

Reading Drill #13

The Expansion of the Steel Industry

The railroad industry could not have grown as large as it did without the development of the steel industry. The first rails were made of iron, but iron rails were not strong enough to support heavy trains running at high speeds. Railroad executives wanted to replace them with steel rails because steel was ten to fifteen times as strong and lasted twenty times longer. Before the 1870s, however, steel was made using a slow and arduous process. Bars of Swedish wrought iron were typically heated together with charcoal over a period of six weeks, during which time the iron absorbed carbon from the charcoal. The bars were then broken into smaller pieces and melted down in relatively small-sized crucibles. Because of the costs and difficulties inherent in this drawn-out method of production, steel found only limited application. Ships, bridges, railroad rails, and axles were still constructed with wrought iron, while steel was only used for smaller items, such as cutlery, tools, and springs.

Given the superior performance of steel, it is not surprising that a number of inventors in Great Britain, the United States, and Germany were working to find a less expensive method of making it. Although several of them arrived independently at the same solution, it was Henry Bessemer who took credit in 1856 for discovering that directing a blast of heated air at melted iron in a furnace burned out the impurities that made the iron brittle, a process he named the Acid Bessemer process. When the fire cooled, the metal had been converted to steel. His machine, called the Bessemer converter, made possible the mass production of steel. The differences between the new and old processes were enormous. The cost of producing steel fell ten-fold, and whereas it had been made previously in blocks of 40 or 50 pounds each, three to five tons of iron could now be changed into steel in a matter of minutes. The effect on the railroads was immediate and enormous: all-steel rails, called Bessemer rails, quickly replaced those of hardened-head iron as the industry standard.

Just when the demand for more steel developed among manufacturers and transportation companies, its costs was driven down still further when prospectors discovered huge new deposits of iron ore in the mountains of the Mesabi Range in Minnesota near Lake Superior.

■ The Mesabi deposits were so near the surface that they could be mined with steam shovels. Barges and steamers carried the iron ore across Lake Superior to depots on the southern shores of Lake Michigan and Lake Erie. ■ With dizzying speed, disparate spots such as Gary, Indiana, and Toledo, Youngstown, and Cleveland, Ohio, became major steel-manufacturing centers. Pittsburgh, at the confluence of the Allegheny and Monongahela rivers in Western Pennsylvania, became the greatest steel city of all.

■ Steel rapidly became the basic building material of the industrial age, and railroads laid down with Bessemer rails helped shape the industrial development of the nation, as manufacturers east of the Mississippi River became connected at all times to the growing markets in the West. Before the nation became connected via railroad, transportation routes had depended heavily upon weather and season. In this regard, steel helped eliminate natural barriers to the progress of economic growth, and the economies of cities like Chicago grew prodigiously. Not only was steel used in crisscrossing the territory with railways, but also in punctuating the urban landscape with structures taller than what was previously thought possible. ■

Total production figures graphically illustrate the rapid proliferation of steel in the last three decades of the nineteenth century. In 1870 only 77,000 tons of steel were produced in America, but by the turn of the century thirty years later, annual production had mushroomed to over eleven million tons.

1. Which of the following is NOT mentioned in the passage as a reason that steel used to be expensive?
 - (A) The process of making it was slow.
 - (B) It had to be made in small quantities.
 - (C) Some readily accessible supplies of iron had not been discovered.
 - (D) Bessemer's machine was costly to operate.
2. The author mentions ships, bridges, railroad rails, and axles to indicate that steel
 - (A) was superior to wrought iron in versatility
 - (B) could be shipped efficiently to buyers
 - (C) made mass transportation possible
 - (D) was too expensive to use in large items
3. The phrase a matter of minutes in the passage indicates that steel
 - (A) was converted in small amounts
 - (B) was difficult to make
 - (C) was manufactured for the first time
 - (D) could be produced quickly
4. According to the passage, the railroad industry preferred steel to iron because steel was
 - (A) cheaper
 - (B) lighter
 - (C) cleaner
 - (D) sturdier
5. Which of the following is a reason given for the invention of the Bessemer furnace?
 - (A) The expense of mining iron ore
 - (B) The risks involved in producing steel
 - (C) Bessemer's desire for fame
 - (D) The high cost of steel

6. According to the passage, how did the Bessemer method make the mass production of steel possible?
- (A) It removed impurities efficiently.
 - (B) It slowly heated large quantities of iron.
 - (C) It made iron into a substitute for steel.
 - (D) It located deposits of iron ore.
7. The word independently in the passage is closest in meaning to
- (A) cleverly
 - (B) separately
 - (C) quickly
 - (D) officially
8. The Bessemer process of making steel from iron involved
- (A) steam shovels
 - (B) repeated stirring
 - (C) hot air
 - (D) a chemical solution
9. The prospectors referred to in the passage were
- (A) owners of businesses that used steel
 - (B) people who searched for sources of ore
 - (C) inventors who wanted to make the manufacture of steel easier
 - (D) owners of shipping companies
10. It can be inferred from the passage that the mass production of steel caused
- (A) a decline in the auto industry
 - (B) a revolution in the industrial world
 - (C) an increase in the price of steel
 - (D) a feeling of discontent among steel workers
11. The word mushroomed in the passage is closest in meaning to which of the following?
- (A) became efficient
 - (B) increased greatly
 - (C) was calculated
 - (D) was planned
12. Look at the four squares [■] that indicate where the following sentence could be added to the passage.

**Later, it was also used in producing automobiles,
which would decrease demand for rail transport.**