### **1. Steam Engine**

Dear students, today we will talk about one of the most important inventions – the steam engine that has changed the history. What is the steam engine? What inventors contributed to the development and improvement of the steam engine? How did it change the world?

In a world of combustion engines, gas turbines and nuclear reactors, the steam engine seems like a relic of the past. But without this game-changing invention the modern world would be a much different place, right? It’s a well-known fact that the steam engine is a machine that uses steam to power mechanical work. The steam engine, the most important development of the Industrial Revolution, facilitated major advancements in mining, manufacturing, agricultural and transportation fields. Several prominent figures of the 18th and 19th centuries are credited with developing and improving the steam engine.

In 1698, Thomas Savory, an engineer and inventor from England, patented a machine that could effectively draw water from flooded mines using pressure. Using two steam boilers, Savory devised a nearly continuous system for pumping water from mines. But it was soon discovered that this engine was only capable of drawing water from shallow depths, it wasn’t functioning in deep mines.

In 1711, another English inventor Thomas Newcomen developed a better way to pump water from mines. His so named “atmospheric engine” was the first commercially successful machine that used steam to operate a water pump. Newcomen used a redesigned steam engine that eliminated the need for accumulated steam pressure. Regardless of some flaws Newcomen’s engine was used for the next 50-or-so years to pump out mines, drain wetlands, supply water to towns and even power factories and mills by pumping water.

 By 1765, a Scottish instrument maker James Watt, who was employed by Glasgow University, began repairing a small model of Newcomen’s engine. He developed a separate condenser which allowed the steam cylinder to be maintained at a constant temperature and improved the functionality of Newcomen’s engine.   Watt was able to manufacture his new and improved atmospheric engine. With financial support from manufacturers he developed a single-acting rotative steam engine that along with separate condenser feature a parallel motion mechanism that doubled the power of existing steam cylinder.

Watts invented many devices. You might have seen the word watt on an electric bill. Watt is the type of measurement used to measure how much electric energy is used. But his steam engine was the most important one as it saved time and increased productivity for pumping water out of mines. Watt’s improvements to the steam engine facilitated the rapid adaptation of steam engines across Great Britain and eventually the United States.

By the beginning of the 19th century steam engines were powering mills, factories, and a host of other manufacturing operations.

A British engineer Richard Trev**i**thick took the concept of a steam engine and improved upon it to make the first locomotive that ran under high pressure, allowing for a greater speed. The invention of the steam locomotive revolutionized travel like no other invention before it. People were able to travel long distances.

In 1825, George Stephenson built on the concept of the steam engine and designed the first steam-powered railway locomotive, named the Active. In 1830, he built another locomotive named the Rocket that could go at speeds of up to 36 miles per hour.

Robert Fulton, an engineer and inventor, invented the first steamboat, the Clermont, the first submarine, Nautilus, as well as torpedoes and other weapons for navy use. In 1852, the first flight of a steam-powered airship took place.

So, after the steam engine was invented, improved and started to be used in many fields, the world became more an industrialized place. Before factories relied on wind and water power to drive their machines they were confined to certain places, but steam meant that they could be built anywhere, not just along fast-flowing rivers.

High-pressure steam engines had become comp**a**ct enough to move beyond the factory, and they were used in transportation, namely, in the first steam-powered locomotive and goods were transported over land by something other than the muscle of man or animal.

Now it’s your turn. Explore other 18th-19th centuries inventions that led to Industrial Revolution and talk about how they shaped the people’s lives back then.

### **1. Lise Meitner**

Dear students, today we are going to speak about Lise Meitner [liza maitner], an eminent scientist and her achievements.

We are going to learn about Lise Meitner’s early years, her education at the University of Vienna, followed by her collaboration with other scientists, Otto Hanh, Fritz Strassmann and Enrico Fermi, and their joint discoveries. We will also learn what Lisa Meitner was doing during World War II.

Lise Meitner was born in Vienna in 1878. She was the third of eight children in a Jewish family. From her early years, she was interested in science, and she carried out her first experiment at the age of 8. She experimented with an oil slick, its colors and light reflection.

At that time, women were not allowed to attend universities till 1897, and Lisa had to finish her education in 1892. However, in 1899 she decided to make up for the lost time, and her father hired private teachers for her. She studied math and physics, and in 1901, she entered the University of Vienna.

Lise Meitner was very enthusiastic in her studies, and, in 1906, she was one of the first women to earn a doctoral in Physics.

With a doctoral degree, and financial support from her father, Lise continued her education at the Friedrich Wilhelm University in Berlin, where she attended the lectures of Max Planck whose was later, in 1918, awarded the Nobel Prize in Physics for the discovery of energy quanta.

In Berlin, Lisa also started her research in beta radiation, together with chemist Otto Hanh. In 1912, they moved to the newly founded Kaiser Wilhelm University. Lise received the position of an Assistant, and the radioactivity section became the Hahn-Meitner laboratory.

Meitner and Hahn conducted experiments in radioactivity. They achieved great results in nuclear physics. In 1926, Meitner and Hahn were nominated eight times for the Nobel Prize for their achievements in science from 1924 to 1934.

By 1937, Meitner and Hahn had identified several new radioactive elements. Together with the analytical chemist Fritz Strassmann, they were working on nuclear fission.  Their colleague from Italy, Enrico Fermi, produced radioactive isotopes by bombarding uranium with neutrons. None of them, however, could say whether these isotopes were transuranic elements.

In 1938, Hitler came to power and all Jews were fired from the university. Lise had to move to Denmark and then to Sweden.

Lise Meitner was very sad about the millions of victims of Nazi concentration camps. She recognized her stay in Germany from 1933 to 1938 as immoral, and she also criticized other German scientists. She was sorry that scientific ideas were used to kill people saying “You must not blame us scientists for the use which war technicians have put our discoveries”.

Despite the war, by Lise Meitner’s initiative, Hahn and Strassmann kept on carrying out experiments, and they discovered nuclear fission in their laboratory in Berlin. In 1945, Otto Hahn was awarded the Nobel Prize in chemistry for his discovery of the fission of heavy nuclei. Neither Meitner not Strassmann were ever mentioned.

In 1966, however, Meitner and her colleagues were awarded the US Fermi Prize for their discoveries, although she didn’t want her discovery to be used for the lethal weapon, and she didn’t take part in its development.

Meitner died in 1968.  In 1992, a new element was named “Meitnerium” after Lise Meitner, thus she received a deserved recognition.

In 2014, a Memorial of Lise Meitner was erected in the Court of Honor of the Humboldt University in Berlin.

Now it’s your turn to speak about Lise Meitner.