is neatly pointed with a file. Finally the whole outer side of the wood is neatly polished with glass. The pencil maker, our informant continues rather quaintly, must have omitted some important particulars, for he has to finish his work in a very short time. The whole dozen only costs 8 groschen (equal to 9d. English).

In this description of a very simple process the pretence of secrecy is rather amusing. No alteration in the process took place until about 70 years ago. As the use of india rubber was yet unknown, those pencils were considered the best, the writing of which could be erased most easily. The chief difficulty in pencil making arose from the employment of a suitable binding substance, which formed the graphite powder into a compact mass without taking away the coloring power. First sulphur, afterwards gum, glue, resin, shellac and other similar substances were tried, and lastly antimony of sulphur melted together with graphite.

In the year 1795 the Frenchman Conte conceived the idea of mixing the graphite powder with clay in ordinary cold water. This method at once revolutionized pencil making and gave it a chance of the most brilliant progress, of which, among others, the Nurembergers most successfully availed themselves. The new mass was very soft and elastic, so that it could easily be formed into any shape. There was no longer any need of making and drying cakes and cutting them afterwards. The pencils could at once be made into the right shape and had only to be dried and hardened afterwards. There was also this further advantage, that by making the addition of clay larger or smaller the softness of the pencils could most accurately be regulated.

However much Conte's invention assisted pencil-making, it may still be said, without presumption, that the great success of modern pencil-making is closely connected with the name of Faber. To show this more clearly, we have only to compare the above primitive sketch of the process with the following description of the modern improved method.

The present process of manufacture is closely connected with the three materials, graphite, clay and cedar wood.

Many kinds of graphite are now supplied by Bohemia, Bavaria, Spain, Mexico, Ceylon, Siberia, and North America. Bohemia furnishes by far the largest quantity, and supplies about 95 per cent. of all. Siberia is too far away, and the land transport takes too long a time and is too expensive.

The value of graphne consists in the grain and the composition: Ceylon, e.g., is very pure and excellent for making melting pots, but pencil makers require the finest grained quality and therefore prefer the Bohemian.

The first process to which the graphite is subjected is the washing. Even the refined quality brought into the market contains many substances, which have to be eliminated. Chemical means have often been tried, but pencil makers find the washing process the most successful. It is arranged in a number of vats, a dozen or more very often, which are each a couple of feet lower than the other. Water is let in, and the mass is stirred up. The heavier parts go to the bottom, the finer mixture flows through the openings into the next vat, where the same process is repeated until the last contains the purest mass. The same is then pumped into the filter presses, which extract the water and line the sides with paste-like cakes. The clay is subject to the same process. The graphite and clay cakes when dry are weighed in certain percentages and moistened in wooden vats, whence they go to the mixers. Very fine graphites are ground 80 to 100 times or more. Afterwards the grinding filter presses extract again the moisture. When the mass has been completely dried, the pencil sticks are made. Special machines pulverize the hard dry cakes, the powder is so far moistened that the elastic paste can be let into steel cylinders which are quite closed, but have a small hole at the bottom formed with jewels. This hole is sometimes round, sometimes square, or has three or six sides, of course, of the exact shape the inside lead the pencil is intended to have. The graphite paste in the steel cylinders is subjected to pressure of about 20 atmospheres and pushed out of the jeweled holes at the bottom, where it comes out like a string and falls in spirals on boards, where the workmen draw it out and straighten it. Then they cut it into the necessary length. The sticks in this state when dry are very brittle, and can only be made suitable for writing by burning or heating. This burning is a very important part of the process. Thirty or forty gross are placed in the graphite melting pot, which must be perfectly airtight, for in the open air the graphite would burn away. The pots are gradually heated in stoves and remain there for several hours, at a temperature of 1875 deg. Celsins. When cold, the leads have acquired the necessary quality.

Now for the wood. Strange to say the cedar wood required for pencils, grows exclusively in America. The botanical name is "Juniperus Virginiana," and is different from other cedar species. All the others, including the cedars of Lebanon, are too hard, have too many knots, and scent too strongly, while the American tree is soft, has no knots and possesses a pleasant aroma. There is some suitable wood found in the Bermudas. but it is rare. The cedars coming from Florida are the best quality, as the climatic conditions are most suitable. The preparation of the cedar wood commences with sawing blocks of pencil length ; these blocks are cut with circular saws into boards of a width of four to six pencils. These boards have to be freed from resin, boiled, washed and slowly dried. After the boards have been kept ready for some time and become thoroughly seasoned, they are placed into the "grooving machines," (The lecturer here showed a drawing of such a machine and explained its objects and working.)

Each pencil has two halves, and in order to hold the graphite the groove must correspond to exactly half the thickness of the "pencil lead." Now one half of the board with the grooves is lightly coated with glue, and the leads are placed into the grooves, the corresponding board is put on the top and then placed into presses till the glue is quite dry. Then they go into "regulating machines," which polish the upper ends of the pencils. Now the boards (of six pencils each), go into the planing room, where specially constructed machines change these boards into round, square, sexagonal, or triangular pencils. These machines generally interest the visitors to a pencil factory as much as the graphite presses. It is certainly very curious how the boards go in at one end of the machine and come out as half-a-dozen finished pencils at the other end. They have now only to be sorted and sent to the polishers.

The polishing is a special branch. The firm of Johann Fabre now employs 70 polishers in the factory and 300 outside workers in addition to the various machines. After the polishing, the ends of the pencils are cleaned and cut to the right length on special machines. Of course