Correspondence.

History of the Thread Spool Industry.

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of September 28 is a mention of the thread spool industry of Maine, in which appears the statement that it began twenty-five years ago.

It can be of no interest to the public, but the writer of that article might like to know that forty-five years is nearer the date.

In 1853 or 1854 two men, Harnden and Leland, went to Augusta, Me., and commenced the manufacture of thread spools. They were from Massachusetts. My father furnished them the timber, cut, sawed, and seasoned at Fayette in that State. After being burned out in Augusta the whole business was removed to Fayette and carried on there by Mr. Leland.

My father furnished the capital for the business and I worked in the woods getting out timber, and in the mill making spools during those years.

Mr. Leland sold out and left the State. His successor removed the plant to another part of the State, where timber was more plenty. The business has been prosecuted in that State ever since. EDWARD CRAIG.

New York, October, 1895.

The New Carborundum Works at Niagara Falls.

Among the new industries resulting from the economical production of the electrical current is that of carborundum, or artificial diamonds, used in the arts as an abrasive, and ranking next to the diamond in hardness. The following account of the opening of the new works is from the Electrical Engineer:

The formal opening of the new works of the Carborundum Company, at Niagara Falls, took place October 19, in the presence of a number of invited guests, and thus was inaugurated a plant which will unquestionably rank among the most important that have thus far been attracted to the Falls.

Before entering upon a description of the work accomplished with the new equipment it may be of interest to relate the events which have led to the creation of the new carborundum works. It will be recalled that, prior to the starting of its Niagara Falls plant, the Carborundum Company manufactured carborundum at Monongahela, Pa., using steam power to produce the current, the daily output amounting to about three hundred pounds. Although the making of carborundum is now carried on only at Niagara Falls, the old plant is operated in making finished goods from the grain and powder carborundum sent from the new plant.

Owing to the limited facilities heretofore existing, the production of carborundum had been so small as to practically restrict its uses to the finer trades, such as the dental and manufacturing jewelers', fine tool grinding, pearl grinding, and kindred industries. The development in the dental trade especially has been remarkable, and, in the form of disks, lathe and engine wheels and cloth finishing, carborundum is rapidly displacing all other abrasives in this important trade, not only in the United States but throughout Europe.

This development is also noticeable in the jewelry trades, where, in the form of wheels and powders, it is used in polishing and grinding the delicate wheels, springs, etc., in the manufacture of watches. Its value is materially enhanced because of the fact that owing to its exceeding hardness, the finest, impalpable powders have remarkable cutting properties; and although no special effort has been made to introduce it into the glass grinding and finishing industries, its value as a superior abrasive for these purposes is recognized.

Its utility has been demonstrated in the more important grinding trades, such as car wheel grinding, machine shop finishing, and all other industries using large wheels; its rapid cutting qualities resulting in a saving of labor and time, a valuable consideration in any manufacturing interest. This large field has remained practically closed, owing to the inability of the Carborundum Company to make a sufficient quantity of the material to manufacture wheels larger than twelve inches in diameter for the general trade, large orders being constantly turned away.

To produce carborundum at the lowest possible cost, and thereby permit of its general adoption as an abrasive for all classes of work, has of course been a subject of vast importance to the Carborundum Company, and after having investigated the possibilities of Niagara Falls as a manufacturing point, they determined to locate a plant in that city that they might have the benefits of cheap power from the Power Company and have also the advantage of railway facilities there offered. A contract was made with the Niagara Falls Power Company for 10,000 horse power to be delivered as required for the purposes of their manufacture, and it is thought that the initial 1,000 horse power now being used will be added to at an early day, and with that in view the plant has been constructed to accommodate 3,000 to 4,000 horse power.

With this brief history, let us now follow the crude materials through the various processes to the state of finished product.

The various buildings and apartments of this superb plant are admirably arranged for the economical handling and manipulation of the materials. The stock building, into which are received the crude materials, is provided with a railway track connecting with the Niagara Junction Railroad, on which the loaded cars are conveyed to the various bins or compartments provided for the reception of the crude materials, which consist of coke from the Pennsylvania bituminous coal fields, white sand from Ohio, salt from the salt works of New York State and sawdust from the mills of Tonawanda. Conveniently arranged, in relation to the storage bins of crude materials, is a most complete grinding, grading, and mixing plant, into which the coke as it comes from the cars is introduced and ground and sifted into assorted sized grains and conveyed into bins, from which it is drawn and mixed in proper proportion, with measured quantities of sand, salt, and sawdust, and these measured quantities thoroughly mixed and delivered in a bin provided for the finished mixture. This work is done by automatic machinery at the least expenditure of manual labor.

The four crude materials having been wrought into what is called the mixture, they are conveyed to the electrical furnaces in an adjoining building. It would, perhaps, be difficult for one unskilled in the arts of the electro-metallurgist and unfamiliar with the apparatus he employs in producing his transformations, to recognize the rough and apparently crude oblong brick boxes, made without cement, mortar, or other binding materials, as furnaces. Provision is made for five of these furnaces, extending down one side of the large spacious building, each of them measuring about fifteen feet in length by seven feet in width and the same in height. In the center of each end is placed a large bronze plate and these are connected by means of four large copper cables to massive copper bars extending under the floor at either end of the furnaces. Connecting with the inner surfaces of the bronze plates are one hundred and twenty carbon rods, sixty to each plate. These carbon rods are three inches in diameter and a little over two feet in length, and they are so placed as to pass through the end walls of the brick furnace, projecting into the interior and toward each other, thus constituting the terminals. Into this furnace the mixture that has been prepared in the stock rooms is introduced, about ten tons constituting a charge; and through the center of the mass of mixed materials is placed a core or cylinder of granules of crushed coke extending from the carbon rods at one end of the furnace to those at the other end, and making a perfect electrical connection through the furnace by means of the bronze plates, carbon rods and the core.

The furnace, as above described, is prepared for the turning on of the current, and this is provided for and controlled in the adjoining building which was specially constructed for the transforming apparatus used in reducing the high pressure current as received from the dynamos of the Niagara Falls Power Company, to the low pressure current used in the electric furnaces. Located in the same building is the regulating apparatus used in controlling the current as it passes to the furnaces.

When everything has been properly prepared, the connections to the furnace are completed, and 1,000 horse power of electric current is turned into the granular core, above referred to, and kept on for twenty-four consecutive hours, making a total expenditure of energy of 24,000 horse power hours. All of this vast amount of energy is transmitted to the core—twenty-one inches in diameter and about nine feet long.

About two hours after the turning on of the current gases begin to escape through the crevices of the brick walls of the furnace, and being ignited they burn with a lambent blue flame. As the process continues, the outer walls and top of the mass in the furnace show a slow rise in temperature, the effect of the transmission of the intense heat from the core, the entire top of the mass becoming redhot in about twelve hours. After the current has remained on for the period of twenty-four hours, or until such time as the workman in charge recognizes that the process is complete, the current is stopped in the transformer building, the flexible cables are disconnected from the bronze plates and others are connected with the plates of the next furnace in the series of five, and it in turn is carried through the same operation.

Interesting as the work may have been up to the point of stopping the current, it cannot compare with that at the moment of opening a furnace. One end of the furnace is removed and a cross section through its center exposed, thus permitting of a ready inspection of the result of the operation. In the center is the granular core, in the same position in which it was originally placed, but it is now purified of all foreign substances. It is now pure carbon and has lost about one-fourth of its weight, this loss representing the volatilized impurities. The presence of grains of graphite disseminated throughout its mass indicates that its temperature must have been near 7,000 degrees, which is the point of graphite formation. Surrounding the core, in the form of a cylinder, is a beautiful crystalline formation, the crystals being constructed on lines radiating from the center. Those crystals in immediate contact with the core are looped or built together into one concrete mass, this solid formation giving way to a loose structure as the distance from the core is increased; the size of the crystals, at the same time, diminishes rapidly, until at about fifteen inches all crystallization ceases and is followed by an amorphous material, of a whitish gray color for a distance of about two inches, when a sudden change occurs to a black mass composed of the original mixture, now held together in a cemented state by the fusion of the salt.

The crystalline and amorphous material lying between the core and the outer black mass is carbide of silicon, being composed of carbon and silicon, atom for atom. It is this material that was discovered by Mr. Acheson and by him called carborundum. About two tons of carborundum is produced in one furnace run, and to prepare it for the market it is first passed under heavy iron rolls, for the purpose of crushing apart and separating the individual crystals, after which it is treated with an acid and water bath to remove all solubles. It is then dried and sifted, to separate the various sized grains, and placed in bins ready for packing for shipment, or to be worked up into wheels, hones, or other forms in which abrasives are used.

At the opening the guests were welcomed by Mr. E. G. Acheson, the president of the Carborundum Company and inventor of its process of manufacture; and to whose energy and ability the present excellent position of the company is principally due.

European Beet Sugar Industry.

The crop of beet sugar in Europe in the season of 1877-78 was 1,420,827 tons. The crop of the season of 1894-95 reaches 4,800,000 tons, an increase in seventeen years of about 350 per cent. This enormous increase in the production of sugar in Europe necessarily arises from the fact that the industry is more profitable to those engaged in it agriculturally and in sugar manufacture than are other industries. The knowledge that they could produce their own sugar supply with reasonable success has led to a full appreciation of the fact that sugar production in the temperate zone has been the one great possibility in agriculture that has not been completely developed. The actual monopoly of the sugar industry held by the tropics for centuries led to the assumption of the impossibility of successful competition with the tropics. The gradual awakening of the beet growers and sugar manufacturers in Europe to the grand opportunity that the sugar industry offered them as a new and profitable crop has finally so affected every leading continental nation in Europe that we find all of them legislating carefully to foster their sugar industry, with the results of enormous production in excess of the home consumption, until now, with their great crops, they are competing with each other actively for the good will of the only two large buyers left to them—Great Britain and the United States.

European statesmen are beginning to recognize the faults of the bounty system as practiced by them, it having so enormously developed their sugar industry.

In discussing the sugar question in Europe at the beginning of this year, one of the largest continental houses issued a circular wherein the following estimates of bounties paid by the respective governments in Europe on sugar there produced were given:

Germany	$5,781,250
France	10,000,000
Austria	2,000,000
Belgium	5,000,000
Total	$22,781,250

The bounties paid by Russia, Sweden and Denmark are omitted.

The consumption of sugar per capita is given as follows:

	Lb.
Great Britain	79
United States	77
France	30
Austria	29
Germany	28
Belgium	22

We thus see France, Austria and Germany consuming an extremely small amount of sugar per capita, and enormously increasing their home production by bounties, until they are deranging the entire sugar trade of the world. The following table shows how largely the production of beet sugar has increased during the last four years, while the cane sugar industry has stood comparatively still:

	1891-2.	1892-3.	1893-4.	1894-5.
Germany	1,198,000	1,225,000	1,303,000	1,900,000
Austria	786,000	803,000	842,000	1,100,000
France	650,000	588,000	579,000	830,000
Russia	551,000	455,000	666,000	630,000
Belgium	180,000	197,000	235,000	285,000
Holland, etc.	136,000	160,000	186,000	230,000
	3,501,000	3,428,000	3,805,000	4,975,000
Production of cane sugar	2,784,000	2,760,000	3,046,000	2,904,000
Total	6,285,000	6,188,000	6,941,000	7,879,000

—Louisiana Planter.