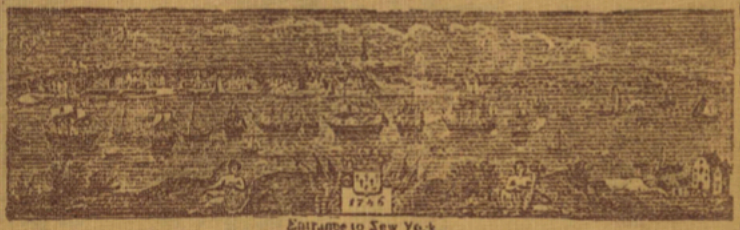
Fulfilment of

THREE REMARKABLE PROPHECIES



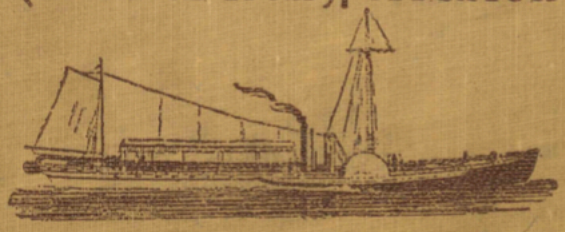
Entrance to New York.

RELATING TO THE DEVELOPMENT OF

Steamboat Navigation

AND

Railroad Transportation



ROBT FULTON'S STEAM BOAT THE FIRST THE CLERMONT 1808

CHAPTER IV

Inventions of Col. John Stevens and Robert L. Stevens in Steam Navigation

The world is indebted to these two men for some of the greatest improvements ever made in steam navigation. Men of high scientific attainments and inventive genius, they were in no way handicapped in their experiments as Fitch and other inventors had been. They had the equipment for experimenting, and abundant means for carrying forward their enterprises both on land and water. In some of their inventions they are entitled to full credit for originality with none to dispute their claims. They attained a world-wide reputation and contributed materially to the commercial prosperity of their native State, and of the country generally.

Col. John Stevens was a native of New York city, and connected socially and by marriage with some of the leading families of New York and New Jersey.

Hon. Abram S. Hewitt, at a public banquet held Feb. 18, 1897, after referring in glowing terms to the great work accomplished by the Stevens family, said in conclusion:

"But I am asked to speak especially of the Founder. I have been speaking of the founder, John Stevens, the elder, John C. Stevens, Robert L. Stevens and Edwin A. Stevens, who were the founders and pioneers who have made the country what it is—the miracle of the ages, the admiration of the world. No one who cannot go back, as I can to the time when there were no railways, to the time when there were no ocean steamers, when there were no telegraphs, no telephones, no armored navies, no access to any point beyond the Mohawk Valley, when the great West was yet unsettled; when this great empire was a wilderness—no one who cannot recall this primitive condition of things, and did not see it, can realize what the Stevens family has done for America."

Col. John Stevens, son of John Stevens the American ancestor of this branch of the Stevens family, was born in New York city in 1749; he was graduated at Kings, now Columbia College. in 1768; studied law and was admitted to the bar in 1771. During the Revolutionary War he held several offices, among which

COL. JOHN STEVENS
Steamboat Inventor and Promoter

was that of treasurer of the State. His winter residence was on Broadway, New York, and his summer residence at Hoboken, N. J., where he owned a large property, and subsequently made that his permanent residence. He seems to have had a greater taste for mechanical experiments than for his profession, and was moreover quite an inventive genius. He was possessed of ample means to gratify his tastes in this direction and very soon after the close of the War of the Revolution he began his experiments in steam navigation and, judging from his own statement he brought his experiments to a successful termination at a much earlier date than any of his competitors in this line. He made application to the State Legislature in 1789 for the exclusive privilege of navigating the waters of the State of New York by steamboats.

To the Honorable the Legislature of the State of New York in
Senate & Assembly convened

The Petition of John Stevens Junr of Hoboken in the State of New Jersey

That your Petitioner has bestowed a great deal of Time and Thought toward perfecting a Machine for propelling a Vessel through the Water by means of Steam That he has at length brought his Invention to that degree of perfection That as he conceives, little or no further Improvement can be made on it —That to the best his Knowledge and Belief., his Scheme is altogether new, or at least does not interfere with the Inventions of either of the Gentlemen who have applied to your honorable Body for an exclusive Right of navigating by means of Steam

That your Petitioner has made an exact Draught of the different Parts of his machine with an Explanation Thereof, he is ready to exhibit provided that after the Exhibition Theory no one be suffered to lay claim to any Invention therein described, unless he shall have before exhibited a draught or model Thereof to your honorable Body—and your Petitioner therefore prays. That in case his machine should appear to be a new and useful Invention, That the Honorable, the Legislature would be pleased to grant to him an exclusive privilege and Right of using the same for the purpose of navigation throughout the State of New York for such term of Years as shall seem meet

And your Petitioner
shall ever pray

John Stevens Junr

presented 9 January 1789

The Proceedings of the New York Legislature show that on

Friday January 9 1789

"A petition of John Stevens Jan. Hocbuck in New Jersey, praying for an exclusive privilege to build steamboats on a plan lately by him invented" was read and referred to the same committee as the petition of James Rumsey.

This shows that James Rumsey's petition had preceded that of Col. Stevens's, and Stevens alludes incidentally to that fact when he says that "to the best of his knowledge and belief his scheme is altogether new, and does not interfere with the inventions of other gentlemen who have applied to your honorable body for an exclusive right of navigating by means of steam." A careful examination of the Proceedings of the Senate and Assembly for some months following, shows that no further action was ever taken in regard to this petition, the reasons for which will appear hereafter. Rumsey's Petition was taken up by the Assembly, Feb. 16, 1789, viz:

"The bill, entitled 'An act securing to James Rumsey the sole right and advantage of making and employing for a limited time the several inventions and implements by him lately moulded, was read a second time, and committed to a committee of the whole house."

Tuesday, Feb. 20.

Reports from the committee to whom was referred the bills for securing to James Rumsey the right and sole advantage of making and employing for a limited time the several inventions and improvements by him lately invented—that amendments had been made in the title of the said bills which were concurred in, and ordered to be amended accordingly. The records of the Senate show that final action was taken five days later.

New York Senate, Feb. 25, 1789.

"Mr. Douw, from the committee of the whole to whom was referred the bill entitled, '*An act securing to James Rumsey the sole right and advantage of making and employing for a limited time the several mechanical improvements by him lately invented;*' reported that the committee had gone through the bill, without amendment, and agreed to the same, which report he read in his place, and delivered the bill at the table. Thereupon,

Resolved, That the bill do pass.

Ordered, That Mr. Duane and Mr. Humphrey deliver the bill to the Honorable the Assembly and inform them that the Senate have passed the bill without amendment."

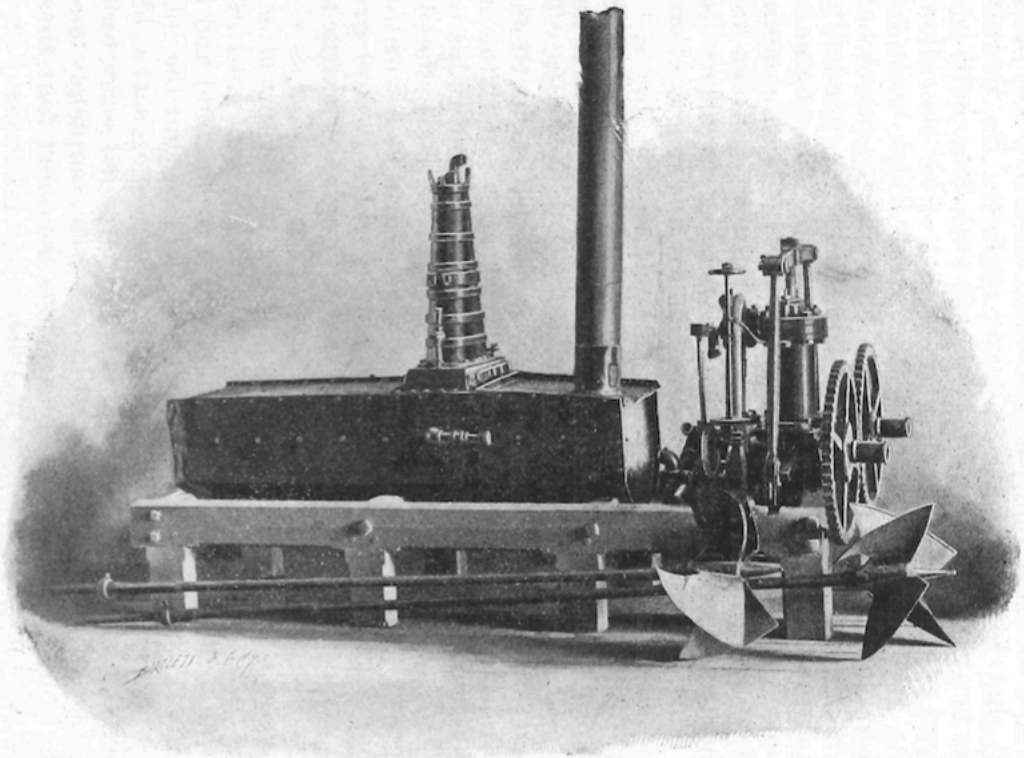
Action was taken on Rumsey's bill as a matter of precedence, his petition having been filed a few days earlier than that of Col. Stevens's. It is not probable that the merits of the two bills received any consideration whatever as the subject was entirely new to that body and Col. Stevens was not a man who would ever attempt to exert political influence, or to use any means whatever that his conscience did not approve. He therefore ceased his activities in this direction until such time as he could obtain legal protection against infringement of his invention.

In May, 1804, he constructed a steamboat which went from Hoboken to New York and returned; its propelling power being a wheel at the stern, formed in the manner of a windmill or smoke-jack, and driven by a rotary engine. This engine not proving successful, it was superceded by one of Watt's engines, when the vessel attained an average speed of four miles an hour. For a short distance he maintained a speed of seven or eight miles an hour, but could not continue this for any length of time, owing to a deficiency of steam.

"That this was a helix," says one writer, "his letter of 1804 to Dr. Robert Hare of Philadelphia shows." This is said to have been the *first application* of steam to the screw propeller. The engine and boiler of the steamboat are preserved in the Stevens Institute of Hoboken. Professor Renwick states that the machinery was made under Stevens's own direction, and in his own shop at Hoboken. It set in motion two propellers (the first double screw) of five feet in diameter, each furnished with four blades, having the proper twist—to obtain which he had great difficulty with his workmen,—and at an angle of thirty-five degrees.

It is somewhat remarkable that after 1804, no serious attempt was made for the practical introduction of the screws until 1837, when it was brought into use simultaneously in England and the United States. Still more remarkable is the fact that the introduction into use in England, was the Archemides screw of a single thread, and in America by a metallic threaded screw on the outer surface of a cylinder; that the first was completely modified in the course of five or six years into the short four thread screw that was used by Stevens in 1804.

Col. John Stevens, in 1806, assisted by his son, Robert L. Stevens, built the paddle-wheel steamboat "Phoenix" that plied for six years on the Delaware river. Prof. James Renwick, in referring to Fulton's steamer, the Clermont, as she was in the autumn of 1807, says: "The Stevenses were but a few days later in moving a boat with the required velocity, and that being shut out of the waters of New York by the monopoly of Fulton and



THE ORIGINAL JOHN STEVENS BOAT ENGINE OF 1804
Now in the National Museum, Washington, D. C.

Livingston, Stevens conceived the bold design of conveying his boat to the Delaware by sea, and this boat which was so near reaping the honor of first success, was the *first to navigate the ocean by the power of steam.*

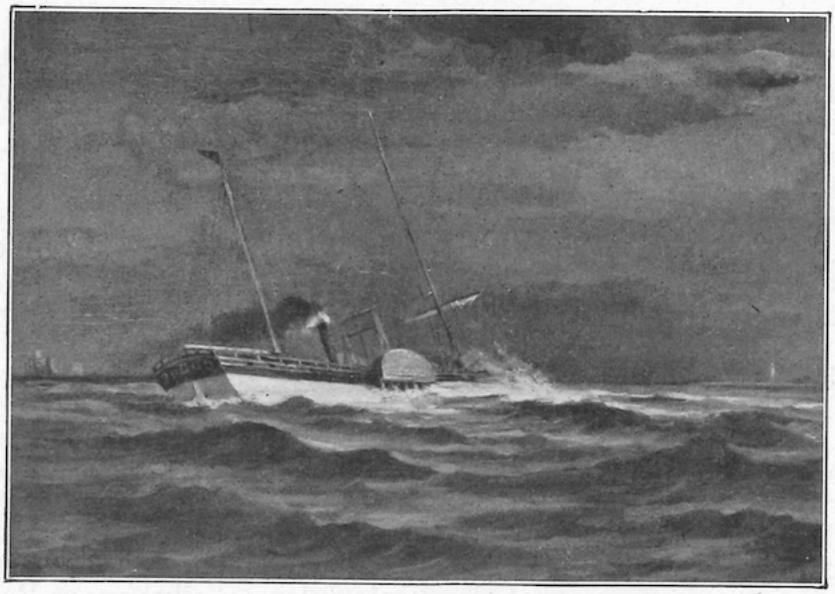
Professor Charles King, of Columbia College, in a lecture on "The Progress of the City of New York During the Last Fifty Years" (Dec. 29, 1851) said: "For at that time (1807) steam engines, as applied to the various processes of manufacturing or other industry on land, were little known generally, and the whole United States furnished, it is believed, but one machine shop or foundry where a steam engine could be made, and that was opposite to this city at Hoboken, in the works of Col. John Stevens.

"The palm thus gained by Fulton was closely contested by John Stevens, of Hoboken, who, long in concert with Robert R. Livingston, had made experiments in steam as a means of propulsion, but now, aided by the genius and practical mechanical skill of his son, Robert L. Stevens, was operating separately. Almost simultaneously, but yet behind by that fatal quarter of an hour which determined the fate of so many enterprises, and of so many human beings, both men and women, Mr. Stevens produced, independently of Fulton's plans and improvements his steamboat 'Phoenix;' but, prescribed by the monopoly which Fulton's success had obtained for him of the waters of New York. Mr. Stevens first employed her as a passage boat between this city and New Brunswick, and finally conceived the bold purpose of sending her round to Philadelphia by sea, and he executed it successfully. His son, Robert L. Stevens, went around with the boat in the month of June, 1808. A fierce storm overtook them. A schooner, in company was driven out to sea, and was absent many days; but the 'Phoenix' made a safe harbor at Barnegat, whence, when the storm abated, she proceeded safely to Philadelphia, and plied many years between that city and Trenton."

The piston rod of the "Phoenix" was guided by slides instead of the parallel motion of Watts, and the cylinder rested on the condenser. Stevens also surrounded the water wheel by a guard-beam.

Among the patents taken out by Colonel John Stevens, was one in 1791, for generating steam; two in the same year described as improvements in bellows, and on Thomas Savory's engine both designed for pumping; the multi-tubular boiler in 1803, which was patented in England in 1805, in the name of his eldest son, John C.; one in 1816 for using slides.

On Oct. 11, 1811, he established the first steam ferry in the



THE "PHŒNIX"
The First Sea-Going Steamship Making Barnegat Inlet, N.J., in a Storm 1809

world, with the "Juliana," which plied between New York City and Hoboken. In 1813 he invented and built a ferry boat made of two separate boats with a paddle-wheel between them; this was run by horses.

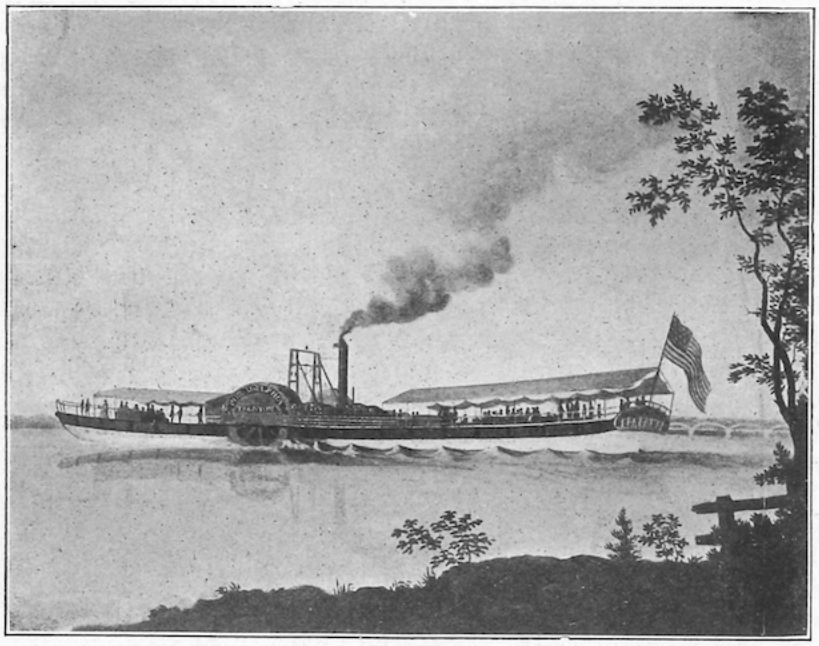
The "Stevens Indicator" for July, 1895, gave the following description of this boat:

"The steam ferry-boat 'Juliana' here referred to, was built by Col. Stevens in 1811. She was an undecked, open boat, 62 feet in length, and only 12 feet in breadth, drawing from two-and-a-half to three feet of water. The engine in her was the model patented by Col. Stevens, having a cylinder 14 inches diameter and two-and-a-half feet stroke; with copper boilers, cylindrical, with flues. The steam was used expansively, cut off in the main valves as is now done in the most approved engines. The 'Juliana' attained a speed of seven miles an hour. Mr. Fulton having an interest in the Jersey City ferry, objected to the right of Col. Stevens to run the 'Juliana' as a ferry-boat between Hoboken and New York city, as infringing his monopoly from the State of New York, and the 'Juliana' was driven off. She afterwards plied on the Connecticut River between Middletown and Hartford, being the first boat to navigate the Sound, although undecked, as Col. Stevens's boat, 'Phoenix,' was the first, in 1808 to navigate the ocean between Sandy Hook and the Delaware."

Mr. J. Elfreth Watkins, E. D., Curator of the Department of Transportation of the National Museum, Washington, D. C., said at a public gathering:

"Over a century ago, in 1792, John Stevens, of New Jersey, took out a patent in the United States to propel boats by steam. He experimented continuously until 1804, when he invented and constructed the first steamboat to navigate the waters of any country, driven by a screw. A model of this twin propeller boat, belonging to the United States National Museum is before us. The original machinery is also in Washington.

"The boat was successfully operated three years before Fulton obtained fame and fortune by putting his English engine, built by Watt, in an American hull, afterwards called the Clermont. . . . The limit, the utmost speed, which Fulton hoped or thought it possible to attain was seven miles an hour, and that he in later boats accomplished; but it was again for the name of Stevens, in the person of Robert L. Stevens, after long, and numerous experiments, cautiously conducted and tested, as to the form of vessel best calculated to overcome the resistance of the dense medium through which it was to make its way, to send forth on the Hudson—the monopoly law of the State of New York having meanwhile been overruled by the Constitution of the



THE "PHILADELPHIA," OR "OLD SAL"
Built in 1813

United States—a boat as superior in size and equipment, as in speed, to all before it, and to travel at the rate of thirteen and a half miles an hour. . . . But when the 'New Philadelphia,' R. L. Stevens's boat, in 1814, started forth at the rate of thirteen and a half miles an hour, even the senses were disturbed; philosophy, which had calculated only the resistance of the medium to the forms then usual, was at fault, and what had actually been done was pronounced impossible. But the steady, far reaching mind of the younger Stevens knew the secret of his success—that it was due to the form he had given his vessel. He saw, too, after some trips, that even that form was far from the perfection he had designed, and accordingly he went to Brown & Bell then, and even yet, I believe—eminent shipbuilders, and begged them to put on the 'New Philadelphia' a long, sharp, false bow of which he gave them the drawings. After considering the proposition they declined, declaring themselves unwilling to encounter the ridicule of what struck them as so unseemly a work, and Mr. Bell added that it would be called 'Bell's nose,' and would be the general laughing stock. Repulsed but not disconcerted, young Stevens, sure of his own conclusions, built a boat at his own shop, put it on, and obtained in consequence an additional speed of several miles an hour.

"With the 'New Philadelphia' commenced the first day line to Albany. This was the commencement of the new models, which alike in clipper steamers and clipper ships, have given to both classes of our build and navigation—our superiority over the world.

"And here let me expatiate a little upon the service to the mechanic arts, and consequently to the welfare of humanity, of the family of Stevens, resident during the half century among us. We have seen that by the lucky quarter of an hour Fulton carried away from Stevens the prize for the first successful steamboat. But years before, namely, 1804, Col. Stevens, whose fertile and ingenious mind was specially turned to mechanical inventions, had constructed and put into operation a steamboat of which the motive power was a propeller, which at this day, I believe, is admitted, in form and proportion to be the best. This boat was a small one. In it Col. Stevens put an engine with tubular boilers, the first ever made, now universal in locomotives. The machinery, made under his own direction and in his own shop at Hoboken, set in motion two propellers of five feet diameter each, and each furnished with four blades, having the proper twist—to obtain which he had the greatest difficulty with his workmen—and set at an angle of about thirty-five degrees. This vessel—used only for testing the possibility of steam naviga-

tion—so completely demonstrated the fact that Col. Stevens applied it on a large scale in 1806 to a pirogue 50 feet long, 12 feet wide, and 7 feet deep—which attained very considerable speed. Encouraged thereby, he commenced the 'Phoenix' with side-wheels to whose success allusion has already been made. It is proof of the remarkable accuracy and mechanical skill of the Hoboken workshop that the engine of the first small propeller, carefully preserved, was set up again more than seven or eight years ago, in a new vessel, and, without altering a screw, worked most successfully. The old hull and the blades of the propeller are yet in existence in Hoboken."

Robert L. Stevens, second son of Col. John Stevens, probably made more improvements in steamboat construction than any one who ever engaged in the enterprise Inheriting all those qualities that made his father famous as an engineer and promoter, his active mind conceived new ideas and solved difficult problems that the most skilful shipbuilders rejected as chemerical and impossible of demonstration. He was born in Hoboken, N. J., Oct. 18, 1787, in the very year when his father saw the crude-looking boat of John Fitch moving up the Delaware, and as a lad of seventeen, he assisted in the construction of the first screw steamboat. Two years later, full of ambition and daring he took the "Phoenix" from New York to Philadelphia by sea in June, weathering the raging storm which overtook him, but at once solving the great problem of ocean navigation. Barred, as he and his father were, from open competition on the Hudson, owing to the monopoly of Livingston they determined simply to take their boat around to the Delaware, and pushed boldly out into the Atlantic, thus out of their deep discouragement, snatching immortal honor.

It was now as a builder of steamboats that Robert L. Stevens made himself famous, each successive boat constructed by him being faster, until, in 1832, with the magnificent "North America," using forced draft, he obtained a speed of fifteen miles an hour.

In 1821 he originated the present form of ferry boat and ferry slips, making his boats with guards encircling them throughout, and constructing the ferry slips with spring piling and spring fenders, the same methods, without any change whatever being still in use. In adopting the overhead working beam (walking beam) of Watt to navigation, he made important improvements, inventing and applying, in 1818 the cam-board cut off, substituting, in 1821, the gallows frame that is now used for the column that supported the working beam, and making that beam of wrought iron strap, with a cast iron centre instead

of purely of cast iron. This he improved in 1829 into the shape that is now universally used. He lengthened the proportionate stroke of the piston, and invented the split water-wheel in 1826. In 1831 he invented the balance valve, which was a modification of the Cornish double-boat valve, and is now always on the beam engine. He placed the boilers on the wheel guards, and over the water, improved the details in every part, and finaly left the American working-beam (or walking beam) engine in its present form. At the same time he strengthened the boiler, beginning with a pressure of two pounds to the square inch, and increasing the strength of the boiler so that fifty pounds could be safely carried. He made the first tubular boiler in 1821, and was among the first to use anthracite coal. In the hulls of vessels he gradually increased the amount of iron fastening until it was finally more than quadrupled, increasing the strength of vessels while diminishing their weight. He reduced the vibration of the hulls by the masts and rods that are now used, and added greatly to their strength by his overhead truss-frames.

From 1815 to 1840 he stood at the head of his profession in the United States as a constructor of steam vessels and their machinery, making innumerable improvements which were generally adopted. In the address of President Charles King, already referred, he said in closing: "Robert L. Stevens will be remembered as the greatest American mechanical engineer—a most intelligent naval architect—to whom the world is indebted for the commencement of the mightiest revolution in the methods of modern naval warfare."

Mr. Stevens constructed what is known as the Stevens Battery, and his invention of the elongated shell are facts familiar to most American readers, a description of which is unnecessary in a work of this character.