

## CAMAGUEY DEPOSIT OF BROWN IRON ORES

WILLIARD L. CUMMINGS (Geologist, Bethlehem Steel Co.) and BENJAMIN L. MILLER (Professor of Geology, Lehigh University) in the *Cleveland* (O.) *Iron Trade Review*

The Camaguey brown iron ore deposit covers the top of San Felipe hill, the nearest point of which lies 14 miles northwest of the city of Camaguey. While there are several low flat-topped hills in the vicinity covered with a more or less continuous mantle of brown iron ore, the deposit of Felipe hill is the only one of any size and importance, and the name "San Felipe District" is proposed for the region.

The deposit extends in a northwest-southeast direction for a distance of about ten miles, with an average width of five miles. The location is shown in Fig. 1, a sketch-map of the eastern part of Cuba. Fig. 2 is a map of the San Felipe district.

Practically every one of the mesas in the San Felipe district contains a mantle of brown ore, and principally at an elevation of from 400 to 500 feet above sea level. On the smaller hills, however, erosion has proceeded so far that the ore is nearly all removed. In different parts of the plain, which has an elevation of from 150 to 250 feet above sea level, there is some ore and some mining denouncements have been made, but the ore on these flats, or sabanas, is very shallow, and outcrops of serpentine appear at frequent intervals.

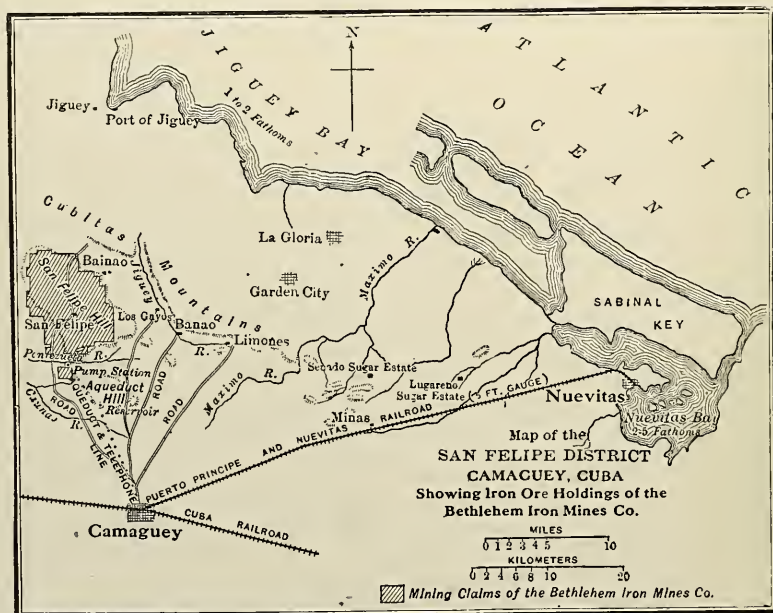
On the San Felipe hill there is a great deal of hard ore similar to that on the

beach at Moa, and in places the boulders are of enormous size. Over other areas, especially the wooded ones, there is no float ore, and the presence of the ore deposit is only revealed by digging through the soil and vegetable matter, which is generally only a few inches deep.

The greatest difference between San Felipe and Moa and Mayari is the coarse nature of the disintegrated capping at the first-mentioned locality and the frequent presence of hard ore below. Thus, at San Felipe, some pits can be dug 30 feet without the use of dynamite, while others can be dug only a few feet before the hard layer, necessitating blasting, is encountered, and in still other areas ore is found immediately under the grass roots. In no case has it been found possible to explore with hand augers, as was done at Moa and Mayari, as the auger is so apt to hit boulders of hard ore, that are frequently of considerable size.

A typical analysis of San Felipe ores is, in average of 10 samples: Fe, 45.18; SiO<sub>2</sub>, 6.75; Al<sub>2</sub>O<sub>3</sub>, 12.3; Mn, 0.56; Cr, 1.7; Ni, 0.53; P, 0.1; S, 0.063; CaO, MgO, 2; loss on ignition, 12 per cent.

A comparison of the average analysis given above with the following average analysis of three samples selected at ran-



Sketch-map of the San Felipe Iron Ore District, Camaguey, Cuba. (*Iron Trade Review*).



Sketch-map of the eastern part of Cuba, showing iron ore districts. (*Iron Trade Review*).

dom from a large number of Buena Vista (Moa) ores, shows the striking similarity of the ores of the two districts: Fe, 44; SiO<sub>2</sub>, 1.62; Al<sub>2</sub>O<sub>3</sub>, 11.61; Mn, 1.18; Cr, CaO, MgO, 1.66; loss on ignition, 19.18 per cent.

The higher percentage of phosphorus in the San Felipe ores probably proves nothing, as ores of a similar origin vary in this element the world over.

The analyses quoted in this section were made by R. E. Kresge, chemist, Bethlehem Steel Co., South Bethlehem, Pa., and by W. W. Fitch, chemist, Bethlehem Iron Mines Co., Camaguey, Cuba.

Not enough exploration has yet been done to prove the economic possibilities of the San Felipe iron ores. Pits in 40 per cent ore are common over the whole area of San Felipe hill. Certain pits have shown the following occurrences:

- 8 feet of 41 per cent ore
- 26 feet of 40 per cent ore
- 6 feet of 43 per cent ore
- 18 feet of 42 per cent ore

Other areas seem to indicate the presence of good tonnages of 45 per cent ore and better, as the following pits show:

- 5 feet of 45 per cent ore
- 3 feet of 48 per cent ore
- 11 feet of 46 per cent ore
- 7 feet of 47 per cent ore

Some areas have yielded 50 per cent ore, but, so far, no great amount of such ore has been found.

Judging from the enormous area controlled by the Bethlehem Iron Mines Co. (nearly 60 square miles), and assuming

that one-third of this area is worthless, which makes an extremely conservative estimate, it is probable that there are 400,000,000 tons of 40 per cent ore and 50,000,000 tons of 45 per cent ore.

Some experiments already performed seemed to show possibilities of raising the percentage of iron in the ore by screening or washing. Careful experiments on 100-pound samples of varying percentages of iron, but all above 40 per cent, seem to prove conclusively that simple screening will give a concentrate which will average 46 per cent of iron, and which will not be finer than 1/8-inch mesh. This will, however, be attended by considerable loss of fines, probably 50 per cent, which will be very high in alumina and silica.

Other economic features of the San Felipe deposit, aside from composition and possible mechanical enrichment, are most favorable. San Felipe being less than 500 feet above the sea level, and with gradual slopes on the west and north sides, requires no inclined planes. The ore, especially if screened, certainly needs no nodulizing to improve its physical character for furnace use, and the known depths of ore and its coarse granular nature favor the work of steam shovels.

A \$5,000,000 syndicate to manufacture and market sugar has been formed in Havana, says the *New York American*, with a number of American capitalists interested. President Gomez and the Spreckels family are associated with Mexican, Louisiana, Porto Rican and Venezuelan capitalists.