

The Great Ideas Of Robert Fulton

Marion Wallace Reninger

Introduction

In her book, "Robert Fulton and the Clermont", his great-granddaughter, Alice Clary Sutcliffe writes:

"It was characteristic of Robert Fulton when he wrote of great ideas, he always spelled the word Ideas with a capital I, and the word money with a little m. Two hundred years ago, he was deeply interested in great ideas, not only as an artist, scientist and inventor, but also as a reformer, a statesman and a patriot. With splendid courage born of conviction, he enriched the world by his time, his talents and his money".

A son of Lancaster County, Pennsylvania, he became an international figure and one of the world's great men of original achievements.

In 1878, J. W. Reigart writes, "Fulton's family asked Washington Irving to write a biography of Fulton. After a tentative endeavor, Irving gave up the undertaking. He told them "Fulton's works are already immortal monuments on the waters of the globe. It would be impossible for me to specify or describe the work of the greatest of inventors".

Anyone can understand what Irving meant. However, various aspects of the great inventor have been described and published in numerous books and articles throughout two hundred years.

Mr. John W. W. Loose, secretary of the Lancaster County Historical Society, has kindly contributed sketches to illustrate the steamboat engine which Fulton invented. For this I am very grateful, as it requires a special understanding of machinery few possess.

Boyhood and Youth

In the Pennsylvania Historical Association's quarterly journal, *Pennsylvania History*, Vol. XXXII, January, 1965, we learn:

The birthplace of Robert Fulton, six miles south of Quarryville in Lancaster County, Pennsylvania, was designated a National Historic Site by the United States National Park Service. The ceremony was held at this house October 4, 1964, and the speaker was Dr. S. K. Stevens, Executive Director of the Pennsylvania Historical and

Museum Commission. The tablet at Robert Fulton's birthplace is inscribed as follows:

**ROBERT FULTON WHO ON AUGUST 17, 1807, FIRST
SUCCESSFULLY APPLIED STEAM TO THE PURPOSES
OF NAVIGATION**

His parents lived here only a few years. Robert was born November 14, 1765, and he was about a year old when they returned with him and their three daughters to the town of Lancaster, where they had lived originally. Robert Fulton, Senior, was not suited for farm life. Robert's mother was Mary Smith Fulton, a sister of Col. Robert Smith of Revolutionary fame in Chester County. Both the Fulton and Smith families were of Scottish ancestry. They had emigrated from Ireland to America in the early 1700's. It was incorrect, as some have done, to refer to Robert Fulton as a poor farmer's son. Robert, Sr. was one of the important and useful citizens of Lancaster. He was a charter member and secretary of the Union Fire Company, along with Adam Reigart, Edward Shippen, William Atlee, and other men of prominence. He was a charter member of the Juliana Library, the third subscription library in the colonies, organized 1759 and incorporated October 22, 1763.

The Fultons were related to the West family of Chester. Certainly the presence of West's portraits of Robert's parents in their home, and the news of Benjamin West's successes encouraged Robert's interest in art. Early in life, Robert Fulton showed very keen powers of observation. His drawings were accurate and his designs could be followed and reproduced in machinery in the workshops of Lancaster. All scientific work was of interest to him.

Robert Fulton, Sr., was a devout Presbyterian. He led the singing when the services were held in the Lancaster Court House and he is buried in the old cemetery beneath the Chapel of the First Presbyterian Church.

The death of his father, when he was only seven, left Robert's mother with three daughters and one son. From an early age he was concerned with the welfare of his mother and sisters.

During the Revolutionary war he was a happy boy in the town of Lancaster. He often stopped on his way to school to watch the work of the gunsmiths in William Henry's shop. This same William Henry had earlier built a steam boat as early as 1770 in Lancaster but it sank in the Conestoga when it was tried out. Men in Europe and America had tried, some almost successfully to build a boat, propelled by steam but all were discouraged and finally failed. James Watt, in Scotland, had invented the steam engine and it was a success.

Robert Fulton's friend, Christopher Gumpf, sometimes invited him to go fishing along the Conestoga creek with his father who had

a boat. This boat was propelled by poles, which the boys used to go far up the stream.

When Robert went for a visit to an aunt at Little Britain he made a model of a boat propelled by paddle wheels joined by a bar. This bar was turned by a crank. So one boy could stand in the center of the boat and turn the crank. This would turn the bar which then turned the paddle wheel and propelled the boat. When Robert proposed building one like this, Christopher was doubtful, but Robert persisted and the people along the banks of the Conestoga were amazed when it worked.

This really began Robert's studies in the solution of navigation. As a boy, and later as a man, he always declared with sincerity, "that to him that had courage and purpose, patience and faith, nothing is impossible".

There were hundreds of war prisoners in Lancaster during the Revolutionary War and the famous Major Andre lived with the Cope family on Lime Street. Here several boys of the town, including Robert Fulton, were tutored in drawing by Andre. Robert enjoyed drawing caricatures of the strange looking Hessians imprisoned in Lancaster barracks at this time. Robert took delight in caricaturing anything that he considered anti-American, for he was devoted to his country.

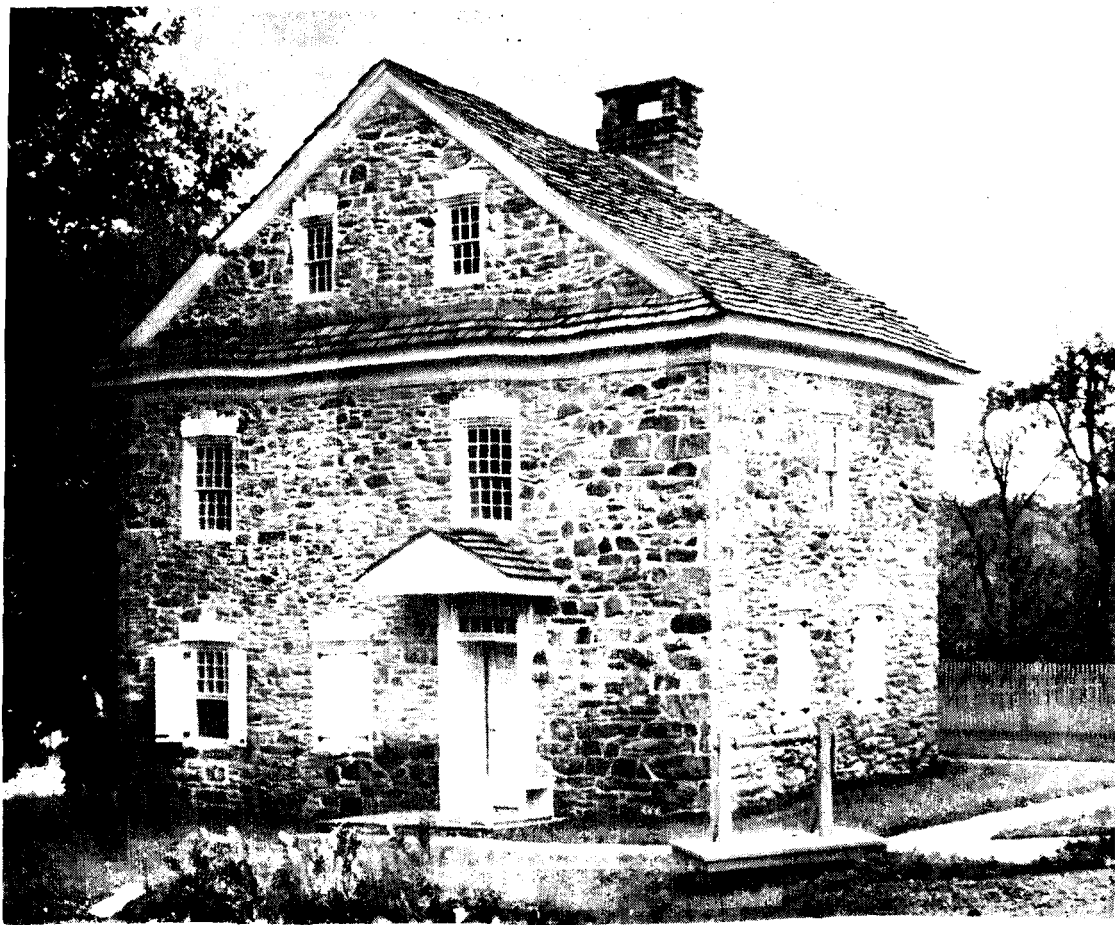
Sometimes Robert, although only a small boy, would give suggestions to the men working in the Lancaster gun shops. He would make sketches of the size and shape of guns. After they were made sometimes the boy would accompany these men to the open fields; by shooting at a mark he could prove his calculations were correct. He always gave careful attention to the details of anything he undertook. The gunsmiths valued the work of this boy Fulton.

For the inns in Lancaster Robert drew and painted signs. Mr. W. U. Hensel once wrote that the "streets of Lancaster in those years were like picture galleries with numerous painted signs".

In 1778, when Robert was 13, the boys of Lancaster wanted to light up the streets with candles to celebrate the second anniversary of the Fourth of July. The City fathers, however, forbade this on account of the scarcity of tallow for war uses. So Robert studied a book on gun powder and made cardboard cylinders, with a small quantity of gun powder in each. When these were exploded the town had a celebration after all.

Robert read any books he could find on chemistry and gun-making, always eager to learn new ideas.

In 1782, aged 17, Robert Fulton left home to go to work in Philadelphia. Here his occupations were varied. He painted signs for the various shops and inns. He drew maps and charts and designs for buildings. His painting was continued and many portraits were completed for Philadelphia patrons.



The newly-restored birthplace of Robert Fulton in northern Fulton Township, Lancaster County. The Pennsylvania Historical and Museum Commission is custodian of the property.

After four years, he became a real success in Philadelphia. His two characteristics were his indomitable perseverance and the charm of his personality. He enjoyed the acquaintance and company of Benjamin Franklin by whom he was much noticed. With a letter of introduction from Franklin, he went to see John Ross, who proposed that Fulton should do crayon portraits of young ladies in Philadelphia society. Thus he met many prominent people and earned money. His sign read:

FULTON — ROBERT
Miniature Painter
Corner of 2nd and Walnut Sts.

After a severe attack of pulmonary trouble, Fulton spent some time at the famous Hot Springs of Virginia. He met

of wise judgment who recommended that he should study the art treasures of Europe.

Since he was in poor health and wishing to provide a permanent home for his mother and his three sisters, he invested his savings of more than four hundred dollars in a farm in Washington County, Pennsylvania. He also bought four lots in the town of Washington. In 1793 he wrote from London to convey deeds for three of these lots to his sisters, all had married by then. They were, Mrs. Mary Morris, Mrs. Isabel Cook and Mrs. Peggy Scott.

After closing up all his affairs in Philadelphia he worked for a short time in New York in order to provide funds to go abroad.

1786 he sailed for London, bearing letters of introduction to distinguished Americans abroad. One letter was from Benjamin Franklin to Benjamin West, the Pennsylvania artist who had now attained high honor and position in England, and was of special help in launching Fulton in the art circles of Europe.

Life in England

Benjamin West had been in Lancaster as a young man and visited for a time at the home of William Henry, the gunsmith, whom the Americans credited with the first plan for a steam boat, which was however unsuccessful. West's father was a friend of the Fulton family and Benjamin West painted portraits of Robert Fulton's parents while he was in Lancaster. It is told that William Henry, who had an extensive library, suggested to the young artist he should read about history and paint historical scenes. This led to great success in that field. Before Fulton arranged to go to England he had been assured of West's help and interest.

After arriving in London he went directly to West's home. He was received with great kindness and admitted to West's heart and home. Their friendship lasted until death.

It has been said that no artist influenced the art of his country as did West. Kind, courteous and hospitable to many Americans after being established in England, he had befriended William Peale and others before Fulton arrived. He painted the King of England, his friend, and became President of the Royal Academy. Because West stressed historical painting, he undoubtedly influenced Fulton's works of—

1—Mary, Queen of Scots

2—Lady Jane Grey

and 3—Louis XVI in Prison

In 1789, two years after Fulton arrived in London, he wrote to his mother that "he had been working hard at his painting since arriving at West's home and now two of his paintings were admitted to the Royal Academy".

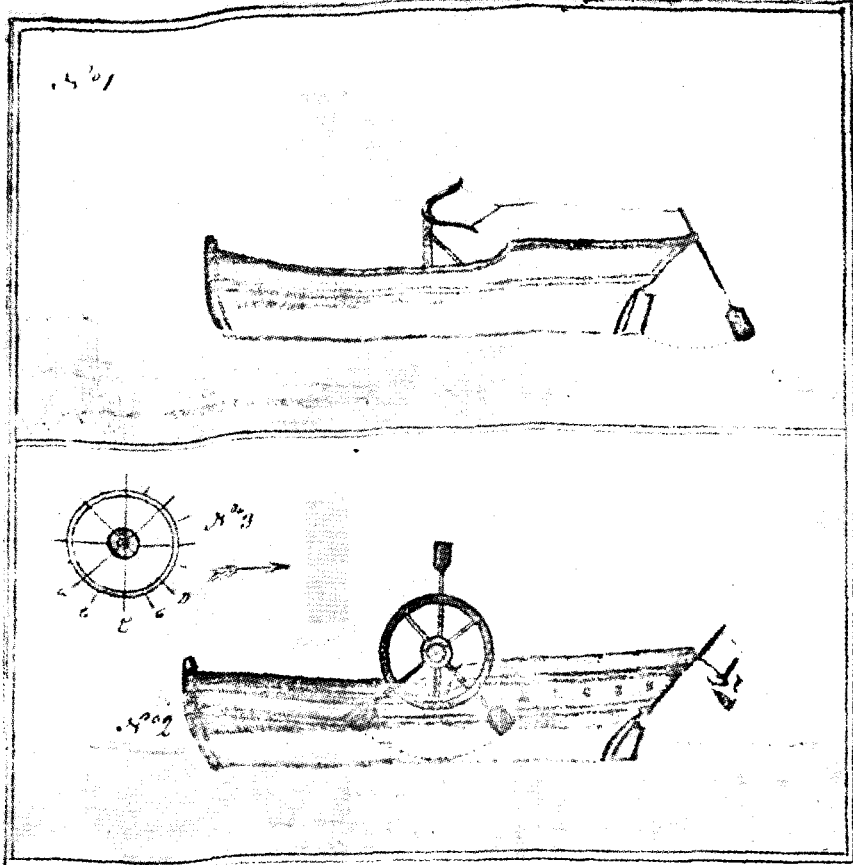
After these two years at West's London house, and with his success as a painter, he took a tour among the castles and country places of the British nobility to study their artistic treasures. First he went to Devonshire and stayed at Exeter. He copied famous works of art at Powderham Castle. He was supporting himself entirely by his own art work. In Devonshire he met two men who played a great part in his study of engineering. The Duke of Bridgewater had large estates. He needed transportation for the coal from his mines in the City of Manchester. Therefore he was perfecting plans, with the help of others and succeeded in opening navigation by canals. This success led to the construction of several large waterways throughout England. In his friendly associations with the Duke, Robert Fulton became engrossed in the civil engineering field. From this time on his mind was busy with the subjects of practical utility.

During this time, also, he corresponded with the Earl of Stanhope and exchanged ideas with him about steam navigation. Although Stanhope met with failure in his own experiments on the London docks, he continued an unbroken interest and friendship with the young American.

From Devonshire Fulton went to live in Birmingham. While there for 18 months, the project of building canals from Birmingham to the main seaports was being worked out by engineers. At this time he met and entered into correspondence with James Watt, the inventor of the steam engine. In a letter to Lord Stanhope in 1793, Fulton writes, "To conform to your Lordship's wish, I have made some drawings descriptive of my Ideas on the subject of the steamship". Here in this old letter, still in the Stanhope's family records, are drawings of Fulton's first plans for steam navigation. In 1796, Fulton published a "Treatise on Canal Navigation". Of this he sent copies to Governor Mifflin of Pennsylvania and to George Washington, President of the United States, urging their thoughtful consideration for canal navigation which would give America great advantages. He received a polite acknowledgment from Washington but there was no official action. This Treatise, however was translated into French and published in Paris, creating great interest among engineers. The French Revolution had charged two nations, France and England, with new desires for potential advancements. Fulton was studying these international disputes. He wrote to his brother-in-law, David Morris, in 1794 his advanced Idea:

"It is believed the French will be successful and establish a Republic. But the Art of Peace should be the study of every American".

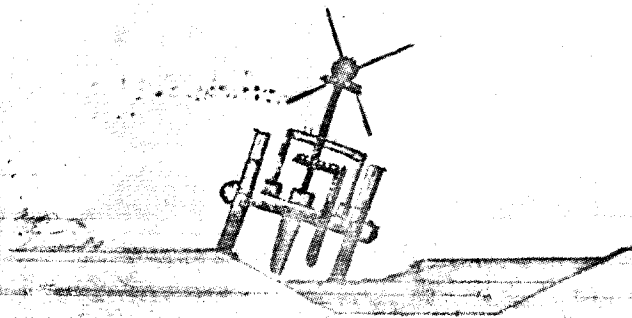
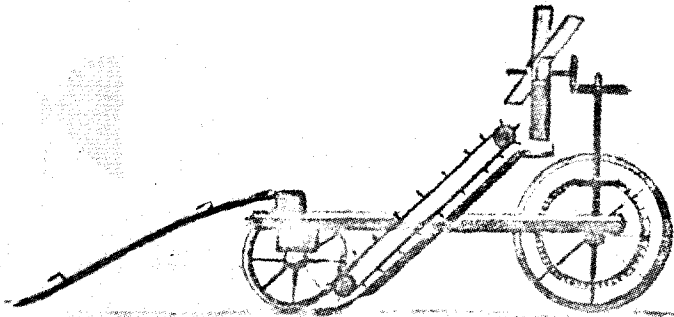
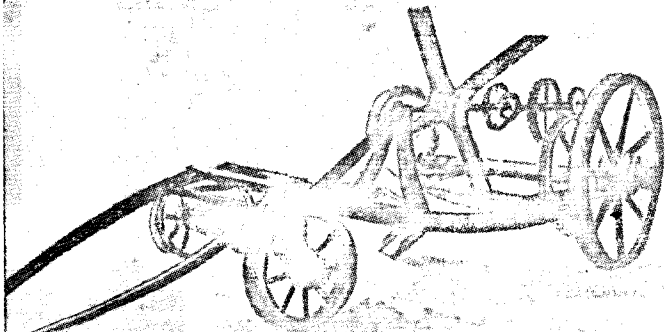
By 1796 the excesses of the French Revolution had ceased. Britain commenced aggression on the seas through which the United States was the greatest sufferer. So Fulton left his study of canal structures temporarily and started the study of a new weapon, designed to promote universal peace—the torpedo. He hoped this tre-



Two of Fulton's early sketches showing possible methods of propelling ships.

mendous explosive force might destroy all the armaments of the seas and so bring the seas and waters as open channels to friendly relationship among all nations. He also wrote a Treatise in 1797 on Free Trade.

During these years in England Robert Fulton perfected many inventions. In 1794 he obtained from the British government a patent for a double inclined plane for raising and lowering canal boats. An honorary medal was presented to Fulton by the British Society of Arts and Commerce for a submitted invention for sawing marble. Also he held patents for machines for spinning flax and twisting hemp in ropes. Dredging machines for canals were invented by Fulton also. John Owen relates that "in England Robert Fulton, the engineer, met Samuel Taylor Coleridge, the poet and author of the Ancient Mariner. In a poem written about that time Cole-



Sketches by Robert Fulton showing an earthmoving machine of his design.

ridge wrote these lines—

“But why drives on that ship so fast
Without a wave or wind?”

This seems like a significant coincidence.

In 1796 Fulton, now aged 31, wrote a “Treatise on Canal Navigation”. This was published in France in the seventh year of the Republic.

In 1797, at the age of 32, Fulton went to France, which was now under the Directorate.

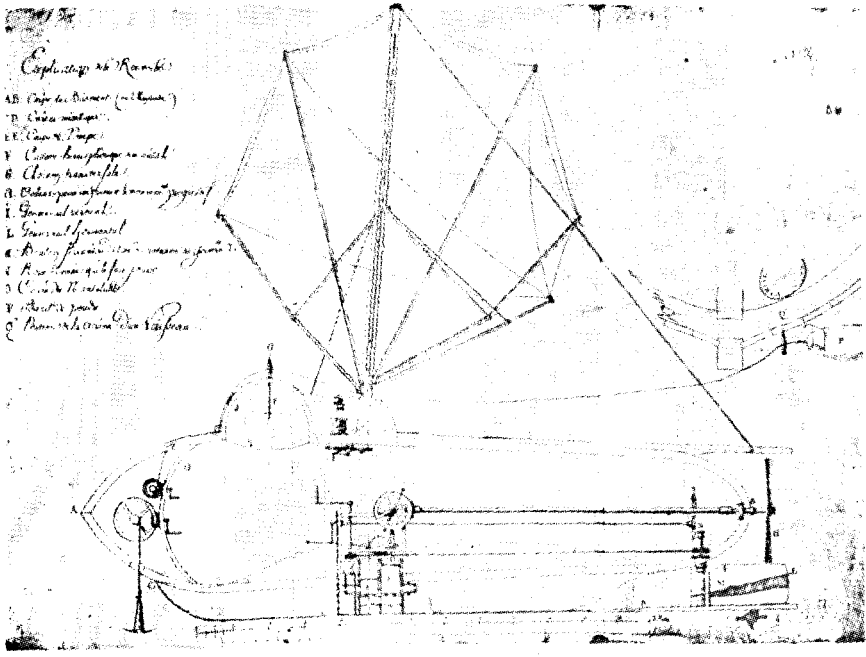
In 1797, Fulton found himself aboard a vessel tossing like a chip on the waters of the English Channel. It was filled with French people. He knew no French. The boat landed at Calais, and the French authorities said he would have to stay there for about three weeks until he could go on to Paris. He was very anxious to show his plans for a submarine to the officials there. As soon as his papers were in order he went on his way to Paris. Napoleon was about to seize the reins of power in France. Robert Fulton still thought of his submarine as an instrument of peace. In a letter to Napoleon he said that the invention of his submarine would end the English monopoly of the seas.

The French government then appointed experts to examine Fulton’s model. These experts were enthusiastic. However they insisted Fulton must first build a full sized submarine, then he could take it with a crew of two men, attach a torpedo to it and try to blow up some English war vessel. The French government was supposed to supply Fulton with some money to build this. But no money from the French government was forthcoming. It was very frustrating as Fulton himself had no money. However, he decided to make some by building a sort of round theatre in Paris. On the inside walls of this building, he called a “Panorama”, he painted huge murals, depicting the fire which had destroyed the city of Moscow in Russia not long before Napoleon was to enter it in his campaign to Russia. The Russians had themselves started the conflagration to prevent Napoleon’s army from taking the city with all its supplies. In order to build the Panorama Fulton had to buy an English patent, form a company, then have the building constructed; after which he began the enormous job of painting these murals. This structure was a great success. All Paris came and paid to see these realistic and dramatic paintings. With the money thus earned, he started to build his submarine.

In the city of Rouen, France, Robert Fulton worked for months until his ship was done in 1800. An official committee came to see the trial trip. The name “Nautilus” was given to this submarine and in July the ship was placed on the Seine River. It submerged, remained under water for 45 minutes, then surfaced again. The Minister of the French Marine then promised to send Napoleon a report of this. It seemed certain that 6,000 francs would be obtained

Explication de l'Invention

- AB Cône du Bâton (ou de l'axe)
- D Cône intérieur
- E E Cône extérieur
- F Cône de suspension
- G Cône de suspension
- H Cône de suspension
- I Cône de suspension
- J Cône de suspension
- K Cône de suspension
- L Cône de suspension
- M Cône de suspension
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- T Cône de suspension
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- V Cône de suspension
- W Cône de suspension
- X Cône de suspension
- Y Cône de suspension
- Z Cône de suspension



Sketch by Robert Fulton of his submarine, "Nautilus."

from the French government. This was only a small fraction for Robert Fulton had spent 18,000 francs of his own money. Time passed and the government did nothing. While waiting to hear Robert decided to try the submarine in the English Channel. It was towed to the port of Le Havre when Fulton and a crew of two practiced in deep water, off the shore. On September 12, 1800, they set out to a small harbor where British ships were anchored. During the night while Fulton and his crew were submerged, waiting for the tide to turn and the torpedo from the Nautilus to explode, the British ships sailed away and were gone by morning. It was a long, disappointing journey across the English Channel, back to the French shore.

Now Robert Fulton was 36. He had failed as an artist and had not really succeeded as an inventor. Nevertheless he did not yield to defeat.

One of Robert Fulton's abilities was to make friends. When he came to Paris, he met Joel Barlow, the American statesman. He was really a citizen of two worlds. Although an American patriot, he stayed in France throughout the Revolution. As a politician, he was there to avert a disaster of a war between France and the United States. When Joel Barlow and his wife Ruth met Robert Fulton, who was staying at their Paris hotel, they were both charmed by the young Fulton. They liked his looks, his manners and his big ideas. The more the Barlows saw of him, the more they liked him. He was

ten years younger than Barlow but he became like a younger brother to them both. They invited him to live with them when they bought a Paris home. For the rest of their years in France he did.

Barlow was a perfect American, ingenious, industrious and shrewd, who went to France on a brief business trip and stayed 17 years. He became a cosmopolitan and a diplomat. Barlow was sent by the United States to bargain with the brutal Dey of Algiers and succeeded in having American sailors released from prison. As a young American from Connecticut, he went to France, and undertook the trip to Algiers. His friendship with Fulton was one of the greatest influences in Fulton's life.

With the same personal charm and ability to make friends Fulton met Chancellor Robert Livingston. He came to France in 1801 as the Ambassador from the United States. They happened to meet at a reception. Livingston had secured the first rights to navigate steam boats on the Hudson River in New York. He had held various ideas on the subject of steamboat navigation for years. Also he had plenty of money. So these two men were drawn by their interest in steam boats. Together they formed a coalition, with Livingston supplying funds to build a steam boat in Paris on the Seine River. This boat moved only as fast as a man could walk but it astounded the people of France. They stood on the banks of the Seine to see it perform its first experiment.

Robert Fulton later went to England to meet James Watt the builder of steam engines. From Watt's firm Fulton ordered an engine to be built for a steam boat on the Hudson River in America. Fulton signed the agreement with Livingston in October, 1802 "to build a steam boat, in partnership and attempt to carry the invention of this steam boat into useful operation". By 1806, Fulton decided to return home to America. But for a long time the British refused permission for James Watt to send the steam engine on to America. Finally permission was granted and the entire steam engine taken apart, packed carefully and shipped to Fulton.

While Fulton was back in America, working on the steam boat for use on the Hudson, he took time to go to visit the Barlows who, too, had returned to America. They were then living in Washington in a beautiful mansion, called Kalorama. Here Fulton designed a summer house to be built on their spacious grounds. His stay was mutually enjoyable but he hastened back to New York to work on the next project. Just when the Barlows had settled into a pleasant routine in Washington, Joel Barlow was sent abroad again. He was to negotiate with Napoleon and prevent any chance of a war with the United States.

Barlow left his wife in Paris with a nephew and travelled in bitter winter weather to meet Napoleon in Warsaw, who was hurrying back to France after the defeat of the Russian campaign. The French army was in utter retreat. The snow and bitter cold killed thousands of Frenchmen. Napoleon hurried to France by another

shorter route and Barlow was unable to meet him on his diplomatic errand. Barlow fell ill with pneumonia and died in a little Polish village, where he is buried. His widow returned later to America and visited the Fultons in 1813.

Return to America

On October 21, 1805, England won the famous Naval victory over the French at Trafalgar. The British Navy now ruled the seas and that government was no longer interested in an order it had given Fulton to build torpedoes. He was free to return to America as soon as the steam engine was ready. He sailed in the fall of 1806 on a fine sailing packet. He had been abroad twenty years. Now he was back in his native country in good health and spirits, ready to work on the new project, the steam boat on the Hudson.

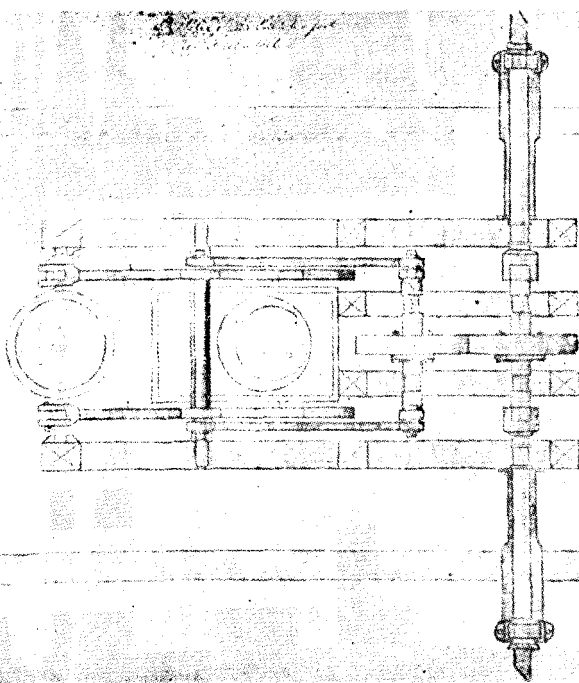
In the spring of 1807, the building of the steamboat began on the East River in New York. Robert Fulton worked steadily with the men in the ship yards. They were accustomed to the construction of sail boats, but this new boat had to be strong enough to hold several tons of machinery. Fulton was busy with hundreds of details. When the boat was finished, it was towed to Paulus Hook Ferry on the Hudson River side of New York. Here a workshop was set up. It was a difficult task to install the new steam engine and the paddle wheels to the most advantage. Many of the men who ran sailboats on the river were very jealous. One night a captain of a sailboat ran into Fulton's boat and did some damage. However, repairs were made and Fulton engaged a watchman to guard it.

While Fulton was busy working on the boat, Chancellor Livingston, who had returned from Paris, was busy in Albany, asking the State of New York to grant a little more time until he could run his steamboat on the Hudson. He had secured the rights years before and he now secured permission to extend the time of operating steam boats on New York waters.

On August 9, 1807, Fulton made the first trial run of the new steam ship. People on the banks of the Hudson looked on in amazement as the boat steamed up the river for a mile and then returned to its slip.

On August 17, 1807, the passengers for the first trip up the Hudson came on board. They looked scared and unhappy. They feared that they were not only risking their lives but their reputations. The noisy crowd on the shore was staring at them and laughing. However, Chancellor Livingston had forced a large number of his family and friends to make the trip. The passengers were all dressed in their best finery. Among those on board was the Chancellor's beautiful niece, Harriet Livingston. She smiled at Fulton, as the handsome young man stood on the deck, full of confidence.

As the boat proceeded to move up the Hudson, the crowds on the shore began to clap and whistle and those on board lost all their anxiety, as they were actually moving against the wind. After an



Drawing by Robert Fulton showing plan for the steam engine to be placed in the Clermont.

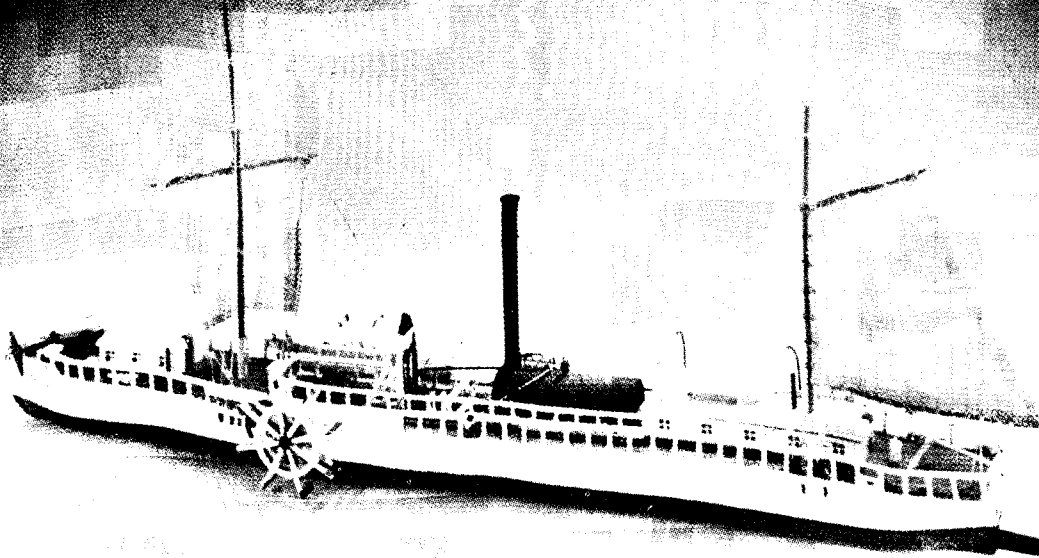
hour or two they began to sing Robert Fulton's favorite song of "Ye banks and brae's o' bonny Doon, etc."

Next morning found the engine still chugging away and now they had traveled 85 miles north of New York. The whole Hudson Valley seemed aware of the progress of the steam boat, and people hurried to the banks to watch the new invention glide upstream.

When the boat approached Clermont, Chancellor Livingston's estate, for which the boat was named, Livingston addressed the company on deck —

"You have taken part", he said, "in what will become one of the great events of history. This proud vessel is the result of one man's labor, that of Robert Fulton. And I also wish to announce the engagement of my niece, Harriet Livingston, to Mr. Robert Fulton". Great applause greeted this speech. This was the greatest day of Robert Fulton's life. Then the Clermont made its successful trip to Albany. As it passed West Point the military cadets were on the bluff cheering it on.

Within a month the Clermont was on a regular schedule of passenger service. Fulton made great efforts for the comfort of passengers. A handbill announced: "Breakfast will be served at 9 a.m.,



The Clermont, or North River, as it was named officially. This model is in the Philadelphia Commercial Museum.

Dinner at 2 exactly. Tea with meat and supper at 8 p.m." The cabin accomodated 120 people.

After the Clermont proved its success, Fulton built two similar boats for use in New York Harbor. He received many honors for his achievements.

He and Harriet Livingston were married on January 8, 1808, and lived on their Hudson River estate, where they had a family of three daughters and a son.

By 1813, Fulton had fourteen steamships in America running on lakes, rivers and bays from the Canadian border to New Orleans on the Gulf of Mexico. Many more were in the course of construction. Fulton wrote to his friend, Benjamin West in London in 1813 that he now had plans to build steamboats on the Ganges River in India and was talking of constructing a fleet of sidewheelers in Russia. For years Fulton had urged the building of the Erie Canal, and he now drew plans for that great man-made waterway.

When the War of 1812 broke out with England, Fulton went to work to build the world's first battleship. It was launched October 29, 1814. It was called "Fulton the First" and was built to protect

New York Harbor from the British. He also was thinking of plans for steam railroads.

Happy in his family life and with plenty of money, he took up painting again in his spare time. Fulton gave large sums of money to encourage the efforts of youthful artists and inventors.

In January, 1815, while Robert Fulton was installing the engines to complete his battleship, he had to go with his lawyer on a trip to New Jersey. On their return trip they stopped for three hours at the shipyards looking at the boats being repaired there. Just as they came out of the shipyard, they saw the ferry boat they wanted grinding through the ice. The two men started to run across the ice to get on the boat. Mr. Emmet, the lawyer, was caught by the ice breaking under him. Fulton went to assist him and, in spite of great difficulty, drew him safely out of the icy water. When Fulton got back home he became gravely ill and his doctor ordered him to remain in bed.

He was notified, however, that his workmen needed some instructions. In spite of his condition, he journeyed to Paulus Hook on the Hudson, the site of his shipyard. This exertion was too much for him and he became critically ill. On February 23, 1815, he died at the age of fifty.

The people of New York state and of all America mourned and honored him. State and national officials and great throngs of silent people attended the funeral services in New York City. Cannon sounded from the great battleship in his honor, as all the city church bells rang.

In H. W. Dickinson's biography of Robert Fulton, he pays the following tribute to him:—

“It seems to us that Robert Fulton should take a higher place even than he has in the records of the Anglo-Saxon race. As a thinker, he saw clearly that free trade intercourse between nations, universal disarmament, the spread of education and political liberty were necessary for the progress of the human race. He opened new fields of activity, never dreamed of before. To mention only a few of Fulton's achievements, he—

- 1—built the first torpedo and submarine
- 2—built the first steam boat
- 3—built the first steam propelled warship

These entitle him to a first place among the greats of the engineering profession. His early death and the fact that others entered in to and benefited by his labors, have tended to obscure the sheer greatness of his achievements.”

Thus our fellow townsman, Robert Fulton, takes a commanding place in the progress of civilization. We have honored him by naming a township for him, the large Fulton National Bank and a Lan-

caster street. His statue still stands in the niche above the Fulton Opera House of Lancaster, where it was placed over a hundred years ago. In the rotunda of the Capitol at Washington stands a large statue of Robert Fulton, a handsome and dignified figure.

It seems almost prophetic that over a hundred and fifty years ago, he wrote to a friend,—“It is so grand an Idea that Americans shall establish steam boats to work in India. My boat, ‘Paragon’, beats everything on this globe for, made as you and I are, we cannot yet tell what is in the moon.” Fulton’s scientific heirs, in the American tradition, have landed on the moon, an adventure he would have applauded vigorously.

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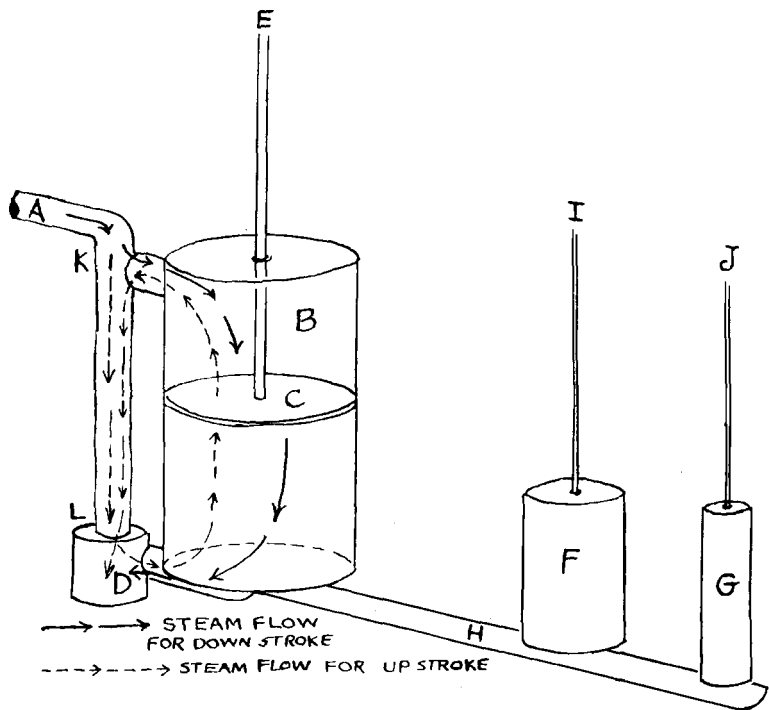
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N.B. Eleanore J. Fulton and Alice Clary Sutcliffe were related to Robert Fulton. Mrs. Sutcliffe was a great-granddaughter of Fulton, and Miss Eleanore J. Fulton was a collateral descendant.

DRAWING SHOWING STEAM ENGINE SCHEME



A=steam supply pipe from boiler, B=cylinder, C=piston, D=condenser, E=piston rod to linkage, beam, or wheels that transmit motion to the paddle wheels, F=air pump, G=force pump to return water to boiler, H=connecting channels, I=air pump rod attached to beam, J=force pump rod attached to beam, K-L=reversing valves. In operation, steam would be admitted to the top of the cylinder, forcing piston down. After piston is fully depressed, the steam exhaust is condensed, and live steam would be admitted into the bottom of the cylinder through the reversing valve, thereby causing piston to rise to top of cylinder. The up-and-down motion of the piston was transmitted through the piston rod to a system of beams and levers and wheels to furnish rotary motion to the paddle wheels. The air and force pumps worked off the beam motion. The air pump forced air to the condenser, and the water force pump forced water from the "hot well" to the boiler.