

HISTORY OF THE PENCIL AND ITS MANUFACTURE.

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THE invention of the pencil has caused one of the most important and interesting peaceful revolutions in the social and industrial life of the world.

We can scarcely conceive now a-days how so many centuries passed without this most useful writing instrument. If we had suddenly to do without it, we should be most seriously hindered in our scientific, artistic, industrial and commercial activity, for the pencil serves us not for writing purposes alone, it has also become in many ways indispensable for our sciences and arts. It has aided the great advance made in drawing, which has to a great extent facilitated the technical perfection of most of our industries, and, in fact, without which we could not have reached the place we now occupy.

The history of the pencil shows its importance. The German word "bleistift" (which for the sake of its derivation we will here translate by "lead holder" or "lead support") indicates that we have to do with a compound article, consisting of the chief part, the "lead," and its assistant or secondary substance, the "holder" or "support," which keeps it together and enables its use. The "stilus" or "writing stick" was already known to the Romans, and is therefore exceedingly old. They used it for writing or rather scratching signs or marks into wax tablets. They wrote with the pointed end and erased the marks again, when necessary, with the flat end of the stilus. Even the use of lead was not unknown to them, as they employed it in the form of round discs for ruling their parchments, in order to arrange their letters in a regular and uniform way. This instrument was called the "præductal," from præ, before, and ducere, to conduct. Though the use of lead in some shape, like our pencil, would appear to us as easily arising from this, still the Romans did not think of it, and such a manipulation as the pencil, in its present form, was first introduced at a much more recent period.

If we refer to Albrecht Dürer's work on the art of drawing, we find that he mentions needles, pens, charcoal and lead. In all his drawings representing artists he generally places a pen in their hands, and always puts his signature written with a pen on his drawings and engravings. He mentions the needle for making perspective points and lead or charcoal for indicating auxiliary lines. He prefers the charcoal to the lead, because it can be more easily erased. However, lead was used for drawing in those times, for some so-called "silver pencil drawings" exist of the younger Holbein and of Dürer himself. Those pencils were, of course, very different from our own. They were sticks of lead with or without any mousing. Italian artists of Dürer's time, instead of charcoal, likewise used pointed sticks made from two parts lead and one part tin, called lapis piombino. The term "lead pencil" has remained up to the present time, though graphite has long replaced the lead. This mineral was supposed in the 17th century to be a compound of lead, because it looked so much like it, notwithstanding the fact that it can neither be melted nor that it is of equal specific weight.

Italian mineralogists mention in 1596 a new mineral "pencil lead," but its discovery is somewhat older and took place in England, where the celebrated graphite mines of Borrowdale, in Cumberland, were opened between 1540 and 1560. This mineral was specially recommended for its usefulness for draw-

ing purposes. The Italians called it grafio piombino, but the German mineralogist, Abraham Werner, at the beginning of the present century, was the first to use the word "graphite" (or as spelled in German, "graphit"). Thus a mineral had been used a couple of centuries, while neither its substance nor its chemical composition seem to have been known. Now, of course, it has long been settled that graphite is carbon with greater or lesser impurities. At the end of the 16th century the newly discovered mineral was already extensively used by Italian artists; sticks were cut from it and surrounded with wood. Thus they greatly helped to make these pencils known and be exported to other countries. Pencils were then already made at Nuremberg, and though no exact dates can now be discovered, an Italian writer, Cesalpinus, mentions that the best quality of the pencil lead (graphite) comes from England, the lower from Holland, and that the Nurembergers use it largely. As mentioned above, the oldest graphite mine is in Cumberland. As soon as the nature of the mine became known, it caused a revolution in lead pencil making. It was only worked during six weeks in the whole year, but during that time £40,000 were realized. The graphite was packed in iron cases and sent to London under due protection, where it realized £16 the kilo (about 2 lbs. English) at public sales. The importance of graphite was so well understood by the British Government that its importation was only allowed in the form of finished pencils. However, after a time the mine became exhausted or nearly so. The famous Cumberland graphite is therefore a thing of the past, at any rate as far as the world's markets are concerned. Even at its original production it would not now be able to supply the constantly increasing demand.

The manufacture of pencils from Cumberland graphite was exceedingly simple. The graphite blocks were sawn into parts, which again were subdivided into small sticks and then set into wood. Manufacturing remained in this primitive state for upwards of a hundred years, even when new graphite mines had been discovered on the continent.

Pencil making became a settled trade in Bavaria early in the 18th century. We know, however, very little about the particulars except that great blocks like those found in England do not exist on the continent, nor is the material so pure. Other ways had therefore to be introduced to improve the quality.

We give from Sprengle's work on industry and arts, published 1772, some notes reported by a pencil maker of the name of Matthias Schmidt, whom King Frederick William I. of Prussia, in 1726, called from Schwabach to Berlin, in order to introduce this industry into Prussia. He says that though pencils are made in Germany looking like English, their inferiority becomes at once apparent when sharpened for use. According to him this is the process of manufacturing: The lead cutter crushes the pencil lead (graphite) in a mortar and throws out foreign matters, such as sand, by running it several times through a sieve. Then he adds $\frac{1}{4}$ to $\frac{1}{3}$ lbs. sulphur to the 1 lb. of graphite in the melting pot. The mass is then melted and allowed to cool. Before it is quite dry, it is put on a board and formed by the hands into a kind of cake. The latter must then become quite cold and is afterwards sawn into thin plates, and the latter are cut into square pencils, which are inserted into wooden frames. These frames are made by cutting a groove with a plane or else burning this groove into the wood. The lead is then glued into the groove and another piece of wood is glued on the open side. The side whence the lead comes out