WERNER VON SIEMENS.*

THE name of Siemens is closely and honorably associated with the amazing development of electrical science and its practical applications in the last half century. The Berlin firm of Siemens & Halske and the later firm of Siemens Brothers, with houses in London, Berlin, and St. Petersburg, have laid thousands of miles of ocean cables, strung long overland telegraphs from Germany to India, and in many other directions led the van in electrical invention and the manufacture of innumerable appliances of this wonder-working force. The life of William Siemens, the English partner who was more particularly interested in the production of regenerating engines, has been written by Dr. Pole. Werner von Siemens, the oldest and most distinguished brother in a remarkable family, employed himself, fortunately, during the last three years of his life in writing his autobiography. Making no pretense to literary finish, this volume of straightforward reminiscence reflects new credit on its author and deserves a high place among the records of great inventors who have made a name and a fortune in ways which have been of immense public benefit. The book is a fine specimen of German handiwork, but the proofreading has not been so careful as it should have been, and Mr. Coupland's translation could easily be bettered; "the three only bills" and similar expressions are very poor English.

Werner Siemens was born in Lenthe in Hanover in 1816. His fondness for science led him to join the engineer corps at Berlin, where he could study in the artillery and engineering school; mathematics, physics, and chemistry were his favorite branches. In an experiment which resulted in an explosion the drum of his right ear was fractured; that of the left had been burst in artillery practice. His first discovery in electrolysis was made while he was confined in the Magdeburg citadel because of participation in a duel. His unwillingness to be pardoned out, since it would interrupt his experiments, reminds one of Archimedes. With his brother William he soon elaborated the differential governor for steam-engines. He returned to scientific study, determined to be its votary:

> But circumstances were stronger than my will, and the native impulse never to let acquired knowledge lie idle but as far as possible to make some use of it led me ever and again back to technology. And so it has been my life long. My affection has always been given to pure science as such, but my labors and achievements have been for the most part in the domain of applied science.

We cannot even name here all these applications, but hot-air engines, the employment of the electric spark for measuring the velocity of projectiles, self-interrupting dial telegraphs, improved guncotton, and gutta-percha insulators were a few at the beginning. After successful trials of submarine mines at Kiel and less fortunate laying of underground wires for the German government, Siemens left the army, having had fourteen years' service, and devoted himself to the electrical business which he had established with his friend Halske. He improved upon Morse's system; married Matilda Drumann in 1852, who bore him four children; went extensively into the construction of telegraph lines for the Russian government with his brother Charles; and laid deep sea cables between Sardinia and Algeria, in the Red Sea and Indian Ocean, and six lines across the Atlantic. His descriptions of his adventures on these voyages, including a shipwreck on the Red Sea, a waterspout on the Mediterranean, and cable-breaks on the Atlantic, add much interest to the more scientific portions of the volume, which are, of course, considerable, especially as Siemens desired to establish the priority of many of his discoveries which German laws did not allow him to patent. No

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small space is given to his three journeys in the Caucasus, where the brothers worked a copper mine successfully. With numerous losses the Berlin firm was, on the whole, highly successful in the new field of electrical business, and in later years it gave its employees a share in its large profits. Siemens received the honorary degree of doctor from the Berlin University in 1860; sat as a German progressive deputy for three years; in 1866 made one of his greatest inventions, in the dynamo-electric machine; and was ennobled by the Emperor Frederick on his ascension to the throne. His death took place last year. He had founded the Charlottenburg institute for scientific research.

In the closing pages of this admirably simple and manly record Von Siemens acknowledges the good fortune which gave the opportunity for his powers and his activity to display themselves and ingenuously sketches his own character. A great leader of men on the path of civilization, he believed that important modifications of our industrial conditions are to come from the general use of electricity as a motive power, and that "the practical ends of social democracy would be attained . . . solely by the undisturbed progress of the age of science. . . . The unshakable belief in the beneficial consequences of the undisturbed development of the age of science is alone competent to repel with success all the fanatical attacks which threaten human civilization on all sides." This extraordinarily interesting autobiography closes with a manly expression of regret at the inevitable separation from loved ones and the end of scientific labors after a life strong in purpose, noble in achievement, and beautiful in benevolence and affection.