulating the amount of air admitted therethrough into the chamber 5 of the burner. A further ingress for air into the chamber of the burner may be provided by adjustable dampers 16 formed in the doors 8 by which access is had into the chamber 5. In the partition 4 separating the chamber of the burner from the combustion chamber another conduit 17 is formed. This conduit extends from the rear end of the furnace at which point the conduit is open to the atmosphere horizontally through the partition 4, and opens at the forward end of the partition into the passage 7 which connects the chamber 5 of the burner with the combustion chamber. The open end of this conduit is controlled by a slide 18 for regulating the amount of air admitted to the conduit. Entrance is had into the combustion chamber by way of a door 19. In this door is an adjustable damper 20 by which air may be admitted into the combustion chamber as occasion may require.

Within the combustion chamber and preferably in the top part thereof is a pyrometer 21 for observing the temperature therein.

Now in connection with the above described apparatus assuming that sulfur has been admitted to the floor of the chamber 5 of the burner air is admitted for inducing the initial burning of the sulfur by way of the conduit 12 and the ports 14 supplemented if need be by opening the adjustable dampers 16 in the doors 8 at the front end of the furnace. Now by reason of the fact that the conduit 12 is located within the chamber 5 air entering into this conduit will of course be heated by the gases and products of combustion from the burning sulfur before entering the chamber of the burner. Accordingly heated air will be supplied for effecting the burning of the sulfur. In order that the sulfur may not be burned in air at too high a temperature as it might be if the only air admitted for burning the sulfur was by way of the conduit 12, further air is admitted by way of the ports or openings 14 through the wall of the furnace which, as said before, are supplemented if need be through openings in the adjustable dampers 16. Now the air admitted through these openings 14 or dampers 16 is a relatively cool air, or at any rate, very much cooler than the air within the conduit. Accordingly it, when mingling with the air coming from the conduit, has a cooling effect thereon when by a proper regulation of the sliding gate 13 controlling the mouth of the conduit and the gates 14 controlling the openings 12, as well as by an adjustability of the dampers 16, not only may just the proper amount of air be admitted for burning the sulfur but the air may be kept at a proper temperature, which temperature, as said before, should not be below 400° or above 1100° C. to eliminate as much as possible the formation of sulfur trioxid gas. It is by way of the conduit 17 that air is admitted to mingle with the gases passing out of the chamber 5 of the burner into the combustion chamber for inducing the burning of the vaporized sulfur therein in accordance with the process described in my aforesaid application. Inasmuch as this conduit is located between the chamber of the burner and the combustion chamber the air admitted therethrough will of course be subjected to the heat of both chambers. By means of the sliding gate 18 controlling the entrance to this conduit not only may a proper amount of air be admitted for burning the vaporized sulfur but by the regulation of this damper and also by a regulation of the damper 20 admitting a cooling air into the combustion chamber, just the proper high degree of temperature may be maintained within the combustion chamber for decomposing or converting any sulfur trioxid that may be contained in the gases into sulfur dioxid in accordance with the process described in my aforesaid application.

The furnace is operated in the following manner. The sulfur is admitted to the floor of the combustion chamber 5 where it is ignited. As the sulfur burns air is admitted for inducing a continuation of the burning thereof by way of the conduit 12 supplemented by the openings 14, or if need be by the openings in the damper or dampers at the front end of the chamber. By a proper regulation of the doors or slides controlling these various openings a proper temperature may be maintained, which temperature is within the limits aforementioned when the sulfur will be consumed within the chamber of the burner and very little sulfur trioxid be formed. The gases from the chamber 5 will pass into the combustion chamber by way of the connecting passage 7 around the end of the partition 4. As the gases and products enter the combustion chamber heated air from the conduit 17 will commingle therewith sufficient in amount to induce a burning of the vaporized sulfur which may be contained in the gases and products and then by opening the damper 20 as occasion may require admitting cool air into the combustion chamber a proper high temperature may be maintained therein as described in my aforesaid application, for decomposing or converting any sulfur trioxid in the chamber into sulfur dioxid.

In practice the furnace has proven very effective. I find that I am enabled to con-

sume all the sulfur admitted inside the furnace and that no traces of vaporized sulfur or sulfur trioxid appear in the pipes or connections beyond the point of the furnace, the same either being consumed or converted therein as before described.

Having thus fully described my invention I claim and desire to secure by Letters Patent of the United States:

1. A sulfur burning furnace having a burner provided with a chamber in which the sulfur is burned, means whereby hot air may be introduced into the chamber of the burner for inducing an initial burning of the sulfur therein, and means whereby the temperature of the gases and air within said chamber may be controlled by the admission of a cooling air thereto.

2. A sulfur burning furnace having a burner provided with a chamber in which the sulfur is burned, means whereby hot air may be introduced into said chamber for inducing an initial burning of the sulfur therein, means whereby the temperature of the air and gases within said chamber may be controlled, a combustion chamber connecting with said chamber of the burner, means whereby air may be supplied to the gases in said combustion chamber which means is adapted and arranged to the end that air introduced therethrough may be heated by the products of combustion, and means whereby the temperature of the commingled air and gases within the combustion chamber may be controlled by a further admission of air.

3. A sulfur burning furnace having a burner provided with a chamber in which the sulfur is burned, means whereby hot air may be introduced into said chamber for inducing an initial burning of the sulfur therein, means whereby the temperature of the gases and air within said chamber may be controlled by the admission of a cooling air thereto, a combustion chamber connecting with said chamber of the burner, means whereby hot air may be supplied to the gases in said combustion chamber, and means whereby the temperature of the commingled air and gases within the combustion chamber may be controlled by a further admission of cooling air thereto.

4. A sulfur burning furnace having a burner within the chamber of which the sulfur is burned, an air receiving conduit located within said chamber and opening into the same and which chamber of the burner is provided with openings in the wall thereof for providing a further admission of air thereto.

5. A sulfur burning furnace having a burner within the chamber of which the sulfur is burned, an air receiving conduit located within said chamber and opening into the same and which chamber of the burner is provided with openings in the wall thereof for providing a further admission of air thereto, means for controlling the mouth of said conduit and means for controlling the mouths of said openings.

6. In a sulfur burning furnace, a chambered structure having formed therein a burner chamber or chamber in which the sulfur is initially burned, and a combustion chamber located adjacent the burner chamber with a connecting passage between said chambers whereby gases and vapors from the burning sulfur may pass from said burner chamber into said combustion chamber; means whereby air may be supplied to said burner for inducing an initial burning of the sulfur therein, and an air receiving conduit located inside of said structure for supplying heated air to the gases and vapors within said combustion chamber.

7. In a sulfur burning furnace, a chambered structure having formed therein a burner chamber or chamber in which the sulfur is initially burned, and a combustion chamber located adjacent the burner chamber with a connecting passage between said chambers whereby gases and vapors from the burning sulfur may pass from said burner chamber into said combustion chamber, an air receiving conduit located within said burner chamber for inducing an initial burning of the sulfur therein, means whereby the temperature of the heated air and gases within said burner chamber may be controlled by the admission of a cooling air thereto, an air receiving conduit located also within said structure for supplying heated air to the gases and vapors of the burning sulfur within said combustion chamber, and means whereby the temperature of the gases and vapors within said combustion chamber may be controlled by a further admission of cooling air as occasion may require.

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