June 28, 1927. 1,634,092

H. BLUMENBERG, JR

SULPHUR BURNER

Filed Oct. 16, 1925 4 Sheets-Sheet 1

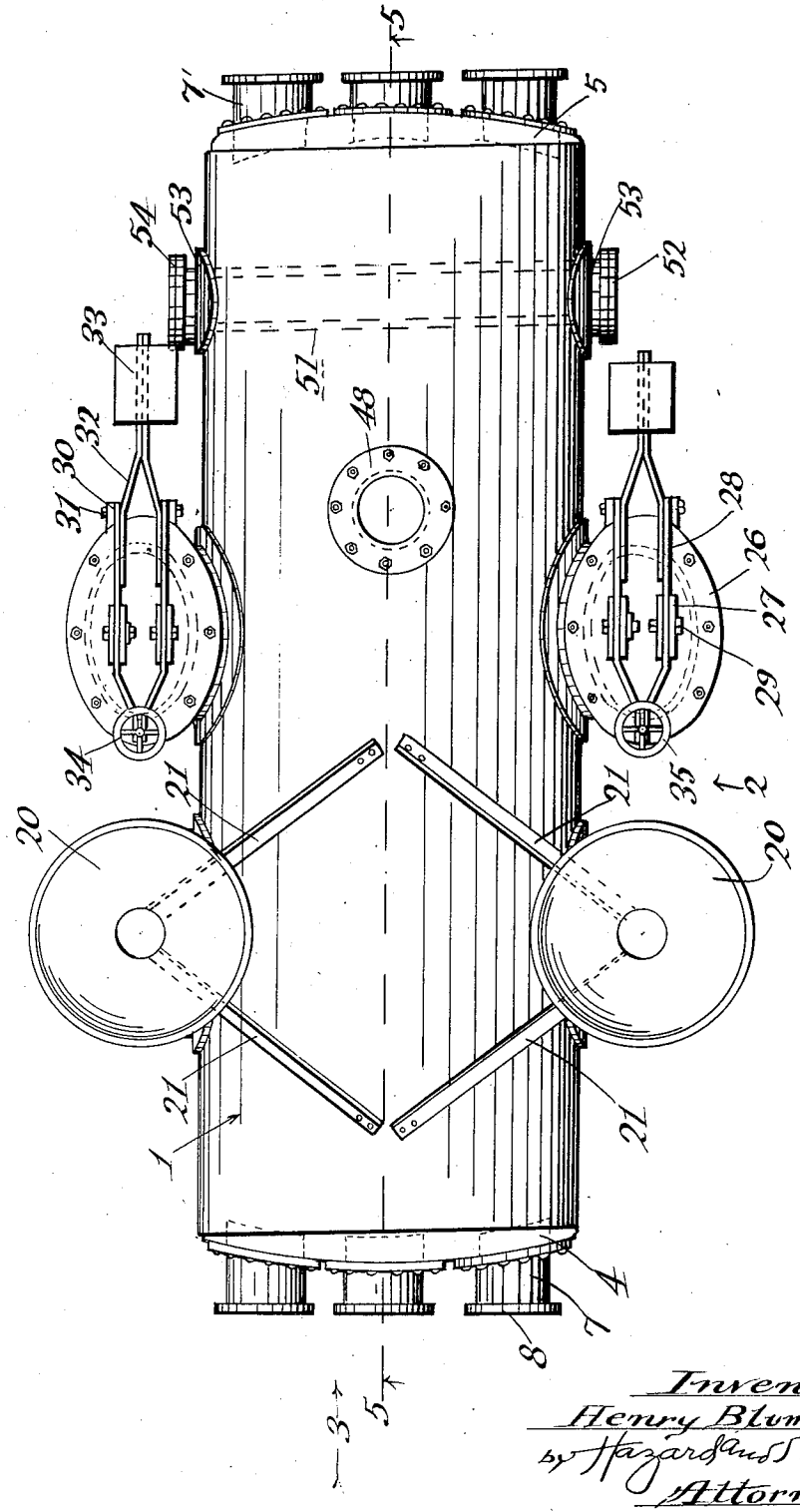

Fig. 1.

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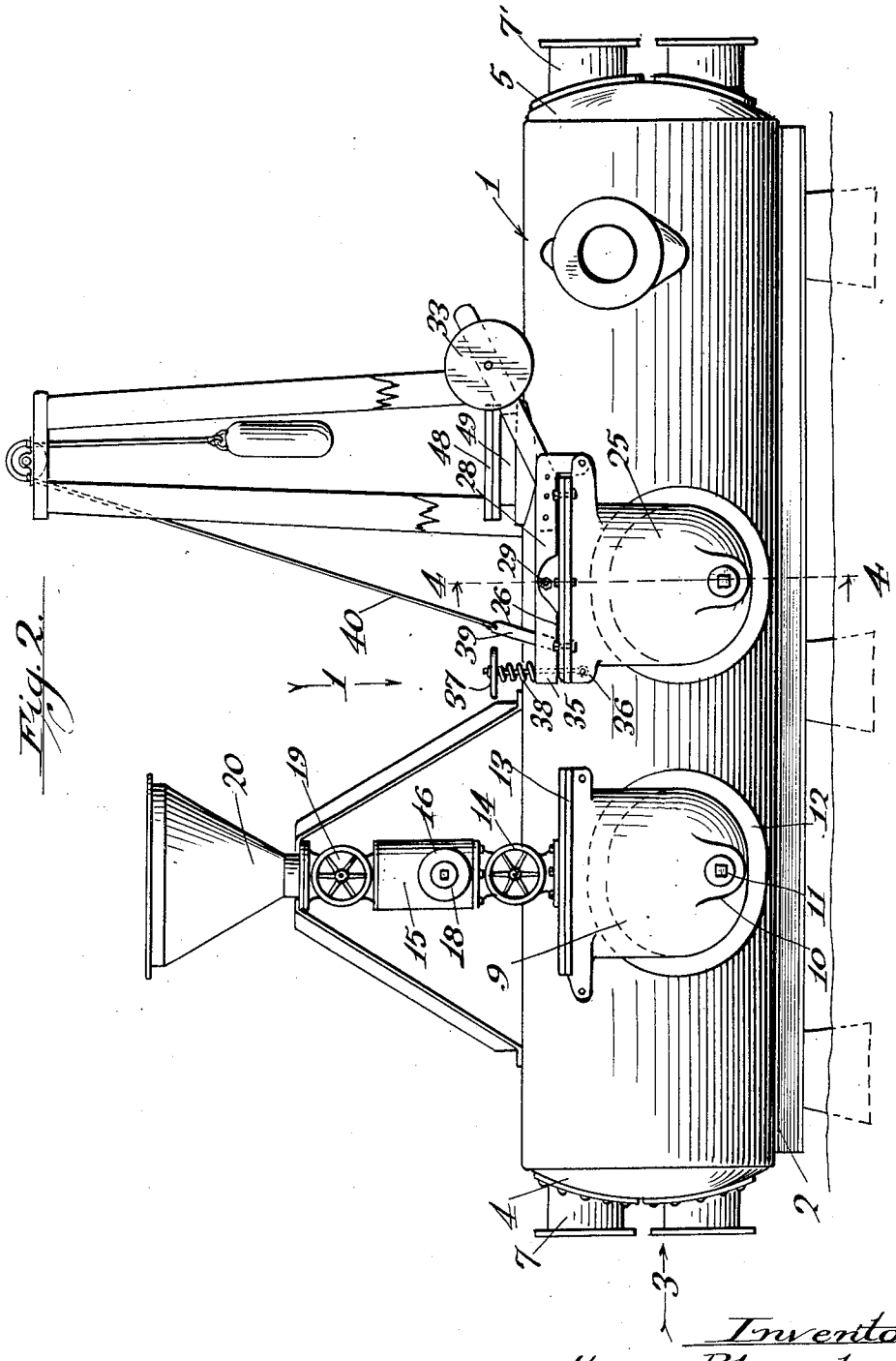

Fig. 2.

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Fig. 3.

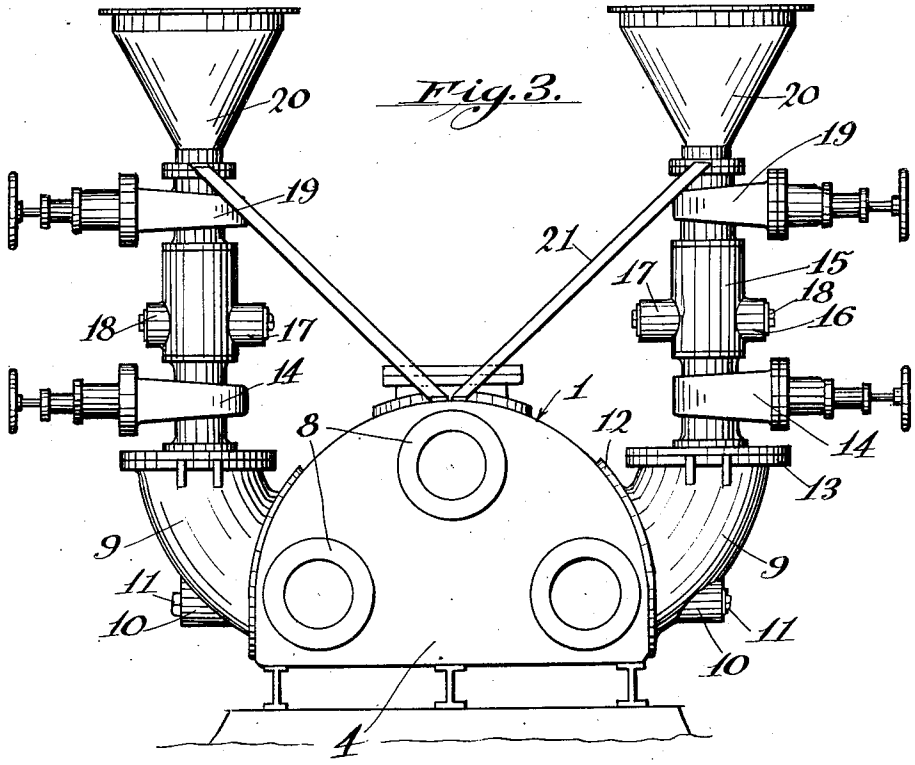

Fig. 4.

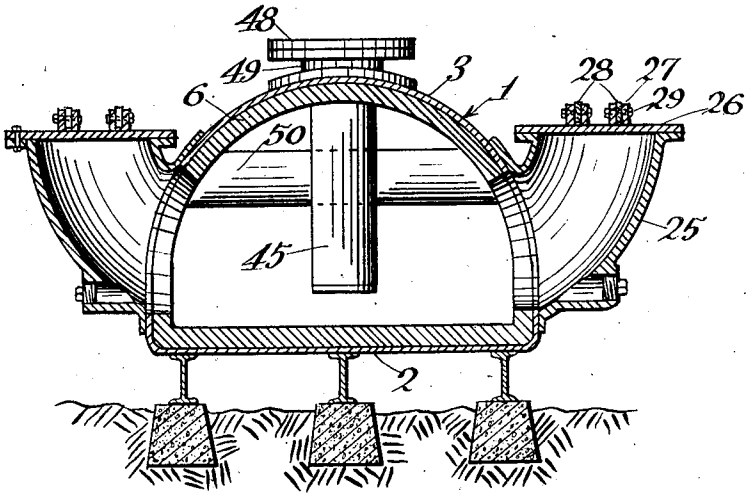

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Fig. 6.

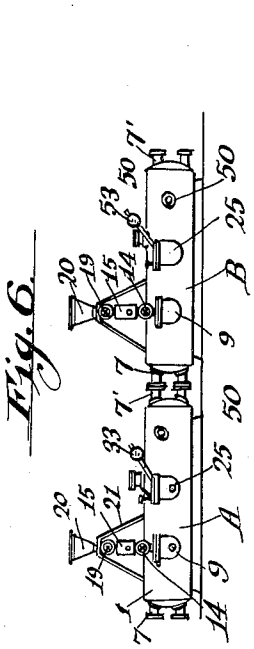

Fig. 5.

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1,634,092

UNITED STATES PATENT OFFICE.

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SULPHUR BURNER.

Application filed October 16, 1925. Serial No. 62,928.

My invention is a sulphur burner and in the method of burning sulphur to form sulphur dioxide.

An object of my invention is to burn sulphur in an elongated flat furnace under a moderate pressure of air and to feed the sulphur at the sides of the furnace, whereby the charge of sulphur is situated out of the direct draft of the furnace and thereby out of the direct heat. The sulphur charged in the sides of the burner melts and spreads over the bottom and then burns with an intense heat, developing the sulphur dioxide.

Another feature of my invention is in the provision of charging stacks which may be shut off by valves to be gas tight, preventing the discharge of sulphur dioxide fumes and allowing definite quantities of sulphur to be charged into the furnace; these stacks being provided with clean out openings to remove the sulphur should it become caked from any cause.

A further object of my invention is to provide cooling radiators inserted in the furnace to absorb the heat and to transfer it to the air surrounding the furnace; thus continuously conducting the heat generated in the furnace away therefrom.

Another feature of my invention is the use of sulphur furnaces in series, whereby a first furnace discharges its products of combustion through the second, and the second furnace may be utilized to cool the first furnace by drawing the air for the second furnace through the first.

The various features of my invention in the construction illustrated will disclose a flat based arch-shaped elongated furnace, having sulphur feeding stacks on opposite sides, with chutes conveying the charge into the opposite sides of the furnace, the stacks being controlled by valves.

A pair of emergency hand feeders are also provided on opposite sides of the furnace and have closure gates allowing the sulphur to be dropped therethrough and quickly enclosed; the sulphur being likewise fed into chutes from which the melted sulphur passes into the base of the furnace in the same manner as with the valve charging stacks.

In each of the furnaces I mount a vertical radiator tube which extends through the roof of the furnace inwardly to a position adjacent the base, forming a vertical closed tube. This becomes heated and causes the continuous current of air to carry away the heat transmitted through the tube. In addition to this I provide a transverse horizontal radiator tube extending across the furnace near its discharge end. This tube is open at both ends and readily conducts heat from the interior of the furnace to the air in the tube which develops a strong current from one side to the other, depending on the direction of the wind, or a current of air may be mechanically blown through the horizontal radiator.

My invention will be more readily understood from the following description and drawings, which show other details than those above mentioned.

Figure 1 is a plan view of my sulphur burner furnace taken in the direction of the arrow 1 of Fig. 2.

Fig. 2 is an elevation of the furnace of Fig. 1 in the direction of the arrow 2.

Fig. 3 is a front elevation taken in the direction of the arrow 3 of Figs. 1 or 2.

Fig. 4 is a transverse section on the line 4—4 of Fig. 2 in the direction of the arrows, illustrating the emergency manually operated charging chutes.

Fig. 5 is a longitudinal section of Fig. 1, on the line 5—5 taken in the direction of the arrows.

Fig. 6 is a diagrammatic elevation illustrating the attachment of my furnaces in series.

In the drawings, the furnace body is designated generally by the numeral 1 and is constructed with a floor 2, an arched top 3 having front and rear ends 4 and 5 forming end closures. The furnace is lined with suitable fire brick or vitrified protecting covering 6 to protect the metal from the intense heat. The front and rear ends of the furnace are provided with pipes 7 and 7′, having flanges 8 thereon which form the inlet for air at the front end and the outlet for sulphur dioxide, nitrogen and any unburned oxygen at the rear end of the furnace.

The side charging stacks are constructed as follows, having reference particularly to Figs. 1, 2, 3 and 5.

Curved feed boxes 9 are attached to opposite sides of the furnace and are provided with a clean-out opening 10 having closure

plugs 11. These feed boxes are bolted to the furnace by a flange 12 and have a horizontal flange 13 supporting the valve stacks. A lower valve 14 is positioned on the flange 13 and has a charge box 15 secured to the opposite side of the valve. This charge box has a pair of oppositely positioned clean-out openings 16 and 17, each closed with a plug 18. An upper valve 19 is connected above the charge box 15 and supports a hopper 20 which discharges through the valve. It is also desirable to utilize braces 21 forming stays from the base of the hopper to the top of the arch of the furnace.

The manner of operation of the charging stacks is substantially as follows:

The raw sulphur will be fed into the hoppers 20 as desired and when the valve is opened the charge box 15 may be filled to the desired level. The valve 19 is then closed and the valve 14 opened allowing the discharge of the sulphur into the feed boxes 9. If the furnace is not in operation this sulphur is ignited through the clean-out opening 10 by removing the plug 11 and reinserting the plug when properly ignited.

The air is fed under pressure to the air inlet pipes 7 of which one or two of the three pipes may be shut off by a closure cap if desired. The pressure of air in the burner is dependent upon the back pressure of the stand pipe in the decomposer for operating on the sulphur dioxide which would have a hydrostatic pressure of about one pound per square inch for each foot of liquor in the decomposer tank. As these tanks would ordinarily run about ten to eleven feet of liquor a pressure of about five pounds per square inch of air is required above atmospheric. When the furnace is in operation the sulphur in the feed boxes 9 melts and flows across and lengthwise of the floor 2 where it burns and as the air is forced in under pressure a violent and direct draft is created through the furnace which carries the flames and products of combustion away from the feed boxes 9 in which a dead air space is formed. This prevents to a large extent the transference of heat from the furnace through the chutes to the stacks contained in the charging valves, charge box and hopper.

The manual emergency feed boxes are constructed substantially as follows, and are shown in Figs. 1, 2, 4 and 5: These feed boxes 25 are of substantially the same construction as the feed boxes 9 of the charging stacks, having similar clean-out openings and securing flanges. The feed boxes are closed by box covers 26 which are provided on their upper surfaces with a double pair of ears 27 carrying a pair of longitudinal straps 28 swivelling therethrough by the swivel pins 29. The straps 28 are hinged to lugs 30 by means of hinge pins 31 and have counter-weight straps 32 secured thereto, carrying a counter-weight 33 on the opposite side of the hinge. The straps converge and form a slot 34 adapted to receive the pivoted bolt 35 which is swivelly mounted on a pin 36, secured to each feed box 25. This bolt is provided with a threaded hand wheel 37 and with a spring 38 through which a quick closure of the cover may be made, securing the cover tightly in position. If desired a hoisting eye 39 may also be secured to the cover and have a hoisting chain 40 leading over a pulley or the like, above the furnace.

Ordinarily the emergency feeding boxes would not be required in operation of the furnace, however, if for any reason the feeding stacks should become closed, these emergency boxes could be used and in practice the air would be shut off for a short time while the raw sulphur is being manually charged through the emergency boxes, thus reducing the amount of sulphur dioxide escaping from the furnace.

The vertical radiator 45 is positioned directly rearwardly of the emergency feed boxes and is illustrated particularly in Figs. 1, 2, 3, 4 and 5. This radiator comprises a tube 46 having a screw threaded closure plug 47 at its lower end and by means of the flange 48 it is bolted to the collar 49 attached to the crown of the furnace arch, the connection being gas tight. As this radiator is placed vertically in the direct draft of the furnace it will become heated under a high temperature, this heat being rapidly conducted to the air contained therein, causing a rapid upflow of air adjacent the walls of the pipe and a down flow of cold air in the center of the pipe. If desired a draft pipe may be inserted blowing air downwardly against the plug 47.

The horizontal radiator 50 is illustrated in Figs. 1, 2, 4 and 5 and comprises a pipe 51 having a flange 52 on one end which is bolted to a sleeve collar 53 secured to the arch wall of the furnace. The opposite end of the pipe is preferably screw threaded and secured to a screw threaded flange 54 which latter is bolted to a sleeve collar 53 of similar character to that utilized in the opposite side of the furnace.

The use of radiators such as above described and the proper positioning thereof is an important factor in my sulphur burner, as it is necessary to burn sulphur within a comparatively narrow range of temperatures, as in operation it is necessary to melt the sulphur in the feed boxes at substantially the same rate that it will flow across and lengthwise of the furnace and be consumed without raising the temperature sufficiently high to sublime the sulphur without burning and forming dioxide. Therefore it is necessary to conduct the heat developed away from the furnace rapidly as this allows

the proper burning of the full charge of sulphur fed into the furnace, developing the greatest amount of sulphur dioxide without loss in the form of sublime sulphur.

In Fig. 6 I illustrate the manner of coupling my furnaces in series, in which a first furnace is indicated by the letter A and the second furnace by the letter B. These furnaces are coupled with the discharge pipes 7' of the furnace A connected to the inlet pipes 7 of the furnace B. Normally in utilizing the furnaces in series, only one furnace will be burning at the same time. If the furnace A should be burning and become overheated, the feed of sulphur can be shut down and the second furnace B can be ignited. Thus cold air will be forced through the furnace A and cool such furnace to the desired temperature. Should the furnace B become overheated, the feed of sulphur thereto could be stopped and it would gradually cool as the sulphur dioxide and nitrogen passing therethrough would lower the temperature to a sufficient extent to prevent subliming of the sulphur and overheating of the furnace.

My invention comprises not only the structure of the furnace, but the method of burning sulphur by charging into a dead air space in the furnace, allowing the sulphur to gradually melt and flow over the floor of the furnace and then burning to sulphur dioxide.

My invention also comprises the method of passing sulphur dioxide from a first furnace through a second furnace to gradually cool such furnace due to the lowered temperature of the sulphur dioxide and nitrogen from that of the temperature of combustion and also the cooling of the first furnace by burning sulphur in the second furnace, utilizing air drawn through the first furnace and thus rapidly cooling such furnace.

In the operation of my furnace the feed boxes 9 and 25 become very hot and are of such a temperature that when the sulphur is dropped into the feed boxes it to a certain extent sticks thereto and does not fall as a full charge into the floor of the furnace. Moreover, the sulphur contained in the feed boxes gradually melts due to the high temperature of the boxes themselves and also to the heat radiated from the burning sulphur in the floor of the furnace. However, the sulphur contained in the feed boxes is out of the direct draft of the furnace and therefore is not subjected to the direct action of the hot combustion flames.

My invention in the constructive details of my furnace, the feeding stacks for the sulphur and other details may be considerably changed without departing from the spirit of my invention as set forth in the description drawings and claims.

Having thus described my invention, what I claim is:

1. A sulphur burning furnace comprising in combination an elongated furnace, a feeder stack located on the side of the furnace, an air inlet at one end and an outlet at the other end for the products of combustion.

2. A sulphur burning furnace as claimed in claim 1, having in addition an emergency feeder box on the side of the furnace with a closure cover therefor.

3. A sulphur burning furnace comprising in combination an elongated arch-shaped furnace with a flat floor, feeding stacks positioned on opposite sides of the furnace having feed boxes connected to the sides of the furnace. charge boxes position above the feed boxes and resting thereon.

4. A sulphur burning furnace as claimed in claim 3, having in addition hoppers on top of the charge boxes and valves between the hoppers and the charge boxes and between the charge boxes and the feed boxes.

5. A sulphur burning furnace as claimed in claim 3, having in addition emergency feed boxes attached to the side of the furnace and having closure covers.

6. A sulphur burning furnace comprising in combination an elongated furnace having an arched top and a flat floor, a plurality of curved feed boxes attached on opposite sides of the furnace to the curved arch and adjacent the floor of the furnace, vertical feeding stacks attached to a pair of the feed boxes, closure caps attached to another pair of feed boxes forming emergency feeds and cleanout openings extending through the feed boxes into the furnace.

7. A sulphur burning furnace as claimed in claim 6, in which the feeding stacks comprise charge boxes and hoppers supported on the feed boxes and having closure valves between the feed boxes and the charge boxes and between the charge boxes and the hoppers.

8. An elongated sulphur burning furnace comprising in combination means to feed sulphur into the furnace, an air inlet at one end, an outlet at the opposite end for the products of combustion and a horizontal radiator tube extending transversely across the furnace having open ends and positioned in the line of the draft from the inlet to the outlet.

9. In a sulphur burner having an arched top, a feed box attached to the side of said furnace, having an opening adjacent the lower portion of the arch. a charge box supported on the feeder box and clean-out openings in the charge box and the feed box.

10. The method of burning sulphur comprising introducing sulphur into a sulphur burning furnace at the sides of the furnace.

away from the direct draft through such furnace, allowing the sulphur to melt and flow into the furnace in the direct line of the draft and of the products of combustion.

11. The method of burning sulphur comprising introducing sulphur into a highly heated chamber on the side of the furnace out of the direct draft of the furnace and in a position having substantially no draft, allowing the sulphur to melt by the heat of the structure of the chamber and the heat from the furnace proper and allowing said sulphur to flow over the floor of the furnace and burn with the products of combustion sweeping past the inlet chamber.

12. A sulphur burner comprising in combination a pair of sulphur burning furnaces connected end to end in series with the air inlet of the second furnace connected to the sulphur dioxide outlet of the first furnace and means to feed sulphur into each furnace independently one of the other, and means to feed air into the first furnace and to discharge the sulphur dioxide out of the second furnace.

13. A sulphur burner comprising in combination a plurality of elongated sulphur burning furnaces having sulphur feeders on the sides thereof, connected in series with the air inlet of one furnace being connected to the sulphur dioxide outlet of the preceding furnace, means to feed sulphur into each furnace independently of the other, and means to introduce air only through the first furnace of the series and to withdraw the sulphur dioxide only out of the last furnace in the series.

In testimony whereof I have signed my name to this specification.

HENRY BLUMENBERG, JR.