

(No Model.)

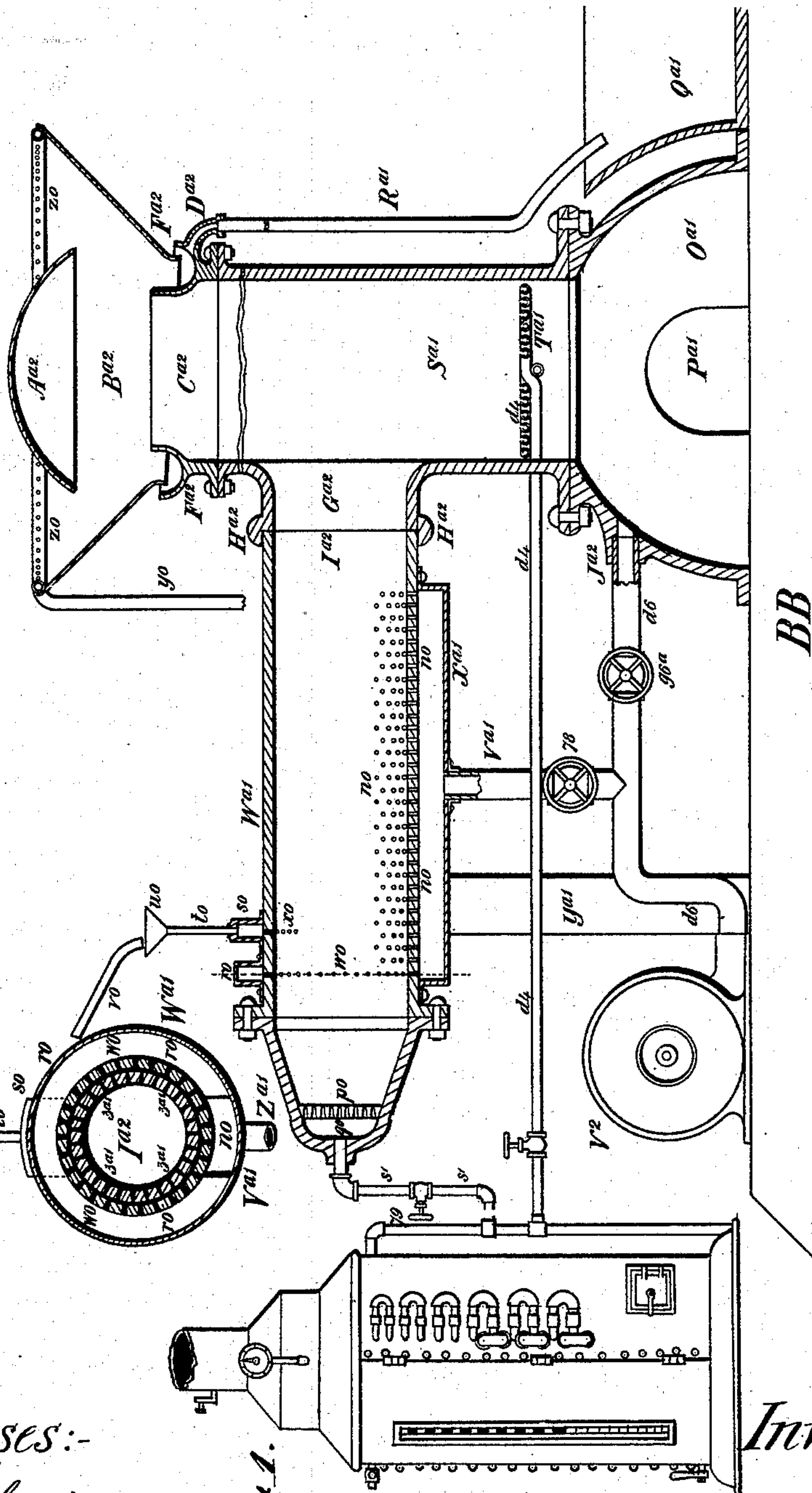
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# METHOD OF AND APPARATUS FOR DESULPHURIZING ORES.

No. 284,178.

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**Fig. 2.**



**Fig. 3.**

*Witnesses:-*

R. Sylvani.  
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Fig. 1.

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# UNITED STATES PATENT OFFICE.

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## METHOD OF AND APPARATUS FOR DESULPHURIZING ORES.

SPECIFICATION forming part of Letters Patent No. 284,178, dated September 4, 1883.

Application filed December 19, 1881. (No model.)

*To all whom it may concern:*

Be it known that I, WM. FRANK BROWNE, of the city, county, and State of New York, have invented a new and useful Method of and Apparatus for Desulphurizing Ores; and I do hereby declare that the following is a clear and full description thereof, reference being had to the accompanying drawings, which form a part of this specification.

10 This invention relates to a method of and apparatus for desulphurizing ores by means of a blast-flame produced by combining an atmospheric and a high-pressure hydrocarbon-gas blast, the ores being at first pulverized and  
15 then introduced into the blast-flame chamber in a comminuted state, wherein the flame and particles of ore become intimately intermingled and quickly heated, whereby the sulphur and other similar properties become volatil-  
20 ized and pass off in a rapid manner, while the precious metals are collected for further treatment.

The invention consists, first, in the combination of a high-pressure hydrocarbon-gas or gaseous-vapor generator with an apparatus in  
25 which ores are desulphurized; second, in a desulphurizing apparatus divided into horizontal and vertical compartments, through which a blast-flame charged with pulverized ore is  
30 forced, in combination with a high-pressure hydrocarbon-gas generator.

Figure 1 is an elevation of a high-pressure gas or gaseous-vapor and steam generator attached by suitable connections to a desulphur-  
35 izing apparatus. Fig. 2 is a longitudinal vertical section of an apparatus for desulphurizing ores connected with a hydrocarbon high-pressure gas generator. Fig. 3 is a transverse  
40 section taken on a line through the horizontal desulphurizing-chamber.

The foundation BB, on which the desulphurizer rests, is made of suitable material to support the superstructure erected thereon. The base of the vertical chamber is made of cast-  
45 iron, in the form of a spherical segment, the top and bottom of which are provided with flanges, as shown in the figure. To the top flange a vertical section, S', of the desulphurizer is bolted, as shown. This section is made  
50 of cast-iron; or it may be made of wrought-iron; or it can be constructed of suitable masonry. When made of cast-iron, the inlet G<sup>a2</sup>

should be cast therewith. This inlet should have a recess, H<sup>a2</sup>, cast thereon for the purpose of receiving and supporting one end of  
55 the horizontal compartment W', while the other end thereof can be supported by standards Y', or by any other suitable device. These compartments W' can be made in sections of suitable length and suitably joined by flanges  
60 and bolts. By means of these sections any required length of compartment can be obtained.

The entrance to the horizontal compartment is provided with a cone cap or head, Z', and a pipe, s', is connected to this cap for the pur-  
65 pose of conducting gas or gaseous vapor to said chamber. The pipe S' is provided with a valve, 79, to regulate the gas passing into the chamber, where it is sprayed out through  
70 perforated plate po into the desulphurizing-compartment, where said gas or gaseous vapor comes in contact with jets of air from the annular blast wo. This air-blast is formed  
75 by drilling an annular row of holes around and through the shell of the compartment W', and then covering the same by a conduit or annular channel, ro, which is connected to the  
80 air-blast chamber x'.

The powdered ore is discharged from pipe vo into funnel wo, thence through pipe to into a  
85 chamber, so, which includes the perforations xo, through which the ore falls in fine streams or a spray into the blast-flame, which blast forces it through the horizontal compartment, from  
90 which it is discharged into the vertical compartment, where it meets the blast-flame, which is derived from the blower V<sup>2</sup> through pipe d<sup>6</sup>, which is connected to the boss J<sup>a2</sup> and provided with a valve, g<sup>6a</sup>, from whence the air is  
95 discharged into the segmental sphere O' and forced up through or between the spiral turns of the grate T', where said air mingles with gas or gaseous vapor which is forced by the  
100 high-pressure gas-generator through branch pipe d<sup>4</sup>, thus producing a blast-flame which passes up through the compartment S', meeting the blast of ore and products of combustion from the horizontal chamber, and finally being discharged through the opening C<sup>a2</sup> against the concave disk A<sup>a2</sup>, from whence the  
current is diverted through the annular pas-  
sage formed by the circumference of said disk and the interior of the inverted conical hopper B<sup>a2</sup> into the open air.



The lower edge of the hopper projects into an annular channel,  $F^{a2}$ , which is for the purpose of receiving light particles of desulphurized ore that may have escaped with the blast into the hopper, there to be arrested by means of a spray of water issuing from the annular perforated pipe  $zo$ , which is supplied by water through pipe  $yo$  from a force-pump, or by any other means, whereby water can be obtained under pressure of sufficient force to spray the water across the annular opening between the disk and the interior of the hopper, whereby the solid particles on coming in contact therewith will be condensed or become mingled with the same and precipitated upon the sides of the hopper and pass down into the channel or trap  $F^{a2}$ , from whence it will flow around to the lowest point  $D^{a2}$ , and from thence through pipe  $R^{a2}$  into tank  $Q^{a2}$ . The coarser particles of the ore will fall through the current or blast into the chamber  $O^{a2}$ , from whence it can be removed through doors  $P^{a2}$ .

The horizontal desulphurizer is provided with the air-chamber  $X^{a2}$ , made of suitable material and attached to the under side of one or more sections  $W^{a2}$ . The air is forced into the said chamber or compartment by the blower  $V^2$  through pipe  $V^{a2}$  on opening valve 78, and from thence through the apertures  $no$ , which cover a suitable portion of the under side of the shell, the purpose of this spray being to keep the ore from falling and agglomerating on the bottom of the compartment. If necessary, the holes can extend around one-half of the circumference of the shell.

The interior of the two compartments can be lined with refractory material, as shown in cross-section, Fig. 3. This section is taken on a plane indicated by the dotted line which passes through the annular row of perforations  $wo$  and the air-channel  $ro$ . The interior  $I^{a2}$  can be lined with perforated fire-brick  $3^{a2}$ . These bricks should be made with a channel or groove on their convex side. This groove should correspond, when the bricks are in place, with the annular row of holes  $wo$ , thus forming an annular channel adjacent to said holes  $wo$ , whereby a passage for the air to the interior of the chamber is at all times insured.

What I claim, and desire to secure by Letters Patent, is—

1. In the desulphurization of ores, the herein-described process, which consists in forcing a blast of powdered ore into a combustion-chamber, introducing a blast of high-pressure hydrocarbon gas thereto, and finally burning said gas by injecting blasts of air opposite the ore blast and at right angles to the gas-blasts, whereby the ore is kept in suspension while being carried through the combustion-chamber, and the necessary oxygen and heat are furnished for the complete removal of the sulphur.

2. The combination, in a desulphurizing apparatus, of means for supplying ore, as described, a horizontal chamber provided with means for supplying gas, and a connected vertical chamber, also provided with means for supplying blasts of gas and air, as described, whereby the ore is maintained in an agitated condition, and thoroughly subjected to the heat resulting from the combination of the mingled gas and air.

3. The combination, in an apparatus for desulphurizing ores, of a horizontal chamber having its bottom perforated, and perforations also surrounding a portion of the chamber near the ore-supply, with an air-blast chamber inclosing said perforated portion, and with a device for supplying ore, consisting of a feed-hopper and conduit inclosing a portion of the desulphurizing-chamber, and connected with the same by means of perforations in the wall of the desulphurizer, and means for supplying hydrocarbon gas to said chamber, as described.

4. In an apparatus for desulphurizing ores, the horizontal desulphurizing-chamber provided with an annular row of holes, in combination with an air-blast chamber inclosing said perforated portion, devices for supplying gas arranged at right angles with the said air-blast, and an ore-supply, as described.

5. In an apparatus for desulphurizing ores, the combination of the horizontal chamber provided with a grate and gas-supply pipe, and the air-blast device arranged to deliver air at right angles to the axis of the chamber, and a vertical desulphurizing-chamber, as described.

6. In an apparatus for desulphurizing ores, a vertical chamber provided with an annular collecting-channel having a discharge-pipe, in combination with an inverted portion of a cone or hopper, a deflector, and an annular spray-pipe, as described, through which water is sprayed into said channel for the purpose of arresting the fine particles of ore which are precipitated and washed into said annular channel, and from thence discharged through a pipe into a receiver.

7. In an apparatus for desulphurizing ores, the combination of a gas-generating apparatus for the production of a hydrocarbon gas under high pressure, and a suitable connected desulphurizing apparatus provided with means for feeding ore, and means for supplying opposing blasts of air, as described, whereby the particles of ore are maintained in a suspended condition, and at the same time thoroughly subjected to the heat resulting from the combustion of the commingled blasts of gas and air.

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Witnesses:

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