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UTILISATION OF HERRESHOFF PYRITES FURNACES FOR ROASTING SULPHUR AND ORES WITH A LOW SULPHUR CONTENT.

by Compagnie de Saint-Gobain. (10/5/1949)

Combustion of Sulphur in Herreshoff furnaces.

It is often a matter of interest to burn sulphur in Herreshof furnaces:

(1) when, in a roasting plant for pyrites it is desirable to increase combustion in one furnace rapidly (for example in the case of immobilisation of the other furnaces owing to repairs) or, in all furnaces of the system, to increase production capacity of the sulphuric acid plant before the extension of the portion for roasting has been carried out;

(2) when, with a Herreshoff system, it is desirable to obtain gases with high SO_2 concentration destined for the manufacture of one or several of the by-products of sulphite, (for example, liquified SO_2, meta-bisulphate).

The entrainment by the gases of the unburnt sulphur in a gaseous state represents the only difficulty. To obviate this the following conditions are required: a thorough mixture of the air and sulphur vapour, and the maintenance of this mixture at a sufficiently high temperature for a period of time, long enough to obtain complete combustion.

As sulphur ignites readily in the air there is no need for as high a temperature for combustion as in the case of pyrites e.g:- circulation of pyrites in the furnace in the opposite direction of the gas flow.

Sulphur is introduced in the lower portion of the furnace, in the 7th hearth where it ignites, the gases travel through the hearths by rising, and the mixing of the gases is assured by their passage through the gas ports of the hearths.

According to requirements, several types of modifications have been introduced in the furnaces.

I. All the hearths and the shaft are retained. The modification applies to the feed: sulphur is introduced laterally into the 7th hearth by a chute. The device consists of a feeding screw conveyor, placed on the upper part of the furnace the outlet of which is connected with a vertical duct made of steel-plate, parallel to the exterior of the furnace (at a distance of 40 centimetres from the outside wall). This duct is followed by a cast-iron tube which enters the furnace at an angle of 45°. This tube must not be blocked on the

side opposite to the furnace in order to allow the passage of air through an aperture which can be regulated so as to avoid the ignition of sulphur in the feeding device.

The sulphur liquifies and burns on the 7th hearth and occasionally on the 8th. One rabble arm is retained on the 7th and one on the 8th hearth in order to mix the liquid sulphur. The shaft also serves to actuate the apparatus for distribution.

The influx of air is arranged on the two lower hearths and also on the 3rd and 4th hearth.

In a furnace with 8 hearths and 3.63 metres in diametre (interior) thus equipped and dealing normally with 7.5 tons of 48% pyrites per day, it is possible to burn 7 tons of sulphur in order to obtain gases with 8% SO_2.

II. In a five-ton furnace with 8 hearths (interior diameter 3.25 metres) the 1st, 3rd, 5th and 6th hearths are removed. A part of the central column is removed leaving only the lower portion up to the 7th hearth and one rabble arm on the 7th and one on the eighth hearth. The hearths are perforated as follows:- 2nd hearth = 5 holes of 160 m/m , 4th hearth = 6 holes of 160 m/m (in these two hearths the central apertures for the column are blocked by refractory lined steel plates), 7th hearth = 2 holes of 160 m/m placed near the centre, on the 8th hearth the usual gas aperture is retained. Six coolers of the wall have been maintained.

The feeding of the sulphur is the same as above.

The influx of air is effected by two valves on the 8th floor and by the sulphur feed intake.

In such a furnace up to 6 tons of sulphur are burnt per day, giving gases with 14 to 15% SO_2.

III. With an 8 hearth 7.5 ton furnace of which the 5th and 6th have been eliminated as well as the column which has been replaced by a truncated shaft reaching up to the 7th hearth and equipped with one rabble arm on the 7th and 8th hearths, all the coolers have been omitted.

Hearths 1, 2,3 and 4 are equipped with diametrical baffles allowing for the passage of gas at one of their extreme ends. The floors of these hearths are pierced by holes in the proximity of the point where the baffle joins the wall of the furnace. Thus the combustion gases are forced to pass through each hearth by flowing round the baffle thereby eliminating a dead zone. Every time a hearth is traversed the gases are mixed.

With such a furnace burning 6 tons of sulphur per day, gases with 17 and 18% SO_2 are regularly obtained without any sublimation.

These latter modifications, however important, are also of interest inasmuch as they permit the adaption of a furnace which is already in use, and are less costly than a new furnace of a different shape which would be difficult to incorporate with the central roasting system already in existence.

Combustion of gas purification residues in the Herreshoff furnace.

In the case of shortage of sulphur or pyrites, in particular, it would allow temporarily the use of Herreshoff furnaces for the combustion of spent oxide.

The composition of these residues varies a great deal: sulphur content from 11 to 60%, moisture may attain 25% or more.

These residues can be burnt in Herreshoff furnaces if they contain 16% of sulphur and 25% moisture: the material has simply to be dried by remaining in the dust chambers. In a five-ton furnace 9 tons of spent oxide are burnt per day. The only modification to be made to the furnace is the perforation of the hearths of the first two floors to the right of one of the two feed apertures; this is in order to supply the 1st and 3rd floor with equal quantities.

With spent oxide with a greater sulphur content and less moisture, the problem is reduced to that of burning pyrites.

The drawbacks are: the difficulty in feeding a sticky material, the low temperature of the gases and the greater waste of nitrous products in the lead chambers.

Combustion of washed residues of pyrites mines.

These products have a very low sulphur content, they have been separated from commercial pyrites by lixiviation. During the occupation of 1940-45 such products were used, they analysed on an average 12 to 13% sulphur and 5% moisture.

In order to burn these washed residues in a Herreshoff furnace it is sufficient to lag the furnace. A five-ton-a-day furnace can burn 15 to 16 tons. The SO_2 content of the gases is normal but their temperature is low (250 to 270°).

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