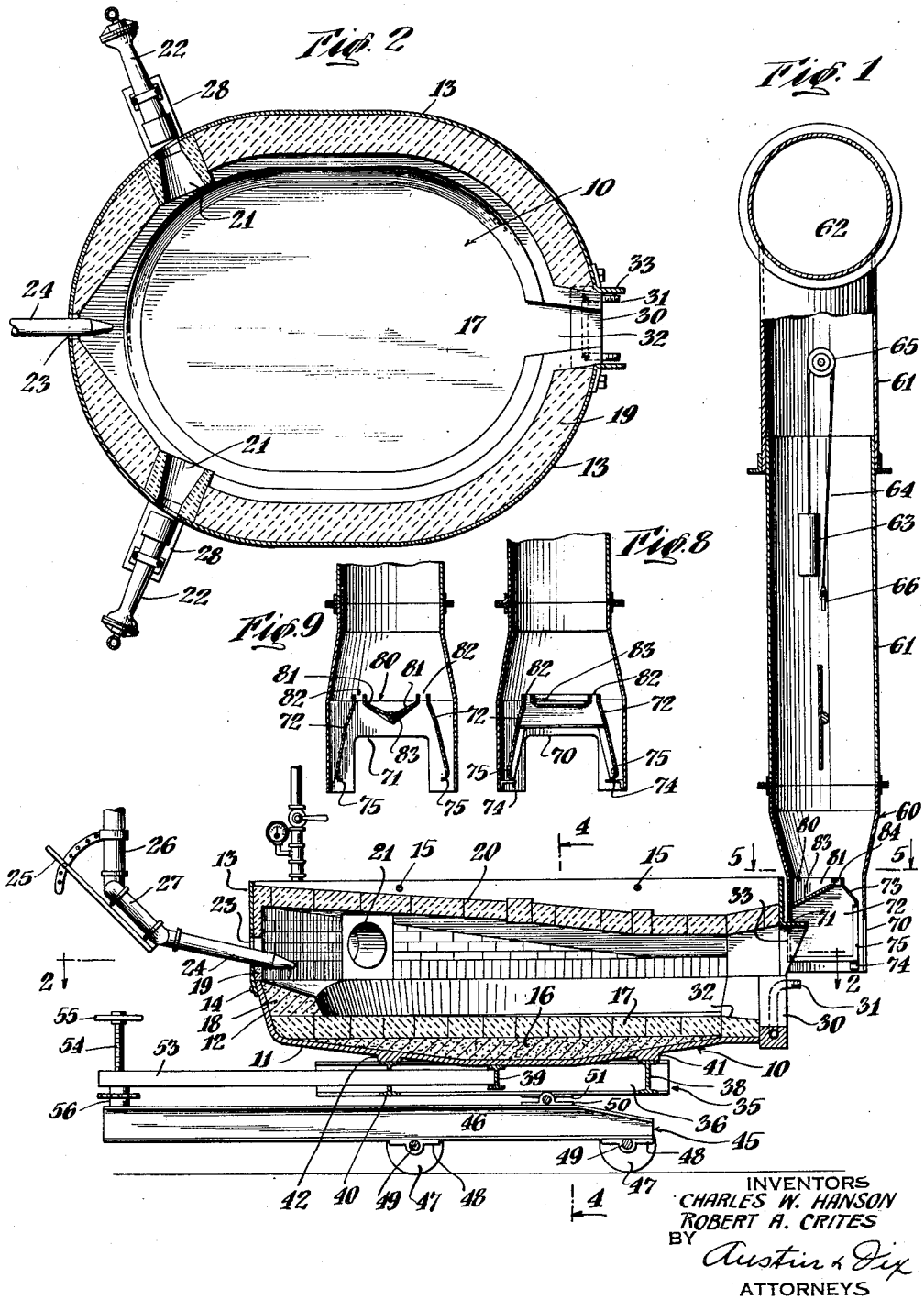
Dec. 29, 1936. C. W. HANSON ET AL 2,065,691

CUPEL FURNACE

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CUPEL FURNACE

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Fig. 3

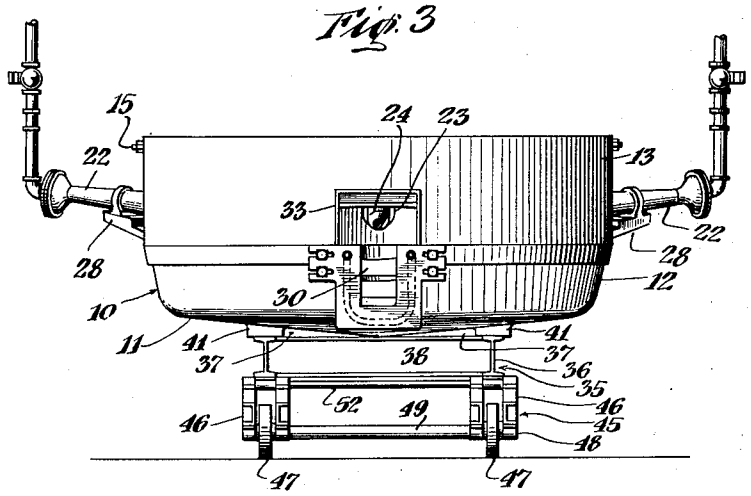


Fig. 4

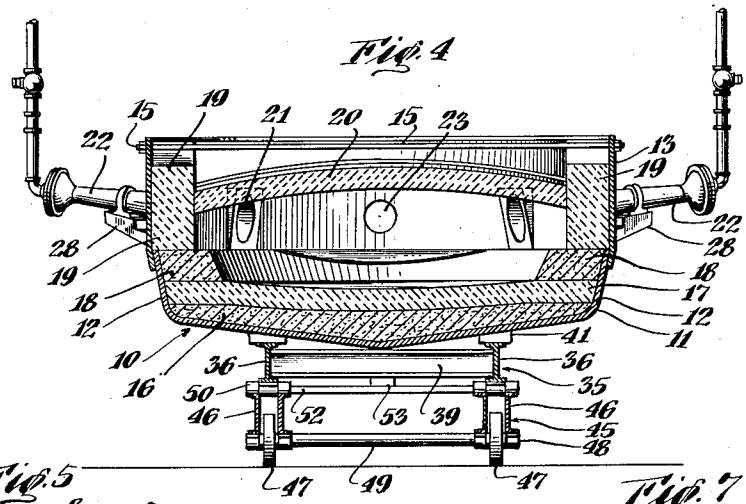


Fig. 5

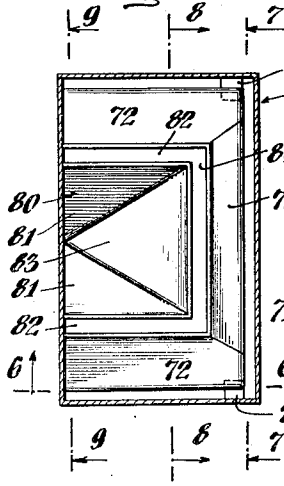


Fig. 6

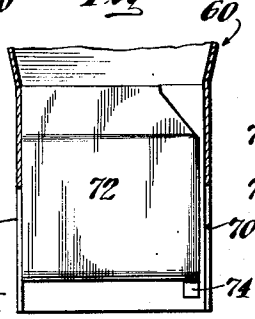
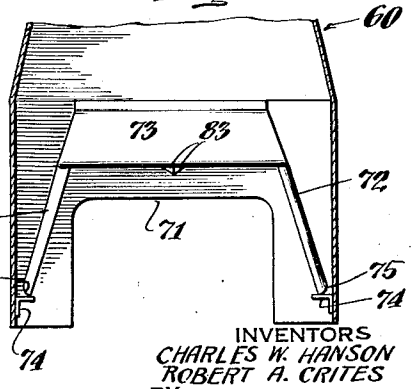


Fig. 7



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CUPEL FURNACE

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21 Claims. (Cl. 266—33)

This invention relates to cupel furnaces and to a ventilating hood therefor. More specifically, the invention provides a cupel furnace in which the bottom, side walls and roof form a single unit.

The combustion gases and fumes are removed through the front working door of the furnace by an improved hood which is adapted to maintain a curtain of air, moving at high velocity, in the path of the discharged gases. The gases are caused to enter this curtain of air and are drawn thereby into the hood whereby they are prevented from contaminating the atmosphere and are removed in a comparatively concentrated condition. The hood is supported independently of the furnace so that the tilting of the furnace for discharge purposes is not interfered with and it is especially adapted to provide proper ventilation for the furnace without requiring movement of a large volume of air.

The invention also consists of certain new and original features of construction and combinations of parts hereinafter set forth and claimed.

Although the novel features which are believed to be characteristic of this invention will be particularly pointed out in the claims appended hereto, the invention itself, as to its objects and advantages, and the manner in which it may be carried out, may be better understood by referring to certain preferred embodiments thereof which are shown in the accompanying drawings for purposes of illustration only.

In the drawings:

Fig. 1 is a vertical, longitudinal section through a furnace and ventilating hood constructed in accordance with the present invention;

Fig. 2 is a horizontal section taken on the line 2—2 of Fig. 1;

Fig. 3 is a front elevation of the furnace;

Fig. 4 is a transverse section of the furnace taken on the line 4—4 of Fig. 1;

Fig. 5 is a horizontal section through the hood taken on the line 5—5 of Fig. 1; and

Figs. 6, 7, 8 and 9 are sections taken on the lines 6—6, 7—7, 8—8 and 9—9 respectively of Fig. 5, showing the construction of the baffles.

Like reference characters denote like parts in the several figures.

Referring more particularly to the drawings, the invention is shown as applied to a cupel furnace comprising a pan 10, having a bottom 11 and sides 12. Upper side plates 13 are secured to said sides 12 in any suitable manner as by bolts 14. The tension rods 15 (Fig. 4) may be extended between the side plates 13 for strengthening purposes and to oppose the outward thrust of the arch, as will be described.

The bottom 11 may be lined with a tamped lining 16 of, for example, limestone, cement and fire-clay, upon which a lining 17 of refractory brick may be supported. A tamped lining 18 similar to the lining 16 may be positioned around the furnace adjacent the sides 12 and may rest upon the refractory lining 17. Upon this lining 18 side walls 19 of refractory brick may be supported, said side walls 19 being positioned adjacent the side plates 13 and being adapted to support the weight of the arch, as will be described.

The roof of the furnace comprises an arch 20 which may be built up of refractory material and extends between the side walls 19. The thrust of the arch is transmitted to the side walls 19 and thence to the side plates 13 which are held by tension rods 15 against outward movement. The arch 20, as illustrated in Fig. 1, is comparatively low at the front of the furnace and slopes upwardly toward the rear thereof to provide clearance for openings 21 through which a heating appliance, such as a gas burner 22 of any well known form, may be inserted. An opening 23 is formed in the side walls 19 in a position to receive an air blast nozzle 24. The air blast nozzle 24 may also be of standard construction and may be controlled by an operating lever 25. It may be connected to a vertical pipe 26 by means of an intermediate pipe 27 which is connected to the vertical pipe and to the nozzle by swivel joints which permit the nozzle to be adjusted or removed from the opening 23 when desired. The burners 22 may be supported by brackets 28 which may be secured to the side plates 13 in any convenient manner.

At the front, the furnace is provided with a working door 30 which may, if desired, be water cooled, for example, by means of pipe 31 which may be embedded therein. A sloping hearth 32 may extend from the refractory lining 17 to the working door 30. A U-shaped shield 33 may be associated with the door to direct the gases discharged therefrom into the hood, to be described.

For supporting the above described furnace, there is provided a frame 35 having side members 36 (Figs. 3 and 4) which may comprise, for example, I-beams, engaging longitudinal bosses 37 formed on the bottom 11 of the pan 10. Suitable cross members 38, 39 and 40 may be secured between the I-beams 36 to form a cradle within which the pan is seated. The members 38 and 40, for example, may extend upwardly a

sufficient distance to engage transverse bosses 41 and 42, respectively, formed on the bottom 11 of the pan.

For supporting the frame 35, there is provided a carriage 45 which may comprise pairs of longitudinal members, such as channel irons 46, spaced to receive wheels 47 therebetween. Said channel irons may have straps 48 secured to the lower side thereof within which axles 49 are supported. Wheels 47 may be rotatably mounted on the axles 49 and are adapted to rotate between the channel irons 46. The channel irons 46 are preferably positioned on opposite sides of each of the I-beams 36 and are provided with straps 50 registering with depending straps 51 carried by said I-beams to provide bearings for a rod 52 by which the frame 35 is pivotally supported upon the carriage.

Suitable adjusting means, such as a lever 53, may be secured to the frame 35 in any convenient manner, for example, by engaging cross members 39 and 40 and may project rearwardly to engage an adjusting screw 54 which is rotatably mounted upon the carriage 45. The adjusting screw 54 may be provided with a hand wheel 55 to facilitate the operation thereof. It may also be provided with a collar 56 which is threaded thereon and is adapted to engage the lever 53 for holding the same in adjusted position.

It is to be noted that the frame 35 is adapted to be tilted about the rod 52 by suitable operation of the hand wheel 55 whereby the entire furnace is tilted forwardly, for example, for purposes of discharge.

For removing the gases from the working door 30 of the furnace, a hood 60 is provided which is carried by a telescoping pipe 61 communicating with a duct 62 which is provided with suitable means for forcing the air currents therethrough, such as a fan, not shown. A counterweight 63, carried upon a cable 64, may pass over a sheave 65 secured to one section of the telescoping pipe 61 and may be anchored as at 66 to the other section thereof to facilitate vertical movement of the hood, for example, when it is desired to raise the hood into inoperative position.

The hood 60 may be provided with front and back openings 70 and 71 which register with the working door 30 of the furnace and provide access thereto. The hood is also provided with a series of baffles, such as side baffles 72 and a front baffle 73, which slope upwardly and inwardly for the purpose to be described. The side baffles 72 may be supported by brackets 74 from the sides of the hood 60, preferably in spaced relationship therewith and may have flanges 75 formed at the edges thereof. The front baffle 73 may be supported by the side baffles 72 and may extend downwardly to the top of the front opening 70 of the hood. A rear baffle 80 may be supported from the rear wall of the hood 60, as, for example, by welding, and may comprise side members 81 which are joined at their rear edges in V-shaped formation, as illustrated in Fig. 9, and slope upwardly and outwardly, their top edges being spaced from the top edges of the side baffles 72 to provide elongated openings 82 therebetween. The rear baffle 80 also may include a front member 83 which is joined to the side members 81 and slopes upwardly and forwardly with its top edge adjacent and spaced from the front baffle 73 to provide a transverse, elongated opening 84.

The above described baffles form, in effect, tapered air passages terminating upwardly in elongated openings 82 and 84, the former extending forwardly on opposite sides of the door 30 and the latter extending transversely across the front of the door 30. These openings are arranged in substantially U-shaped formation and have been shown for convenience as constructed in the form of a three-sided rectangle.

It is to be noted that the air in passing into the hood 60 is caused to pass through elongated openings 82 and 84 or between the baffles and walls of the hood. Inasmuch as these openings are of considerably less area than the hood, the air currents are caused to pass therethrough at a comparatively high velocity which is reduced as soon as the air is permitted to expand into the comparatively large area of the hood.

The high velocity air currents passing through the openings 82 and 84 form a curtain of air which entirely surrounds the front and sides of the door 30 in the path of the gases which may be discharged therefrom. The gases from the door 30 are accordingly caused to pass into this air curtain which is moving upwardly at high velocity and are drawn thereby into the hood 60 and thence pass through the duct 62 to any suitable recovery or discharge apparatus.

In the above described furnace it is to be noted that a tight seal is readily maintained between the arch and the side walls inasmuch as the arch is supported by the side walls and is adapted to move therewith. This tight seal prevents infiltration of air which would tend to cool the charge or to interfere with the operation of the furnace. All of the fumes and combustion gases are removed from the front working door by means of the hood which is supported independently of the furnace so that it does not interfere with the normal operation thereof.

The baffles above described provide a particularly efficient means for ventilating the furnace inasmuch as all of the exhaust gases from the furnace are caused to pass through a rising curtain of air by means of which they are drawn into the hood before they have an opportunity to contaminate the atmosphere. Furthermore, the above construction permits efficient ventilation without requiring the movement of large volumes of air and maintains the fumes in a sufficiently concentrated condition to facilitate recovery of the metal values therefrom. It is obvious that the arrangement of baffles may be varied and that the shape of the openings through which the air curtain passes may also be varied within the limits of the invention. Also, various changes may be made in the construction of the arch and in the arrangement of the furnace lining. The invention is accordingly not restricted to the particular embodiment above described, but is to be limited only in accordance with the scope of the following claims when interpreted in view of the prior art.

What is claimed is:

1. A cupel furnace comprising a pan having a refractory lining forming a bottom and side walls, a roof of refractory material engaging the side walls below the tops of the latter and means associated with said pan adapted to support said roof as a unitary structure therewith.

2. A cupel furnace comprising a pan having a refractory lining forming a bottom and side walls, a roof of refractory material sprung between the side walls and mounted integrally

therewith, said roof being supported by said pan so as to move therewith and being sealed to said side walls to prevent passage of gases therebetween.

3. A cupel furnace comprising a pan having a refractory lining forming a bottom and side walls, a roof of refractory material engaging the interior vertical sides of said side walls and means associated with said pan adapted to support said roof as a unitary structure therewith and means supporting said pan for tilting movement.

4. In combination, a furnace having a working door through which flue gases are vented and a hood in front of and above said door, said hood having a substantially U-shaped opening extending outwardly on opposite sides of and in front of said door and forming a passage through which air is drawn at high velocity to form an air curtain surrounding said door and adapted to draw the flue gases into said hood.

5. In combination, a furnace having a working door through which flue gases are vented and a hood in front of and above said door, said hood having means comprising constricted elongated openings extending outwardly on opposite sides of said door and a transverse opening in front of said door to form a curtain of air surrounding the door whereby gases discharged from said door are caused to enter said curtain and are drawn thereby into said hood.

6. In combination, a furnace having a working door through which flue gases are vented and a hood in front of and above said door, said hood having means comprising constricted elongated openings to form a curtain of air extending in front of and at the sides of said door whereby gases discharged from said door are caused to enter said curtain and are drawn thereby into said hood.

7. The method of ventilating a furnace which comprises forming a U-shaped curtain of air in the path of the discharged gases and causing the gases to enter said curtain and to be drawn along therewith whereby they are prevented from escaping into the atmosphere.

8. In combination, a furnace having a working door through which flue gases are vented and a hood in front of and above said door, said hood having upwardly inclined front and side baffles and upwardly inclined rear baffles spaced therefrom to form tapered air passages terminating in elongated openings which extend forwardly on opposite sides of said door and transversely in front of said door and means to cause air to pass through said openings at high velocity so as to form an air curtain surrounding said door in the path of the flue gases discharged therefrom.

9. A cupel furnace comprising a pan having a side plate associated therewith and a lining of refractory material forming a bottom and side walls and a roof of refractory material mounted between said side walls to form a unitary structure, a working door located at the front of said furnace and a hood associated with said furnace adjacent said working door and adapted to remove flue gases therefrom, said hood having means comprising constricted elongated openings adapted to form a curtain of air at the front and sides of said door in the path of the gases discharged therefrom, said curtain of air being adapted to draw said gases into said hood.

10. A cupel furnace comprising a pan having a side plate associated therewith and a lining of refractory material forming a bottom and side walls and a roof of refractory material mounted between said side walls to form a unitary structure, a working door located at the front of said furnace and a hood associated with said furnace adjacent said working door and adapted to remove flue gases therefrom, upwardly inclined front and side baffles and upwardly inclined rear baffles spaced therefrom to form tapered air passages terminating in elongated openings which extend forwardly on opposite sides of said door and transversely in front of said door and means to cause air to pass through said openings at high velocity so as to form an air curtain surrounding said door in the path of the flue gases discharged therefrom.

11. A cupel furnace comprising a pan having a side plate associated therewith, a lining of refractory material forming a bottom and side walls, a roof of refractory material mounted between said side walls to form a unitary structure therewith, a working door located at the front of the furnace and a hood supported independently of said furnace, the hood being formed with a U-shaped passage through which air is drawn at high velocity whereby gases which pass through the working door are drawn into said hood.

12. Metallurgical furnace comprising the combination with a furnace body having a bottom portion and sides upstanding therefrom, of an arch spanning the furnace and supported between the sides so that the arch exerts an outward thrust on the sides, and reinforcing means for the sides preventing substantial yielding thereof under the said outward thrust.

13. Metallurgical apparatus comprising the combination with a furnace body having a bottom portion and sides upstanding therefrom, of an arch spanning the furnace and clamped in position between the walls, the said arch forming a substantially gas-tight seal with the said walls.

14. Metallurgical apparatus comprising the combination with a furnace body having a bottom portion and sides upstanding therefrom, of an arch extending between the sides and exerting an outward thrust thereon, and instrumentalities for preventing substantial yielding of the sides under the said outward thrust and enabling the said sides to rigidly clamp the arch between them for securing the arch firmly in position between the sides and producing a substantially gas-tight seal with the said walls.

15. Metallurgical apparatus comprising the combination with a furnace body having a bottom portion and sides upstanding therefrom, of an arch extending between the sides and frictionally clamped in position by the said sides.

16. Metallurgical apparatus comprising a combination with a furnace body having a bottom portion and sides upstanding therefrom of an arch frictionally secured between the sides, the said arch being comparatively low at the front of the furnace and sloping upwardly towards the rear thereof, and heating means for the furnace at the rear thereof positioned between the arch and furnace bottom.

17. Metallurgical apparatus comprising the combination with a furnace, of a supporting frame for the furnace forming a cradle in which the furnace is seated, a carriage for the supporting frame, means for pivotally supporting the frame upon the carriage, and mechanism for pivoting the supporting frame and furnace relatively

to the carriage, the said mechanism including a lever secured to the frame, an adjusting screw for operating the lever for effecting adjustment thereof relative to the carriage, and means enabling the application of power to the adjusting screw for effecting a turning movement thereof.

18. Metallurgical apparatus comprising the combination with a furnace having a working door through which flue gases are vented, of a hood associated with the furnace adjacent to the working door and adapted to remove flue gases therefrom, the said hood being provided with openings registering with the working door of the furnace, and baffles in the hood positioned at the front, sides and rear of the hood, the said baffles defining tapered air passages terminating in elongated openings for drawing air into the hood at relatively high velocities.

19. Metallurgical apparatus comprising the combination with a furnace having a working door through which flue gases are vented, of a hood associated with the furnace and adapted to remove flue gases therefrom, the said hood being provided with openings registering with the working door of the furnace, and means in the hood defining tapered air passages terminating in elongated openings for drawing air into the hood at relatively high velocities.

20. Metallurgical apparatus comprising the combination with a furnace having a working door through which flue gases are vented, of an adjustable hood associated with the furnace and adapted to remove flue gases therefrom, a telescoping pipe communicating with the hood, and means associated with the pipe for facilitating adjustment of the hood.

21. Metallurgical apparatus comprising the combination with a furnace having a working door through which flue gases are vented, of an adjustable hood associated with the furnace and telescoping pipe communicating with the hood, and a counterweight arranged within the said telescoping pipe for facilitating vertical movement of the hood.

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