



POWERING PROGRESS

An
Introduction to
Innovation

The American Precision Museum

We are about to embark on a journey of exploration, experimentation, and innovation! In the mid-1800s, the American Precision Museum (then the Lawrence & Robbins Armory) was the site of incredible innovations that transformed how products were forever manufactured.

Revolutionary **machine tools** and precision **interchangeable parts** led the way, and our journey begins at that moment in history.



Life in 1846: The Age of New Machines

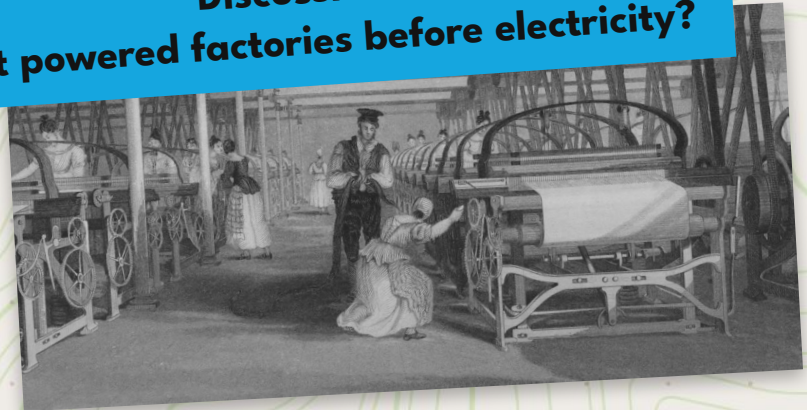
Imagine growing up in 1846. All your life, people have made things slowly and carefully by hand. New products are expensive and difficult to come by. Most children do not have a bicycle, their clothes and shoes are made at home, and toys are simple, like hoops and jump ropes.

But the world is suddenly changing. **New machines are engineered that do the work of many people at once!** They shape metal, weave cloth, and grind grain faster than anyone thought possible.

There's just one problem: **these machines can't run on their own.** Electricity is still being studied and not yet widely available. To bring these inventions to life, people must use **other powerful forces** of nature.



Discussion:
What powered factories before electricity?



Hydropower

The **water wheel** helped accelerate the pace of innovation. Hydropower provided the energy to run the factories. The flowing water turned the water wheel and the wheel was connected to the machines through pulleys and lineshafts. The moving water provided a steady and powerful source of energy to keep the machines running.

Now, the machines that shaped metal, cut wood, and ground grain didn't have to rely on people or animals for power. They could operate faster and more efficiently. This made products more available and affordable.



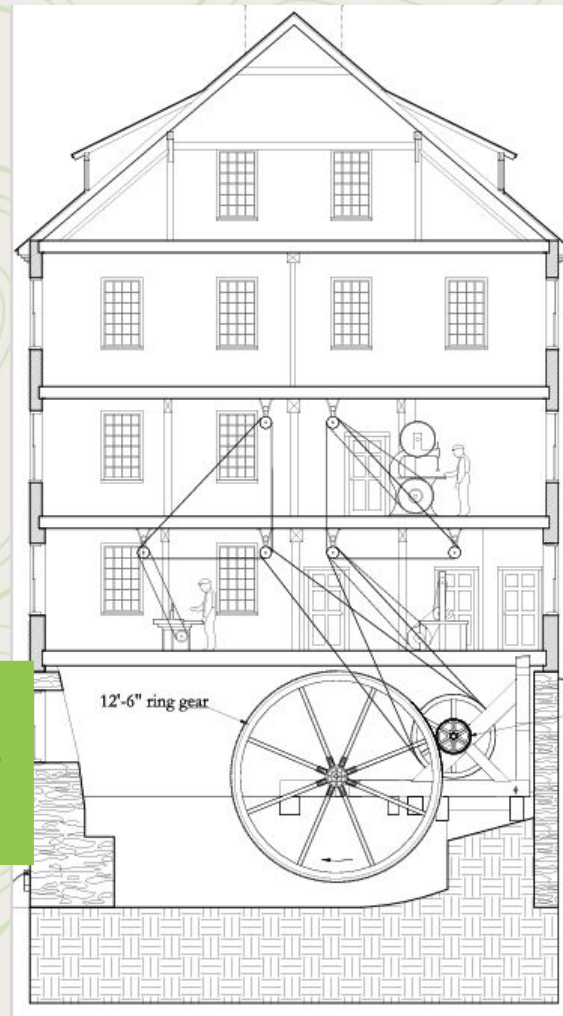
APM's Water Wheel

At APM, the wheel itself is gone, but its story remains an important part of the Armory's history.

The original, giant water wheel - at least 16 feet tall and 12 feet wide - spun slowly in the basement. Water from Mill Brook flowed through a wooden trough, hitting the wheel just above its center. Iron gears and wooden pulleys transferred the wheel's motion to line shafts across the ceiling, and belts ran from those shafts to power machines throughout the building.

The wheel only turned about 8–10 times per minute and produced roughly 30 horsepower—small by today's standards, but enough to run a factory that helped shape the industrial age.

Activity: Use the *Follow the Energy* worksheet to trace to flow of energy from river to machine.



Energy Transfer

There are lots of ways to talk about energy:

- Where does the energy to power your home and school come from? Does it all come from the same source?
- Where does the energy to power your body come from?
- How many different types of energy can you name?

Think about how energy transforms as it goes from a power plant to your home and is then emitted as light and sound from a screen or as heat in an oven.

Next, you'll explore your surroundings for examples of different energy types and energy transfers.

