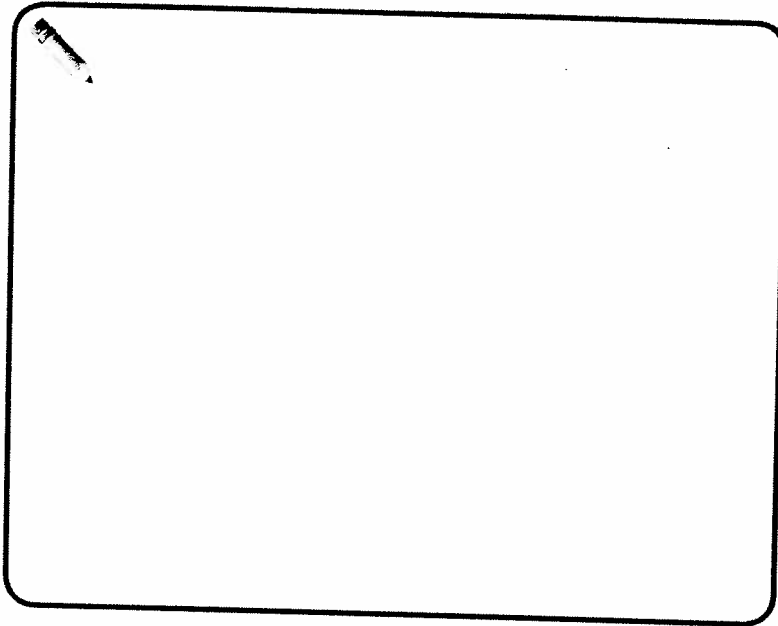




Reading 1.1 – Perpetual Motion Machines

Getting Ready

You probably use batteries for many things you own. Flashlights, cameras, watches, and other devices work by using batteries. Sometimes batteries stop working, and you need to buy new ones. Imagine that someone invents a battery that never stops working. If you had to choose one device to use with the battery, what would it be? Do you think such a battery could be invented someday? Explain.



As you read, think about the different machines you know of and how they help people do things. Think about whether a battery that does not stop could make some of those machines even better.



Machines Are All Around You

For thousands of years people have invented machines to make their work easier. What machines have you used today? A bicycle is a machine that helps you move without walking. A washing machine washes your clothes. A dishwasher washes your dishes. Every day machines make your life easier.

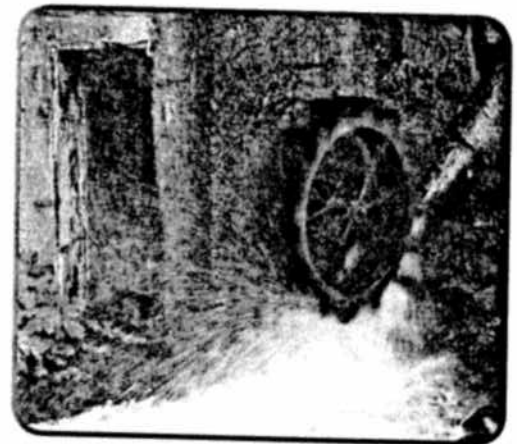
You do not even see most of the machines you rely on each day. When you take a shower, a machine called a water pump lifts water so that it will pour onto your head. A machine called a generator produces the electricity that flows to your house. A machine called a flour mill grinds grains into flour that is used to make bread.

How Do Machines Work?

Even though machines do things for you, they do not work on their own. A bicycle will not move unless you push on its pedals. A car will not go without fuel. A washing machine will not wash clothes without electricity. Every machine needs something to make it work.

The Power of Water

For a long time, the only way to make flour for bread was to grind grains by hand. Even today, some people make their own flour by using a heavy stone to grind grain. Centuries ago, someone came up with the idea for a machine called the watermill. The idea was to place a giant waterwheel in a flowing river, and to connect the wheel to a heavy grinding stone. As the flowing water turned the waterwheel, the stone would turn and grind grain into flour. The watermill was a wonderful invention. It made far more flour than any person could make on his or her own. It also made life easier because no one had to push the heavy grinding stones.

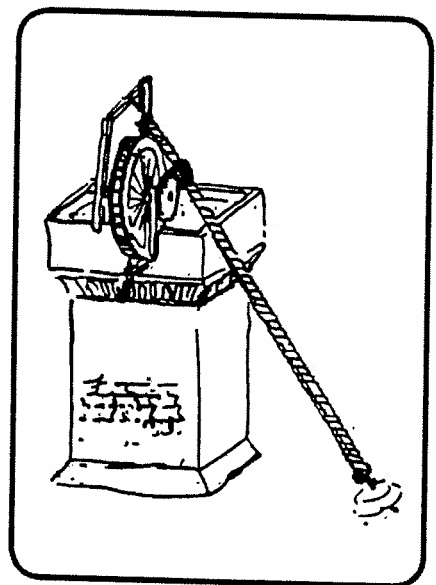


Before long, people realized that watermills could be used to do many jobs. A watermill used to make flour is called a flour mill or gristmill. A watermill used to saw logs is a sawmill. A watermill used to spin cotton is a cotton mill. Although watermills were useful, there were two problems. First, watermills could only be built near flowing rivers. Towns located far from rivers could not use watermills. Second, water moves between reservoirs, such as the atmosphere and rivers. If it does not rain for a while, there might not be enough water flowing in a river to turn the waterwheel.

Could Someone Make a Self-Powered Watermill?

Some of the world's best scientists spent years trying to figure out how to make a watermill work without a river. One of the most famous scientists ever was Leonardo da Vinci. He was among the first people to try to design a waterwheel that could run without a flowing river. His idea was to use water falling from a tower to turn the waterwheel and then fall into a pool. The waterwheel would be attached to a special screw that could lift water from the pool back up to the tower, where it could again fall down into the pool. A drawing similar to the one shown was found in one of his notebooks. His idea was very clever, but it did not work.

Many others have come up with ideas similar to da Vinci's. They all hoped to design a watermill that could power itself. The picture shows a large waterwheel turned by water falling from a higher pool to a lower pool. The large waterwheel then turns a smaller wheel attached to a pump. The pump lifts water back up to the higher pool so that it can fall on the waterwheel again. According to the sketch, if someone filled the higher pool with water, this watermill would keep on running forever. Unfortunately, like da Vinci's machine, this one did not work either.



What factors might affect how the watermill works?

Perpetual Motion Machines

Machines like the self-powered watermill are called perpetual motion machines. Perpetual means never ending. If someone were to invent a perpetual motion machine, it would be able to run forever without stopping. People have been trying to invent perpetual motion machines for centuries, but no one has succeeded.

Besides self-powered watermills, inventors have tried to develop self-powered windmills, clocks that do not stop, and engines that do not need fuel. Thousands of people have claimed to invent perpetual motion devices, but not one has ever worked. Today some inventors are still trying to develop perpetual motion machines that could run forever. Their dream is to invent things like a car that will never need to be refueled, a cell phone that never needs charging, or a flashlight that never needs new batteries. Most scientists believe that these devices can never be invented.

In class, you saw several devices that did not seem to stop. You saw a top that kept spinning and a pendulum that kept swinging. These may seem like perpetual motion devices, but they are not. If you wait long enough, they will stop. One of the goals in this unit is to find out why they keep going much longer than expected. Learning about energy will help you to understand why these devices go for so long. Learning about energy will also help you understand why scientists believe that perpetual motion devices will never be invented.

Most scientists believe that perpetual motion devices can never be invented, but people come up with new ideas for them all the time. Do you think people should keep trying? Why?