

mering them out of wrought iron ; and, the labour being great and the product small, the cost of these articles was necessarily very high. But by this process the patterns are moulded in sand very rapidly, and with far greater accuracy than could be attained with the hammer and file. The melted iron is then run into these moulds. This cast-iron ware is now converted by Mr. Boyden's discovery into tough iron.

The history of Mr. Boyden's discovery is just this : He does not pretend to have made an original discovery, since it was some malleable iron castings imported from England by Mr. David Beach in 1825 which fired his mind with the immense advantages of the art, and a desire to discover it. To think with him is to do, and forthwith he began a series of experiments. In the course of one or two years he attained the desired result, and opened a foundry in Newark.

At that time a part of the secret of the business consisted in the supposed fact that the malleable castings could only be made from iron produced from the ore of the Sterling Mine in New York. The fact that the two foundries in Newark were the only ones in the country, and that the Sterling ore was the only ore which could be used in making the wares, induced some speculators who had purchased the Sterling mine also to purchase the Newark foundries and the secret discovered by Mr. Boyden. This company was named "the Boston Malleable Iron Company." Their supposed monopoly was broken up by the discovery that certain ores in Pennsylvania produced iron which could be converted into malleable as readily as the Sterling ore.

When the discovery was first made the malleable iron castings sold readily at from 30 to 75 cents per pound, but now the price ranges from 9 to 16 cents for a more perfect article. In Newark there are seven foundries for making malleable iron. These establishments sell their articles in an unfinished state, that is to the plating factories, or those who use them in manufacturing articles of which they are a part, for instance to the makers of patent safes, reapers, &c. The pig metal used is made principally from the Salisbury (Conn.) and Sterling ores, these furnishing not only a tough article but a smooth surface. In the first room of the foundry we found the moulders at work, forming the various articles in sand. The raw pig-iron is melted in an air or refining furnace, which removes from it all its impurities, and when thus refined is run directly into the moulds. The castings thus made are placed in a revolving cylinder, and by rubbing against each other are cleaned of the moulding sand. This is in a separate room, near the engine. From this place they are taken to the annealing room, where the annealers trim, select and pack them in cast iron boxes, the spaces between the castings being filled with an oxyd of iron. Each box is then tightly covered with an iron plate and carefully luted, *i. e.* sealed around with clay or some other substance, to keep the fire from reaching the castings. The boxes are then placed in the annealing furnace, which in its appearance somewhat resembles an ordinary heating furnace in a rolling-mill. When the boxes are arranged properly, the furnace is walled up tightly and the heat applied for about seven days, and the work is done. It seems to be a simple process, but if you will take a stirrup iron as it is cast from pig iron and break it as easily as a pipe stem, and then one which has been annealed and find it tough as a horse-nail, you will own that this simple process is one of very great value. It will be seen how much depends on having the right ores, and then on properly refining the iron. If these parts of the process are not carefully attended to, an imperfect result is secured.

In the fire-proof room of the Messrs. Erben are deposited two thousand patterns of articles manufactured into malleable iron castings : among them the spear used in taking whales, the boarding pikes, parts of guns and pistol locks ; parts of various cotton, woollen, reaping and mowing machines ; stirrups, hames, and all sorts of saddlery hardware ; parts of stove and tin ware, parts of carriages, &c.—giving an imposing idea of the uses to which the discovery has already been applied. As to the value of the discovery, it may be inferred from the fact that it has reduced the prices of many articles one thousand per cent, beside producing a perfectly uniform article in a most endless quantity. The articles thus produced can be more easily and neatly finished, and they can be furnished at a price but a little above the value of the wrought iron, as in the old process it would go to the blacksmith to be forged with the hammer into the various articles needed. It is, in truth, a very valuable and interesting business.

In seven malleable iron foundries of Newark about two hundred hands are employed, who receive some \$70,000 in wages a year, and the annual sales are about \$375,000 a year.

Roses.—According to Agassiz, no fossils of the rose have ever yet been discovered by geologists. He thinks the creation of the plant is coeval with that of man.