

SULPHIDE ORES CONTAINING NICKEL.

He first shows that the nickel ores of the world fall into three principal classes.

1. Ores containing arsenic and antimony, with or without bismuth.
2. Sulphuretted ores without arsenic, that is to say, nickeliferous pyrrhotite or pyrite, millerite, polydymite, etc.
3. Silicated nickel ores.

Of these, No. 1 occurs principally in veins, as for instance in various places in Saxony also, at Mine la Motte and Bonne Terre in Missouri.

No. 2, which is the class of which this paper treats, occur in basic intrusive rocks being apparently formed by a differentiation of the magmas and local concentration of the ore. Of these, the celebrated Norwegian deposits as well as those of Varallo in Italy, and of Sudbury in Canada are examples.

No. 3, occur as veins in serpentine, which results from the alteration of basic eruptive rocks, the ore being leached out during the process of decomposition and accumulated in the veins by lateral secretion as in the case of the great nickel deposits of New Caledonia, which are now the principal competitors of our Canadian nickel deposits.

Dismissing the first and third classes of deposits as having quite a different origin and confining our attention to the second class, the first striking fact to be noticed concerning them is, that they are so simple and uniform in character in all parts of the world, that a mineralogical description of one set of deposits would serve for all. The principal minerals which they contain are pyrrhotite or magnetic iron pyrites, a sulphide of iron which almost invariably holds a little nickel and cobalt, but which in these deposits usually contains 2 to 5 per cent. of these metals. Pyrite containing nickel and cobalt is also present, usually in smaller amount than the pyrrhotite, and having a better crystalline form owing to the fact that it is crystallized sooner. This mineral usually contains proportionately more cobalt and less nickel than the pyrrhotite. With these in a few deposits, minerals richer in nickel have been observed, three of these have been certainly recognized and possibly others may yet be discovered. Of these pentlandite (Fe, Ni) S has been recognized at two Norwegian localities, and in considerable quantities by Mr. D. H. Brown at the Copper Cliff and Evans mines and at the Worthington