in 1694. But long after this it was generally considered to be an ore of copper, but an ore which no one knew how to treat in order to get the copper out of it. The fact is that, in spite of the fine coppery appearance, this kupfer-nickel contains no copper at all. It was reserved for Cronstedt, an eminent Swedish mineralogist, to discover, in 1751, that it contained a new metal, to which he gave the name of nickel. And a most interesting metal it has proved, destined not very long after its discovery to give rise to the important trade in German silver which has employed and still employs thousands of hands and millions of money. The "false copper" was found to consist of this new metal nickel and of arsenic in nearly equal proportions.

In the days of Cronstedt analytical chemistry was not so far advanced as at present, so that it is not astonishing to find that two well-known French chemists, Professor Sage and M. Monnet, denied that kupfer-nickel contained any new metal; and they openly asserted that it consisted only of ordinary substances that could be perfectly well separated by proper methods. This denial aroused the curiosity of another Swedish chemist, the illustrious Bergman, from whom the great Berzelius derived much of his chemical knowledge, to examine this kupfer-nickel with the greatest care. This was done in the year 1775. He successfully refuted the assertions of the French chemists, and confirmed in every respect the views of Cronstedt. Moreover, he first obtained the new metal nickel in a comparatively pure state, and described its curious properties, its white colour, its hardness, its difficult fusion, its magnetic attraction, and its beautiful green salts. It then attracted a great deal of attention, and many treatises were written upon it, one of the best and most exhaustive being that of the German physicist Richter, in 1804.

Such is the brief history of the discovery of nickel, which is very similar to that of cobalt. This was achieved by another Swedish chemist, Brandt, in 1733. Here also the new metal was extracted from a mineral called "Kobalt"—an "evil spirit" of the German miners—a gray metallic, heavy mineral, that was very annoying to the miners when met with in their copper lodes, as, in spite of its great weight and metal-like appearance, it yielded no copper, nor anything else. Here, again, the celebrated Bergman, in 1780, confirmed and extended Brandt's discovery, and this new metal cobalt finally came into prominence by the large number of investigations to which it gave rise. As in the case of nickel, the ore was found to consist of cobalt and arsenic. Ever since the fifteenth century, however, this ore of cobalt has been used in different parts of Europe to give glass and porcelain a beautiful blue colour which has never been surpassed. These two metals usually accompany each other in the mines; in some lodes the nickel predominates, in others the cobalt, and the ores are separated and treated accordingly.

Iron, nickel and cobalt are the only three metals that can be converted into magnetic needles such as that used in the mariner's compass. Of these, iron appears to be the best suited for this purpose, and if either of the other two contains any admixture of arsenic its magnetic property disappears entirely. When pure, both nickel and cobalt will form horseshoe magnets little inferior to those of steel. The complete separation of nickel and cobalt has always been looked upon as a very difficult process, on account of the similarity of their properties, and a great number of more or less complicated methods have been described for this purpose; but the writer showed some years ago that it can be accomplished with ease by means of a salt called xanthate of potash. The process would be too expensive, perhaps, on the large scale, but it is excellent in the laboratory.

Some time back a new ore of nickel, a silicate of nickel and magnesium, was found in New Caledonia, and latterly the same ore has been discovered in Canada. It is called Garnierite, from the name of its discoverer, and is now actively worked as an important source of this valuable metal which is now being used with great effect, combined with the steel, to harden the armour plates for warships.

For ages past the Chinese have produced an alloy of copper and nickel, called in their language "white copper," the exportation of which was always strictly forbidden, and its process of manufacture kept secret. A curious property of this alloy is that when a small bar of it is suspended by a string and struck with the finger, the sound emitted can be heard for more than a thousand yards. By some means a specimen of this curious compound metal was obtained by a Scotch chemist, the late Dr. Fyfe, Professor at Aberdeen, who made an analysis of it, showing that it contained more than half its weight of copper, a large amount of nickel, with some zinc, and a very little iron. The Chinese evidently obtained it by smelting together a mixture of copper ore and nickel ore. The same practice was put in operation in Germany, and gradually led up to the production of "German silver," which is now a very important branch of metallurgy. There are many kinds of Gersilver-which the Germans themselves still man China-silber-but they all contain rather call more than half their weight of copper and about a quarter of their weight of nickel with the same amount of zinc. The eminent chemist Pelouze, when Master of the Mint at Paris, found that if the latter metal is omitted entirely the product is much finer, but far more expensive. Many inferior kinds are made for the commoner purposes. The best kind takes a high polish, and tarnishes less readily than silver; it is a white metal with a shade of blue. It contains eight parts of copper to four parts of and three and a-half parts of zinc. nickel But probably all has not yet been done in this direction; an alloy of this kind is known which contains fifteen per cent. of nickel, and is remarkable for its malleability and whiteness. It may be drawn into wires or rolled into sheets of any thickness, and is well adapted for ornamental work of every description.

Nickel is difficult to obtain in a perfectly pure state, and the metal as found in commerce sometimes contains less than sixty and seldom more than eightyeight per cent. of pure metal. Of late years absolutely pure nickel has been successfully deposited from its solutions by means of electricity, and is now largely used in electro-plating.

The metal cobalt is not put to any use at present; the beautiful blue colour (cobalt blue, or smalt) which we all know so well, was long ago discovered by calcining cobalt ore with sand (silica). It is a silicate