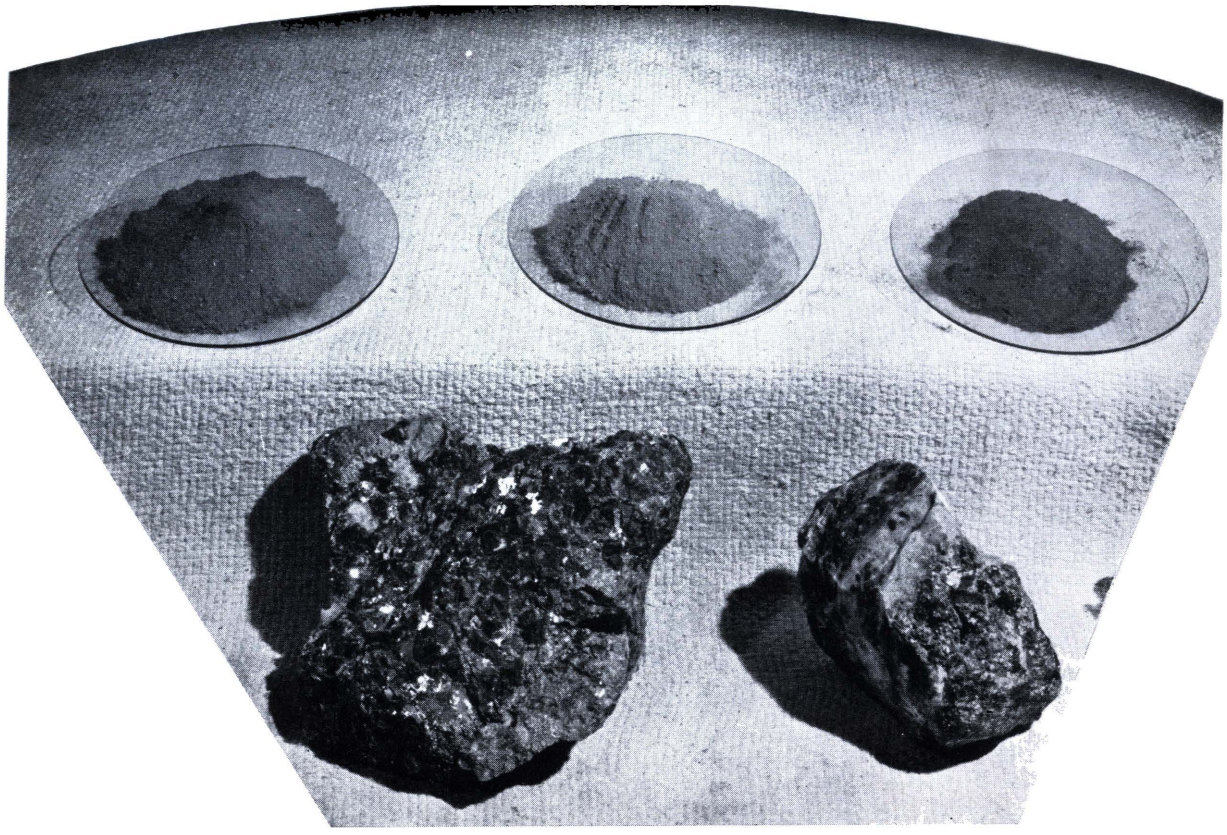


From these concentrates and ores come the gold and silver: top row, left to right, flotation concentrates from United Paracale, San Mauricio, and North Camarines. Bottom row, high grade direct smelting ores from San Mauricio and from Santa Barbara.

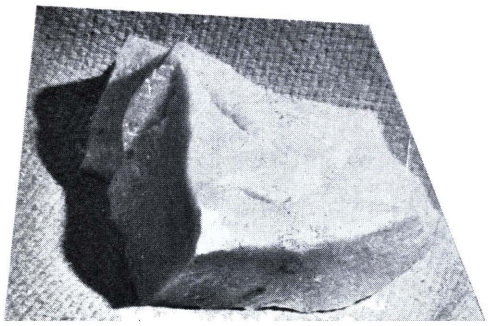
SMELTER MATERIALS AND PRODUCTS

The main object of smelting is to remove the sulphur from complex ores and concentrates, and to separate the copper and lead from the gold and silver. How this is done was described in detail by C. A. Weekley, general milling and smelting superintendent of Marsman & Co., in the Marsman Magazine for December, 1937, and in the Philippine Mining Year Book, 1939. The materials which go into a smelter, the various combinations formed during the different processes, and the final products are pictured on these pages. Many of these materials look alike; a chemical analysis, however, shows that they vary greatly.

Shown above are the concentrates and high grade ores which contain the values, as follows:

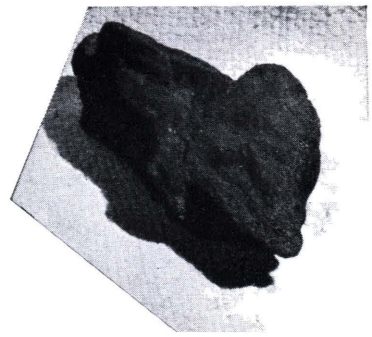
(Concentrates (from flotation plants)

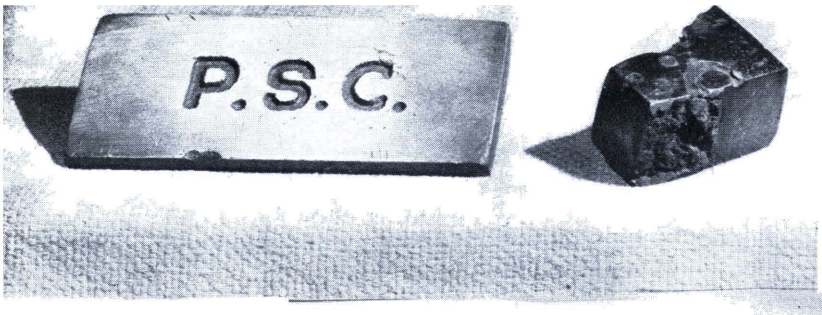
	San Mauricio	United Paracale	North Camarines
Gold (ounces per ton)	10	4	10
Silver (ounces per ton)	12	16	30
Copper (per cent)	2	8	15
Zinc "	9	10	
Lead "	8	7	
Sulphur "	37	35	



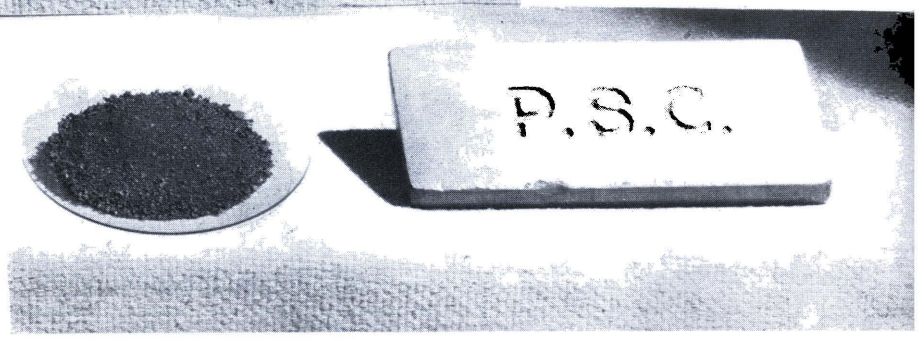
Limerock, used as a flux in the smelter charge.

Coke, which has to be imported from Belgium because a sufficient supply of coke of the proper quality is not available in the Philippines.





Unrefined lead bullion (at the left), and copper bullion, in which most of the values are finally concentrated. Below, left, granulated copper matte and refined lead bullion.



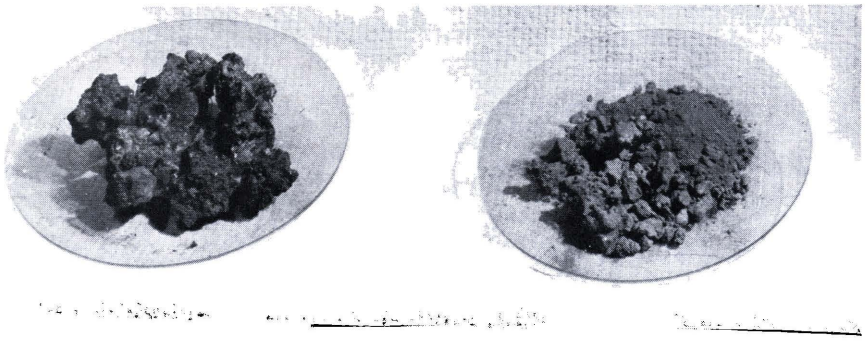
Direct Smelting Ores

	Santa Barbara	J. R. Reed Estate
Gold (ounces per ton)	0.5	0.4
Silver (ounces per ton)	1.0	5.0
Lead	—	5%
Silica	80%	75%

Mixed with these concentrates and ores is limerock flux, which contains 99 plus per cent of calcium carbonate, and coke imported from Belgium, which contains 90% fixed carbon, 3% volatile combined matter, 1% sulphur, and 6% ash.

After the charge has been sintered —most of the sulphur burned out—the fluxed sinter has the following average analysis:

Gold	7 ounces per ton
Silver	15 ounces per ton
Copper	7%
Sulphur	5%
Silica	32%
Iron	26%
Lime	10%



Top left, fluxed sinter, and burned Cottrell dust. Bottom, furnace bag house dust and granulated slag.