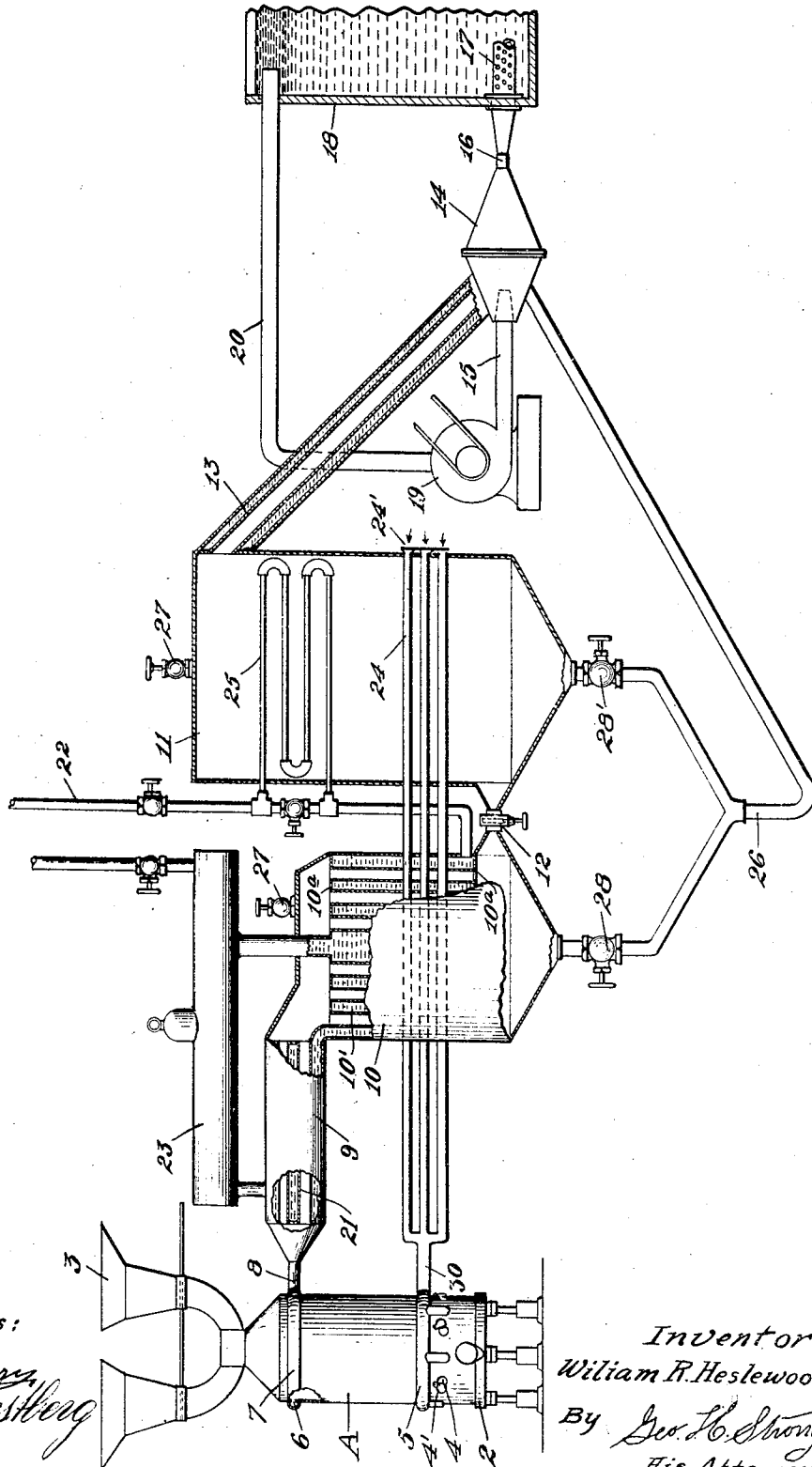


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 FUME CONDENSING AND REGENERATIVE APPARATUS.
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1,052,144.

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Witnesses:
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UNITED STATES PATENT OFFICE.

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FUME CONDENSING AND REGENERATIVE APPARATUS.

1,052,141.

Specification of Letters Patent.

Patented Feb. 4, 1913.

Application filed August 1, 1910. Serial No. 574,973.

To all whom it may concern:

Be it known that I, WILLIAM R. HESLEWOOD, citizen of the United States, residing at Berkeley, in the county of Alameda and State of California, have invented new and useful Improvements in Fume Condensing and Regenerative Apparatus, of which the following is a specification.

This invention relates to an apparatus for condensing fumes, and particularly pertains to an apparatus for reducing the temperature of and condensing the fumes or gases of smelting furnaces and the like.

It is the object of this invention to provide an apparatus for condensing fumes and noxious gases; and to provide means for gradually reducing the temperature of the fumes to facilitate final and complete condensation; and in so doing utilize the heat of the fumes for heating water and generating steam.

Another object is to combine with the furnace and fumes-condensing apparatus a means for regenerating or super-heating the air used in the furnace through the medium of the hot fumes and gases issuing therefrom.

The invention consists of the parts and the construction and combination of parts as hereinafter more fully described and claimed, having reference to the accompanying drawing, in which the figure is a side elevation of the invention with parts broken away.

In the drawing A represents a furnace or kiln which may be of any type and construction, and is here shown as a cupola smelting furnace having a bottom hearth 2 and charging hoppers or gallery 3 at its top. Air is supplied to the furnace through a series of tuyers 4 which are disposed around the furnace a little above the hearth 2. Some of these tuyers 4 connect with an outside surrounding trunk or feed pipe 5, while others open to the atmosphere and are provided with dampers 4'. The feed pipe 5 is for the purpose of conveying super-heated air to the furnace A, as will be later described.

A series of flues 6 are provided in the upper end of the furnace A, which open into an outside surrounding trunk 7 having a suction pipe 8 connected therewith through which the fumes and gases generated in the furnace A are drawn. The

suction pipe 8 leads to and terminates in one end of a horizontally disposed drum or expansion chamber 9; which opens into the top of a larger vertical expansion and settling chamber 10. Chamber 10 has vertical tubes 10' secured in head 10^a through which the gases travel. The chamber 10 connects at the bottom below the lower head 10^a with the bottom of a still larger expansion and regenerator chamber 11. The connection between the chambers 10 and 11 is disposed near the bottom of each, and is provided with a valve 12 for opening or closing the communication between the two.

A water-jacketed suction pipe 13 connects with the upper portion of the chamber 11 and terminates at its lower end in a suction case 14. The latter consists of two bell-shaped or opposed conical sections bolted together at their mouths. A nozzle 15 projects axially into the case 14 and discharges into the contracted throat 16 which has a flared, perforated extension 17 projecting into a water-containing tank or condensing reservoir 18. The nozzle 15 is connected with a centrifugal pump 19 which may have its inlet connected to a circulating pipe 20 leading to the upper portion of the reservoir 18, and terminating beneath the surface of the water therein, in such manner that when the pump 19 is operated, water will be drawn from the reservoir 18 through the pipe 20 and be returned to the reservoir through the nozzle 15, case 14, throat 16, and the perforated pipe 17. The rapidly moving jet of water directed across the chamber 14 tends to create a vacuum therein, thus causing a suction to take place so as to draw a continuous current of gases and fumes, previously generated in the furnace A, through the suction pipe 8 and the chambers 9, 10 and 11; and discharge them through the perforated pipe 17 into the water in the reservoir 18.

In order to utilize the heat of the gases for generating steam, etc., and in turn help cool the gases so they condense better and economize water, I have a series of water tubes 21 arranged within the drum 9, and these tubes connect with the water space in chamber 10 around the tubes 10' and between the heads 10^a; the highly heated fumes from the furnace A freely circulating around and between the water spaces. The water space in chamber 10 is connected to

a water supply pipe 22, through which water is admitted as desired. The steam generated by the boiling of the water in the tubes 21 and chamber 10 is collected in a steam dome 23 in the usual manner, from whence it may be drawn off and utilized for any desired purpose.

The fumes on passing through the drum 9 and tank 10 become greatly reduced in temperature by reason of the absorption of heat by the water in the tubes 21, but as the cooling action of the water alone is not great enough to sufficiently reduce the temperature of the fumes, they are further acted on in chamber 11 by cold air pipes 24 and water super-heating pipes 25. The air pipes 24 are open at one end, as shown at 24'. A circulation of fresh air continually takes place in pipes 24, and in so doing the air becomes heated by reason of absorbing heat from the fumes in the chamber 11, this heated air being delivered to the feed pipe 5 from whence it is delivered into the furnace A. The action of the suction device or ejector 15 in drawing off the fumes in the furnace A also tends to draw the air through the flues 24 which, when the dampers of twyers 4 are closed, insures a constant feed or delivery of superheated air to the furnace A. Pipe 25 provides a means of warming the water before delivery to the water tubes 21 and chamber 10, and also further assists the cooling of the fumes. The fumes on passing through the water-jacketed pipe 13 become thoroughly cooled so as to be acted upon by the water-condensing apparatus at a normal temperature, thus facilitating the process of condensation.

The chambers 10—11 have funnel-shaped bottoms which connect with a draw-off pipe 26 leading to any suitable suction or vacuum pump, the purpose of which is to remove the substances and particles in the form of soot or dust deposited on the interior of the chambers 10—11 by the fumes. This is accomplished when the furnace is not working by opening air inlet valves 27 on the chambers 10—11 and creating a high suction in the pipe 26, thus inducing a rapid and forceful circulation of air in the tank which loosens the deposits and carries them

out through the pipe 26. Valves 28—28' are disposed in the pipe 26 near the bottom of each chamber 10—11 which are opened only at such times as the tanks are being air cleaned. Either chamber 10—11 may be cleaned separately by closing the valve 12 and opening the valve 28 or 28' on the desired chamber.

By using a furnace closed at the top, except for the vapor outlet 8, and regulating the air feed by dampers 4 and 30 near the bottom to attain perfect combustion, I am able to save many bi-products like sulfur, mercury, etc., in a pure state from the treatment of sulfurous, mercurial and other ores, as no oxidation takes place.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. The combination in a fume condensing and regenerative apparatus, of a furnace having air inlets and vents, a steam generator to which the vents lead, a regenerator chamber opening to the steam generator, flues leading to the air inlets passing through the regenerator chamber for superheating the air to be fed into the furnace, and suction means for drawing air into the furnace through the superheating flues and air inlets, withdrawing the fumes and gases generated in the furnace through the vents, steam generator and settling tank and ejecting them into a body of liquid.

2. In a fume condensing and regenerative apparatus, the combination with a furnace having air inlets and gas outlets, of a steam generator having flues connecting with the gas outlets, a regenerator chamber connected with the flues of the steam generator, a suction device for drawing air into the furnace, and causing the fumes to pass through the steam generator and regenerator, and a settling tank into which the gases are discharged by the suction device.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

WILLIAM R. HESLEWOOD.

Witnesses:

CHARLES EDELMAN,

C. C. COOK.