ERNST WERNER SIEMENS.

In the fields of steam engineering, of metallurgy of iron and steel, and of electricity, no name occupies so prominent a place at once in all three as that of the Siemens brothers, Werner, Carl, William, and Frederick. A review of the life of Sir William, with his portrait, has already been published by us.* In most of the Siemens inventions he had some part. Dr. Werner Siemens has won his principal fame as an electrician. He was born at Lenthe, near Hanover, December 13, 1816. He entered the Prussian army in 1838. His mind was early occupied with studies in electricity, the problem of electro-gilding engaging his attention. In his experiments on the new art, as it was then, he was joined by his brother William, six years his junior. His first patent on the subject was taken out in 1841. A year later George Elkington had executed successful plating in Birmingham. This was the beginning of the great electro-plating industry. The Siemens invention was introduced into England in 1843. Still working with his brother, he was a joint inventor of the process of astatic printing. It was described in one of Faraday's lectures in 1845, and represents the beginning of the reproduction of prints and drawings. It was mechanical and chemical, the resinous matter of the ink of a printed page being destroyed by caustic baryta or strontia, and the letters being then transferred to a zinc plate by pressure. Photographic processes have now superseded this method.

In 1844 he assumed the charge of the government artillery works at Berlin, but continued to devote himself to electricity. In 1847 he laid the first sub-aqueous telegraph line, insulated with gutta percha, across the Rhine at Cologne, a distance of one-half mile. A year later he experimented at Kiel with submarine mines exploded by electricity through his cable. In 1849 he left the army and founded the great telegraph construction house of Siemens & Halske, in Berlin.

To the year 1856, a period when the mechanical generation of electricity, founded on Faraday's researches, was in its infancy, the old Siemens H armature is referred. This antedates the Pacinotti ring four years. It is not easy to ascertain to which brother it is due, or if to both. The prolific nature of both makes it difficult to accurately define their individual work. Sir William took out about one hundred patents of his own, while forty or fifty inventions stand to the credit of the brothers jointly.

In 1858, Werner Siemens, with Herr Halske, his partner in Germany, and with his brother William, founded the English house of Siemens & Halske, at Charlton, West Woolwich, a branch of the Berlin establishment, and principally in Sir William's charge.

Eleven years after the invention of the armature, Werner sent a very remarkable paper to his brother, in London. On the 14th of Febrnary, 1867, Sir William read it before the Royal Society. Its subject was "On the Conversion of Dynamic into Electrical Force without the Aid of Permanent Magnets." A paper on an identical subject was read by Sir Charles Wheatstone on the same evening. In these papers, for the first time, the principles of the dynamo-electric machines were laid down—the self-contained, self-exciting dynamo was then disclosed simultaneously by both scientists. It forms one of the remarkable coincidences of invention.

DR. WERNER SIEMENS.

The discovery is claimed, as independent inventors, by Varley and Hjorth.

The subject of electrical railroads engaged his attention for many years. He proposed to establish them in Berlin, but the city authorities interfered and stopped it. He exhibited one at the German Industrial Exhibition in 1879, and eventually built a short line in the suburbs of Berlin, the Lichterfelde road, which was opened in 1881. At the Paris Exposition of Electricity, in the same year, he ran a line carrying many thousand people successfully and without accident. The Portrush line, in Ireland, is worked largely on the same plans, and was built under the supervision of his brother.

Among his inventions may also be named the method for determining the position of faults in submarine cables—something essential to the economical success of long submarine cables.

The business and engineering enterprise and achievements of the firm of Siemens & Halske in telegraph construction is worthy of notice. They are the only rivals of the Telegraph Construction and Maintenance Company, of East Greenwich, England. The Indo-European overland telegraph line was built by them, through almost unexplored countries, across Russia and Persia to India. It was built under the agreement that no payment should be made to the firm until a dividend of 12½ per cent had been earned on the paid-up capital.

Years were consumed in the work, which has proved a commercial success. The connection of the firm with it terminated in 1882. The story of the difficulties encountered and overcome in this work reads like a novel. They laid the direct U. S. cable, the Brazil line, the North China line, and the ocean is everywhere underlaid by their cables, placed in position by their special cable-laying ship, the Faraday.

The Siemens armature, already spoken of, was the old grooved or H armature. The more recent one, the drum armature, resembling in its theory the Gramme or Pacinotti ring, is to-day used in probably a third of existing dynamos. A great proportion of motors also embody it in their construction. The Weston dynamo, as made by the United States Electric Lighting Company, contains it. The Siemens electrical lamp also stands very high in order of merit.

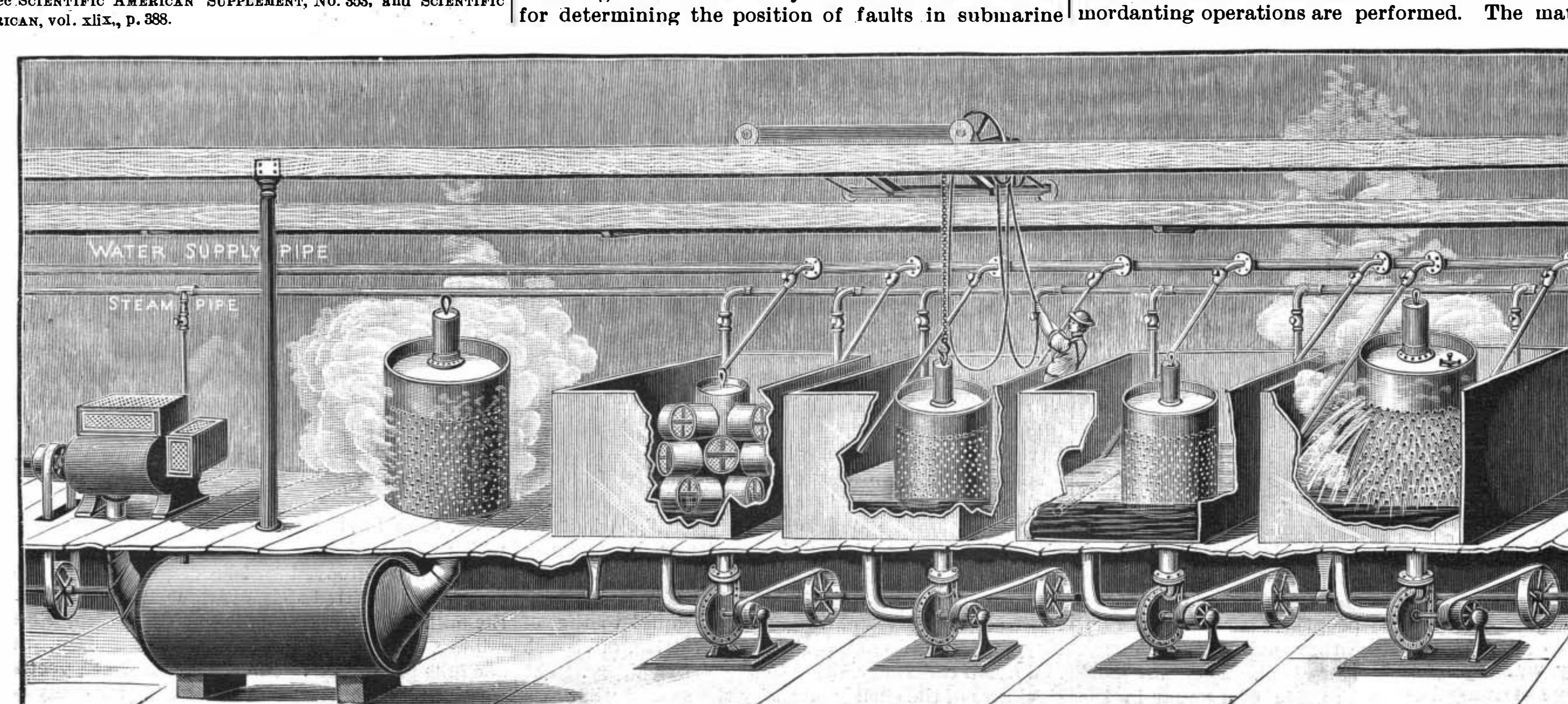
Thus Ernst Werner Siemens stands as one of the pioneers of electricity in almost all its applications—electric plating, telegraphy, submarine cables, mechanical generation of electricity, and electric lighting. In much of his work he cannot be separated from his brother.

* See SCIENTIFIC AMERICAN SUPPLEMENT, No. 353, and SCIENTIFIC AMERICAN, vol. xlix., p. 388.

MECHANICAL DYEING.

That modern industry ceaselessly aims to make itself independent of hand labor is a fact well known, and many useful apparatus and contrivances have been already devised for effecting this object in the different branches of the tinctorial trades. The dyeing of loose wool and cotton also have had their share of attention at the hands of inventors, without, however, bringing forward any very striking changes over the old methods until within the last few years. The process under consideration may be considered as a thoroughly modern method. It relies, of course, on the well known and necessary principle of effecting a circulation of the dyeing or mordanting liquids; but, unlike the older systems, the material is left standing while the liquids are kept in motion. It is to the mechanical arrangements, therefore, that our attention must be first given, and then to the amount and quality of the work performed.

As will be seen from the illustration, the dyeing apparatus consists of a cistern in which the dyeing or mordanting operations are performed. The material



IMPROVED MECHANICAL DYEING PROCESS.

is placed in the cylinder, which is a perforated vessel of copper, or even galvanized iron, according to the nature of the bath, and this cylinder is fixed at the bottom of the cistern and put in communication with a centrifugal pump, which forces the dyeing or mordanting liquors through a pipe into the cylinder, and after reacting on the material through the perforations all over the surface of the cylinder, back again into the dyeing cistern. This latter is filled only with sufficient liquor to affect the dyeing or the mordanting of the material, and consequently it is possible to work with stronger liquors, which means also a saving in the fuel, since only small quantities of liquors have to be heated, and not as in the old process of having to heat comparatively a large amount of liquor for a small quantity of the material. The liquors in the cistern only average in all about 15 inches.

The construction of the cylinder or receptacle for holding the material to be treated differs according to the nature of the material itself, and consists either of a plain cylinder with a perforated column in the middle, with which it communicates with the pump, or the apparatus is of more complicated construction, having one central cylinder and several others protruding from it, in which the material is placed, and is especially suitable for the dyeing of tops. In both cases the main cylinder is supplied with a lid to press down the material and keep it in its place, and at the same time to allow, by means of a hook at the top of the lid, the whole of the cylinder to be lifted up and down by a crane, and thus a great saving of labor and handling is effected.

To this must also be added the advantage of its being possible to do all the operations of mordanting, dyeing, or washing without removing the material from the cylinder. The drying may similarly be done without removal of the material, it being only necessary to put hot air through after the drying and washing off are completed, since from the first placing of wool in the apparatus to its being completed in a dyed and thick state, there is no handling required. As to the amount turned out, three men will do 12,000 lb. to 15,000 lb. of wool a week, of course according to the quality of the wool. The dyeing of blacks especially seems to be effected with special ease and thoroughness by this system, either for wool in the sliver or loose wool; the method of dyeing being the well-known process of mordanting with bichromate. This operation lasts one hour; the dyeing itself takes one and one-half hours for the washing, or two and one-half hours in all.

We have seen the process at work in the extensive establishment of Messrs. Markendales, in Salford, and are thus enabled to give details.—*Textile Manufacturer.*

Grano-Metallic Stone.

The grano-metallic stone, the invention of Mr. J. H. Bryant, of London, is composed of blast furnace slag and granite, which are crushed, chemically treated, dried, and mixed with Portland cement. For use these ingredients are brought to a pasty consistency with an alkaline solution, and laid. It possesses the important property of always having a rough surface, which is due to the atoms of the vitreous slag always presenting themselves just above the other ingredients, which are more readily worn. This stone has undergone a special trial in one of the metropolitan gas works, where a section was laid at the request of the engineer. It was there successfully subjected to tests which natural and artificial stones have, it is stated, been unable to withstand. It is found to stand not only the wear and tear of heavy horse and van traffic, but the sudden and extreme alternations of temperature incident to the slaking of coke upon it. Valuable as this material has proved itself for paving and road making purposes, however, it has now been proved to possess the additional important feature of being highly refractory.

A cement kiln lined with this stone has stood a number of burnings without any repairs having to be done. Even where the lining happened to be torn away by a portion of adhering clinker, there is not the least sign of the stone having been injuriously acted upon by the heat. This is certainly a most crucial test, and the satisfactory manner in which the stone has passed through it stamps it at once as an absolutely fire proof material, and, therefore, of special value for constructive purposes.—*Iron.*

Umbrellas.

The Chinese and Japanese, long, long ago had their queer parasols, and in Burma a man's rank is known by the number of umbrellas he is allowed to carry, the king limiting himself to 24. Jonas Hanway introduced the umbrella into England more than a hundred years ago. The people all made fun of him, but may be it was because they hadn't sense enough to get out of the wet when it rained. There are more than 7,000,000 of umbrellas made every year in the United States. If they were placed open in a row, allowing three feet of space for each, they would make a procession more than 8,000 miles long.

THE EPIORNIS.

Michelet, in his book, "The Bird," thus speaks of the *epiornis* as the conqueror of the giant saurian, the *plesiosaurus:*

"Who would have met face to face the horrible leviathan? The capacity of flight was absolutely needed, the strong, intrepid wing which from the loftiest height bore down the Herculean bird, the epiornis, an eagle twenty feet in stature and fifty feet from wing tip to wing tip, the implacable hunter, who, lord of three elements, in the air, in the water, and in the deep slime, pursued the dragon (*plesiosaurus*) with ceaseless hostility."

This rhapsody of our brilliant writer has for text little more than the egg which is illustrated in our cut. Michelet's imagination has supplied most of the material, and has done well. It is certain that the egg never could have produced so marvelous a creature. The epiornis was probably a strictly terrestrial bird, incapable of flight. Nothing has been found to determine its conditions and way of existence, except some eggs and a few other semi-fossil remains. The giant bird of Madagascar otherwise belongs to tradition. The Sakalawas of Madagascar tell of a bird that kills cattle and devours them. To it they attribute these eggs, still occasionally found. The fact that new species are continually being discovered on the island lends some probability to the expectation that a living epiornis may yet be seen. Its remains occur in recent alluvial

EGG OF THE EPIORNIS.

deposits, and from their recency are classified as subfossils. The legend of the ferocity and carnivorous habits of the bird are groundless. In all probability it was a vegetable feeder. Tradition has brought down to us a similar tale of the extinct dinornis of New Zealand. It is said to have been seen by some sailors, who, frightened at its size and height, left it unmolested. But while the remains of this bird include organic tissue, and bones still impregnated with gelatine, the epiornis has left no such recent relics. All that has been found of it belongs to an earlier period.

In 1850 Isidore Geoffroy St. Hilaire exhibited the egg of the epiornis to the French Academy of Sciences, and named its producer the E. maximus. The museum in Paris placed the egg in its collection, and a few of the bones, constituting enough to classify it imperfectly, were brought to Paris a short time after. Three and possibly four well defined species of the genus, placed in the family of Struthionidæ (ostriches), have now been identified. It comes in the same order with the dinornis and the rare apteryx, soon to become extinct also, though at first there was some disposition to consider it reptilian. The extinct dodo of the Mauritius Islands, immortalized by Du Maurier in his illustrations of "Alice in Wonderland," gives a probable type as regards its appearance. Though five or six times larger than the ostrich, its height is not supposed to have exceeded ten or twelve feet.

Its egg is of gigantic size, as may be inferred from the cut. Its exact dimensions are given by De Chenu, in his "Encyclopedie d'Histoire Naturelle," Paris, 1875. Its largest diameter is 13·38 inches, its smallest diameter 8·86 inches. The largest circumference is 33·46 inches. Its capacity is 77 quarts. Compared with those of existing birds, its capacity is equal to that of fifty thousand humming bird, of six ostrich, of sixteen and a half cassowary, or of seventeen emeu eggs. The thickness of the shell is given by the same author as a little over one-tenth of an inch. In the *Magasin Pittoresque*, for 1851, one of the earliest references to it may be found.

The discovery of these eggs recalls the roc of the "Arabian Nights," and in the natural histories we even find this allusion. But they do not come near the size requisite to remove the roc from the realms of myth.

There is a curious confusion noticeable about the spelling of the name. It is spelt æpiornis or epiornis. St. Hilaire, in naming it, is said to have derived its title from the Greek words επι, above, and ορνις, a bird, presumably in allusion to its size. If this derivation is correct, a very general error in the spelling seems to have been fallen into by modern naturalists. The diphthong is used in the article on birds in the last edition of the "Encyclopædia Britannica."

Instantaneous Method of Retting Flax.

The retting of flax is an operation designed to convert the pectose that surrounds the fibers of cellulose, in the green plant, into pectic acid, which, in the retted material, constitutes the brilliancy, and facilitates the sliding of the fibers in a longitudinal direction during the various operations of spinning. The detaching of the boon is a useful consequence of this transformation of the pectose.

Flax is usually retted by allowing it to undergo the long and irregular action of fermentation. In the *Bulletin de la Societe Industrielle du Nord de la France*, Mr. P. Parsy describes a method which he calls "instantaneous retting," and which consists in converting the pectose into pectic acid by a method pointed out by the chemist Fremy, that is to say, by heat. He first submits the flax to the action of water under pressure, at a temperature of about 150° C., and then finishes the operation by substituting for the water steam under pressure at the same temperature. Under the action of the heat, the transformation of the pectose begins. The steam, which has not the same dissolving effect as the hot water, permits of afterward maintaining the temperature necessary to finish the conversion of the pectine into pectic acid, without the loss of any of this valuable substance. The operation takes but an hour and a half.

By this process, Mr. Parsy succeeds in giving the retted flax either a blue or yellow color at his pleasure. For blue, he uses the water of a preceding operation, which is then slightly acid from the organic acids of the flax that it holds in solution. For yellow, it is only necessary to employ a slightly alkaline water.

One of the principal advantages of the method resides in the rapidity with which the drying is effected. Mr. Parsy states that the flax, on being removed from the steaming apparatus, contains but one and a half time its weight of water.

Varied Accomplishments of an Armless Man.

There recently died at Potsdam, St. Lawrence County, N. Y., Richard Donovan, who was in some respects one of the most remarkable men in northern New York. Twenty years ago, when a boy, Donovan worked in a flour mill. One day he was caught in a belt and received injuries that necessitated taking off both arms at the shoulders. This misfortune did not discourage him, and, after recovering his health, he set about earning his livelihood as best he could without the use of hands or arms. Part of the time he had lived alone, and from the necessity of helping himself he became wonderfully adept in performing all kinds of work, using his feet and mouth principally. He owned a horse, of which he took the entire care, harnessed it, fastened and unfastened the buckles with his teeth, and drove with the reins tied around his shoulders.

Being in need of a wagon, he bought wheels and axles, and built a box buggy and painted it. He went to the barn one winter day and built a cow stable, sawing the timber with his feet, and, with the hammer in one foot and holding the nail with the other, he nailed the boards on as well as most men could do with their hands. He dug a well twelve feet deep on a farm in this town, and stoned it himself. He could mow away hay by holding the fork under his chin and letting it rest against his shoulder. He would pick up potatoes in a field as fast as a man could dig them. He would dress himself, get his meals, write his letters, and in fact do almost anything that any man with two arms could do.—*Boston Transcript.*

A Large Engine.

Messrs. Douglas & Grant, Dunnikier Foundry, Kirkcaldy, have at present in hand a compound Corliss engine of a very large description, for a cotton mill in Bombay. The high pressure cylinder of this large engine is 40 in. diameter and the low pressure cylinder 70 in., each having a stroke of 6 ft. The fly wheel, which weighs about 110 tons, is 30 ft. in diameter by 8 ft. 6 in. wide, grooved for 38 ropes, by which the power is to be transmitted to the various lines of shafting in the mill. The engine is to run at 60 revolutions per minute, giving a speed of ropes of considerably over one mile per minute. The crank shaft, made of Whitworth fluid compressed steel, is 25 in. in diameter in the body and 20 in the bearings. The steam pressure is to be 100 lb. per square inch, and the engines will work easily up to 2,500 horse power.