

UnLOCKing Change: One Invention at a Time

A Study of Water-Related Inventions Throughout History

The Sixth Grade Class at the
Genesee Community Charter School
2010-2011

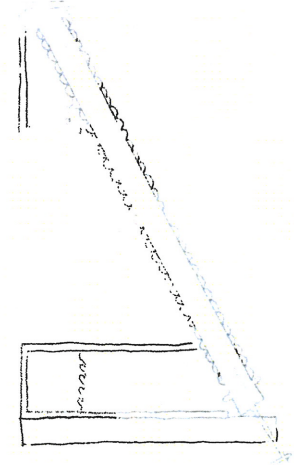
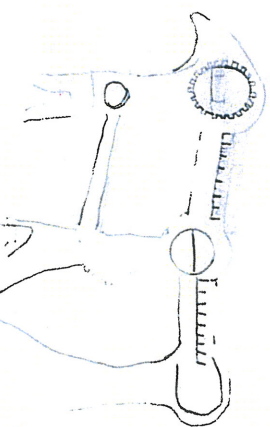


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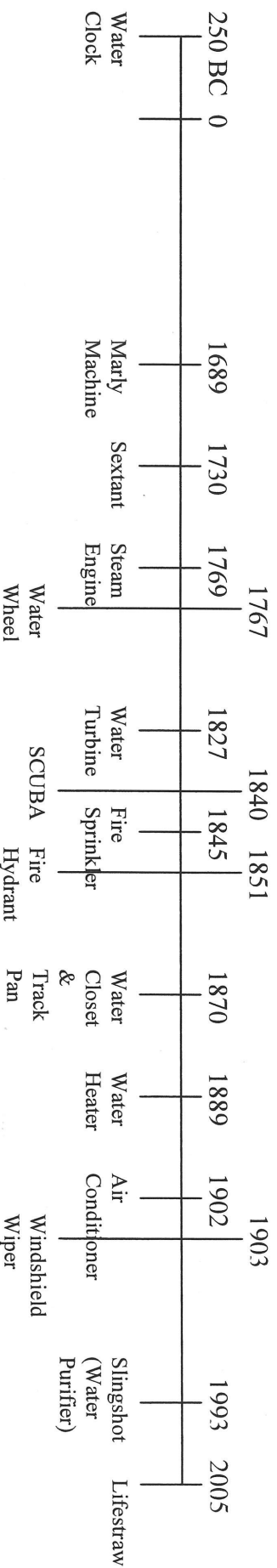
Introduction

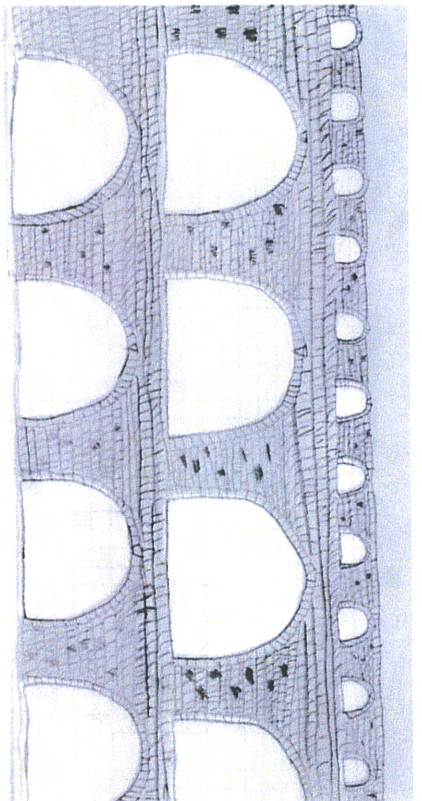
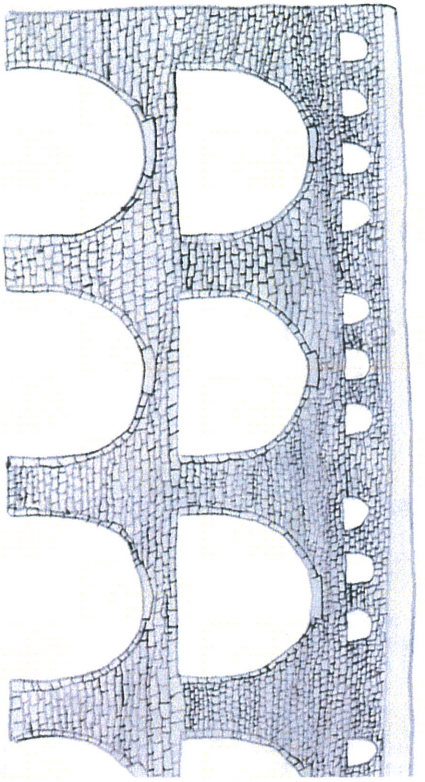
During this Expedition, students have been studying how people have found ways to control water throughout time. They have been answering guiding questions such as: “How have civilizations manipulated water?” and “How is water important to a civilization?” These two questions have both been explored in each student’s water-related invention research.

In addition, the class has studied four other water-related inventions related to canals. These four inventions are:

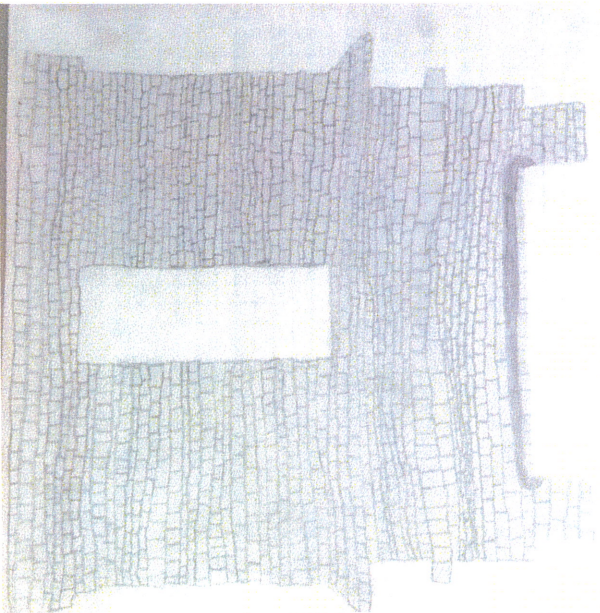
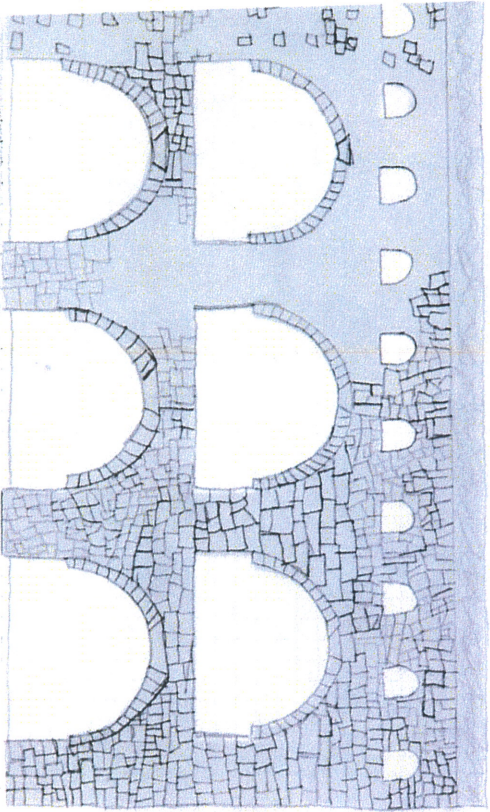
1. The Falkirk Wheel – A modern alternative to a flight of locks joining the Forth and Clyde and Union Canals in Falkirk, Scotland. The Falkirk Wheel is mainly an invention for tourism.
2. The Double Lock – The very first double, mitered gate lock created on the Grand Canal in China. The Double Lock was invented for easier transportation.
3. The Archimedian Screw – A device created by Archimedes in Alexandria, Egypt. It was invented to help irrigation of crops and to help combat floods in the Nile River.
4. The Roman Aqueduct – A structure that is used to transport water to another location. This type of structure has withstood the test of time by using arches to keep it strong. The first structure was created in Ancient Rome.

The following inventions are displayed in chronological order. The timeline below shows the inventions in order (not drawn to scale).





The Roman Aqueduct



The Water Clock

By: Brian

Archimedes, an inventor, engineer, Greek mathematician, Physicist, Scientist and astronomer, was a very important man. He invented the water clock, war machines, and discovered Density and Buoyancy. He also discovered angles, numbers, and gravity. Archimedes was one of the most important men in history.

Archimedes

During the Hellenistic age (when Archimedes was alive), there were the first Roman victories over Greece. Archimedes was born in Syracuse, Sicily in 287 BC. When Archimedes was a baby boy, two family festivals celebrated his birth. Five days after his birth, the baby boy was wrapped in warm cloth by his nurse. Members of his family ran after the nurse, who ran around the hearth several times, honoring his birth. Five days after that, Phidias the astronomer, who was Archimedes' father, named him "Archimedes." For school, Archimedes had to go to the teacher's house, which was school in those days. He also had to scratch letters on a wooden tablet with a sharp-pointed iron graver.

Later, he traveled to Alexandria as a teen. He learned many things about Greece while at the Greek Providence and invented the Archimedean screw to help farmers get water out of the Nile River at a faster pace. He also invented the water clock in Egypt. Sadly, Archimedes was killed during the Second Punic War, when a corrupt soldier killed him. When the soldier was killed for punishment, a cylinder and a sphere were placed on Archimedes' tomb in honor of his work with mathematics.

At the request of King Hiero, Archimedes built several powerful war machines to defend the city. These included the Archimedes heat ray, which shot a beam of sunlight reflected from the sun. He also amazed King Hiero, such as the time

when he created a lever and showed its power, or when the inventor discovered that the goldsmith had cheated the king making him a "Gold" crown, with lots of silver, giving the goldsmith half of the gold.



The Water Clock

One of Archimedes' most important inventions was the water clock, which measured drips of water to tell time. The water clock is an invention that was featured in France, Europe, England, Egypt, Babylon, China India, Greece, Rome, Japan, Arabia, and Korea. The water clock was first used in Egypt, then in Greece.

The Greek word for water clock is "Clepsydra." During the 1700's, clockmakers made water clocks secretly, but dared not sign their finished products, for fear of being exposed. The water clock was a set of two bowls containing water. Priests used these water clocks to perform sacrifices and Temple rites at the correct hour. When the water got to certain marks, it showed what the time-change was.

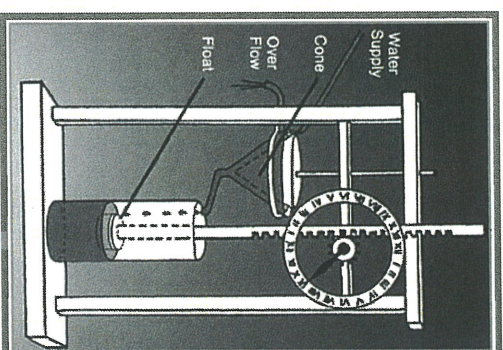
During Archimedes' Time...

Scribes and officials in Egypt were separated into the "white kilt class", because of their white kilts. Archimedes was also placed in the upper class. During the Bronze Age, city-states had and were ruled by monarchies. The man, Aristotle, divided the Greek government into many things. Also, Greece has access to water, mining, street, and more types of technology.

Archimedes was probably the most important man in history. His ideas and discoveries opened paths for millions of famous inventors in the future to come. His invention, The Water Clock, spread throughout other countries and states and became a global discovery. Greek life was exiting back then, and we continue to honor Greek people and their ways to this day!

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The Marly Machine

By: Elijah

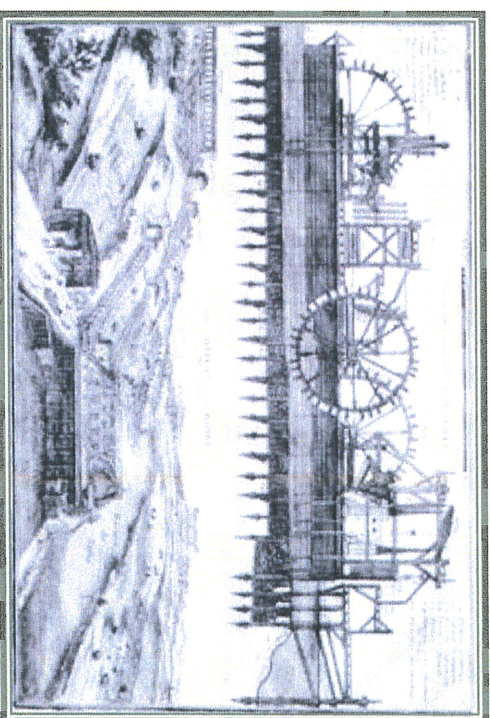
Imagine being an inventor searching for glory and fame. What would you build? Who would you build it for? Well, I would build something for someone with a lot of power. And I would build something that would help people get something they need, like water. A man in Imperial France named Arnold De Ville would agree with me. Let's take a look...

Arnold De Ville and The Marly Machine

Arnold De Ville was a man who lived in Rome during the Grand Siècle Era. This time period took place in 1598-1715. During this time there was a king named King Louis the XIV (14th). King Louis loved power, so he and the Principle Minister (the king's right hand man) changed the government from a constitutional monarchy to an absolute monarchy. He didn't want any of the prince and princesses to think about killing him to gain power, so he tried to make their life fulfilled and distract them with big projects and other things.

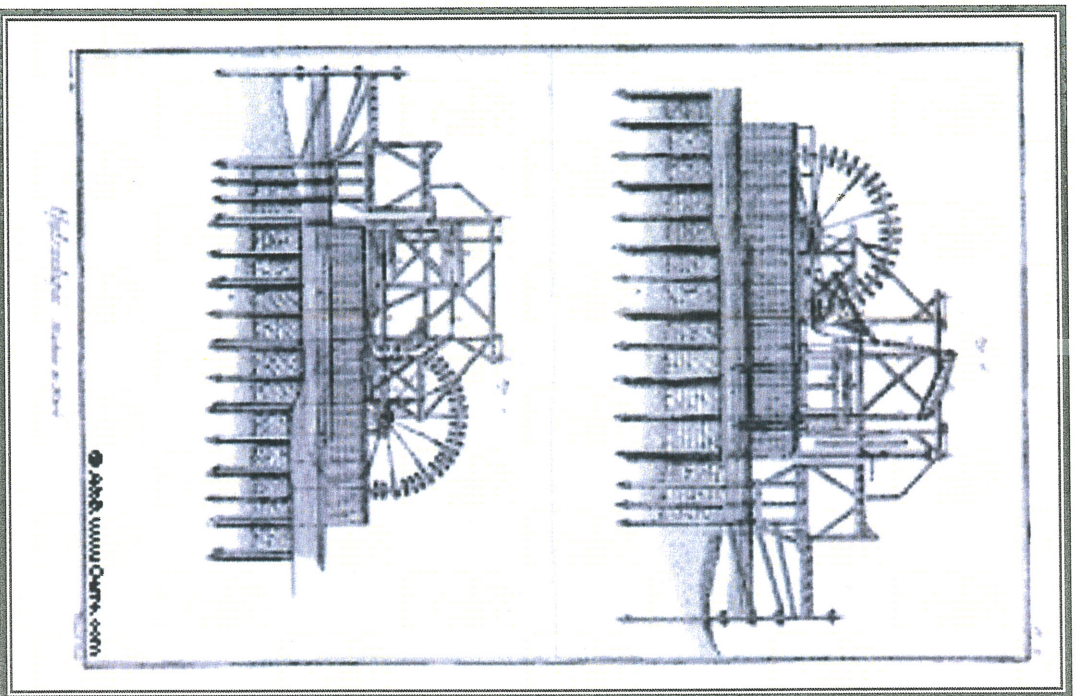


King Louis XIV



In 1689, Arnold presented the Marly Machine (or La Machine De Marly) to King Louis as the head engineer of the project. It took seven years to build and was complete in 1696. The Marly Machine was one of many machines that were used to pump water to King Louis' chateau (castle) and also one of the most costly. It took 4,000,000 Livres (the currency of France up until 1795) to complete construction. It had 14 paddle wheels 38 feet in diameter on an axle that moved 221 pumps bringing water 177 yards up a hillside from the Seine River to the Chateau Modave through pressure pipes and the Marly Aqueduct.

The Marly Machine was a copy of the Paddle Wheel, which was almost in ruins by the time the Marly Machine was proposed. Even with upgrades in 1817 and 1963 to install electric generators, the Marly machine failed constantly and required a staff of 60 people at all times. Nevertheless, it was considered a wonder of the world well up until 1968 when it was finally demolished.



Arnold De Ville took credit for the building of the Marly Machine when really it was all Rennequin Sualem the architect who came up with all the ideas. King Louis the XIV bought Arnold a small Shatough when the machine was finished and Arnold became a baron which is a title that can be given to people from kings. Rennequin Sualem got promoted to head of maintenance staff.

In the end the greedy win. Arnold might not have been the most truthful inventor but he got money and fame from what he did. So next time you see someone name as the inventor of something look closer and see who really did all the work.

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The Sextant

By: Dominique

Imagine if you were born in 1682, and you were on a boat and you didn't know where you were going. All you knew was that you needed an instrument to help you find your way. Imagine if your parents were Katherine and George Hadley and your brothers were Henry and George junior. Well they weren't this person; John Hadley was.

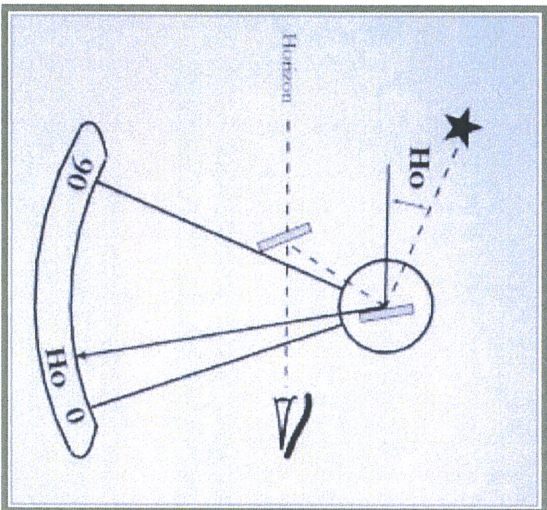
The Sextant

Has anyone ever told you that there is only one way to find your way at sea? Well, that's not true. John Hadley invented a device that measures the altitude at sea to help you find your way. This device is not only for finding your way, it's also to help you find land. This instrument was remade at least 5 times. This instrument is the Sextant. The sextant was invented in 1731.

I bet your wondering how this instrument works. Well I'm going to tell you. First you have line it up with the Sun. Then, line it up with the moon. Then, you line your thumb up

with the North Star and the compass shows the way you should go.

The sextant is made up different parts like the convex lens, little gears, a compass, and wires. The word sextant came from the root word "sextans" which means six parts.



John Hadley

John Hadley wasn't just a creator of an invention. He was the governor of Barnet Grammar School. He invented the sextant in the year 1773, which was a late time in his life. If we didn't have those people that invented those fancy GPSs, we would still be using the sextant. He also made a Gregorian reflector in 1726.

John Hadley was a wealthy man but not rich. He was wealthy enough to have two houses and he used the money he made to pay for the equipment he needed. Before he started making the final sextant, he asked his brothers to help him with the first model.

John Hadley did not only have successes but also failures. He struggled with determining longitude and latitude at sea. John Hadley also discovered his invention in late 1700s and had to problem solve how to make his device work.

In conclusion, just because his footsteps are gone doesn't mean you can't make new ones. In other words, it's important to take inspiration from great inventors and apply it to today's role of technology.



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The Steam Engine

By: Jonah

Did you know that the steam engine could easily be called the most important invention to the Industrial Revolution? People say James Watt invented this magnificent machine. But should we give him credit for this? Some say that Thomas Newcomen was the real inventor. Why did Watt take credit for making the steam engine and why is it so important?

James Watt

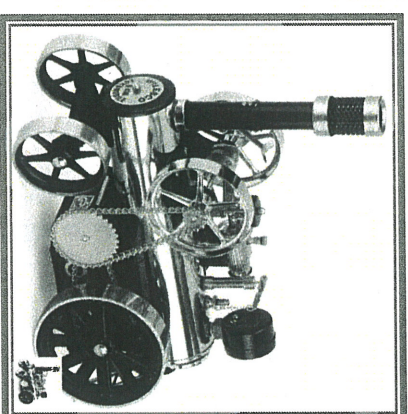
James Watt was born and grew up in Scotland, in the Valley of Cusgarne. He lived during the Industrial Revolution, a time full of inventions and inventors. Scientists say that this may have been a spark towards the steam engine. One invention led to another and people would constantly improve on each other's work.

Watt was born in 1736 and had never invented anything of his own, but had repaired some of Newcomen's steam engines. His invention originally pumped water out of mines. Watt was always thinking of ways to improve the steam engines and find new uses for them. Some scientists say that James Watt watched the lid of a boiling kettle lift up and down and that gave him the idea for his own version of a better steam engine. At this point Watt invented a new steam engine to be used for transportation. In 1769, James Watt invented the Steam Engine. By 1827 the steam engine was the popular form of transportation!



The Steam Engine

This revolutionary form of transportation has four main parts. The first is the pressurized steam. The pressurized steam is pumped into the top of a special cylindrical box with three pipes on the bottom. There is a rod with a special half a circle pipe (the pipe is not cut in half it's half a circle). This rod slides back and forth redirecting the old cooler steam is push out the funnel. The hot steam goes into another cylindrical box and pushes the piston rod, a wall type piece that touches the sides of the wall attached to another rod. The rod is pushed back and forth. That motion is what gets trains going.



During Watt's Time...

During the Industrial Revolution, the technology in that time was not very advanced (compared with today). Overall, it was simple, but they were starting to look into electricity. During this time, they were using a lot of steam-powered machines. Therefore, James Watt's invention was the second most advanced engine to use steam.

The Scottish government during the Industrial Revolution was a Parliament. This type of a government has a group of people that make up the laws. They are called the MSPs (Members of the Scottish Parliament). Like the US government, they make bills into laws and they vote. Most people lived a low life plowing fields and selling goods. Owning land was the main form of wealth in the 18th century. At the top where the nobility. Then come the rich landowners, which were called the gentry. The class lower than the gentry is called the yeomen, which is between the rich and the poor.

After reading this paper, I hope that you have realized how something so simple (compared to today's technology) was partly why we have trains and subways now. Thanks to James Watt.

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The Water Wheel

By: Olivia

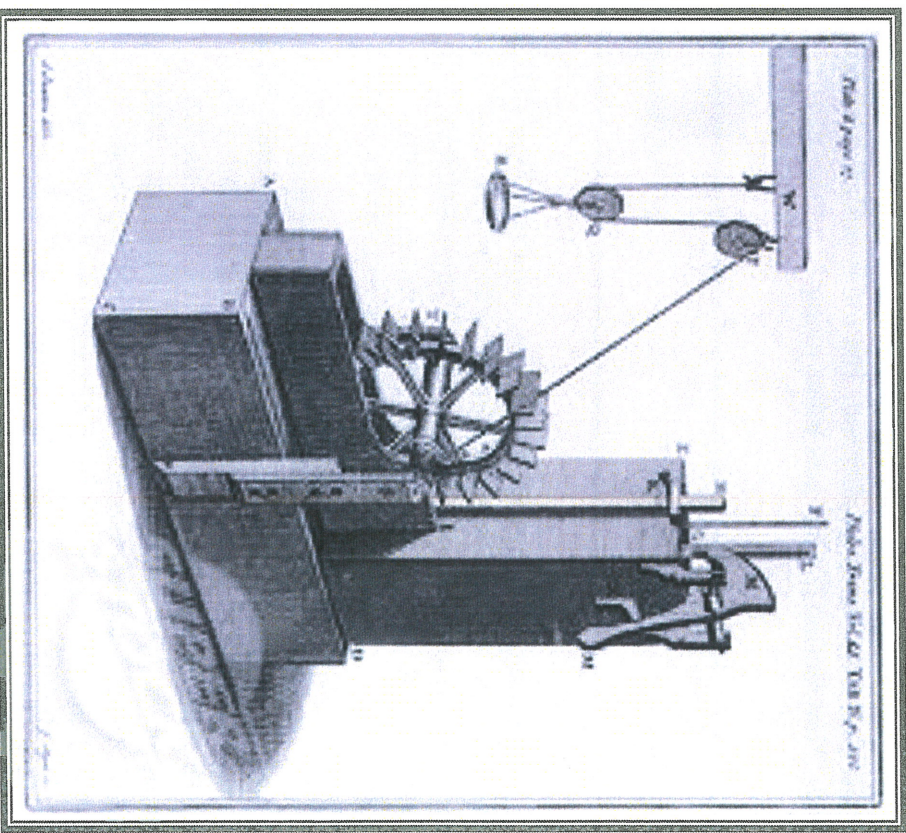
GRIND! GRIND! GRIND! Grind! Grind! Grind! Grind! Grind! MUSH! MUSH! PATI! PATI! SCREECH! SCREECH! These are all of the sounds of the tumbling and rising of the grain as it goes through the incredible water wheel. The water rushes in, furious and ready to push the stone to help produce flour and help the civilization flower.

The Water Wheel

John Smeaton invented a new type of water wheel in the early 1700's. It was called a Vitruvian wheel and was a wheel carried on a horizontal axis. This wheel was a little different because it was made with a new and inspiring material, waterproof cement made out of limestone and clay. Therefore, it will last longer and be stronger than a regular wood mill.

There are three types of original water wheels. The first is the horizontal wheel, which is called a Norse Wheel that turns the millstone directly. There are two types of vertical wheels, the first, called an Undershot Wheel, which requires gears. The second, the Overshot Wheel, requires an elevated stream. Though later, John Smeaton proved that the Undershot wheel was less effective than the Overshot wheel.

Smeaton's Water Wheel was invented in the 1700's, but the Water Wheel was first referenced in 4000 B.C.! A poet named Antipator wrote about a group of girls who were operating two small hand mills to grind corn. This might have been the first method of using mechanical energy.



John Smeaton

John Smeaton was born in 1724 in Austhorpe, Leeds, England. That is also the place that he died. While his father was an attorney and wanted him to get involved with the law, John had other plans. He was a lot like Archimedes in that he loved mathematics and lived to invent. He was selected to invent a lighthouse near Plymouth, England in 1755 and finished in 1759.

The result of his proof was that the undershot wheel was less effective than the overshot wheel. This was the idea of gravity. Water acts as a more efficient source of power when falling vertical then when flowing horizontal. This way, the overshot wheel would be able to power mills more efficiently.

John invented a tidal pump that went from London Bridge to people's houses in 1767. James Watts condensing steam engine later replaced this. He made improvements to Edmund Halley's diving bell just by adding an air pump to it. Over his lifetime, he engineered a few canal or bridge projects including the Forth and Clyde canal in Scotland! By the end of his life, John had built 43 mills.

When John Smeaton died in 1792, The Institute of Civil Engineers from Scotland renamed themselves the "Smeaton Society," after how much he inspired them. All of them went on to continue his ideas by building bridges and more advanced mills. Again, much like Archimedes.



The 1700s

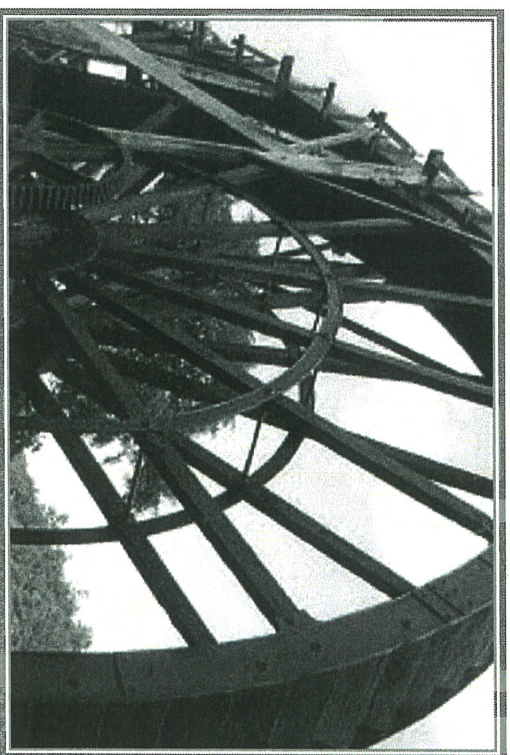
In Britain in the 1700s, John Smeaton lived in the environment of a monarchy, meaning that they had a king who was related to the past king, who was related to the past king. The king at the time was King George I who was ruler from 1727 until 1760. He was succeeded by George II, who was king until 1820, after Smeaton died.

The class structure in Britain in the 1700s was very respectful, except for when they traded slaves, but especially the higher class. They also started a charity school for the poor! In Elizabethan England, gentleman were knights and Squires. Women of the upper class didn't do much at all, but women of lower class worked around the house. Things changed from then until John Smeaton lived. Mostly the higher class was the wealthier and older families and the lower classes were those who worked.

During this time in history, Britain was called the Agricultural Revolution, where lots of people had jobs farming. Britain's population was expanding, and people had new methods for produce. But because of population growth, small farms needed to be made bigger. A lot of people lost their jobs due to enclosed land.

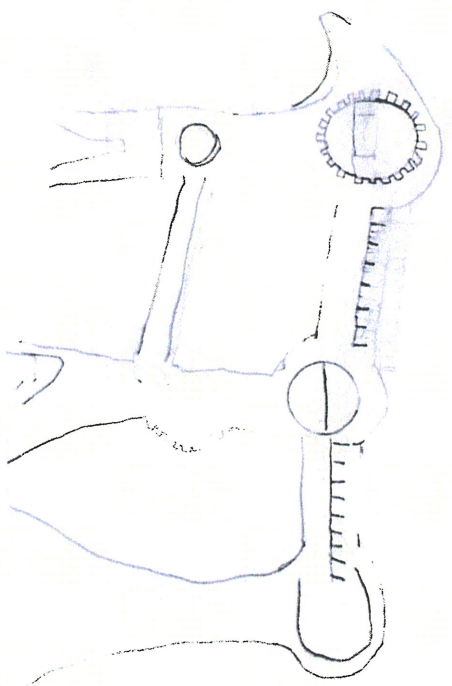
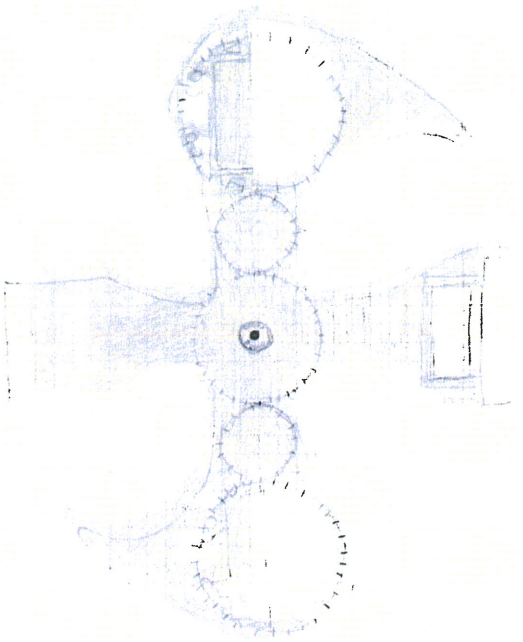
In the 1700s, more than half the population of Britain was employed in agriculture. The events before that in 1688 led to establishing a modern financial system. Manufacturing and trading became very important. The trade with India brought new fabrics for the higher class to wear, there became a new interest in the idea of variety, and consumerism developed. This was the rise of cultural trade, investing in trade, and the rise of consumerism.

Think about the future. If water wheels hadn't been invented, Rochester wouldn't have been able to BOOM! We wouldn't have been able to grind grain for flour, downtown wouldn't be called 100-Acre Tract! We wouldn't be known for our main street bridge with now, our ever-important aqueduct. So think about it. Water wheels really were important weren't they?

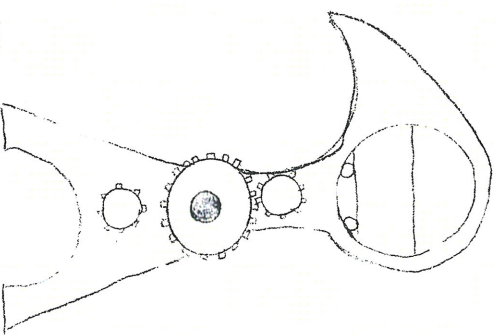
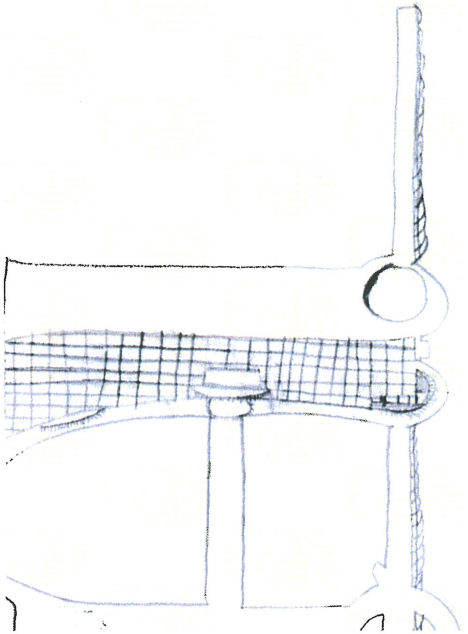


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The Falkirk Wheel



The Water Turbine

By: Katherine

Have you ever wondered how waterpower gets turned into electricity? A man named Benoit Fourneyron invented a machine that does that exact job. He called it a water turbine.

Benoit Fourneyron

Benoit Fourneyron was a French inventor in the upper class who lived from October 31, 1802 to July 31, 1867. His father was a mathematician. He graduated from an engineering school called Saint-Etienne in 1816.

There were many changes with the revolutions in the 1800s. The Industrial Revolution (1760 – 1850) developed new scientific methods and new ways to make materials. These new discoveries caused people to improve Benoit's turbine. In 1895, after he died, his turbines were installed on the American side of Niagara Falls to use all the natural power.

The government in the 1800s was a mix of a monarchy, with kings, and a parliament. A couple things that happened in Benoit's life was that Napoleon was declared emperor. After all the invasions, there was finally peace in 1815. France was one of the world's richest nations. Because of the French Revolution, France was not as successful with advanced technology as the rest of Europe, so they were more of an agricultural nation.



The Water Turbine

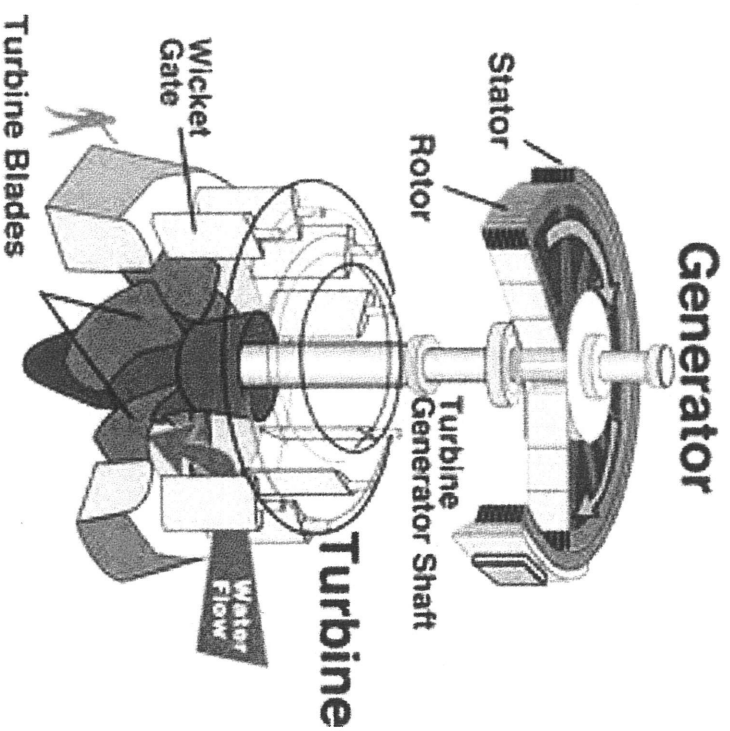
The original purpose of his invention was to grind grain and to operate bellows for furnaces. We might still use it for that, but now we mainly use it for converting water to electricity; to power everyday things like TVs and light bulbs. A water turbine works by water turning a series of blades, which then is transferred to the electrical grid and used as electricity.

A professor from Saint-Etienne gave Fourneryron the idea for the water turbine. Eleven years later, he built his first water turbine, which had six horsepower and is similar to the power of today's lawn mower. An advantage of a water turbine is it has a swirl, which makes it more efficient than a traditional water wheel and it can be smaller. He kept working on it so that in 1832 it was capable of 50 horsepower. In 1837, he built a turbine that could spin 2,300 times per minute. It had a diameter of one foot, weighed 40 pounds with 60 horsepower.

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Benoit Fourneryron was a great engineer that was very helpful to the economy. He tried to help solve problems in ways everyone could use. I hope you enjoyed reading about Benoit Fourneryron and appreciate what he invented.



SCUBA

By: Grace

Imagine you are floating below the surface of the ocean. Fish swimming elegantly. Sunlight is pouring down on you in a haze. Your breath as light as silk. The water is smooth as glass and like a blanket to your skin.

All of this is possible by SCUBA (Self-Contained Underwater Breathing Apparatus). A simple, but unique machine to allow divers to dive deeper, to the underwater depths of the unknown; the Ocean. Learn how this unique piece of equipment was used and about its mastermind inventor.

Augustus Siebe

Augustus Siebe was born in Prussia, Germany, where he then went to Berlin, to learn metalworking. After learning this skill, he soon became an artillery officer in the Prussian army. Augustus fought in the war of Leipzig in 1813 against Napoleon. After being wounded, Augustus immigrated to Waterloo, England where he found work on Denmark Street. He worked there for nearly half of a century! It was then in 1840 that Augustus created the closed water helmet. He also created countless other things like a paper-weighting machine, paper making machine, and even an ice-making machine! He was a man of great cleverness; he changed the way some people live today.

In ancient times, divers would use hollow reeds to allow themselves to breathe while exploring the surrounding water. They used VERY thin sliced turtle shells for goggles.

It was in the 1830s that the Deane brothers (Two young inventors, working together to create things) had asked Augustus Siebe to first make a variation of their very own; the smoke mask. However this mask would be used for divers to dive deeper to the bottom of the ocean floor.



SCUBA

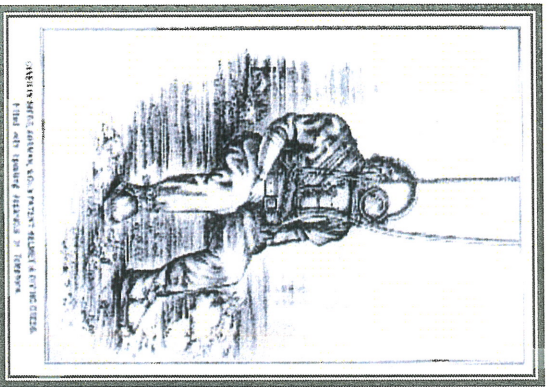
England in the 1800s

During the time in which Augustus Siebe lived in England, Queen Victoria was the ruler. Queen Victoria became the queen when she was only 18! She had a lot to learn, and ended up being the queen for 64 years!

The government at the time, since there was a king/queen ruling, meant that it was a monarchy. When the king or queen dies the next person to take the throne, would be a relative, son, grandson or granddaughter. Today the source of government is called the Parliament, which is a group of representatives who all work together to create laws.

England was the mother country for many things; this was great, because they traded to get goods. This helped them become a very rich country. In the 17th century, England had colonized in America. They took over many places such as; Massachusetts, Virginia, New Hampshire, Maryland, Connecticut and Rhode Island. The current king (George the III) was in debt after getting soldiers into America to protect the colonists. This led to the famous event, the Boston Tea Party. The Boston Tea Party caused the famous Revolutionary War! But eventually the colonists won the war, and became an individual country. The mother country was separated from its daughter. How do you think this affected the inventors at the time? I think that since England now had, even more debt that there would not be as much money to borrow from the government to get materials for inventions. However in England money is different. We have dollars; they have Euros.

So next time you go swimming and you dive down in the deep water with your friends to see who can hold their breath longer think about Augustus Siebe. Think about how he created that device so you could breathe underwater; almost like a fish! You might be the one to invent pool friendly scuba equipment. But who knows! Maybe someone else will learn about the genius Augustus Siebe and be inspired... but that's another story.



You might understand better if you knew how this machine works. The divers are in a rubber, airtight suit. A large tube connects to the back of the suit that connects to the boat above water. There is a large tank on the boat filled with gas. The oxygen is delivered right from the boat, to the diver. It's like door-to-door service.... Well, boat to back service.

Nowadays, modern SCUBA divers use tanks in which they carry upon their backs filled with oxygen. Instead of wearing the large suit where oxygen flows freely around the suit, they bite upon a mouthpiece connected to the suit, letting oxygen flow into their mouths.

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The Fire Sprinkler

By: Taylor

Imagine if you lived in a house in the early 1800s and you were cooking and you say, "Hey, it's getting a little hot in here." So you try to open a window in the kitchen, but it won't open. You go outside to open it and you come back and your food is on fire! Don't you wish you had a fire sprinkler system to put out your fire?

James B. Francis

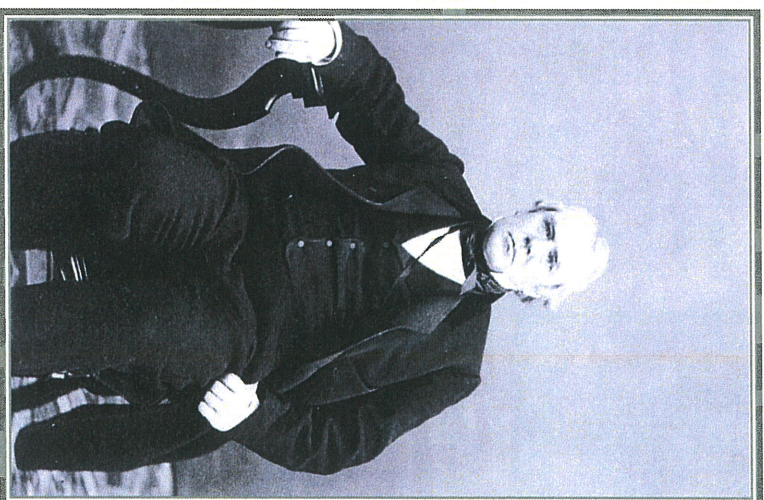
Because of James B Francis our buildings and schools are safer. Today if there is a fire in a building, the sprinkler would sense that and it would go off where the fire was. Back in 1845, all the sprinklers would go off and most of the time it would flood the whole house. Then they would have water damage.

When James Francis was 14 years old, he started working as his father's apprentice at Porteraw in South Lowell, MA. Four years later at the age of 18, he decided to migrate to United States in 1833 as a railway engineer for George Washington Whistler Jr. When he was 18 years old, he got another job as a draftsman for locks and a Canal Company. He stayed at that job for a couple of years. Then he became chief engineer.

A few years later, he got married to Sarah W. Brownell in Lowell on July 12, 1837. They had their first son born on March 30, 1840 and then had five more after that. In 1841, he was given a major project; He had to analyze how much water watermills used from the canal system company. After that happened, he was named manager of the lock and canal company. So all of his jobs mostly relate to water; just like the fire sprinkler system.

If you were an inventor, what kind of character traits would you have? James Francis had perseverance and took initiative for inventing what he did. He used perseverance because he had to try out lots of experiments so that he could

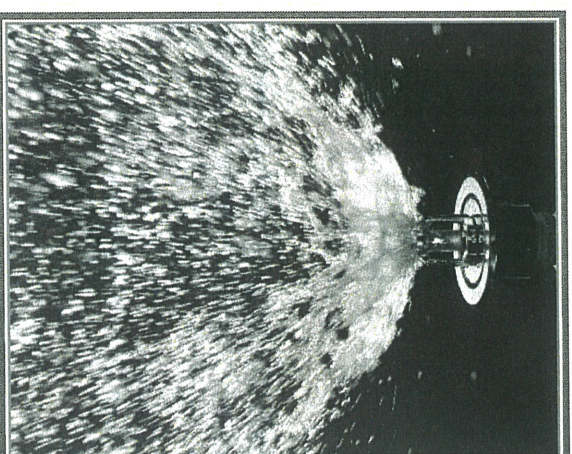
create the sprinkler system or draw a lot of diagrams to figure out what to do, what to get, and how to make this invention.



The Fire Sprinkler

The fire system was made to put out fires and for the safety of others. Pipes were put close to the ceiling and allowed water to flow through when the valves were manually opened, at the end of the pipes, jets would force the water out of the sprinkler valves.

Before fire sprinklers were made, there were steam fire engines and fire hoses. Firemen would fight the fire from the outside of the house. When fire sprinklers were first invented, they would fight the fire from the inside the house and that was more efficient. Have your parents ever told you that there is always two sides to a story? The other side of the fire sprinkler system was that back then it would go off and the water wouldn't stop. So it would flood the whole house or building. After they modified the sprinkler, only one would go off at one time instead of all of them because it would know where the fire would be from the smoke and/or heat.



During Francis' Time...

James Francis was in the middle class. People know this because he was an apprentice and only the highest class had slaves and only the lower class people lived in apartments or with other people. The highest class is called the upper class and they either were elected or were rich.

At the time, William Henry Harrison was President and John Tyler was Vice President. The US has always had a democracy. People elect our presidents, governors, mayors, senators, congressmen and judges. There are three branches of government: the Judicial Branch, Executive Branch and the Legislative Branch. All laws are made through these branches.

Technology was very different in the 1840s. James Francis was experimenting with designing turbines with Uriah

A. Boyden. James and Boyden improved turbines. The Francis Folly still was used from 1852 until 2007 (155 years), and saved the city from the Merrimack River from entering the canal system.

In 1850, he constructed the Great Gate over the Powtucket canal to protect the downtown, mills from the devastating floods. Then became known as the Francis Folly.

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The Fire Hydrant

By: Cameron

Imagine if there were no fire hydrants to help drench the blazing flames as they rage through the town. The world would probably be decimated. For the fire hydrant has allowed the world to become a safer place for us all as we fight the mistress of destruction, warmth, safety..... FIRE!

Birdsill Holly

Birdsill Holly lived in a time when Abraham Lincoln was killed and when the Civil War began and ended. He was also alive when William Henry Harrison was elected as the 9th President. Holly was also lucky enough to be alive when the first electric street lighting was invented in 1878.

Birdsill Holly had an early bad life, but slowly his life got better. Holly was born on November 8th, 1820 and died on April 4th, 1894. When Birdsill's father died in 1828, Birdsill had to drop out of school with a third grade education to support his family. But in 1851, he created Holly Manufacturing and was a great inventor who created the rotary pump, district heating, the fire hydrant, and was a key person in the invention of the first non man-powered fire engine.

Birdsill Holly needed certain traits to be a good inventor and these traits were curiosity, perseverance, and open-mindedness. He needed to be able to be open-minded to take criticism instantly because he would never get anything done if he gave up every time someone said his invention was bad. He also knew perseverance because most inventions fail the first few times so he had to know it would work if he kept on trying.

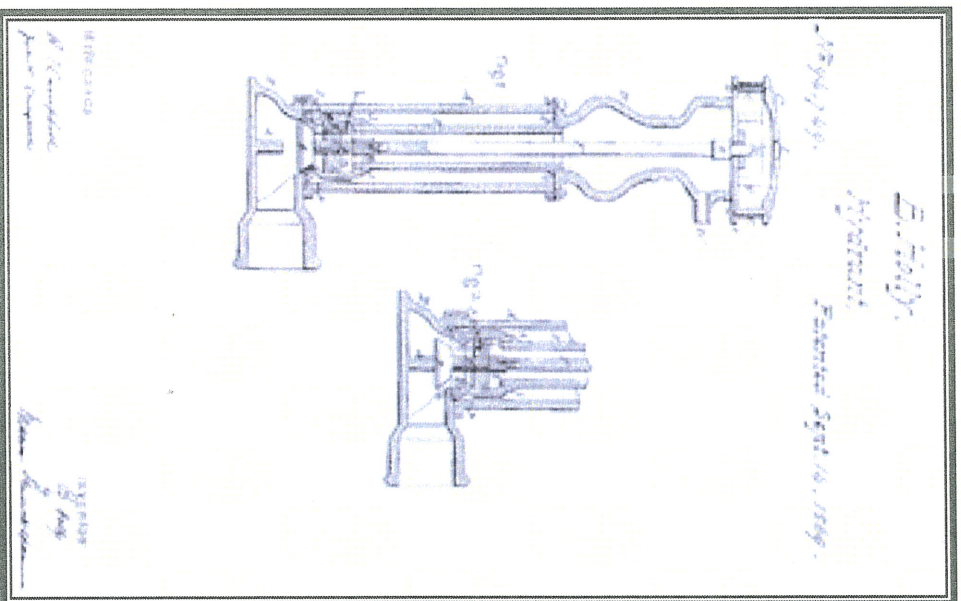


The Fire Hydrant

Now that you've heard a little bit about Birdsill Holly as a person and an inventor, let me tell you a little bit about the fire hydrant. It was invented in 1851. The purpose of the fire hydrant was to put out fires faster because the water was easily accessible to firemen, and it also helped to bring water to all parts of the city.

The fire hydrant works by storing water in an underground well. When the plug is opened, it uses pressure to push the water out. Then the hose is used to control how much water comes out at one time and lets you aim the water at the fire.

The history of the fire hydrant is pretty interesting. For instance, fire hydrants used to be called "fire plugs" and you actually had to dig to get to the underground well that contained water to put out the fire. Then an X would be placed over the well so it could be found again. Bucket brigades also helped to put fires out. A bucket brigade is a line of people that pass the water in buckets in an assembly line.



During Holly's Time...

Birdsill Holly lived in a somewhat interesting time for America. Luckily he lived in a pretty fair time period where the rich, poor, and working class had the same rights but could only do what they could afford. The rich usually owned plantations and slaves, and the middle class consisted of Frontier's Men who made their lives off the land.

The government on the other hand wasn't the best because the Civil War was being fought which meant that the government had divided loyalties. The US government had only started about 20 to 30 years before he was born. The government did have the Legislative, Executive, and Judicial Branches that we still have today. But sadly the government didn't really have an opinion on his invention besides the fact that it saved many lives.

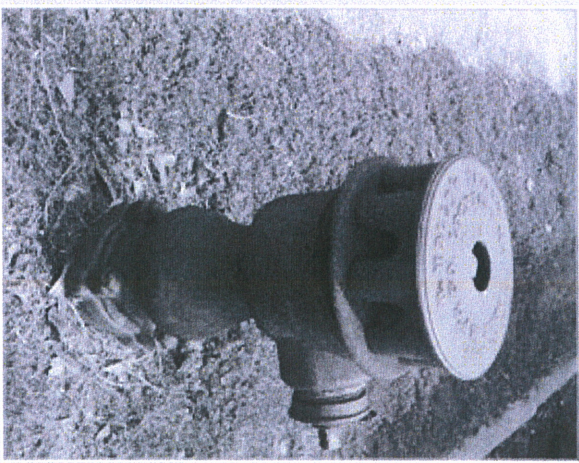
Back then, the technology was advanced for its time because the Industrial Revolution was going on and this was a huge technology spike! For instance, the telephone, airplane, diesel engine, and the first reliable steam engine were invented at this time. The invention didn't really help advance technology further but it allowed people and buildings to be safe.

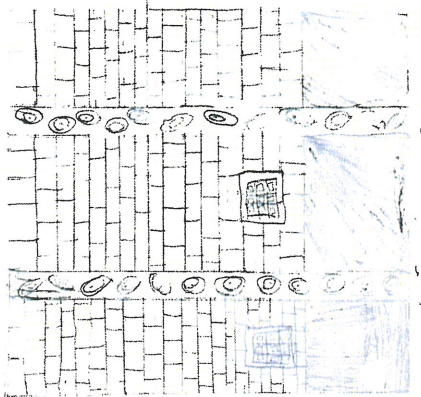
The economy was not very strong when the Civil War was happening and for a time after that, the economy was fine. The US used coins and dollars to buy things. Birdsill Holly was a pretty normal man when it came to money and he made most of it from his company Holly Manufacturing. His invention of the fire hydrant was a very good investment because it really almost neutralized the threat of most fires.

Now that you have learned about Birdsill Holly and the fire hydrant, I hope that when you see a fire hydrant you realize how many lives it has saved and how one man's thinking has saved many people and buildings.

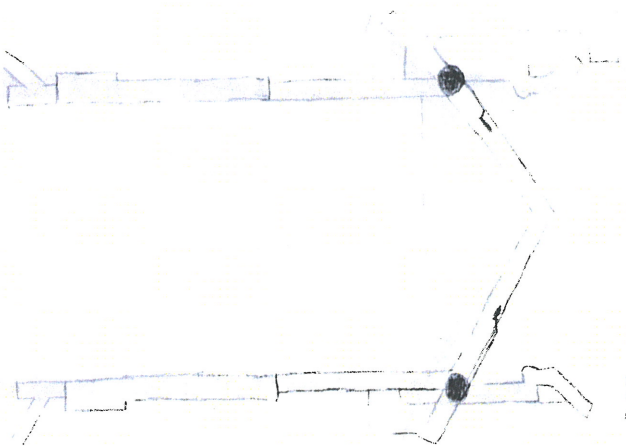
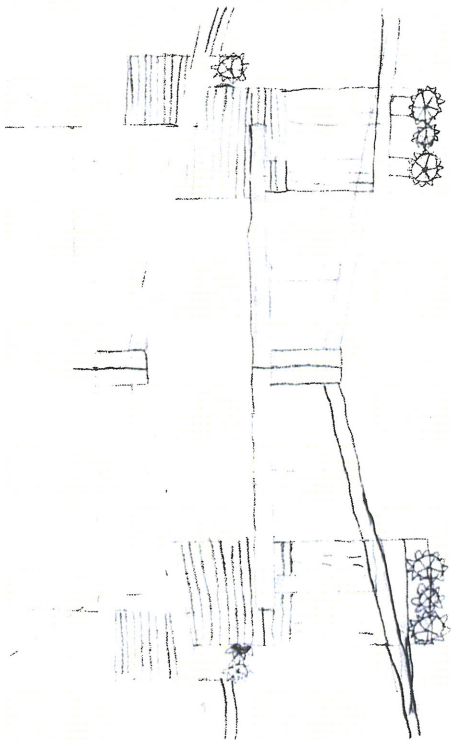
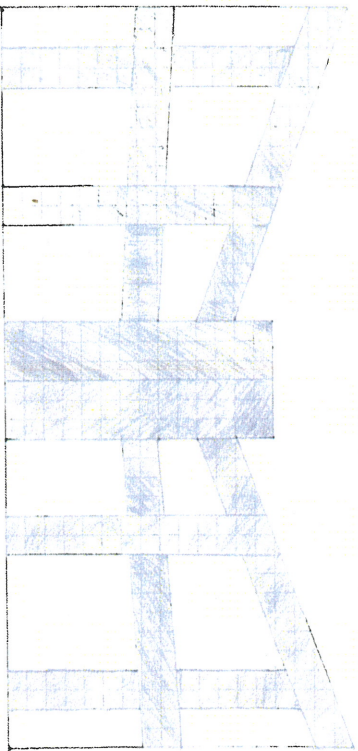
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The Double Lock



The Water Closet

By: David

Imagine a world without toilets.

Imagine having to dump your waste from your chamber pot onto the street. Imagine having unsanitary water. Imagine human waste blocking the streets. Lucky for you, the bad sanitation days were back in the Victorian ages. In 1885, Thomas Twyford (1849-1921) introduced the first all-ceramic, free-standing, one-piece, washout, pedestal water closet. (Other names include the WC, the crapper, the toilet, the latrine, the lavatory, the thunder box, the porcelain throne, the porcelain god, the John, the Loo, the potty, the head, the can, the poop depository, etc.)

Thomas Twyford

The Twyford family actually began potting way back in 1680 when Joshua Twyford started making household pots. Some of his original productions can still be seen in the local Potteries Museum in Hanley, Stoke-on-Trent, in Staffordshire, England.

One year after Thomas William Twyford was born, in 1850, Millard Fillmore was elected the 13th president of the United States. The proceeding president was Franklin Pierce. Also, five years before Twyford introduced his toilet, California became a new state.

Thomas William Twyford was an English potter from 1849 to 1921. He and his dad founded the company now known as Twyford bathrooms. Thomas was also recognized as a leading pioneer in the application of principles of hygiene to sanitary appliances and known as the "Father of British bathrooms."

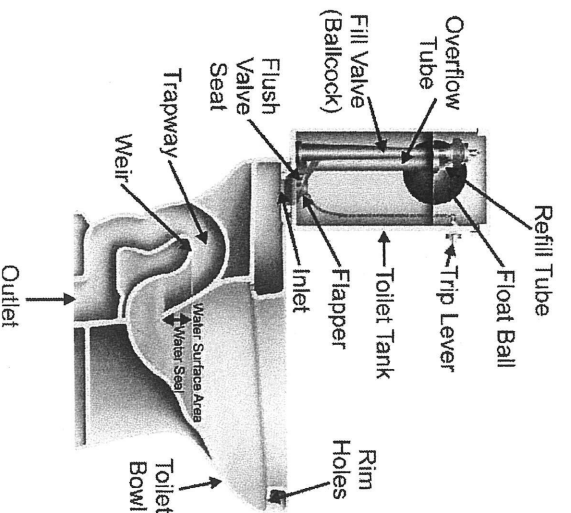
On January 2001, HSBBC sold Twyford Bathrooms to the SANITTEC Corporation in Finland. Twyford Bathrooms was re-established with the Twyford, Doulton and Royal Doulton brands of bathroom products.



The Water Closet

The toilet has been used for a long time; the first flush toilet was invented over 2800 years ago. However, this was not like the flush toilets we use today. Older flush toilets used a system of continually trickling water to slowly replace the water. In castles, garderobes were a type of toilet. They were like little hidden closets near the wall, so that any waste would drop down to the moat. Sometimes, the moat would smell so bad that people would shoot arrows through the waste chute, attempting to hit the person who was responsible for making the moat smell so bad.

Do you take toilet paper for granted? What if you woke up and found out that you had to use a reusable sponge, a rock, hay or even your left hand? Believe it or not, ancient people used these things for toilet paper until the late 14th century, when the Chinese invented and ordered actual paper toilet paper in 2x3 foot sheets. But still, it wasn't really perfected until 1935, the year in which northern tissue co. invented "splinter free" toilet paper.



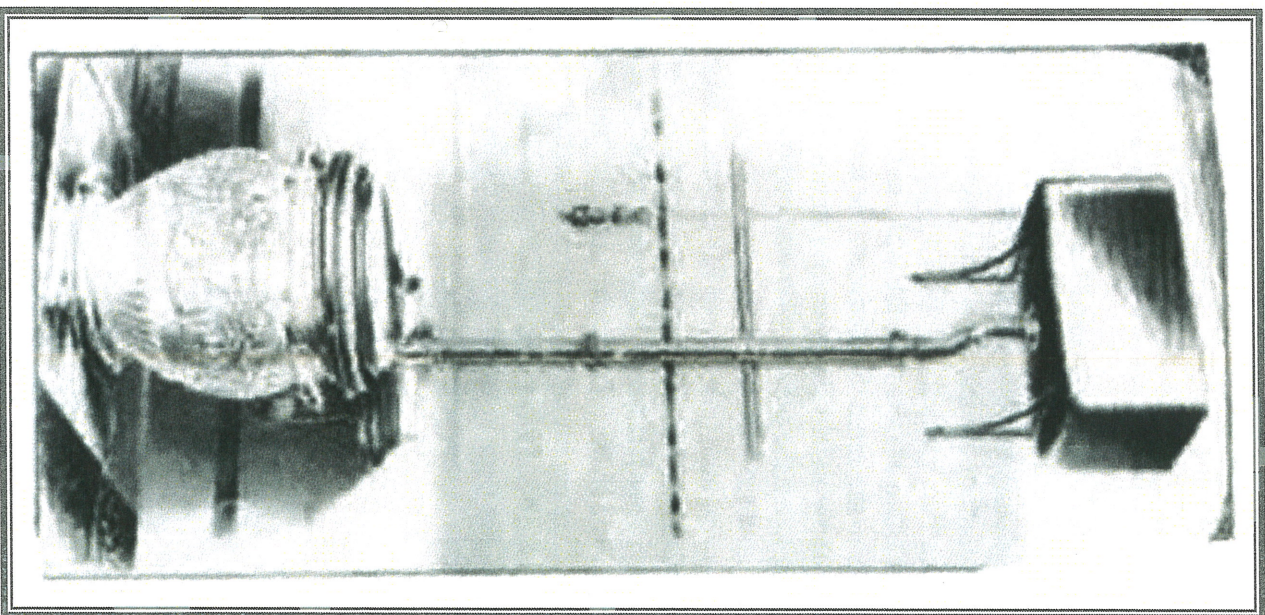
Toilets are used nowadays almost everywhere, so wouldn't you like to know how it works? The main technology used in the modern water closet is a siphon. A siphon uses water pressure and gravity to move water. When there is more water on

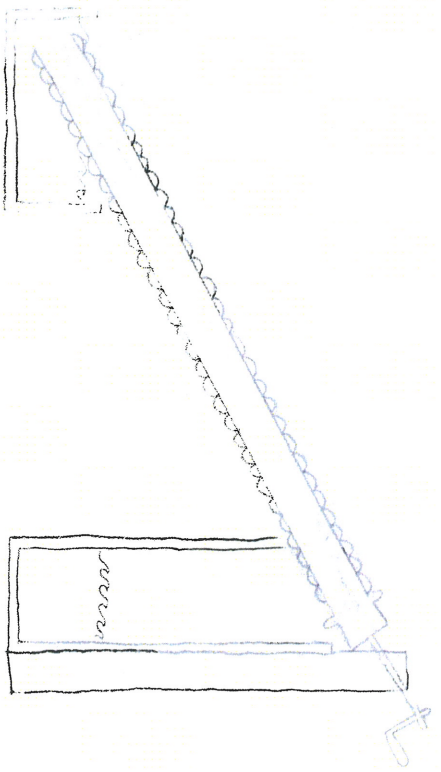
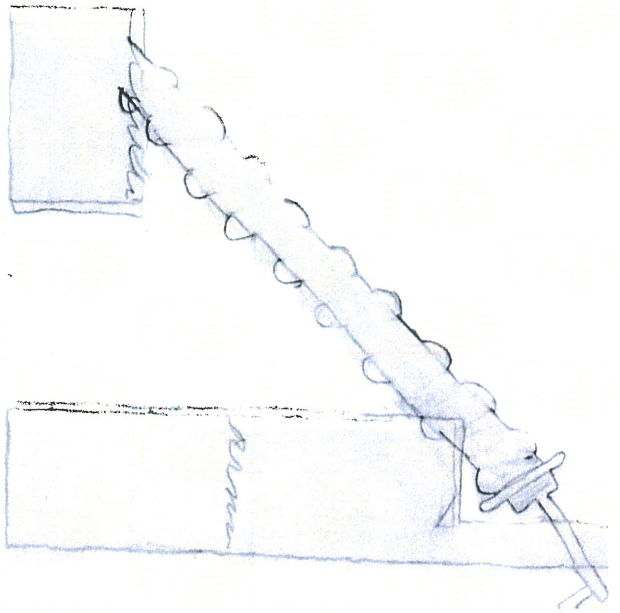
one side of an downwards curved tube, the weight of the water pulls the rest of the water down, like a roller coaster on the first hill. First, a toilet works by pushing on the handle that pulls the chain, which releases the flush valve. Then, about 2 gallons (7.6 L) of water rush from the tank into the bowl in about three seconds. The flush valve then resets. This rush of water activates the siphon in the bowl. The siphon sucks everything in the bowl down the drain. Meanwhile, when the level of the water in the tank falls, so does the float. The falling float turns on the refill valve. Water flowing through the refill valve refills the tank as well as the bowl. As the tank refills, the float rises, and when it reaches a certain level the refill valve shuts off. Should something go wrong and cause the refill valve to keep running, the overflow tube prevents a flood.

This invention helped with improving technology by making a new toilet bowl. Think of what would happen with an older toilet bowl- unsanitary leakage and so much more. With Twyford's invention, it was just the beginning of a revolution in toilet technology. Think of what we have now, like the toilets in Japan, which have special features, including one for a water jet to clean your butt. (Hee hee) Hey- maybe in the future there will be toilets that can pop up from the ground, or maybe there will be some awesome robotic toilet that wipes for you. But for now, we can only hope.

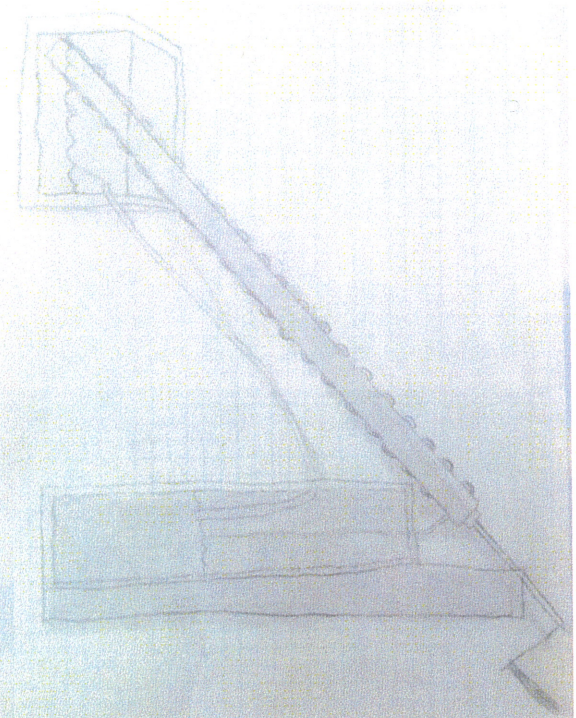
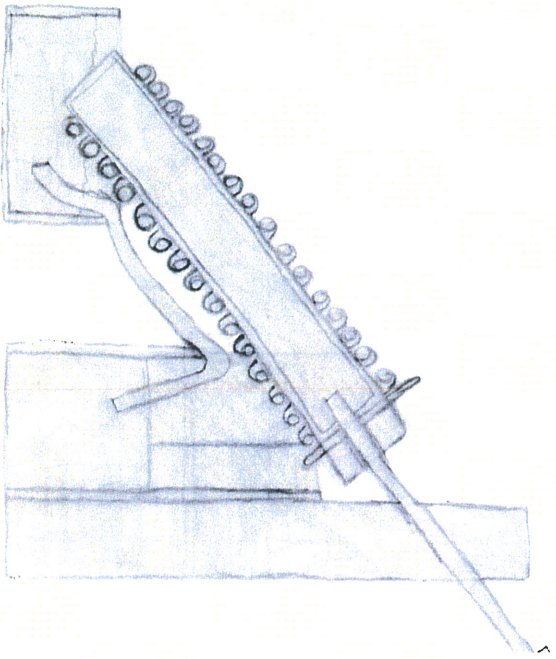
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The Archimedian Screw



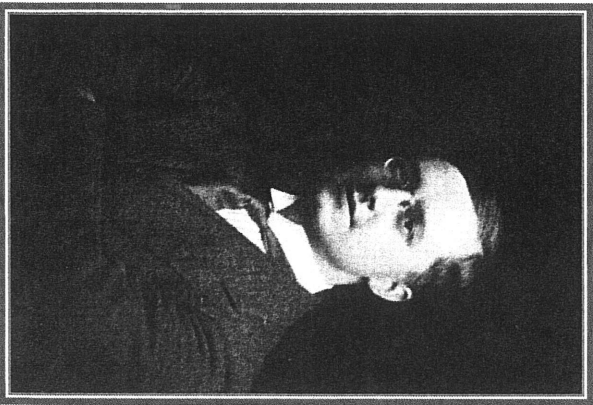
The Track Pan

By: Serena

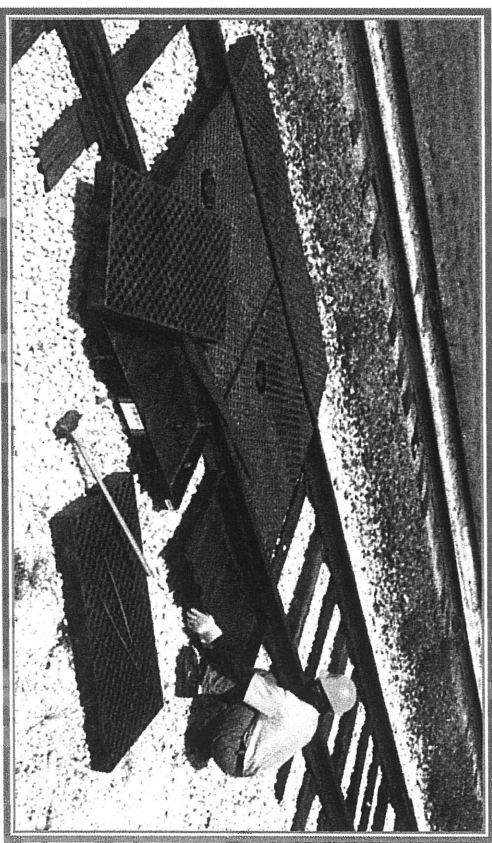
Imagine if there was no way to recycle water on a locomotive. You would have to stop a lot of times to get water for the steam engine. Every time you stopped, it would make the trip longer using up valuable time. Now, there is a way to recycle water on a train. It is called the track pan.

John Ramsbottom and the Track Pan

John Ramsbottom was the inventor of the track pan, and many other railway inventions. He lived from September 11, 1814 to May 20, 1897 (he was 83 years old when he died). John was the locomotive superintendent of the Northern Division based at Crewe. When John was a boy, he learned about steam engines. His dad was a steam cotton mill owner. John's character traits are perseverance, leadership, and philanthropy. Because he wanted to help his community to save water.



John lived in the 19th century in England during the Industrial Revolution. Inventions at that time were trains, cars, light bulbs, the telephone, typewriter, and the sewing machine. In 1870, the New York Central and Hudson Railroad system built the first track pan.



The purpose of the track pan is to recycle water on the train. The track pan is a receptacle that is in the ground between the wooden railroad ties. When the train comes, it lowers the scoop and returns the water to the engine and never has to stop once. Before the invention of the track pan, the train had to make so many stops for water because the train would use all of their water and then had to go pick up more.

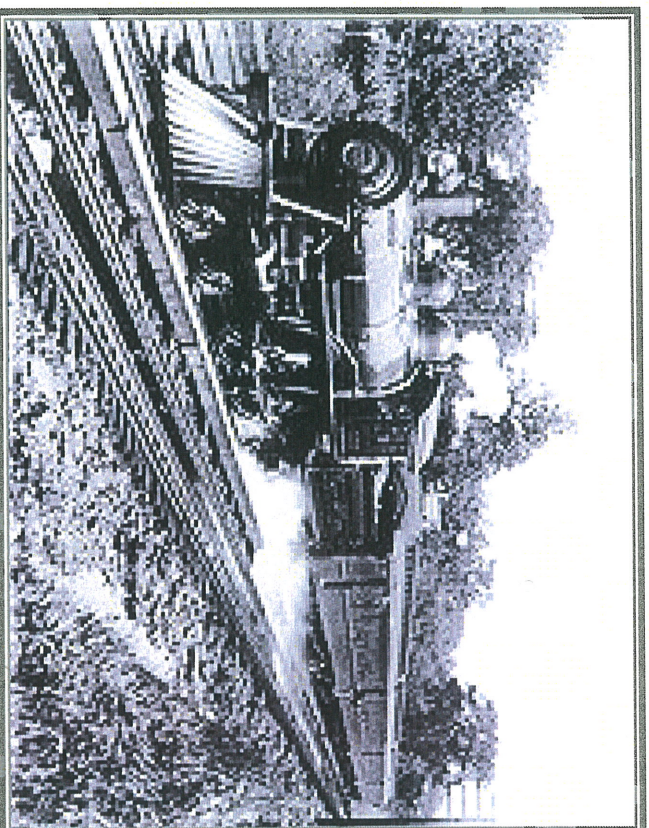
During Ramsbottom's Time...

England during the 19th century, was a monarchy and Queen Victoria ruled the country. The social classes in the 19th century were the upper, middle and lower classes. The upper class was made of people who inherited their wealth. The middle class was the majority of the people so that means that most people had jobs. They were also called "Townspople." In the lower class, it was pretty sad because those people had to work in the mines for the rich people.

The track pan helped the railroad community a lot because it helped to recycle water and save time. This allowed trains to not use so much water and also not to make so many stops. But with the track pan you would just recycle water, which made it a **WHOLE** lot easier.

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The Water Heater

By: Shawn

Imagine if you had to heat water in a kettle over a fire just to get a warm bath. Would you take all that time to prepare the bath? Over a hundred years ago it was a rare treat to get a warm bath. In fact, people didn't really care if they were clean or dirty. Then the water heater was invented. But who made the better water heater, Benjamin Maughan or Edwin Ruud?

Benjamin Maughan and Edwin Ruud

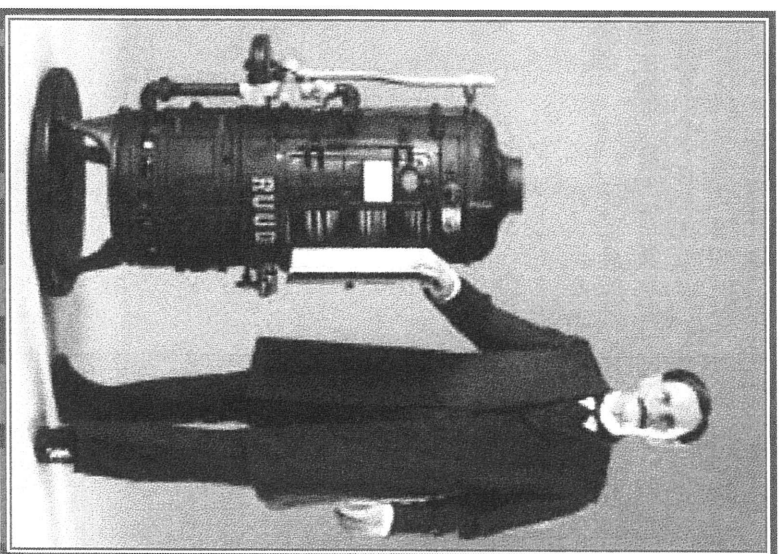
Benjamin Maughan

There is little known about Benjamin Maughan. Maughan invented the water heater in 1868. Maughan's water heater heated water as it got poured into the bath. Benjamin's invention was so dangerous that only a few people dared to use it. Then Edwin Ruud got inspired and built his own version of the water heater. It is call the automatic storage water heater.

Edwin Ruud

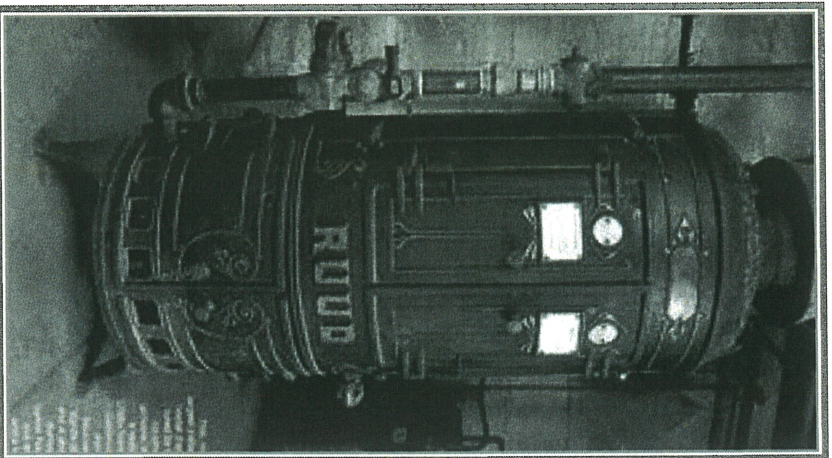
In 1889, Edwin invented the automatic storage water heater. Ruud didn't give up while making the automatic storage water heater and when he finished making his invention he was very proud! Edwin Ruud actually got the idea of the automatic storage water heater from Benjamin Maughan. Ruud improved Maughan's water heater and made it less dangerous and more efficient. Edwin also founded his own company called *Ruud Manufacturing Company* and it is still running today. But before he founded his company, he has to buy his rights to invent.

As you know, Benjamin Maughan invented the water heater. Maughan's invention inspired Edwin Ruud to make the automatic storage water heater. Ruud's invention led to the invention of the shower.



The Water Heater

The four foot tall automatic storage water heaters' purpose is to store water and heat the water so you can get hot water whenever you want. When you use up all of the hot water from your gas powered, metal tank, cold water comes in to get heated. It takes a couple hours for the cold water to become hot.



Do you know who the president of the United States was in 1889 when Edwin Ruud's version of the water heater was built? It was Benjamin Harrison. At the time, the United States was a democracy and still is today.

Although you had to pay lots of money for the water heater and for heating the water, it was for a good reason: to get clean. But sometimes the poor couldn't afford buying the water heater, so they were dirty. Still, the people who could afford the automatic storage water heater were clean and many people could afford the water heater. Today, almost everyone has a water heater.

The water heater has lots of history to it. Starting off with Benjamin Maughan to Edwin Ruud. Many people have the automatic storage water heater and they use it every day. Can you imagine being dirty for months like the people who lived over a hundred years ago did?

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The Air Conditioner

By: Peter

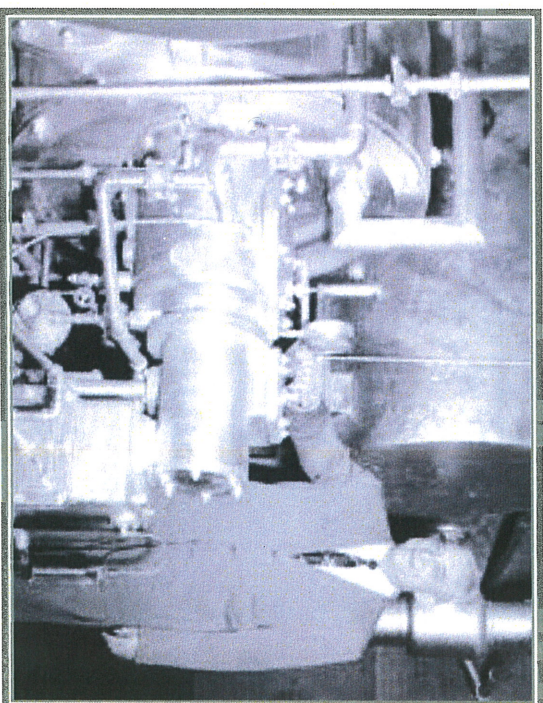
Imagine a world without anything to cool you off... Imagine a summer without ice cream or snow cones. What would you do then? Now, imagine a world with a device that has the ability to cool you off... Imagine an entire new world...

Willis Haviland Carrier

In the early 1900s many things changed the America that we know today. In 1901, Theodore Roosevelt was promoted from vice president to president after president McKinley was assassinated. In 1903, The Wright brothers took their first flight. Then from 1914 to 1918, World War I took place. During the course of all these events, one person changed the way we look at humidity and air pressure. That person's name was Willis Haviland Carrier.

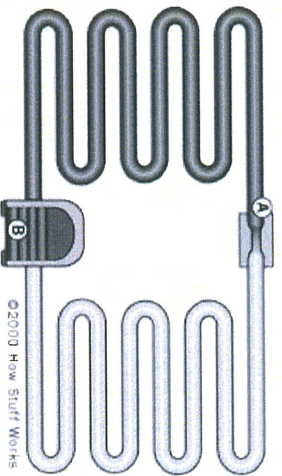
Willis H. Carrier was born on November 26th, 1876 in Angola, New York. Carrier was a student at Cornell University in 1902 when he invented the "Apparatus for Treating Air" (The air conditioner). One year later, he graduated and had a job at Buffalo Forge Co. (The same year the Wright brothers had their first flight). His salary was ten dollars a week. Three years later, Stuart Cramer coined the name "Air conditioner" to describe the Apparatus for Treating Air. Then in 1911, he disclosed the formula to the public. After ten more years he invented another invention, the centrifugal refrigeration machine. But sadly, on October 7th, 1950 Willis Haviland Carrier passed away.

Some of the character traits he possessed were never giving up, intelligence and helpfulness. His inventions helped a lot of people who were hot or collapsing of heat.



The Air Conditioner

The purpose of the air conditioner is to cool people off. People use it in houses, hospitals, and theatres. The way an air conditioner works is there is a special liquid that is inside the device. Inside the box there are two wires that wind in a circle. The liquid evaporates, and when it does it feels cool. The liquid evaporates up one coil. When it gets to the top it's a gas. Then, the cold gas travels down the second wire to a freon compressor. When it comes out it's a liquid again. The reason your house is cool is because there is a fan that blows air from outside into the box. The air brushes against the wire that has the cold gas traveling down on it. The air turns cold and goes through the box into your house. The liquid keeps turning into a gas and the gas keeps turning into a liquid. It's a never-ending cycle! Just like that, your house is an air treated place.



The history of air conditioning started a long time ago. One of the first things that have made air conditioning possible was in 1607, when Galileo Galilei invented the thermometer. Another was in the year 1800 John Dalton formulated the laws of pressure and water vapor in air. All these events led up to the first idea of an air conditioner in 1881. It happened when President James Garfield was dying. Engineers created a device powered by a fan blowing against cold ice. This helped Carrier think of an invention to cool things off. But the first public air conditioner was made in 1902, by none other than Willis Havilland Carrier.

The class structure going on around the 1900s was really simple. The lower class, the middle class, and the upper class divided it. The lower class was made of people who were poor and had little money. The middle class was the people like average townsfolk. The upper class was rich people like famous stars.

In America the government was a democracy. One of the most famous presidents that had a term while the air conditioner was being started was Theodore Roosevelt. Unfortunately around 1929, the Great Depression started. It was when the many people had no or little money. The government was having a nightmare.

Between 1902 and 1929, air conditioner sales were becoming higher and higher each year. The reason why the height of the sales stopped in 1929 was because the Great Depression hit. Many people were joining the lower class and plunging into a huge economic disaster. Things were looking pretty grim until the late 1930s when the Great Depression was over. Slowly, but surely the air conditioner was coming back into civilization after World War II. What was invented so long ago was rising again. Think about that, in your cool home.

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The Windshield Wiper

By: Jessica

Have you ever wondered if there ever was a female inventor who made something really helpful, that we still use today to help us? Actually, Mary Anderson invented the windshield wiper that was a very helpful device.

Mary Anderson

In November 1866, Mary Anderson was born in a town called Burton Hill Plantation. Mary's mother was a widow with two children. Mary, whom was one of them, was the youngest. Mary's father died of a sickness when Mary's mom was pregnant or when Mary was a little kid.

The government in 1866 was a democracy. The president of the United States was Andrew Johnson. The citizens were divided into three social classes. The classes were the rich, the middle class and the poor.

Prior to her aunt's death, Mary operated a cattle ranch and vineyard. However when her aunt became ill she returned home. When Mary was an adult, her aunt died. When Mary Anderson's aunt died, they found jewels and gold. This helped the Anderson family to no longer have financial worries. Mary used the money to go on a trip to New York City. In New York City, Mary got her idea to make a windshield wiper when she saw a person constantly stopping to clean off his windshield. When Mary came back home she hired a designer to design the windshield wiper blade.

Before Mary's invention, cars were much harder to drive. They had to keep on stopping to clean there windshield, even when they were running late. People had to drive with there windows open in the winter when it got really cold.

At first when Mary tried to publish her ideas companies did not want her idea because they thought it would not sell. Fred and William Filbert stole Mary's idea and made millions. Then they made the electrical windshield wiper blades however Mary did not seem to mind, she never got frustrated. Mary never gave up at trying to tell people that she invented the windshield wiper blade and people noticed that the windshield wiper was Mary's idea, not Fred and William Filbert. Mary started making lots of money off of her invention (I am not sure if Fred and William Filbert went to jail or if they had to pay a huge fine).



The Windshield Wiper

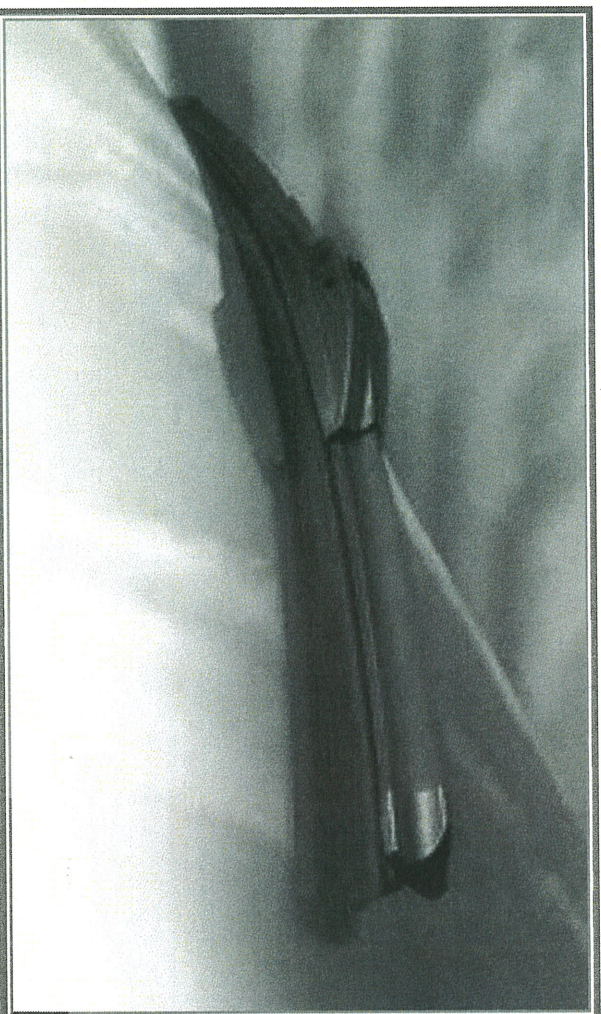
The first blade was a rubber blade with a lever, the lever functioned by using a spring-loaded arm with rubber blades so the blades could go back and forth to remove rain, ice and snow on the windshield, enabling the driver to see the road and avoid having to constantly stop, get out the car and clean the windshield. This also helped with people not having to leave their windows open in the cold winter months. Today you don't need to buy windshield wipers separately because they put them on all cars now.

In 1903, Mary won an award for her windshield wiper idea. After the windshield wiper Mary went from being a third class to first class citizen.

Years past, then in 1953, Mary was 87 and died of old age. But you can always be reminded of Mary Anderson when you drive your car and turn on your windshield wipers.

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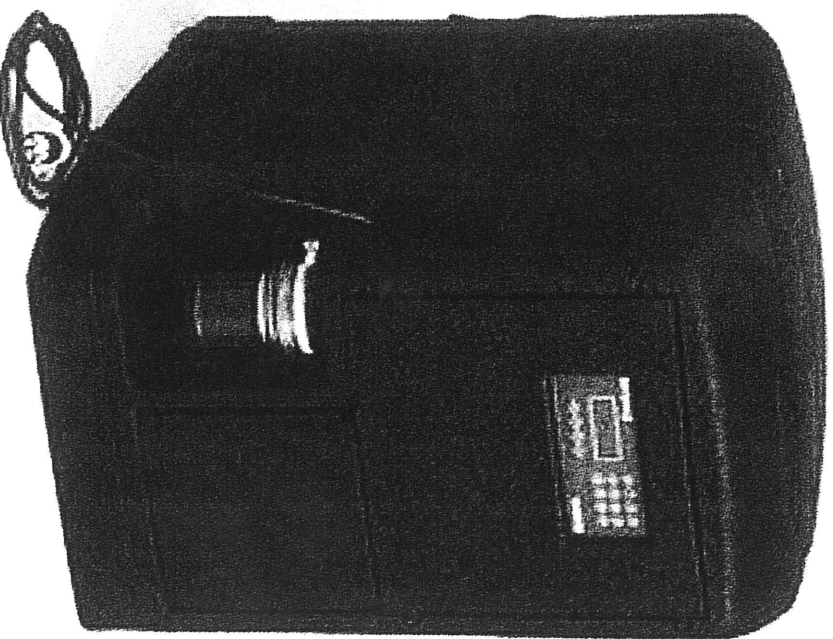
The Sling Shot

By: Maya

Have you ever wondered how many people in Africa die from dirty water? Have you ever asked yourself how sick they would get when they drink it? The African people would have to travel great distances to get water but when they got to the water it would be dirty and undrinkable.

The Sling Shot

Now there is the Sling Shot water purifier created by Dean Kamen. This water purifier is very useful in Africa. It is portable, can clean any dirty water, runs low on energy and is not expensive. This invention is a little bigger than a footstool. It is black and cylinder shaped. It can be carried by hand and doesn't need additional supplies.



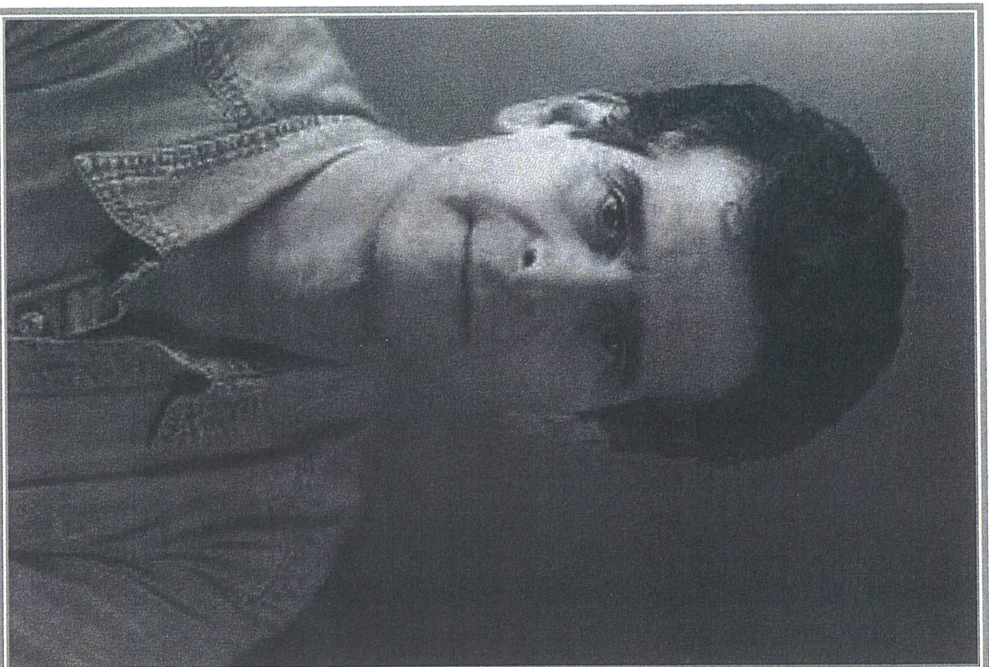
Dean Kamen

Dean Kamen was born in Rockville Center, Long Island New York in 1951. He was raised by his mother, Evelyn and his father, Jack. When he was five, he invented a way to make his bed just standing on one side of it. In 1993, when he was forty-two, he invented the Sling Shot water purifier.

He created the Sling Shot water purifier for a few reasons: to make clean water for people who don't have it and for people who do not have enough money to get clean water. The Sling Shot water purifier can be powered by an electric generator.

I would say that Dean Kamen is either in the middle class or higher class because after he invented the Sling Shot, he probably got a lot of money. Since he invented this recently, I know that America has a Democracy where people are elected to make decisions. We have the three branches of government: Judicial (makes sure laws are fair), Legislative (makes laws) and Executive (the leaders).

I think the Sling Shot water purifier made a difference in a lot of places so now a lot of people have clean water.



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The Lifestraw

By: Lydia

Imagine if you lived in a world where you couldn't get one cup of water without being afraid that you might get sick and die. Imagine if you had only one child and he died because he drank contaminated water. Imagine if people around you were dying and you knew you couldn't do anything about it. These are only the starters of what is happening around the world today. Thankfully somebody realized this problem and made an invention that changed the world. And that invention was the Lifestraw.

Mikkel Vestergaard Frandsen

This 21st century inventor's name is Mikkel Vestergaard Frandsen. He first became interested in making an invention that would help decrease the population of people dying from water poisoning at age 19 when he moved to Africa. When he got older, he became the head of his own business. Along with the Lifestraw, Frandsen also invented the Carepack, Permanet, Zerofly and the Zerovector. With his successful business came successful business trips. Mikkel also worked and lived in Nairobi, Kenya and New Dehi India. But he mostly worked in Africa.

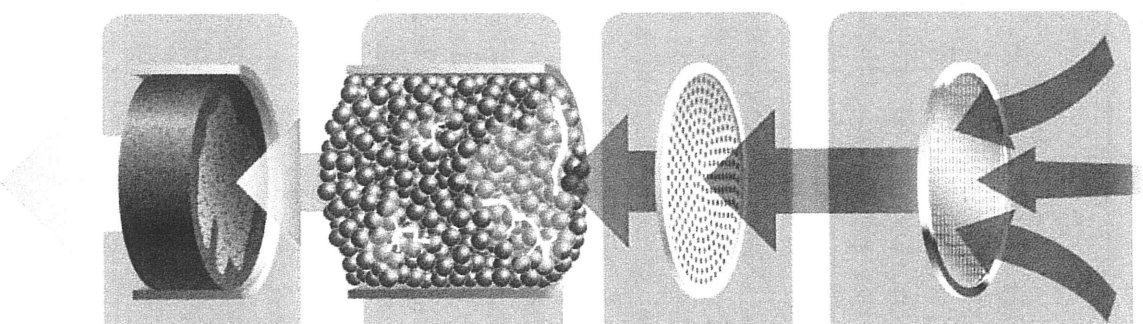
To make a difference in the world you have to have a lot of character traits that help you become a leader. Mikkel Vestergaard Frandsen has a lot of them. One, he had a lot of empathy and caring which made him recognize the need for disease control having to do with water around the world. Two, he just really wanted to help the people who were suffering which also adds up to all his caring to people around the world. And three, he had a lot of self confidence in himself which made him believe that he could make a difference in the world. He just seemed to know that all of his inventions would work.



The Lifestraw

You are probably wondering what in the world is this whole Lifestraw thing? The Lifestraw is a straw that has multiple filters so when you drink out of it the filter will remove all of the bacteria so you will actually be drinking clean water! So if you think about it, you would be able to drink right out of a river or stream! Before the Lifestraw, people would get sick with a disease. You might think that mainly the older people in Africa would most commonly get the disease. But no, actually it was the kids who were more likely to get sick. So the Lifestraw also helped with saving kids lives and also to lower the population of people dying.

This is how a Lifestraw works. First, a person will suck water out of a river or stream. Second, the untreated water goes through the first filter, which is a textile pre-filter. This filter is made to remove bigger particles like dirt or sediment. Next the some-what untreated water goes through a second filter which is called the polyester filter the holes in this filter are a lot smaller than the ones in the textile pre-filter. This is the filter that takes out all of the clusters or bacteria that cause diseases. From there the water goes through a chamber of beads that are saturated in iodine to make the water more sanitary. The iodine kills 99.3 percent of bacteria and viruses. Finally, the water passes through a chamber of granulated active carbon. But this not only improves the taste and smell of the water it also gets rid of any other remaining parasites. But remember, when you drink out of a straw how fast that water goes through the straw? That's still how fast the water travels through a Lifestraw.



Before the Lifestraw, people would drink the water from a river or stream nearby. In that water, there would be bacteria that would make the person who drank it sick. There was a very common sickness that would occur after they drank the water. This disease was called Cholera. It was mostly the little kids who got sick because their bodies were smaller so they couldn't handle the sickness as well as the adults. Also around the world, lots of stores sell the Lifestraw for only \$2.00 U.S.

The 21st Century

Since this invention is relatively recent, the world of Denmark is still basically the same as everyday life. In Denmark people think outdoor time is very good for you as well as how you grow up. So when most people are not in work or taking care of something else, they will spend most of their free time walking in the park, which will most likely be right next to the place where they work. Sports and community activities are important to the culture in Denmark. Some of the most popular sports are sailing and bicycling or in Denmark they call it "cycling." There also might be local races held in one of the many town parks. Just like here, people in Denmark usually spend 5 days a week in work and then 2 days for the weekend.

The government in Denmark is a constitutional monarchy which is that there is one document (like our constitution) that has strict rules and the whole country has to follow those rules. Also the ruler can't just randomly add a new law unlike Rome for example. When the country was first born it started off with a constitutional monarchy, but in 1849, the government added a representative democracy.

Since the Lifestraw was invented, it has saved a lot of lives as well as a lot of time. There was only one real purpose for this invention and it exceeded its expectations in the world. To save more lives than were dying.



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