What We Owe To Graphite.

This is a story of lead pencils, electric lights, and graphite mines. Do you know that the lead in the pencils you use every day is the product of the earth's inferno of several million years ago? And that the carbons in the powerful electric lights that glow in our streets come from volcanoes that blazed centuries ago when the world was young? Uncle Sam's scientists have just completed an investigation of graphite mining—sometimes called lead mining—in the United States and the Old World, and the results of this inquiry have developed many interesting facts.

Some of the most interesting facts brought out in this inquiry were the few mines of graphite in the world, how artificial graphite or lead is made, and the extraordinary manner in which it is mined in Ceylon, India. It is also explained how nature lays up great stores of lead for future generations of school children. After making coal, it seems that nature simply took one step further and made graphite, for the latter is nearly pure carbon and was formed through the action of molten rock forced from the bowels of the earth. This rock, after being reduced to almost a fluid state by the tremendous pressure in the center of the earth, was brought into contact with coal. The coal was burned out through chemical actions and the graphite remained.

A description by the scientists of a graphite bed in New Mexico will illustrate how nature goes about the job of making lead. "This is one of the few graphite mines in America. The graphite vein extends into coal fields, which contain coke. In the early ages of the world molten rock was forced into the coal-bearing rocks in many places and formed natural coke, but in some places, due to the presence of certain chemicals, it formed graphite when it came in contact with the coal. The coal was completely graphitized where the rock was forced into the coal bed. Some of these desposits contain 80 or 90 per cent pure graphite. This and artificial graphite are the materials most often used in the manufacture of lead pencils."

Every one speaks of a "lead" pencil as though it were really made of lead, but, as a matter of fact, there is no lead in a lead pencil. The heart or core of a "lead' pencil, commonly known as lead, is really graphite. It goes under three names—graphite, plumbago, and black lead. It is known as graphite in scientific circles, plumbago by the custom house people, and lead by the ordinary people.

History of the Lead Pencil.

There is little real history to the lead pencil. It probably goes back two or three centuries, but that is all. Some old parchments have been found marked with lead ruling, but this must have been metallic lead. Le Moine, an authority of the early days, speaks of documents marked with graphite. Other writers have found papers evidently written with a piece of graphite inserted in the end of a stick. And this shows the evolution of the pencil.

The first pencil factory in America was founded by a school-girl. There was a graphite mine in England at that time called the Barrowdale mine. A school-girl obtained some pieces of graphite and anticipated quite closely the pencil method of modern days. In some way she crushed the graphite, either with a hammer or a stone, and then used gum, mixing the two together. Then she cut an alder cylinder, filled it with this gum and graphite, and thus produced the first lead pencil made in America. This took place in Danvers, Mass. Later a man by the name of Joseph W. Wade co-operated with the girl, and together they made a number of lead pencils after the same fashion. The girl's name was not recorded.

The Barrowdale mine in England was the source of the first graphite, and the pieces quarried were said to be in such form that they could be sawed and pressed into the wood. Scientists say, however, that pieces of this kind were not very numerous. Later it occurred to a Frechman named Conte to powder the graphite and then combine the pulverized substance with a binding material. He worked on his scheme until he produced the graphite part of the pencil substantially as it is made now. Not much, however, was done with it, either by Conte or by any other Frenchman. The Germans then took it up, and while the Frenchman was the real inventor, to the Germans belongs the credit of working out and putting into its present shape the lead pencil as we know it to-day.

The work of pencil-making is picturesque. It is ingenious and attractive, and the method reflects rare mechanical talent. The number of raw materials used is between 40 and 50, and the whole world contributes to the assembling of these materials. Most of the processes are done by automatic machinery.

The Mines in Ceylon.

Edson S. Bastin is Uncle Sam's scientist in the geological survey at Washington, who has made a study of graphite for many years. In speaking of mining graphite in Ceylon, Mr. Bastin said:

"Athough their existence was known in early times and mentioned in print as early as 1681, the graphite deposits of Ceylon were not exploited until some time between 1820 and 1830. Joseph Dixon is said to have imported a small quantity into the United States in 1829, but it was not until 1834 that the industry assumed any commercial importance. From that time to this, as a result of the growth of the metal industries and the great demand, the industry has developed rapidly, until at present graphite is subordinate in value only to tea and the products of the cocoanut palm among the exports from the island.

"The graphite is mined either from the open pits or through vertical shafts connected with underground workings. The majority of mines are not deeper than 100 feet, though a few go as deep as 400 or 500 feet. On account of the heavy rainfall, water is one of the chief obstacles in mining. In a few mines steam pumps and hoists are employed, but as a rule the mining methods are still crude, the acme of mechanical ingenuity being reached in a windlass operated by five or six men to hoist the graphite in a sort of tub. The workmen usually climb rough wooden ladders hundreds of feet long. The ladders are tied with jungle ropes and rendered very slippery by the graphite dust and water, so you can imagine what a hazardous job it is.

"The mineral as it comes from the pit, usually contains about 50 per cent of impurities, mostly in the form of quartz and wallrock. It is carried in bags to a dressing shed, where it is picked over by hand and the impurities reduced to 5 or 10 per cent. It is then packed in barrels for transportation to Colombo or Galle. At these ports it is unpacked and submitted to further treatment known as 'curing.' The graphite merchants have fenced yards of 'compounds' for the final preparation of the graphite for the market.

"In the methods of 'curing' there is some diversity, but the first step is usually to set aside large lumps and pass the remainder through stationary screens of several sizes of mesh. The large lumps and the screened pieces are then broken with small hatchets by Singalese women to remove the coarse impurities, such as quartz, and are then rubbed up by hand on a piece of wet burlap and finally on a piece of screen to give them a polish. Finally, various grades, coming from several mines or differing in size or texture, are blended to meet the demands of purchasers, a process requiring skill and long experience.

Best Pencils Made of a Blend.

"The poor material is usually beaten to a powder with wooden mauls or with beaters shaped like a rolling-pin, and is then sorted into different grades. In some establishments the poor grades are washed in a tub or pit. In this process the mineral is placed in saucer-shaped baskets, and by a circular 'paling' motion of the baskets under water the graphite particles are thrown off into the pit, while the heavier impurities, especially pyrite, remain behind. To separate the very fine material the powdered graphite is placed in a basket looking like a large dustpan. The contents of the basket are thrown into the air, and the heavier particles fall back into the basket, while the finer material is blown forward and thrown on the floor.

"The use of graphite in the manufacture of pencils probably is both its oldest and best known application. The industry in Germany and England is several centuries old, and many of the modern factories manufacture hundreds of varieties of pencils, yet the percentage of graphite used for this purpose is not large, being less than 10 per cent. of the world's production, and one authority estimates it as low as 4 per cent.

"In this country the physical character of the graphite is of great importance. Crystaline graphite, however pure, would, if used alone, yield a 'lead' that would slip over paper without leaving more than a faint streak. Further, it is almost impossible to grind the flake graphite into a powder of the finest grain required for the better grades of pencils. The better grades of graphite constitute the bulk of material used in pencil manufacture. For some of the cheaper pencils only one kind of graphite is used, but the graphite for pencils of the better grades is a careful blend of several kinds. One blend, for example, contains about one-third Ceylon graphite, one-third Bohemian, and one-third Mexican. The Ceylon graphite adds to the smoothness of the 'lead,' the Bohemian adds blackness.

"Graphite when used for pencils is mixed with carefully refined clay, which is usually imported from Germany; no domestic clay has been found entirely suitable for pencil manufacture. The more graphite and the less clay the softer the pencil; the less graphite and the more clay, the harder the pencil. The cores of softer pencils are usually made larger than those of the harder ones in order to give them equal tensile strength. For a pencil of medium hardness about one-third clay is commonly used. The wet mixture of clay and graphite is worked and reworked until it is so pliable that it can be looped in coils and even tied in loose knots.

An American Graphite Mine.

"Up to a few years ago every American pencil manufacturer had to import his graphite from India or Bavaria. About twelve years ago a large deposit of amorphous graphite was discovered in Senora, Mexico. This proved to be of excellent quality for pencil making and many other uses, and the American pencil trade now derives its supply mainly from this source. Some Mexican graphite is also exported to European pencil manufacturers.

"A use which has increased rapidly in importance within the last few years is the manufacture of graphite paint, especially for structural iron and steel work. Much of the graphite used for this purpose is rather impure. Recent tests made in cooperation between the office of public roads of the Department of Agriculture and the Paint Manufacturers' Association, for the purpose of determining the relative merits of various paint pigments as preservative coping for iron and steel, have yielded results of great importance."

What nature can do, man can sometimes do even better, and in the case of making graphite, a single company using the power generated by Niagara Falls, manufactures more artificial graphite than all the graphite produced by the mines of the United States. Hard coal with a small amount of ash is the material used, and the electric furnace does the rest.

85 Pencils a Year for Each Human.

The process is a patented one. The product is used largely as a lubricant, known generally to the trade as plumbago, and the invention solves the problem of the supply of grease to make the world go round, so long at least as the coal supply lasts. Since 1904 this company has made fully 50,000,000 pounds of graphite at an average cost of 7 cents a pound, and a multitude of wheels of industry have thus been made to spin more easily. Graphite greatly improves the oil as a lubricant in every respect. Specially prepared graphite will remain suspended in oil, displaying no tendency to sink, so that it can be fed through automatic oil cups. When suspended in water this graphite will pass through the finest filter paper.

The use of graphite in pencil making is its oldest application, but the percentage of graphite used for this purpose is estimated as low as only 4 per cent of the total production. Still, with a world's production annually of about 5,000,000 tons, it can be seen that allowing 4 per cent for pencils, 200,000 tons, there would be some pencils. Two hundred thousand tons is 6,400,000 ounces, and one ounce of graphite will make the "lead" for 20 pencils. This is 85 pencils for every man, woman and child in the world, illiterate, heathen and all.

Another use for graphite is in the manufacture of crucibles for making fine grades of steel, brass and bronzes. The fact that graphite is nearly pure carbon, is relatively inert chemically, and volatilizes only at high temperature makes it of exceptional value for this purpose. Most of the graphite used in the United States for crucibles is imported from the great graphite mines of Ceylon, the equal of the Ceylon product for this purpose not being found in any other locality. Stirring rods and other refractory products are made from material similar to that used in crucibles. Another important use is as a rust preventive for structural iron and steel. Graphite is also largely used in various electrical processes, for stove blacking, and as a protective coating for gunpowder.

The story of what is probably the oldest graphite mine within the United States is interesting. This mine became known to the whites in 1633, and has been worked intermittently for more than two centuries and a half. Recently a company has been incorporated which is now attempting to develop the property by the methods of modern mining engineering. The mine is located in the midst of a tract of land almost as wild and desolate to-day as it was a century ago near Sturbridge, Mass.

The existence of this deposit of graphite was known early in the colony's history. About 1633 one John Oldham, of interesting memory in connection with the battle of Plymouth and the Massachusetts Bay Colonies, made a trip overland to Canada, trading with the Indians on the way. He returned with a stock of hemp and beaver, and also brought along some "black lead" he found near Sturbridge. The Indians told him there were great quantities of it around that region.

Governor Winthrope became interested, and made a contract with a man named Keene for developing and working the mine. Winthrope was to advance 20 pounds in trading cloth and wampum in consideration of which Keene agreed to go to the Black Lead Hill with a number of men, and there to dig the black lead for which he was to be paid at "the rate of 40 shillings for every tunne when he had digged up 20 tunnes of good merchantable black lead and put it into an house safe from the Indians."

The venture came to nothing, and for a number of years the mine lay idle, although schemes for its development were often under discussion. It was thought then that the presence of graphite indicated the nearness of silver, but no silver being found, the early colonists were much discouraged. The mine was so remote it was hard to get workmen to go into the wilderness or to stay there after they arrived. And so it remained for two centuries, until finally early in the nineteenth century the value of graphite became known, and the mining of the mineral was undertaken and carried on up to the present time.

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Six Stitches in His Heart.

New Orleans, Jan. 25.—Making a half dozen stitches in a negro's heart while almost blinded by blood, which spurted from that organ, was part of a remarkable operation performed today by Dr. J. A. Danna, house surgeon of Charity Hospital. The patient, Lodge Lee, who was stabbed in a row with a woman, was conscious throughout the ordeal, and conversed with those about the table. Hospital attendants say he will live.

There are more brands of cussedness than there are brands of religion.

TO INDIA AS MISSIONARIES.

Rev. and Mrs. Ranson, of Charlotte, Sail February 15th.

(Anderson Mail.)

Rev. and Mrs. J. W. Ranson, of Charlotte, N. C., are going to India as missionaries from the Associate Reformed Presbyterian church. Rev. Mr. Ranson attended a meeting of the board of foreign missions of the church, held at Due West a few days ago, at which time it was decided that he should take up the work. He will at once begin preparation for work in India and will sail for that country on February 15th.

Much of the funds necessary for the expenses and maintenance of Mr. and Mrs. Ranson in the mission field was raised in Charlotte and in Mecklenburg county, North Carolina, of which Mr. Ranson is a native.

"Human Bomb" Convicted.

Los Angeles, Jan. 25.—Carl Reidelbach, the "human bomb," who terrorized the central police station several months ago, when he entered it carrying an infernal machine, and announced that he intended to blow everything into "kingdom come," was convicted to-day on the charge of having deposited dynamite in an inhabited place.