dealing with a secondary feldspar, which has been formed during or after the metamorphism. This "regenerated" feldspar, as it may be called, is a regular growth through and around the altered variety. and in optical continuation with it, but of a much more acid nature. The new feldspar is clear, fresh and glassy, and contains no inclusions. This regenaration of feldspar is exceedingly interesting, and for a rock of this kind rare. That quartz grains, and at times feldspar, in sandstones and related rocks, are enlarged by secondary processes, is quite well known. That it should occur in other rocks, especially those subjected to the influence of dynamic metamorphism, is therefore not strange. At the same time it is so uncommon, as to deserve special mention. The other rock minerals, consisting now largely of secondary hornblende, and chlorite, (pennine), occupy the spaces between the large feldspar crystals.

The sulphides as usual are most intimately associated with the dark silicates, which they replace in a characteristic way. The feldspars, although strongly altered, have not been extensively replaced by ore, except where they have been crushed and broken, and then the ore is found filling the planes of fracture.

The replacement of hornblende and chlorite by ore, is typically developed, and a number of almost complete pseudomorphs can be seen. (Fig. 5.)

(4). Specimens consisting almost exclusively of ore, do not show anything new. The rock residue consists largely of feldspar, with a small amount of green hornblende, and chlorite. The minerals are all strongly decomposed, and are penetrated by threads of ore along all lines of weakness, and in some cases are almost wholly replaced.

CONCLUSION.

From the results given above it is possible to draw a number of conclusions, with certainty. Briefly these are as follows:—

(1). The deposits are *not* the result of a direct magmatic segregation from an original magma.

(2). The ores are largely of a secondary nature, deposited from circulating solutions, by a metasomatic replacement of the rock minerals.

(3). The relations of the rock minerals, can only be explained by such a replacement.

(4). Where the effects of metamorphism, in the crushing and alteration of the rock, are most apparent, the largest quantity of ore is developed.

(5). The ore has been introduced into the rock, *after* its complete differentiation and solidification.

(6). The ore first replaces the rock along planes of brecciation and least resistance, and finally extends, till it has replaced considerable masses of the rock.

(7). The ore is most prominently associated with secondary non-metallic minerals, namely hornblende and chlorite.

(8). The different relations of the magnetite and sulphides, to the rock minerals, gives additional proof that the latter are secondary.

(9). Pyrrhotite at first, probably formed the larger proportion of the ore, and chalcopyrite has been introduced still later.

(10). A comparison of this deposit with those of Sudbury and Sohland, show that the three are practically alike.

The ore-bearing rocks are of the same type, with only minor differences of local development. The underlying principles of the ore-formation are essentially similar. Whether the important concentration of the ore, took place during or after, the period of metamorphism, which crushed and sheared the rock, is not clear. It is very probable however, that the metamorphism had a more or less direct effect, in stimulating the circulation of the ore-bearing solutions, as well as rendering the rock permeable to these solutions. The ultimate source of the metals themselves is still problematical. As in the case of Sudbury, the associated basic rocks, can hardly be looked upon as capable of furnishing the necessary amount of ore, by a process of "lateral secretion". The only alternative is therefore, to ascribe a more distant source to the metals, which have received their *first* important concentration by means of *ascending* waters.

Considering our comparative ignorance of the laws governing the circulation of deep underground waters, a discussion of the actual processes, which resulted in the formation of the ore-body as it is to-day, would be purely theoretical.

As the object of this investigation has been to inquire into the *facts*, as presented by the actual occurrence and relations of the ore, and not to go into theoretical details, such a discussion will not be attempted.

THE PYRRHOTITE NICKEL DEPOSITS OF SOHLAND, GERMANY.

The geology of the interesting nickel deposits near Sohland, Saxony, discovered in 1900, has been described by Prof. Beck, in a recent valuable paper.*

* "Die Nickelerzlagerstatte von Sohland a.d. Spree, und ihre Gesteine." Zeit. der Deutsch. geol. Gesell., 1903.

Other literature on Sohland.

Beck, R. Lehre von den Erzlagerstatten. I Ed. 1900, p. 47; II Ed., 1903, p. 46.

Beck, R. "Ueber eine neue Nichelerzlagerstatte in Sachsen. Zeit. fur prakt. Geol. Feb., 1902, pp. 379-381.

Beyer, O. "Die erste Erzlagerstatte der Oberlausitz." Wissensch. Beil. der Leipziger Zeit. Feb. 13, 1902.

Geology of the Ore Bodies.

The country rock of Sohland is the so-called Lausitzer granite, which is cut by numerous diabase dykes, and often shows the effects of metamorphism. Where the ore was discovered, the granite is fine grained; further east a middle grained variety is predominant. The ores are closely associated with diabase dykes, called "proterobase", striking in a general W.N.W. direction. The main dyke is about 30 to 60 feet wide, and has been traced for more than half a mile. Ore has been found in a number of test pits, and prospecting with a magnetometer, makes it probable that the ore-bearing rock extends at least a mile in length.

The Ore-bearing Rock.

The principal ore-bearing dyke is not uniform in character. It is most largely developed as the so-called "proterobase"; in part it takes the form of a biotite-diabase. Besides these, there are small basic segregations, containing spinel, corundum, and sillimanite.

(a). Proterobase. Without going into petrographic details, the proterobase is a fine to middle grained rock, consisting chiefly of plagioclase, augite, brown hornblende, and brown mica. The chief accessory minerals are, a colorless pyroxene, magnetite, ilmenite, hornblende, talc, chlorite, andr serpentine.
apatite, zircon and rutile, as well as secondary green

(b). Biotite-diabase. The biotite-diabase is much finer grained, and occurs as irregular nodules within the proterobase. Its microscopic structure is typically ophitic. Brown hornblende fails, otherwise it is very similar to the proterobase, with which it is connected by gradual transitions.