

New Chinese Technology



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- **Main Idea (Objective):**



- The Chinese developed new technologies, such as steelmaking, printing and gunpowder.

New Chinese Technology

- **Lecture Focus (Essential Question):**



- The books in this class are made from paper with letters printed on that paper by a printing machine...lets look at how printing was first invented during the Tang Dynasty.

New Chinese Technology

- During the Tang Dynasty and the Song Dynasty new inventions and technologies changed China's society.



- In time these discoveries spread to other parts of the world.

New Chinese Technology

- Lets check out the ancient Tang capital city of **Chang'an**.



- Chang'an may have had a population of one million people at its peak, which is a lot of people in today's standards.

New Chinese Technology



New Chinese Technology

- The city was a marvel of technology, having large city blocks that included houses, businesses and temples that set along straight streets.



- The layout inspired the design of many later cities in China and Japan.

New Chinese Technology

- Think about **The Growing Economy** lesson we had about China's development.



- **What improvements in agriculture would allow China's population to grow in areas of the Tang Dynasty and actually reach one million people in certain areas?**

New Chinese Technology

- Think about The Growing Economy lesson we had about China's development.



- **What improvements in agriculture would allow China's population to grow in areas of the Tang Dynasty and actually reach one million people in certain areas? Super Rice, irrigation and a fair and productive government.**

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- For most of China's history, people burned wood to heat their homes and cook their food.



- By the time of the Tang Dynasty, wood was becoming scarce in China.

China discovers Coal and Steel



- However, the Chinese had discovered that coal could be used to burn and ultimately heat things, and soon a **coal mining** industry developed.

China discovers Coal and Steel

- The Chinese used coal to heat furnaces to high temperatures, which lead to another discovery...**Steel!**



- When iron was produced in hot furnaces heated by coal, the molten iron mixed with the carbon from the coal created steel.

China discovers Coal and Steel

- **Carbon** - A nonmetal that has two main forms (**diamond and graphite**) and that also occurs in a impure form in charcoal, soot, and coal.



- The mixing of **Carbon** and **Iron** created a new, stronger metal known today as **Steel**...remember this is a chance mistake, that happens from burning coal!

China discovers Coal and Steel

- The Chinese used steel to make many things...armor, swords and helmets for their military.



- However, they also used this new metal stoves, farm tools, drills, steel chains, nails and even sewing needles.

China discovers Coal and Steel

- **Questions:**
- **1)** What was the new discovery China made that allowed them to heat things?
- **2)** What was the new metal that was created by using coal and iron?
- **3)** What were some items that were made out of this new metal?

China discovers Coal and Steel

- **Questions:**
- **1) What was the new discovery China made that allowed them to heat things?**
 - **Coal**
- **2) What was the new metal that was created by using coal and iron?**
 - **Steel**
- **3) What were some items that were made out of this new metal?**
 - **Armor, swords, stoves, needles, chains and drills...**

China discovers Coal and Steel

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- History Tragedy Time!!

China discovers Coal and Steel



- Coal has been used as an energy source for centuries...in fact it still is.

China discovers Coal and Steel

- One of the biggest producing areas in the world is right in our back yard...Pennsylvania!



- There is a fundamental problem with coal though...the pollution it causes is intense and is currently causing a major problem in China and all over the world.

China discovers Coal and Steel

- China's coal emissions is responsible for 250,000 – 500,000 premature deaths in the country each year.



- Hundreds of thousands of Chinese citizens are at risk from dangerous levels of air pollution as poisonous smog fills cities due to the burning of coal. (**Shanghai** with burning coal)

China discovers Coal and Steel



- (**Shanghai** without burning coal)

China discovers Coal and Steel

- China's air pollution problems frequently make headlines around the world.



- China is the world's largest consumer of coal, which is its main energy source, and is responsible for around half the world's coal consumption...the impacts of its reliance on coal are becoming more well known after an eight-year-old girl was diagnosed with lung cancer which her doctor blamed on air pollution.

China discovers Coal and Steel

- In some eastern cities including **Shanghai**, coal pollution levels were off the index that tracks dangerous pollution, with schools closing and flights being cancelled or diverted.



- Sales of air purifiers and face masks have soared with many retailers selling out of stock as residents try to protect themselves from the poisonous smog.

China discovers Coal and Steel

- In September, the Chinese government announced a plan to tackle the high levels of air pollution including for the first time measures to cut coal consumption.



- Under the plan, China aims to cut air pollution in some of the worst affected areas including Beijing by 2017.

China discovers Coal and Steel

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- (Imperial City, **Beijing China**, with coal smog)

China discovers Coal and Steel



China discovers Coal and Steel

- **What do you think can be done about this...what are your ideas?**

China discovers Coal and Steel

- Paper had been invented centuries earlier under the Han Dynasty.



- Under the Tang, the mass production of paper led to another important Chinese innovation: a method of printing books.

The Printing Press

- Before mass printing books were copied by hand, a process that was extremely expensive and time consuming.



- The Chinese began this process in the 600's C.E.

The Printing Press

- They used blocks of wood on which they cut their language characters of an entire page of what will become a single page in a book.



- Ink was then placed over the wooden block.

The Printing Press

- Then paper was laid on the block to make a print.



- Cutting the block took an extremely long time, but the woodblocks could be used again and again to make countless copies...think of it like an ancient copy machine!

The Printing Press

- Paintings and other artwork were also done in this style.



- *The Great Wave off Kanagawa* by Hokusai...my favorite painting in the world!

The Printing Press

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- The Chinese soon began printing books after their printing press was invented.



- The earliest known printed book was a Buddhist book called *The Diamond Sutra* and it dates back from about 868 C.E.

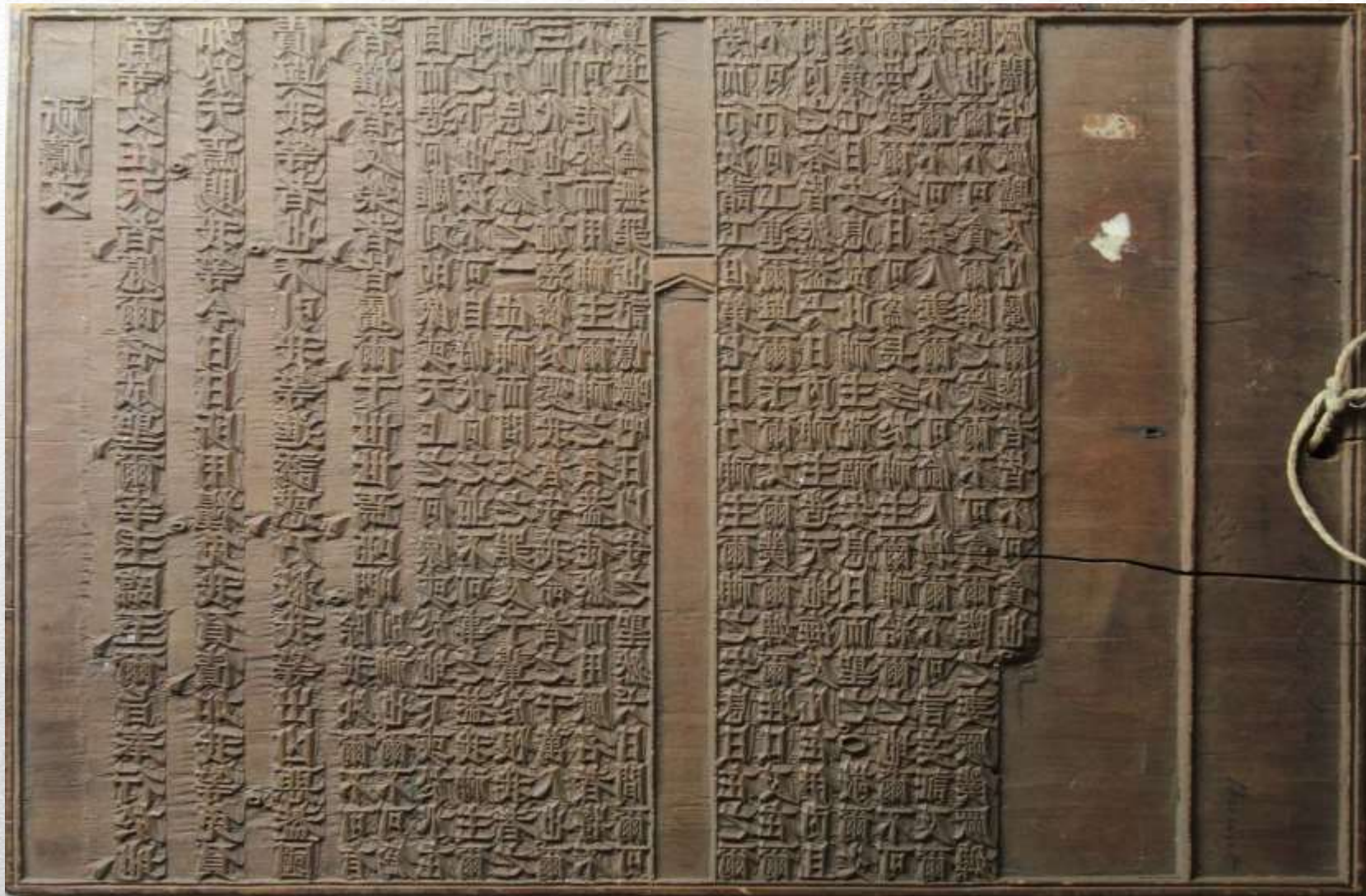
The Printing Press

- *The Diamond Sutra* is a Mahayana Sutra and emphasizes the practice of non-attachment.



- A copy of the Chinese version of *The Diamond Sutra*, was found in the early 20th century by Aurel Stein, was dated back to May 11, 868...it is in the words of the British Library, "the earliest complete survival of a dated printed book."

The Printing Press



- The invention of printing was extremely important...helping to spread ideas more rapidly throughout a large area.

The Printing Press

- In the 1000's C.E., a Chinese printer named **Pi Sheng (BEE ShuHNG)** invented **movable type** for printing.



- With movable type, each character is created on a separate piece, rather than carved into a large block of wood.

The Printing Press



- This allowed pieces the ability to be moved freely at will, making sentences and paragraphs very quickly and easily.

The Printing Press

- Printing also led to the invention of paper currency.



- In 1024, during the Song Dynasty, China printed the world's first paper money as a way to help merchants...paper money helped the economy to expand and cities to grow.

The Printing Press

- **Questions:**
- 1) What were **woodblocks** used for during the original method for copying books?
- 2) What did Pi Sheng invent?
- 3) During the Song Dynasty what was printed that helped merchants and the economy grow?

The Printing Press

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- **Questions:**
- 1) What were **woodblocks** used for during the original method for copying books?
 - **To make books, by carving Chinese letters into the woodblock.**
- 2) What did Pi Sheng invent?
 - **Movable type for printing.**
- 3) During the Song Dynasty what was printed that helped merchants and the economy grow?
 - **Paper currency**

The Printing Press

- **Printing:**



- When the Chinese invented movable type, they improved the art of printing

The Way It Was: Science and Inventions

- A Chinese author, **Shen Kua** described the work of **Pi Sheng**:
 - *“He took sticky clay and cut in it characters as thin as the edge of a copper coin. Each character formed as it were a single type. He baked them in fire to make them hard. He had previously prepared an iron plate with a mixture of pine resin, wax and paper ashes. When he wished to print, he took an iron frame and set it on the iron plate. In this he placed the type and set it to close together. When the frame was full, the whole made on solid block of type.”*

The Way It Was: Science and Inventions

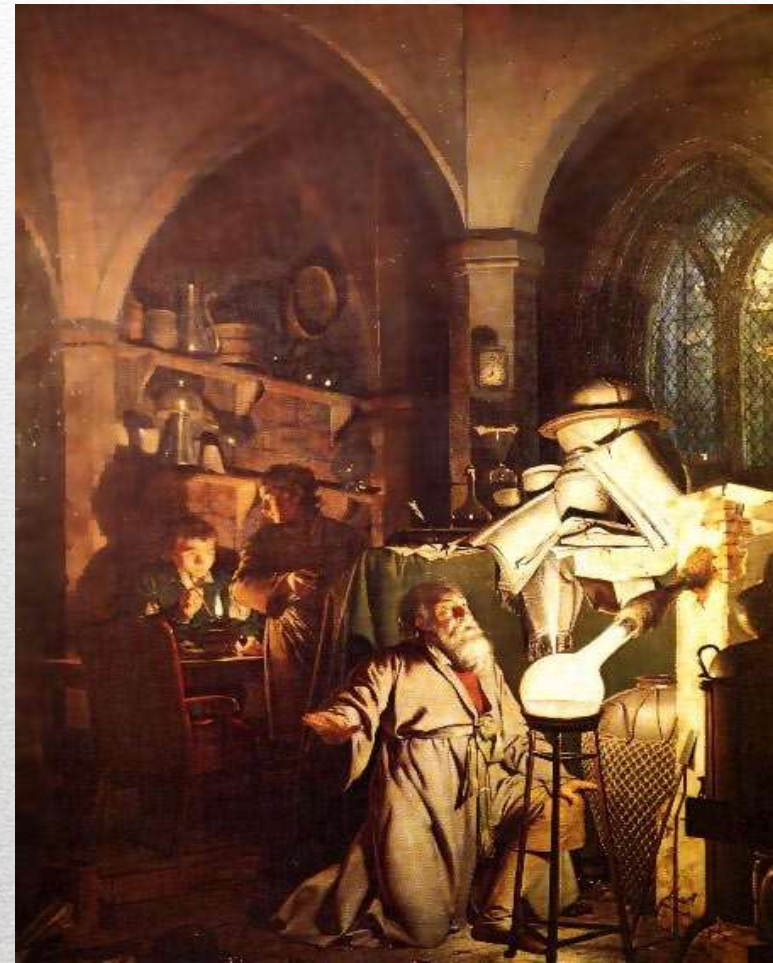
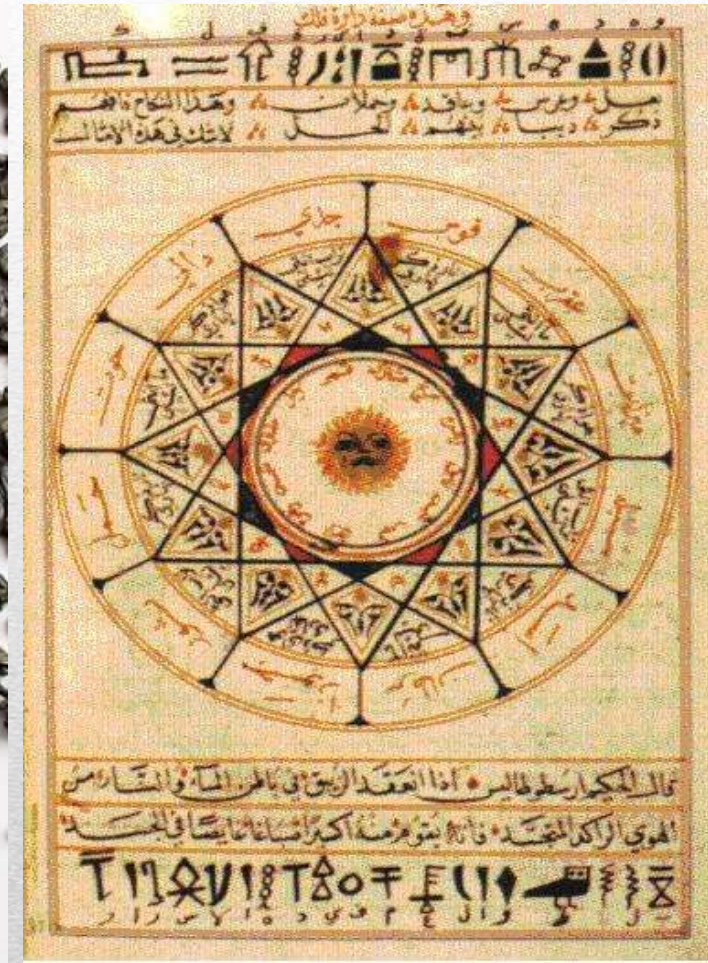
- **Connecting to the past:**
- 1) Why do you think Pi Sheng used clay to make his characters?
- 2) In what instance would woodblock printing have been a better method to use than movable type?

The Way It Was: Science and Inventions

- **Connecting to the past:**
- 1) Why do you think Pi Sheng used clay to make his characters?
 - **It was easy to manipulate**
- 2) In what instance would woodblock printing have been a better method to use than movable type?
 - **To make just a few copies of something**

The Way It Was: Science and Inventions

- **Gunpowder** was the first physical explosive and propellant...the invention of gunpowder is usually attributed to **Chinese Alchemy**, and is popularly listed as one of the "Four Great Inventions" of China.



- **Alchemy** - a science that was used in the Middle Ages with the goal of changing ordinary metals into gold

Other Chinese Inventions

- It was invented during the Tang Dynasty and the earliest record of a written formula appeared in the Song Dynasty.



- The overall consensus from Historians and Archeologists is that gunpowder was formulated in the 9th century by Chinese alchemists searching for an elixir of immortality.

Other Chinese Inventions



- Knowledge of gunpowder spread throughout the Old World as a result of the Mongol conquests of the 13th century.

Other Chinese Inventions

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- The Chinese gunpowder was used in various explosives and parts of other weapons.



- One of the most intense weapons that used gunpowder was the **Fire Lance**, which was the ancestor of the gun.

Other Chinese Inventions

- The earliest fire lances were spear-like weapons combining a tube containing gunpowder and projectiles tied to a Chinese spear.



Other Chinese Inventions



- Upon firing the Fire Lance a charge ejected a small projectile or poison dart along with the flame.
- This weapon paved the way for further improvements to gunpowder weapons and is the direct ancestor of the modern day firearm and artillery.

Other Chinese Inventions



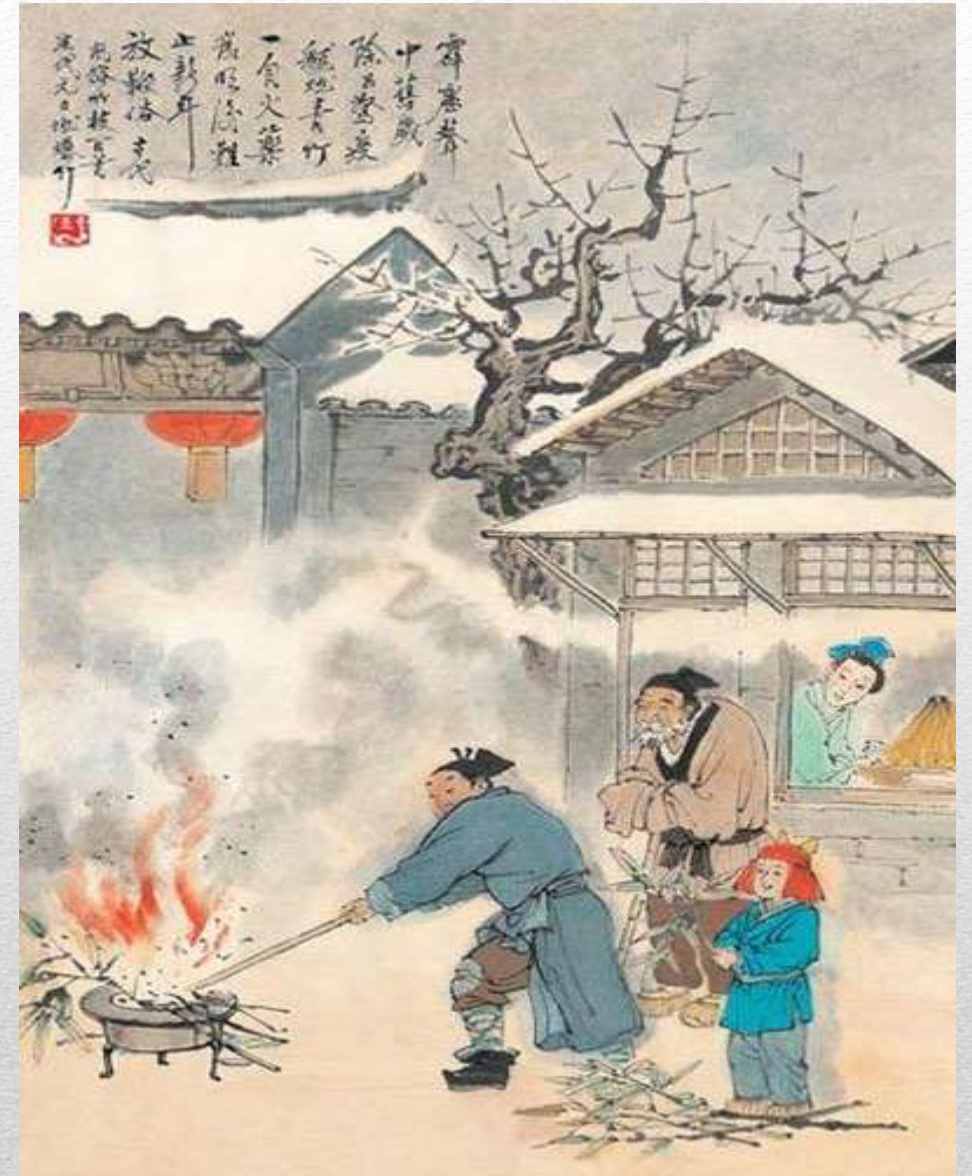
- The **Fire Lance** and other variations became an important part of the Chinese military and truly made them a strong fighting force.

Other Chinese Inventions



Other Chinese Inventions

- The Chinese also used gunpowder to make fireworks.
 - Fireworks originated in China some 2,000 years ago...one legend states that fireworks were invented by accident by a **Chinese Cook** working in a field kitchen who happened to mix charcoal, sulfur and saltpeter...the mixture burned and when compressed in an enclosure (a bamboo tube), the mixture exploded.
- Another legend states that a Chinese monk named **Li Tian** invented firecrackers about 1,000 years ago...the Chinese people celebrate the invention of the firecracker every April 18 by offering sacrifices to Li Tian. During the Song Dynasty, the local people established a temple to worship Li Tian.



Other Chinese Inventions

- The firecrackers, both then and now, are thought to have the power to fend off evil spirits and ghosts that are frightened by the loud bangs of the firecrackers.



Other Chinese Inventions



- Firecrackers are used for such purposes today at most events such as births, deaths and birthdays... **Chinese New Year** is a particularly popular event that is celebrated with firecrackers to usher in the new year free of the evil spirits.

Other Chinese Inventions



Other Chinese Inventions

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- The Chinese also built large ships with rudders and sails.



- In about 1150 C.E., Chinese sailors began using the compass to help them find their way over long sea voyages...and allowed them to sail further away from land!

Other Chinese Inventions



- **Questions:**

- **1)** What does Alchemy mean?

- **2)** What were some uses for gunpowder in ancient China?

- **3)** What is a Fire Lance and how was it used?

Other Chinese Inventions

- **Questions:**
- **1) What does Alchemy mean?**
 - **A middle Ages practice of turning normal metals into gold.**
- **2) What were some uses for gunpowder in ancient China?**
 - **Fireworks, explosive weapons and Fire Lances.**
- **3) What is a Fire Lance and how was it used?**
 - **The first ancient gun, used in the Chinese military**

Other Chinese Inventions

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- **Reading Check:**
- Answer the following questions in a well organized, 3 to 4 sentence response.
 - **Why was the invention of printing so important to the world?**

Other Chinese Inventions