

Frenching or Refining Process.—The metal from the doubles is broken up into pieces and placed in a red-hot crucible in charges of 70lb. and 80lb., which requires 10lb. of the slag from the previous refining process and about 3lb. of pearlash (American potash). When melted the mass is stirred with an iron bar, and the character of the slag adhering to the stirrer enables the workmen to judge whether the refining is complete or not. This process requires the most skilled workmen, so as to produce good star-metal. When it is deemed sufficiently refined the crucible is lifted out, and the contents poured into a mould, where it slowly cools, and acquires, if properly treated, a crystalline structure characteristic of this metal. To favour the crystallization, the metal, when cooling, is covered with slag, and should be left quite undisturbed.

Furnace for smelting Crude Ore.—There is a furnace built for desulphuring the ore; but it had not been used at the time of my visit. It is built in the form of a reverberatory furnace, with the hearth sloping towards the centre and to one side. The furnace is charged with broken ore, and the sulphides are melted, and when in that state a plug-hole, on a level with the bottom of the furnace, is opened and the molten mass run out, which, when cool, is broken up and treated as before described; but, judging from its construction, I am afraid it will be a failure.

There is one grave defect that I observed at these works, and that is the length of the flues between the furnaces and the stack, and the absence of plenty of condensing-chambers. Antimony, when melted and subjected to a great heat, is very volatile, and a large percentage goes into the flues and up the chimney. The workmen informed me, on inquiry about this, that for five months' work in the singling process between three and four tons of oxides were taken out of the flues, which are about 150ft. in length. There is no doubt but that a large percentage of antimony is at present carried up the chimney in fumes. These fumes require a very long, serpentine flue to get condensed.

It may be interesting to those engaged in working antimonial ores to give a description of a blast-furnace that is in use at Příbram, in Bohemia, where both oxides and sulphides, with a considerable quantity of siliceous waste, are melted for crude star regulus. A description of this furnace was given by C. M. A. Balling, in a paper read before the Institution of Civil Engineers, London, from which the following particulars have been taken. The composition of the materials forming the blast-furnace charge is as follows:—

Materials.	Dressed Ores.		Oxidized Ores.	Liquation Residue.		Fine Stuff.	Refining-slag.
	Raw.	Calcined.		Raw.	Calcined.		
Antimony	43·3	48·9	46·4	21·4	23·1	56·1	25·7
Iron	14·4	...	...	12·9	...	...	...
Sulphur	25·3	0·7	3·6	15·1	2·4	...	...
Ferric oxide ... ..	...	23·4	2·4	...	17·3	6·9	...
Silica	11·7	23·3	26·6	41·6	49·2	10·8	5·9
Alumina	0·3	4·0	...	0·5	2·4	...	...
Carbonate of lime	3·3	...	7·0	4·0	...	...	...
Lime ... ..	...	1·0	...	4·0	0·7	...	...
Sulphide of antimony ... ..	...	...	...	...	...	...	2·4
Sulphide of iron ... ..	...	...	...	...	...	...	53·4
Sulphide of sodium ... ..	...	...	...	...	...	...	9·0
Carbon ... ..	...	...	...	...	...	5·1	...

The furnace has a cylindrical stack, 20ft. in height, 4ft. 7in. in diameter at the throat, and 3ft. 3in. in the hearth, which is closed, and has five water-tuyeres and three outlets for the molten products—an upper one for the slag, and two at the hearth-bottom. Of these latter, one communicates with the exterior by a passage having a slight rise, and forms the ordinary tap-hole for the metal, while the other has a horizontal outlet, and is only used for blowing out the furnace. The blast, supplied by a Krigar screw-blower, amounts to 540 cubic feet per minute, under a certain amount of water-pressure. The gases are collected by a tube leading from the side of the furnace a short distance below the throat. The furnace is kept in blast three weeks continuously, and smelts 19·2 tons of materials daily.

The smelting-mixtures are of two kinds, whose composition is as follows:—

				Lb. (a.)		Lb. (b.)
Calcined dressed ore ... ..	...	...	...	1,213	...	1,323
Liquation residues ... ..	...	...	...	1,654	...	1,323
Ores balled with lime ... ..	...	...	...	440	...	...
Fine stuff ... ..	...	...	...	220	...	...
Raw ore ... ..	...	...	...	...	...	220
Oxidized ore ... ..	...	...	...	...	...	220
Raw liquation residues ... ..	...	...	...	...	...	220
Limestone ... ..	...	...	...	1,323	...	1,764
Foul furnace-slugs ... ..	...	...	...	882	...	882
Refining-slugs ... ..	...	...	...	...	...	441
Crude-antimony metal ... ..	...	...	...	...	...	220

The most favourable result is obtained when these mixtures are used alternately, two charges of (a) being followed by one of (b). Lime is used, to the extent of 10 per cent., to ball up part of