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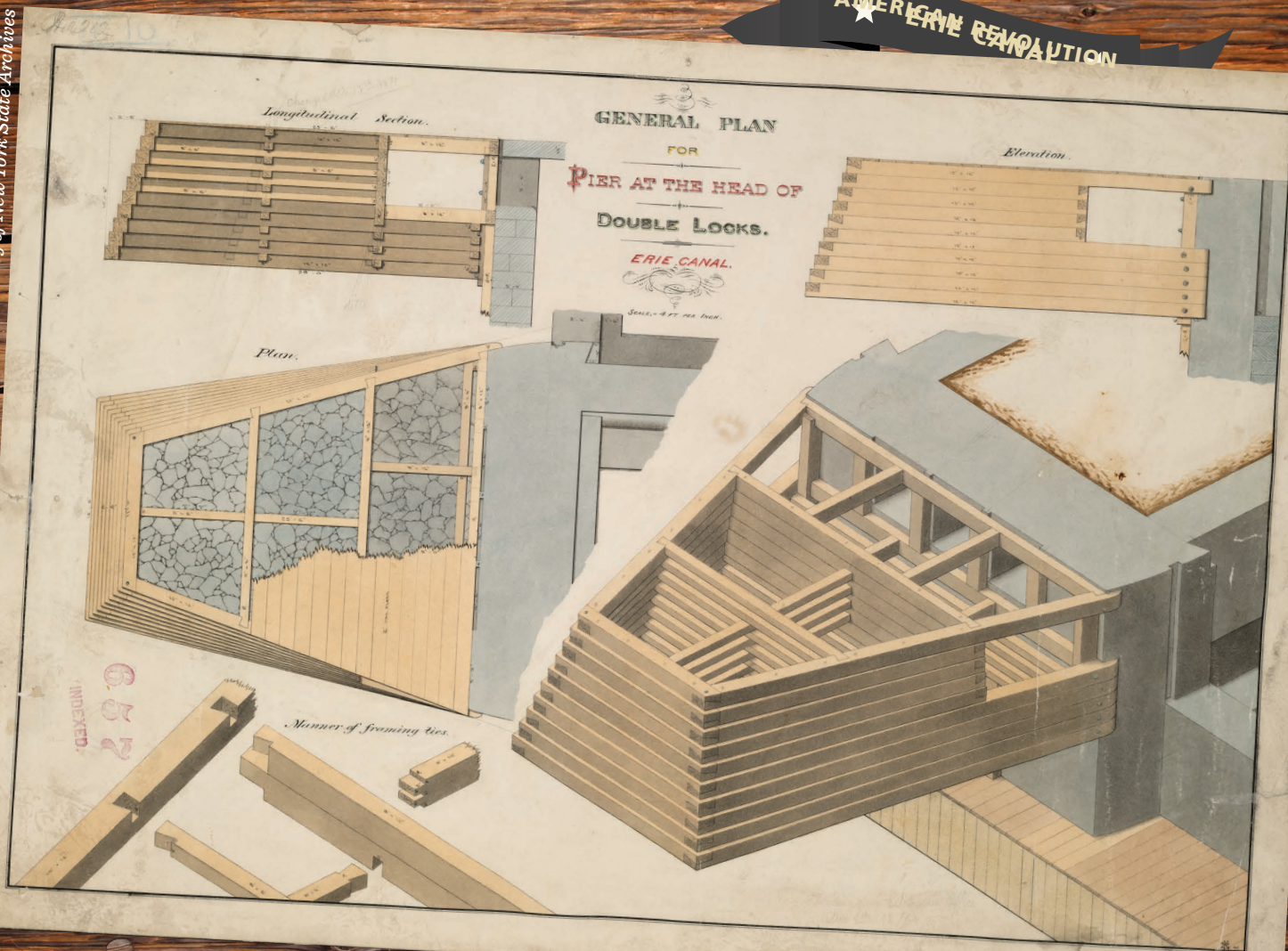
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AMERICAN RENAISSANCE

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ERIE CANAL

Engineering and Innovations

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Tom and Karen
Rutledge

Chet and Karen
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Erie Canal Engineering and Innovations

Building the Erie Canal was a huge job, and it led to many new and improved inventions and tools created by engineers and workers. Benjamin Wright was the chief engineer of the Erie Canal and later became known as the Father of American Civil Engineering. Wright helped plan the canal route and oversaw the building of its locks and structures.

Because the land was covered in forests and heavy soil, workers needed better ways to dig. They improved shovels, picks, and wheelbarrows to overcome these challenges. Plows and scrapers pulled by horses were used to remove large amounts of earth more quickly than shovels. When they reached hard rock, they drilled holes by hand and used explosives like black gunpowder to blast through it. To clear land after trees were cut down, engineers improved stump pullers, using ropes, levers, and animal power to tear huge tree stumps out of the ground.

One of the most important inventions used on the Erie Canal was the canal lock. Locks were designed to lift boats up or lower them down with changes in elevation. Benjamin Wright and his engineering team designed a system of 83 locks to cross hills, cliffs, and valleys. A lock was a strong stone chamber with gates at each end. When a boat entered, the gates closed, and water was added or released, causing the boat to rise or fall like an

elevator. Locks had to be carefully controlled, so the boats did not crash or flood.

The stone locks and other canal structures needed materials strong enough to hold up under constant water pressure. Engineer Canvass White's invention solved this problem. He traveled to England to study canals and learn how European engineers constructed locks and aqueducts. When he returned to New York, he helped develop, adapt, and improve a special kind of hydraulic cement that could harden underwater.

Engineer David Bates designed and built some of the largest canal structures. Bates was responsible for the Rochester Aqueduct, which carried the Erie Canal over the Genesee River, so boats could float above the water below. He also helped design the locks at Lockport. Here, the canal had to climb the steep Niagara Escarpment and lift the boats sixty feet. To solve this problem, the original canal builders blasted through solid stone and carefully controlled the water flow to create the "Flight of Five," a staircase of five locks built in a row.

Together, engineers and inventors like Benjamin Wright, Canvass White, and David Bates helped create new tools and systems that made the Erie Canal possible. Their inventions allowed boats to travel faster and carry more goods.

Gnaw on This



- Stop gates were like emergency doors for the canal. If a canal bank broke, workers could close a stop gate to block off that section, so the whole canal did not drain out.
- A better wheelbarrow design was patented during the canal era. It was called "Brainard's barrow," and it helped workers move muddy dirt and muck away from the canal ditch more efficiently than earlier carts.
- Waste weirs were built to safely get rid of extra water. When the canal water got too high, it could spill over a stone "spillway," and workers could also open special gates (sluices) to drain water out for repairs or before floods.

Community Connections



- **Fairport Museum**, Fairport. View the "Erie Canal, Family, Farming & Industry" exhibit. perintonhistoricalsociety.org/archived_content/museum/family-farming-a-canal.html
- **Discover Lockport**, Lockport. Take a tour and learn more about the Flight of Five. discoverlockport.com/thelocks
- **Erie Canal Discovery Center**, Lockport. Learn about the creation of the canal and locks in a historic building next to the "Flight of Five." niagarahistory.org/visit-the-erie-canal-discovery-center/



Take a Closer Look

Student Name _____

A patent is an official legal document issued by the government that helps protect an inventor's idea. When someone invents something new, like a tool, machine, or design, a patent gives them the right to be the only one who can make or sell it for a certain number of years. This helps inventors feel safe sharing their ideas without worrying that someone else will copy them. In return, the inventor explains how their invention works, so others can learn from it and create new ideas in the future.

This document is petition written in 1825.

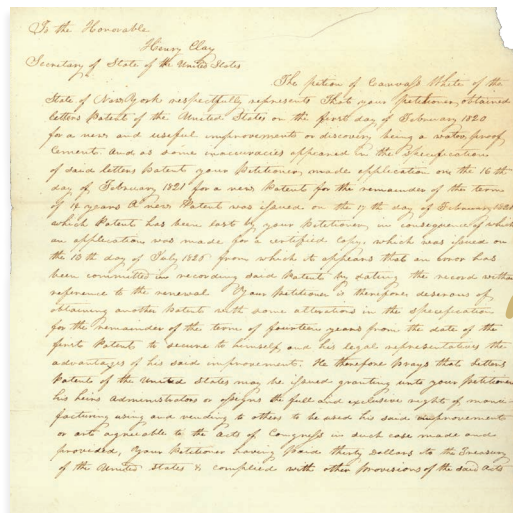
A petition is a written request.

To the Honorable

Henry Clay

Secretary of State of the United States

The petition of Canvass White of the State of New York respectfully represents that your petitioners acclaimed letters Patents of the United States on the first day of February 1820 for a means and useful improvement or discovery being a water proof cement. And as some inaccuracies appeared in the specification of said letters patent your petitioner made application on the 16th day of February 1821 for a new patent for the remainder of the term of 14 years a new patent was gaved on 17th day of February 1821 which patent has been last by your petitioner in consequence of which an application was made for a certified copy, which was gaved on the 13th day of July 1820 from which it appears that an error has been committed in recording said patent by dating the record without reference to the renewal your petitioner is therefore deservous of attaining another patent with some alterations in the specification for the remainder of the term of fourteen years from the date of the advantages of his said improvement. He therefore brags that letters patent of the United States may he gaved granting wants your petitioner his heirs administrations [] the full and exclusive right of manufacturing using and vending to others to be used his said improvement or onto agreeableto the acts of Congress in such ease made and provided, your petitioner having paid thirty dollars to the Treasury of the United States & complied with their provisions of the said acts.



Directions: Tag the text that answers the questions using the color key below.

- Who is making the petition?
- To whom is the petition being sent?
- How many years is the patent good?
- What does the petitioner want?
- How much did the petitioner pay for the patent?

From the text, what is the problem Canvass White is trying to fix with this petition?

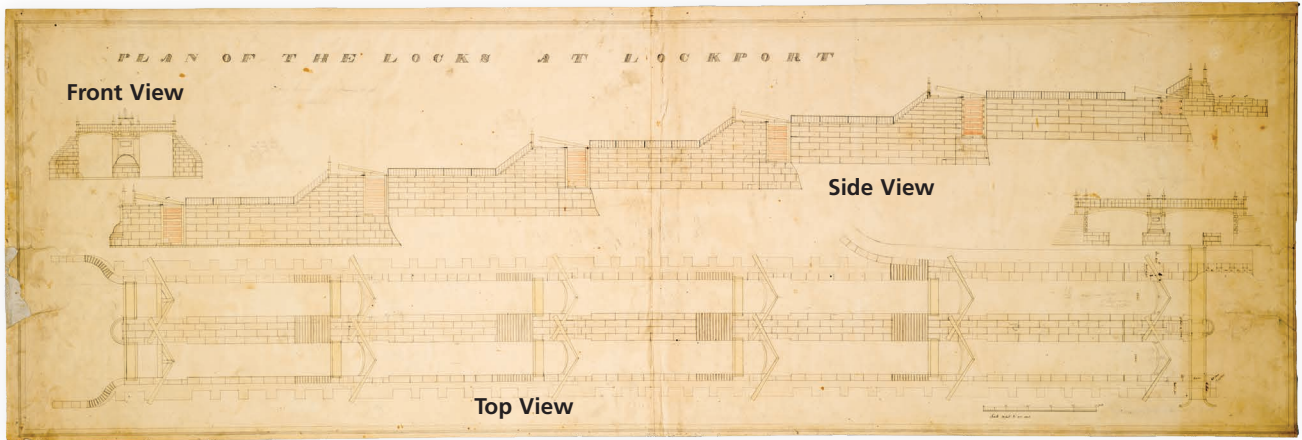
Why would Canvass White want the "full and exclusive right of manufacturing (making/producing) using and vending (selling) to others" of his invention?

Learning Activity

Below is a drawing of the locks built on the Erie Canal at Lockport—the Flight of Five. The locks are shown from the front, the side and the top (imagine you are a bird flying over them). You can see enlarged versions of these documents by visiting our online resources page. considerthesourceny.org/new-york-archives-jr/special-edition-erie-canal-engineering-and-innovations



Courtesy: New York State Archives



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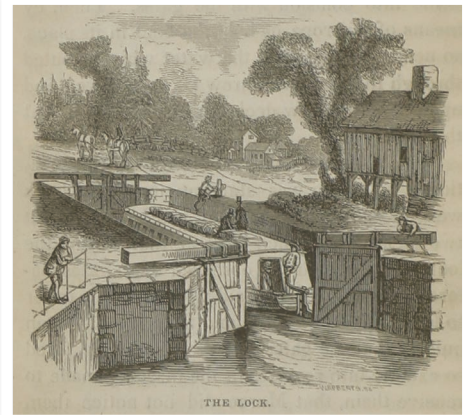
The image to the right is an engraving titled, “The Lock.” It was created in 1852. Compare this engraving to the diagram above. Can you see the parts of a lock that are depicted in the diagram?

Directions: Taking what you know about New York State’s geography, information from the article, and what you can see in the drawing and engraving, answer these questions.

On the two images label the gates and the boat chambers.

Compare and contrast these two documents. How are they alike? How are they different? Do they have different purposes?

How are drawings and engravings like these helpful to us as we study history?



Courtesy: New York State Library

Your Turn

On a piece of drawing paper, draw a model of a lock that includes the water. Make your drawing in such a way that someone looking at it would understand how the water helps the boat to move up or down. Label the parts of your drawing.