E. ROSSITER.

SULFUR BURNER.

APPLICATION FILED SEPT. 15, 1910.

1,038,442. Patented Sept. 10, 1912.

Fig. 1.

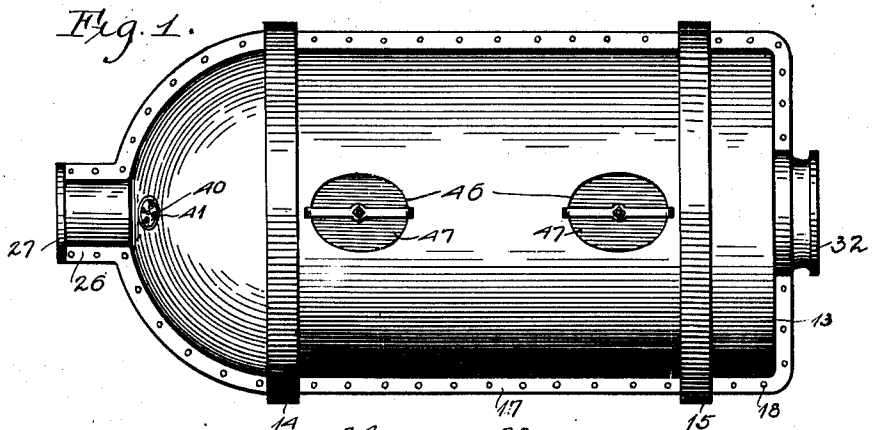


Fig. 4

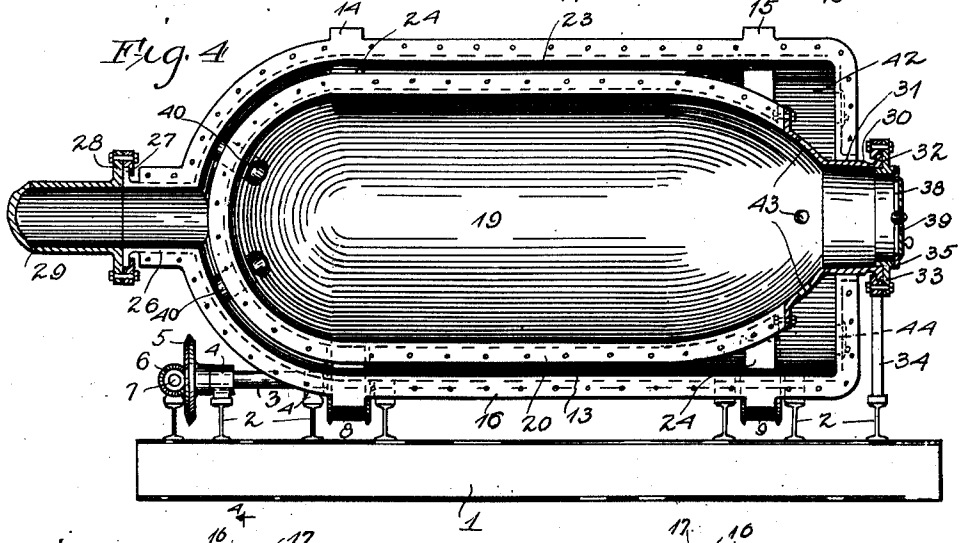


Fig. 2.

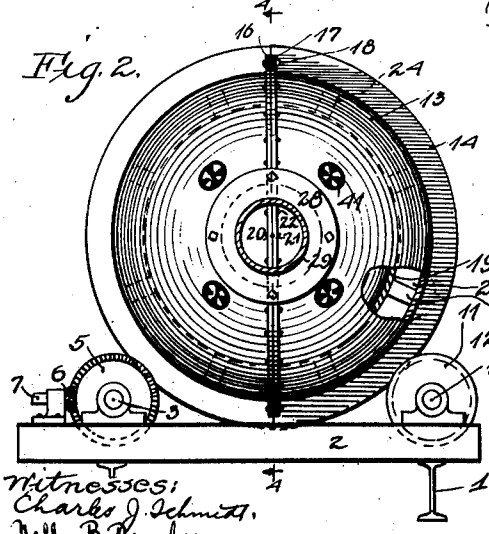
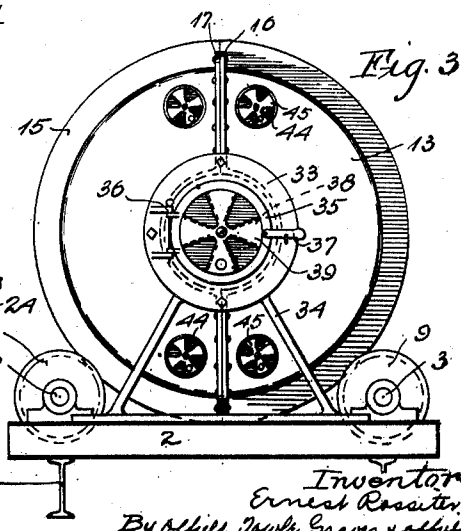


Fig. 3.



Witnesses:
Charles J. Schmitt.
Nelly B Pearborn

Inventor:
Ernest Rossiter.
By Offield, Towle, Graves & Offield
Attys.

UNITED STATES PATENT OFFICE.

ERNEST ROSSITER, OF PORT EDWARDS, WISCONSIN.

SULFUR-BURNER.

1,038,442. Specification of Letters Patent. Patented Sept. 10, 1912.

Application filed September 15, 1910. Serial No. 582,161.

To all whom it may concern:

Be it known that I, ERNEST ROSSITER, a resident of Port Edwards, in the county of Wood and State of Wisconsin, have invented certain new and useful Improvements in Sulfur-Burners, of which the following is a specification.

My invention relates to sulfur burner, and contemplates improved construction and arrangement therefor which will render its operation more efficient.

For the production of sulfur dioxid, sulfur is usually burned in the presence of air. In prior processes the sulfur is discharged into an oven and ignited, means being provided to agitate the sulfur and to mix air therewith during such burning, the product being sulfur dioxid (SO_2), this product being led away to be used for various purposes in various arts. However, the sulfur gas which is formed in the compartment in which the sulfur is agitated and burned will carry in suspension small solid particles of sulfur, and if this gas is drawn directly from the combustion chamber it will be more or less impure and not in the best and fittest condition for use for a great many purposes.

One object of my invention is, therefore, to give the sulfurous gas a secondary combustion treatment in order to thoroughly burn all such sulfur particles in order to produce a gas which is entirely pure and which can be used to better advantage in the arts, such as in treating wood to make pulp in the paper manufacturing art.

Another object is to utilize the heat of the burning main body of sulfur for heating the gas during its secondary or purifying treatment.

Another object is to mix a sufficient quantity of air in the most efficient manner with the sulfurous gas during the purifying period.

Another object is to provide improved apparatus for thoroughly agitating the burning sulfur and for thoroughly mixing air with the agitated sulfur during burning thereof, the sulfur being preferably charged into a drum or barrel adapted to be rotated to thoroughly agitate and tumble the contained sulfur and to force air currents through the drum to thoroughly mix and commingle with the sulfur and the generated sulfur dioxid.

Another object is to provide for drawing from the sulfur drum the generated sulfur dioxid and to cause this gas, together with sufficient air supply, to flow intimately about the sulfur drum so that the gas and air are given a secondary heating, during which any sulfur particles carried with the gas will be entirely consumed and transformed into sulfur dioxid, so that the gas which finally issues from the apparatus will be in its purest state. To provide for such treatment the sulfur burning drum is surrounded by a secondary drum carried thereby to revolve therewith and separated therefrom to leave an annular comparatively shallow compartment through which the sulfurous gas must flow, the drum in which the sulfur is primarily burned having at one end controllable air inlets and at its other end being connected with said annular compartment, which compartment at this end also has controllable air inlets.

Another object is to provide a common means for causing air to flow into and through the primary burning drum and to cause the nascent gas and fresh air supply to be drawn into and through the annular compartment, and to deliver the pure gas from said compartment.

In the accompanying drawings which illustrate a preferred form of apparatus Figure 1 is a plan view of the apparatus, Fig. 2 is an end view of the outlet end, Fig. 3 is an end view of the other end, and Fig. 4 is a sectional view taken on plane 4—4, Fig. 2.

The supporting bed 1, which may be a number of I-beams, carries a plurality of transverse members 2, which may also be I-beams, these transverse members supporting various bearings for the drive and drum supporting mechanism. As shown, the shaft 3 is journaled in bearings 4 and carries at one end a bevel gear 5 engaged by bevel pinion 6 on a drive shaft 7, which may be connected with a suitable driving source (not shown). Shaft 3 extends longitudinally along one side of and over the bed and carries rollers 8 and 9, while at the opposite side of the bed a shaft 10 is journaled and carries rollers 11 and 12, which are respectively transversely opposite the rollers 8 and 9. An outer drum or barrel 13 has annular bands or rails 14 and 15 engaging with rollers 8, 11 and 9, 12 respectively to thus support the drum 13 to be rotated upon rotation of shaft 3 by the driving source. The drum 13 may be constructed of two similar

halves having peripheral flanges 16 and 17 connected together by suitable bolts 18. Within the outer drum 13 is the inner primary combustion drum 19 which may also be constructed of similar halves having peripheral flanges 20 and 21 connected together by bolts 22, the diameter of this inner drum being somewhat less than the diameter of the outer drum to leave an annular compartment 23, the inner drum having spacing lugs 24 extending therefrom in line with the bands 14 and 15 of the outer drum to space the drums apart. As shown, the left ends of the drums are semi-spherical, and the outer drum walls are extended near the axis to form the annular neck 26, which terminates in a flange 27 adapted to be connected to a flange 28 at the end of piping 29 with which a pump (not shown) is connected. The other end of the inner drum is contracted and terminates in a neck 30 which extends through the axial opening 31 in the corresponding end of the outer drum, this neck terminating in a flange 32 having bearing in an annular head 33 supported from the bed 1 by a standard frame 34. The entrance through this annular head is adapted to be closed by a door 35 hinged at 36 and having the latch 37, the door having segment openings 38 controllable by the rotatable damper 39 pivoted to the door. At the left end air inlet ducts 40 extend through and between the walls of the outer and inner drums and are controllable from the exterior by pivoted damper disks 41. The right end of the outer barrel remains cylindrical, so that between this end and the contracted end of the inner drum a compartment head 42 is formed for the annular chamber 23 between the drums. Through the walls of the inner drum are the passageways 43 for connecting the inner drum with the compartment 42. In the adjacent head of the outer compartment are air inlet openings 44 controlled by rotatable dampers 45. As shown in Fig. 1, the outer drum has also a plurality of cleaning man holes 46 which may be closed by covers 47. Sulfur, usually in powdered form, is charged into the inner drum through the door 35, and the sulfur is ignited and the drums slowly rotated to tumble about and to thoroughly agitate the burning sulfur within the drum. The pump (not shown) connecting with the outlet pipe 29 is set in operation, and the suction effect thereof will cause air to be drawn through the air inlets 40, through the air inlets 38, if the damper 39 is open, and through the air inlets 44 to the annular compartment. The air flowing into the combustion drum flows longitudinally therethrough, and is thoroughly mixed and commingled with the burning sulfur as it is tumbled about and across the drum, so that sulfur dioxid is formed. The suction effect on the air inlet openings of the inner drum is by way of the outer compartment 23 and the communicating passageways 43 between the inner drum and said annular compartment, and the generated gas will be drawn through the passageways 43 into compartment 42 and through compartment 23 and out through the piping 29 to be delivered into a storage tank or to a place where it is desired to utilize the gas. The door 35 may be opened at any time to inspect the interior of the inner drum, and the damper 39 can be regulated to assist in supplying air to this drum, and ordinarily this damper is closed, so that the air supply to the inner drum will ordinarily be through the inlets 40. This air, flowing through the burning sulfur and through the unburned sulfur, will take on and hold in suspension unoxidized sulfur molecules, and if the gas were delivered for use directly from the inner drum it would be quite impure on account of the unoxidized sulfur therein and could not be used with the best results and the greatest efficiency. However, the impure gas, before it can be delivered for use, must first circulate through the compartment 23 which intimately surrounds the hot inner drum containing the burning sulfur, and the gas passing through the compartment 23 is therefore given a secondary heating, and in the presence of sufficient air which, by force of the pump, is drawn through the properly regulated dampers 45 into the compartment 23 to be thoroughly mixed with the gas, so that the sulfur particles in the gas will be thoroughly burned and converted into sulfur dioxid, and the delivered gas will therefore be of maximum purity and in the best condition for subsequent use in the various arts, as for example, in chemical pulp making in the paper manufacturing art. My process therefore involves the primary combustion of sulfur in one compartment, the thorough tumbling about and agitating of the burning sulfur in such compartment, the controllable supply of air into said compartment, the drawing off of the impure sulfurous gas from this compartment into a secondary compartment, the heating of the impure gas in this secondary compartment by the heat generated by the burning sulfur in the primary compartment, the controllable supplying of air into the secondary compartment, and the provision of suction means for in common causing the flow of air supply into the compartments and the delivery of the pure gas from the auxiliary or secondary compartment.

The apparatus above described which I use for carrying out my process is very compact, and requires very little power for its operation, the inner drum being within and concentric with the outer drum and supported in common therewith on the driving

rollers, these drums forming between them the secondary heating or combustion compartment, which receives its combustion heat from the burning sulfur within the inner drum. The common suction means for drawing air supply into the drums, for drawing the nascent gas from the inner drum into the secondary compartment, and for delivering the pure gas from the secondary compartment also constitutes a very important and novel feature. The air supply for the inner and outer drums can be accurately regulated at any time to get best results and the purest gas. The apparatus is entirely symmetrical and therefore perfectly balanced, and the apparatus can be readily inspected at any time while in operation and can be readily cleaned.

Changes and modifications are, of course, possible both in the construction and procedure, which would still come within the scope of my invention, and I do not, therefore, desire to be limited to the embodiment shown, and I therefore claim the following:

1. In a sulfur burner, the combination of an outer rotatable drum having a gas outlet at one end, an inner drum rotatable with the outer drum and spaced therefrom to leave an annular compartment, air inlets for said inner drum, gas passages connecting the interior of the inner drum with the annular compartment, and air inlets for said annular compartment.

2. In a sulfur burner, the combination of an outer axially rotatable drum, a drum having air inlets within said outer drum and connected to rotate axially therewith, said inner drum being spaced from the outer drum to leave an annular compartment, air inlet ducts leading from the outside of the apparatus to the inner drum, said inner drum being connected by gas passages with the compartment between the drums, said outer drum having air inlet passageways to said compartment between the drums, and an outlet from said annular compartment adapted for connection with a suction producing device whereby air will be drawn into said inner drum and the gas and vaporized sulfur of said inner drum drawn through said passageways into the annular compartment between the drums and the gas drawn from said annular compartment through the outlet from said compartment.

3. In a sulfur burner, the combination of an outer drum mounted to be axially rotatable drum within said outer drum connected to rotate axially therewith, said inner drum being spaced from the outer drum to leave an annular compartment, air inlets for connecting one end of said inner drum for air supply, the other end of said inner drum having passageways connecting said drum with said annular compartment, said outer drum having air inlets at one end located near said passageways for supplying air to said annular compartment, and a delivery outlet from the other end of the drum for connecting said annular compartment with a suction producing device, the suction from said device causing air flow inwardly through the various air inlets and causing the gas particles to be drawn from the inner drum into and through the annular compartment and out through the outlet from said annular compartment.

4. In a sulfur burner, the combination of an outer drum mounted to be axially rotatable, a drum arranged concentrically within said outer drum and connected to rotate axially therewith, said inner drum forming a primary sulfur combustion chamber and being spaced from the outer drum to leave an annular compartment for receiving the heat radiated from said inner drum, air inlets at one end of the inner drum, the other end of said drum having passageways through which gas may flow from the inner drum into the annular compartment, said outer drum having air inlets located near said passageways for supplying air to said annular compartment, and an axial outlet extension from said outer drum located near the air inlets to the inner drum, said outlet being adapted for connection with a suction device adapted to cause air to flow inwardly through the various air inlets and to cause the gas to be drawn from the inner drum into the annular compartment to be there given a secondary heating to be purified, and to draw off the purified gas through said outlet.

5. In a sulfur burner, the combination of an outer drum mounted to be axially rotatable, a drum arranged concentrically within said outer drum and connected to rotate axially therewith, said inner drum forming a primary sulfur combustion chamber and being spaced from the outer drum to leave an annular compartment for receiving the heat radiated from said inner drum, air inlets at one end of the inner drum, the other end of said drum having passageways through which gas may flow from the inner drum into the annular compartment, said outer drum having air inlets located near said passageways for supplying air to said annular compartment, and an axial outlet extension from said outer drum located near the air inlets to the inner drum, said outlet being adapted for connection with a suction device adapted to cause air to flow inwardly through the various air inlets and to cause the gas to be drawn from the inner drum into the annular compartment to be there given a secondary heating to be purified, the purified gas being drawn off through said outlet, the inner drum having an axial closure opening at its outlet end

through which the interior of the inner drum may be inspected.

6. In a sulfur burner, the combination of an outer drum mounted to be axially rotatable, a drum arranged concentrically within said outer drum and connected to rotate axially therewith, said inner drum forming a primary sulfur combustion chamber and being spaced from the outer drum to leave an annular compartment for receiving the heat radiated from said inner drum, air inlets at one end of the inner drum, the other end of said drum having passageways through which gas may flow from the inner drum into the annular compartment, said outer drum having air inlets located near said passageways for supplying air to said annular compartment, and an axial outlet extension from said outer drum located near the air inlets to the inner drum, said outlet being adapted for connection with a suction said device adapted to cause air to flow inwardly through the various air inlets and to cause the gas to be drawn from the inner drum into the annular compartment to be there given a secondary heating to be purified, the purified gas being drawn off through said outlet, said air inlets being controllable.

7. In a sulfur burner, the combination of an outer drum mounted to be axially rotatable, a drum arranged concentrically within said outer drum and connected to rotate axially therewith, said inner drum forming a primary sulfur combustion chamber and being spaced from the outer drum to leave an annular compartment for receiving the heat radiated from said inner drum, air inlets at one end of the inner drum, the other end of said drum having passageways through which gas may flow from the inner drum into the annular compartment, said outer drum having air inlets located near said passageways for supplying air to said annular compartment, an axial outlet extension from said outer drum located near the air inlets to the inner drum, said outlet being adapted for connection with a suction said device adapted to cause air to flow inwardly through the various air inlets and to cause the gas particles to be drawn from the inner drum into the annular compartment to be there given a secondary heating to be purified, the purified gas being drawn off through said outlet, said inner drum having an opening at its outlet end, a door for closing said opening, and an air inlet in said door, all the various air inlets being independently controllable to control the air supply therethrough.

8. In a device of the class described, a rotatable burner comprising an outer cylindrical casing provided at one end with a gas discharge opening, an inner casing arranged within and spaced from the outer casing and provided at one end with a charging opening, a door arranged over the charging opening, said inner casing being provided adjacent to one end with a plurality of openings serving to establish communication between the said inner casing and the space between said casings and draft tubes extending from the opposite end portion of the inner casing through one end portion of the outer casing.

9. In a device of the class described, a rotatable burner comprising an outer cylindrical casing provided at one end with a gas discharge opening, a concentrically disposed inner casing arranged within and spaced from the outer casing, said inner casing being provided at one end with a tubular neck leading through one end of the outer casing, said inner casing being further provided at a point adjacent to said neck with a plurality of openings communicating with the space between said casings, and a plurality of draft tubes extending from the opposite end portion of the inner casing through one end portion of the outer casing.

In witness whereof, I hereunto subscribe my name this 8th day of September, A. D., 1910.

ERNEST ROSSITER.

Witnesses:
G. F. STEELE,
J. E. BRYAN.