THE CREATORS OF THE AGE OF STEEL. By W. S. Jeans. New York: *Charles Scribner's Sons.*

This is pre-eminently the age of the practical arts, and among these arts those connected with the manufacture and use of iron and steel take the highest place. The utilization of iron has been agreed on as the measure of the world's more advanced civilization. For example, the archæologists have divided the progress of man from savagery to civilization accordingly as he has made his weapons and tools of stone, bronze, or iron. It is not till

man in the history of the race had reached a comparatively advanced stage of progress that he learned to smelt and work iron, and the use of this most valuable of all metals contributed largely to advance him in that civilization. The knowledge of that peculiar modification of iron called steel existed almost contemporaneously with the other, but for many thousand years the world advanced not beyond the very threshold of knowledge as to what the capacity of steel was. It may, in fact, be said that as much was known about methods and processes of working and tempering steel at the time of the Christian era as in the year 1800 A.D. The age of steel had not yet begun. The dawn of modern physical science was in the middle of the fifteenth century. For a hundred years progress was slow. From the middle of the sixteenth to the middle of the seventeenth century it became universally recognized that observation and experiment were indispensable to the extension of physical knowledge. This was the period of Galileo. During the next hundred years the world witnessed the application of mathematics to mechanics and physics. This was the age of Newton and Leibnitz. From 1750 to 1850 there existed no distinctive characteristic except the enormous and widespread application of these principles of physical and industrial knowledge. It has been reserved for the latter half of this century to witness the marvellous discoveries in the properties of steel, processes of making it, and varieties of application which have revolutionized the conditions of the age in so many particulars. The little book before us is an interesting sketch of the great inventors and scientists who have contributed most largely to making this the age of steel—Sir Henry Bessemer, Sir William Siemens, Sir Joseph Whitworth, Sir Thomas Brown, and others. Of course, it is only an outline sketch, but it gives an admirable résumé of the field and a sufficiently graphic idea of what the world owes to some half dozen men. To illustrate, for example, the value of the invention of Bessemer in steel-making: It is stated by M. Chevalier, the French economist, that the whole gold yield of California up to 1882 amounted to about $1,200,000,000. Yet he claims that the Bessemer steel process has saved the world much more than that enormous sum, though it was only discovered or at least made known to the public in 1856. Sir William Siemens supplemented the discoveries of Bessemer in processes of cheap steel-making, and so these two men have revolutionized the industrial conditions of the century, for all other industries depend on iron and steel. It would be interesting to collate various facts and statements from the book of Mr. Jeans, and thus give a more vivid notion of the value of these brief biographies, but this we cannot do. Sir William Siemens, it need hardly be said, was not only intimately associated with the greatest operations in steel metallurgy, but a scientist of most versatile attainments, who seemed indefatigable in the more abstract branches as well as in the practical field. It is to him, too, that we owe some of the most important steps in modern electrical engineering. Sir Joseph Whitworth is specially known as the inventor and manufacturer of the heaviest rifled ordnance and Sir Henry Brown as the iron-master who has carried the art of rolling armor plates of vast size to a higher perfection than any other manufacturer in the world. Of the other two men whose biographies are sketched in this book we can only say that they are worthily grouped with the others. The author has done his work with good taste and sufficient skill, and succeeded in making a very interesting book, and one not less instructive than interesting.