York, the enameled peak of a German military cap. Because the material was rather brittle, it was not widely used. Although he had no knowledge of the process, he analyzed the enamel and improved on the imported product. He thought that this new "patent leather" would be suitable for harness decoration and for a period manufactured it only for his own business.

Despite the name "patent" leather Boyden never patented the process which he invented. In fact he persistently declined to use the protection of his rights afforded him by law; all his inventions became public property, for anyone to profit from them, and Boyden was generally the least likely to do so. "Patent" leather, now so closely identified with dress shoes and purses, probably got its name from the process of baking, known technically as "patenting."

The process consisted in placing several layers of japan or varnish on the leather, all but the final coats being dried in the sun; it was then polished. In 1818, when he built a plant to produce patent leather, he changed the process by drying the japanned leather in a specially designed oven. In 1822 sales were $4,521 and by 1828 had grown to $21,500. But he became interested in another problem and sold his business. He lived to see $6,000,000 profitably invested in the production of patent leather in Newark alone.

At his grandfather's iron furnace Boyden had learned the differences between cast iron, which was very hard and brittle and could not be mended when broken, and wrought iron, which was softer and tougher and could be bent when heated but was far more expensive. Americans had to use either expensive hand-forged wrought-iron hardware made in this country or import from England malleable cast iron made by a secret process.

Once young Seth observed that part of a cast-iron bar that had been near the fire bed of a furnace and had been heated to a high temperature for long periods of time had taken on the appearance of wrought iron. He found that by heating this he could hammer it like wrought iron and change its shape; but the part that had not been continuously heated was still hard and brittle.

Twenty years later when he was still conducting his harness shop in Newark and had to use expensive wrought-iron hardware, he began to experiment on malleable cast iron. He built a small forge in his house and there melted and refined in a crucible small quantities of pig iron which he cast into spikes. These he baked for long periods in his furnace. He tried many kinds of crude iron until he found one that proved best for his purpose; he experimented by adding such substances as sulphur, phosphorus, tin, zinc, lead, antimony and nickel to the molten iron, but such additions did not help; he tried many kinds of packing material in which to bake the castings. For six years he persisted in his search. Finally, on July 4, 1826, he produced the first satisfactory malleable cast iron in the United States. Without modern methods of chemical analysis, he had found iron from a certain iron works that had just the right amount of carbon in it. The castings he made from this iron he then baked at high temperature continuously for nine days and nights, when it was found annealed, or softened, so that it could be hammered without breaking.

Boyden's discovery freed America from dependence upon England for imported malleable castings and wrought iron and from the necessity of making many articles by expensive hand forging. His new method was one of the most important steps in the development of modern steel.

He built a small factory for producing articles from malleable iron castings. As the business grew he employed sixty men and operated his furnaces from early morning until late at night. Over a thousand useful articles were made by his new process, and he was widely recognized for his notable discoveries and success in manufacturing. In 1828 the Franklin Institute of Philadelphia pre-