

Copper Mining and the First Steam Engine in America

Introduction

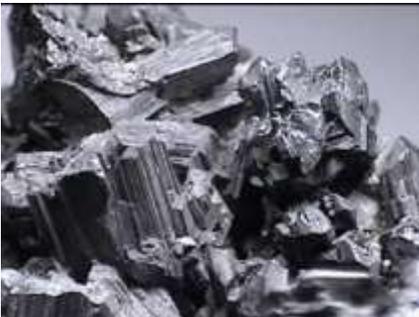
Most people associate “steam engine” with railroad locomotives. But steam engines first came into existence long before railroads. The earliest steam engines were built for the purpose of pumping water out of coal mines. As the demand for coal to power the Industrial Revolution grew and surface deposits were depleted, coal needed to be extracted from underground sources. Sub-surface mining must handle underground water seeping into the mines or they fill up. Early mining companies used carts drawn by animals to move water out of mines. But this was limited by how much water each cart could carry and, as mines deepened, how long it took to clear the water. In some cases, steep slopes within the mines made this impossible.

The invention of the steam engine overcame many difficulties. (See [“Brief History of the Steam Engine”](#).) Steam engines powered pumps to remove water from mines. They could be assembled at the site of the mine, work at great depth, and remove a lot of water quickly. The earliest mining steam engines designed for this particular purpose were built in England in the second half of 17th century.

What does this have to do with the Hackensack River? One of the earliest successful copper mines was in North Arlington in the Meadowlands!

The Schuyler Mine

In the early 1700s, Arent Schuyler from a Dutch settler family purchased land in New Barbadoes Township, now North Arlington. Not long afterwards, tradition has it that one of his slaves found an odd-looking greenish rock, which turned out to be copper ore. Copper minerals here are primarily chalcocite and chrysacolla, with smaller amount of malachite, azurite, cuprite, and native copper. Magma and lava flows that formed the Palisades and other igneous bodies brought copper minerals to the surface, and intruded them into the Triassic shales and sandstones by solution reactions. Small amounts of silver and gold were also found.



Left: Chalcocite (<http://webmineral.com/specimens/picshow.php?id=220&target=Chalcocite#.VddD6PIViko>)

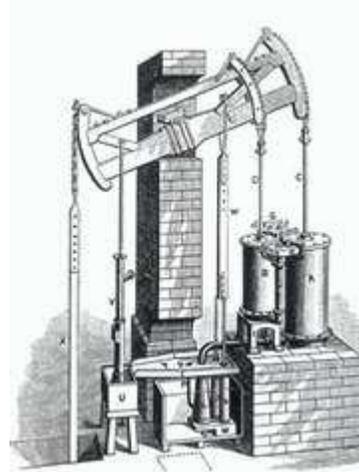
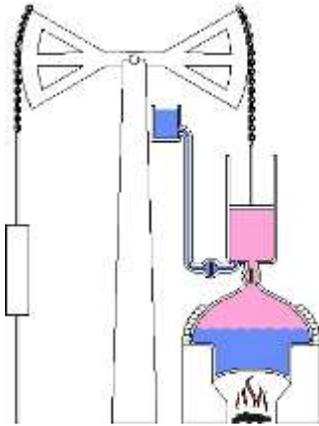
Center: Chrysacolla (<http://webmineral.com/specimens/picshow.php?id=242&target=Chrysocolla#.VddEwPIViko>)

Right: Malachite (<http://webmineral.com/specimens/picshow.php?id=710&target=Malachite#.VdsiUPIViko>)

The first ores were obtained from surface rocks. They were packed in 110 casks and shipped for processing in Holland in 1721. In that decade, it was reported than about 91,000 kg of ore were produced. The Schuyler property and mine lie near the Hackensack River, which served as an important transportation route for a long time before railroads. Ores were crushed, washed, and packed in casks. They were transported to New York before being shipped to England, in part because of heavy taxes imposed by the Colonial New Jersey legislature. (See Woodford, pp. 39 – 60, for a detailed history of the mine and its minerals.)

As surface deposits were depleted, workers attacked the underground veins with hand tools. By the late 1740s, flooding was such a problem that John Schuyler, then managing the mine, ordered a Newcomen steam engine from England. This was done quietly, as the Colonies were not allowed to have the technology that allowed them to process ores. The engine was installed by 1755 by Josiah Hornblower, famous for his contributions to

Mechanical Engineering in this country. This pump allowed operations eventually to reach more than 100 m (nearly 350 ft.) below the surface, making it the deepest mine in America at that time.



Left: Newcomen engine (Source: https://en.wikipedia.org/wiki/Thomas_Newcomen)

Right: Hornblower steam engine (www.sciencemuseum.org.uk)

The engine performed well, as it was capable of pumping 720,000 gallons of water per day. But the machinery was partially destroyed by fire in 1760. It was restored and continued to serve until another fire in 1768. A third fire in 1773 stopped production. Nothing came out of the mine during the Revolutionary War, in part because there were no locations to smelt the ore.

America's Industrial Revolution expanded during the Presidency of George Washington, led by Secretary of the Treasury Alexander Hamilton and others who established Paterson, NJ, as the Nation's first center for manufacturing. In 1794, the owners set up a foundry and machine shop in Belleville, near the mine, and built the first steam engine in the new nation, under the direction of Josiah Hornblower. The Belleville Engine Works thrived for nearly 130 years, constructing not only steam engines but also, later, steam boats.

The subsequent history of the Schuyler mine was never as distinguished. It was operated on and off by various companies with little success, and operations ceased entirely in the early 20th century.



Remnants of the Schuyler Mine operation in the 1940s. (Source: <http://www.theobserver.com/2013/12/mining-north-arlingtons-past/>)

After closing mine operations, the site was used at times to grow mushrooms. The abandoned shafts were a magnet for local youth, and in the 1980s local authorities completely covered the entrances to prevent accidents. Today, nothing visible remains of the operations which brought the first steam engine to this country.



The closed-off mine entrance (Source: <http://www.mindat.org/loc-4509.html>)

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