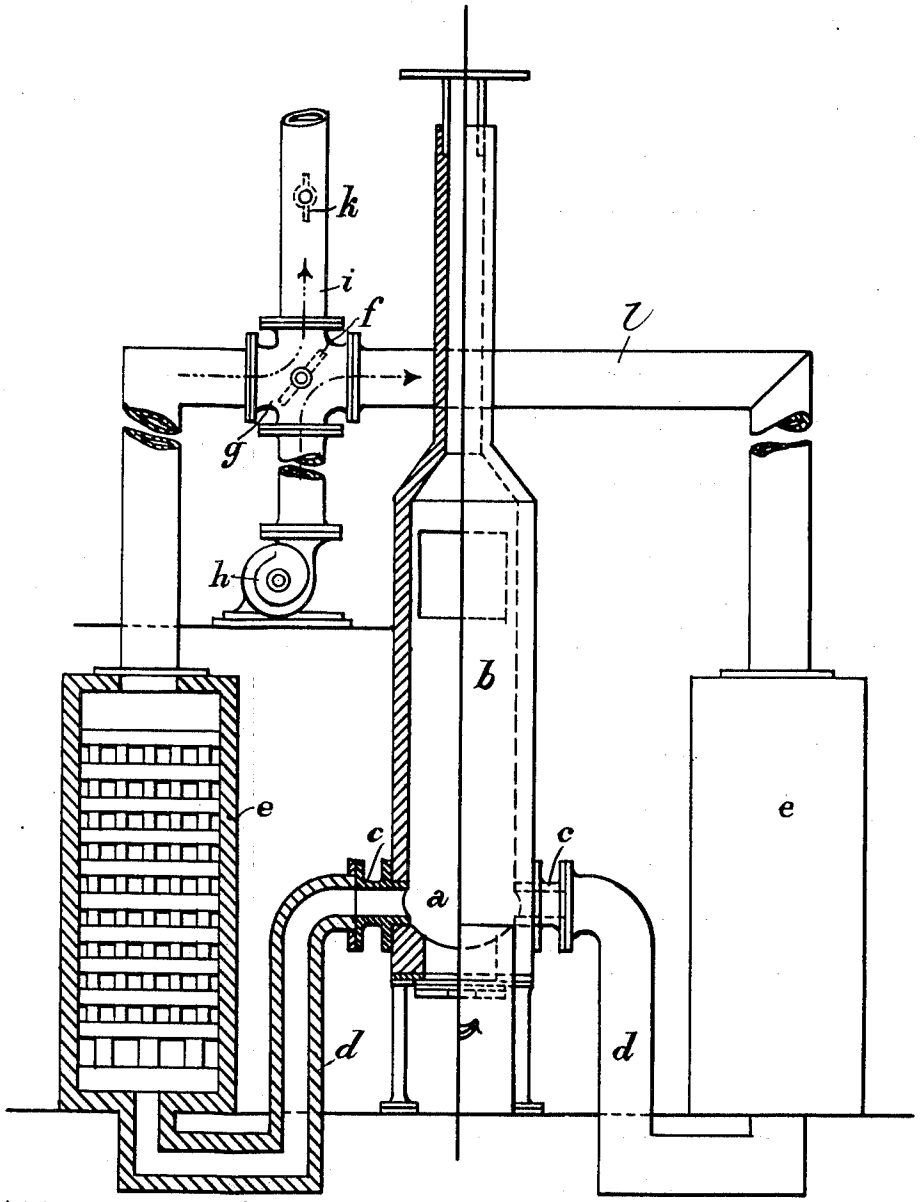
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CUPOLA FURNACE.

APPLICATION FILED MAR. 8, 1913.

1,112,846. Patented Oct. 6, 1914.



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EDUARD SCHÜRMANN, OF KOETZSCHENBRODA, NEAR DRESDEN, GERMANY.

CUPOLA-FURNACE.

1,112,846. Specification of Letters Patent. Patented Oct. 6, 1914.

Application filed March 8, 1913. Serial No. 752,818.

To all whom it may concern:

Be it known that I, EDUARD SCHÜRMANN, managing director, a subject of the King of Saxony, German Empire, and resident of Albertstrasse 5, Koetzschenbroda, near Dresden, Saxony, German Empire, have invented new and useful Improvements in Cupola-Furnaces, of which the following is a specification.

It is a known fact that in shaft-furnaces of any kind the carbonic acid formed in the so-called "melting-zone" will be reduced to carbonic oxid, when passing or traversing the incandescent combustible above the melting-zone mentioned, said carbonic acid taking up carbon with a loss of heat. As the carbonic oxid gas is not used in melting or calcining-furnaces in the same manner as for instance in blast-furnaces, it burns without any profit when leaving the chimney. It has been tried to discharge or remove the carbonic acid by openings, slots and passages situated closely above the melting-zone in the walls of the furnace. However only a very small part of the carbonic acid formed was thus removed, whereas the greater part was nevertheless decomposed to carbonic oxid gas. The above mentioned openings, slots and passages provided in the walls of the furnace have the drawback that large quantities of the blast after having left the blast-pipes or nozzles pass along the walls of the furnace instead of entering the interior of the charge therein. It has also been tried to utilize the carbonic acid gas by sucking it through a blast jet and by blowing it from one side against the melting mass. But even this operation was not successful for the reason that constantly new quantities of blast were needed and in consequence the greater part of the gases formed was wasted, and that, besides the heating of the melting mass took place on or from one side only, thus excluding a uniform downward movement of the charges.

The object of the present invention is to prevent the formation of carbonic oxid altogether. For this purpose the heated blast is passed horizontally and alternately and in a transverse direction through the melting-zone, transforming the carbon to carbonic acid. The latter passing off on the other side of the furnace and out of reach of carbon a reduction to carbonic oxid is practically prevented. The heat formed carried away from the melting-zone by the blast is taken up and stored alternately by regenerators arranged on both sides of the cupola-furnace and also alternately utilized for preliminarily heating the blast newly supplied. At the same time a uniform downward movement of the charge is insured by the alternative admission of the heated blast. The fact that the blast admission and discharge openings of the furnace face each other, makes it necessary for the air or blast current to positively penetrate the coke-layer in a transverse direction even if nozzles or openings of large diameter are used. An upward movement of the combustible gases within the shaft of the furnace will only take place in a small measure, inasmuch as the shaft acts as a chimney. In this manner the necessary preliminary heating of the charges within the shaft of the furnace is well insured. The admission and discharge of the blast on a common level offer also the technical advantage that the furnace shaft may be kept lower, furthermore that a considerable economy of combustible is obtained and that the need of only one nozzle on each side simplifies the connection with the regenerator. In this way the costs for such a melting-furnace plant as to its construction, operation and repairs are essentially reduced. The fact that the blast must pass transversely through the furnace, allows a reduction of the high pressure now necessary to insure that the blast will really penetrate into the center of the furnace.

In a melting-furnace plant forming the object of the present invention the operation may take place with a low pressure, if only the necessary quantity of blast is always at disposal. Therefore power may be saved. The low pressure mentioned is of course also of advantage with regard to keeping all

packings tight. The small surcharge or overpressure within the blast admission pipes may also be obtained by the arrangement of a suction-fan which may be preferable, for instance, if it is desired to further on utilize the heat still present at the point in which the gases enter the draft-pipe or near the butterfly-valve provided in such draft-pipe, or to make use of the carbonic acid present in the combustible or waste gases. The air will then be admitted near the butterfly-valve mentioned without necessitating any alteration or modification of the plant itself.

A mode of construction of the cupola-melting-furnace forming the object of the present invention is shown in the drawing annexed herewith partly in longitudinal section and partly in front elevation.

The two nozzles *c* open into the furnace shaft *b* in the height of the smelting-zone *a* and are connected by pipe-like air passages or channels *d* with two hot blast apparatus or regenerators *e*. Both apparatus or regenerators *e* are connected one with another by a passage or channel *l* both sides or ends of which ending in the upper walls or ceilings of said apparatus or regenerators. However the latter may be disconnected one from another by the butterfly valve *f* inserted into a connecting pipe *g*, the lower mouth of which is connected to a fan or ventilator *h* whereas its upper mouth is connected to a discharge-pipe *i*.

In the position of the butterfly-valve *f* shown in the drawing the atmospheric air sucked in by the fan *h* passes or traverses the right hand hot blast apparatus *e*, takes up heat and circulates through the right hand channel *d* to the right hand nozzle *c* from which the heated blast issues into the lower smelting-zone *a* maintained within the shaft of the furnace. When the hot blast or air has traversed or circulated through the smelting-zone in a horizontal or nearly horizontal direction, the blast or air enters in the form of waste gas into the left hand nozzle *c*, passes the left hand channel or passage *d* and delivers its heat, received within the smelting-zone *a*, to the left-hand hot blast apparatus or regenerator which hereafter is ready to receive the atmospheric air circulating through the plant in an opposite direction. The waste gases are, after their issue or discharge from the left hand regenerator *e*, directed along the butterfly-valve *f* to the chimney *i*, in the direction shown in dotted lines. If after a certain lapse of time the position of the butterfly-valve *f* is changed in a known manner, the atmospheric air supplied by the fan or ventilator *h* circulates through the left hand regenerator in an opposite direction and enters through the left hand nozzle provided for the furnace-shaft into the smelting-zone, maintained in it and passes, after its circulation through the said zone, into the right hand hot blast apparatus or regenerator *e*.

A damper *k* may be inserted into the upper part of the chimney *i* which is opened when in its vertical position, which however is reversed into its horizontal position at the end of the melting operation, because when the column of the melting material within the furnace is reduced in height, the blast will take the course of least resistance, viz: It passes through the melting-furnace itself in an upward direction and the air circulates through the shaft of the furnace. When the damper *k* is in its closed (horizontal) position and the throttle-valve *f* in its opened (also horizontal) position the air may enter into the furnace from both sides and the melting-operation may be terminated.

I claim as my invention:

1. A cupola furnace comprising a cylindrical body having a melting chamber provided with ports in diametrically opposite positions, in the melting zone thereof, a stack rising from the said cylindrical body, and devices for passing a heated blast through one of the said ports into the said melting zone, causing the same to pass through the melting zone in a substantially horizontal direction and the carbonic acid gas generated to be withdrawn through the other port and discharged independently of the said stack so as to prevent the formation of carbonic oxid within the melting chamber.

2. A cupola furnace comprising a cylindrical body having a melting chamber provided with ports in diametrically opposite positions, in the melting zone thereof, a stack rising from the said cylindrical body, regenerators on both sides of the said cylindrical body, a pipe connection between the corresponding ends of the said regenerators, a pipe connection between each regenerator and one of the said ports, and means for creating a blast and alternately directing the flow of the same through one of the regenerators through the melting zone in a horizontal path and withdrawing the resultant carbonic acid gas into and through the other regenerator and discharging the same independently of the said stack.

3. A cupola furnace comprising a cylindrical body having a melting chamber provided with ports in diametrically opposite positions, in the melting zone thereof, a stack rising from the said cylindrical body, regenerators on opposite sides of the said cylindrical body, pipe connections from corresponding ends of the said regenerators to the said ports, a pipe connecting the opposite ends of the said regenerators, a butterfly valve within the last aforesaid pipe, and

a blower by which and the said butterfly valve blasts of air are created and alternately directed through one regenerator through the said melting zone in a substantially horizontal path and the resultant carbonic acid gas withdrawn through the other regenerator and discharged independently of the said stack.

In testimony, that I claim the foregoing as my invention, I have signed my name in presence of two witnesses, this 17th day of February 1913.

EDUARD SCHÜRMANN.

Witnesses:

CLARE SIMON,

PAUL ARRAS.