tense heat to be developed, and consequently produce very perfect combustion, as evidenced by the absence of smoke from the top of the chimney. The results of these tests, coupled with our own observations, lead us to the conclusion that Mr. Engert has so far, established a claim to having advanced the question of steam boiler efficiency in a very important degree. —*Iron.*

THE FIRST STEAMBOAT.

A telegram from Trenton, New Jersey, announces the important fact that a search among the old State records shows that Robert Fulton was not the inventor of the first steamboat, and that John Fitch was the inventor, having run a steamboat on the Delaware river some twenty years before the launching of Fulton's steamboat on the Hudson. It will now be settled in the minds of those who read the article from Trenton that Fitch invented the steamboat, and for generations this fiction will become an accepted fact, and be believed by vast numbers of people. It will be accepted for the reason that it appeared in a newspaper as from the State records of New Jersey, and for the further reason that it ascribes the invention to an American. There is in every country an intensely patriotic desire to retain the credit for all inventions—as, for instance, Holland and Germany both claim to have invented the process of using movable types for printing; England, America, France, and one or two other countries claim the discovery of appliances for the employment of steam. The same three countries insist, each for itself, that it was the inventor of the processes of using electricity as a means of communication between distant points, and what is true of steam is also true of the telephone.

The steamboat is not the invention of Robert Fulton, John Fitch, or any other man. It is a development of many centuries, having been the result of a slow evolution. The paddle-wheel was known to, and was in use among the Romans; and this mechanical appliance constituted the essential difference between the steamboat built by Fulton and that of Fitch and others. The Spaniards claim a long priority in the use of steam for the propulsion of water craft. Our late minister to Spain, Hon. Geo. Marsh, has translated a document found in the national archives, in which there is an official account of an experimental trial of a vessel constructed by Blasco de Garay, a sea captain, which moved in all directions without sails or oars, and whose machinery "consisted of a large caldron of boiling water, and wheels of propulsion attached to the side of the ship." The experiment was witnessed by several of the highest dignitaries of the empire, by whom the account is furnished, and who made a highly complimentary report to the emperor, Charles V. The sole exception was Treasurer Renargo, who, for some reason, was unfriendly, and condemned the invention as being dangerous from the liability of the caldron to explode, and the complicated and expensive character of the machinery. This was in 1543 just two centuries before the birth of Fitch. Papin, a well-known Frenchman, published a work in 1690, in which he describes a steamer to be moved by paddles and built one in which a steam-pump was used to raise water to a certain height, which then was poured on the paddles of the vessels, as is done in the case of an overshot wheel. His boat was destroyed by a mob of watermen, under the impression that his invention would take the bread out of their mouths.

In 1736, Jonathan Hull, of England, described a method of propelling a vessel by steam, in which he placed the paddle at the stern. From this period to 1760 there were plans submitted for the propulsion of vessels by steam by Bernouilli, a Frenchman, Genevoise, a Swiss clergyman, and Abbe Gauthier, of France. At the close of this period, the United States appear on the field. William Henry, a Pennsylvanian, went to England, where he inspected Watt's invention, and on his return constructed an engine and placed it on a boat fitted with paddle-wheels. He ran it for a time on the Conestoga river, when by accident it was sunk. There is no doubt as to Henry's being the first to "bring out" a steamboat in this country.

In 1781, the Marquis Jouffroy constructed and ran a steamboat on the Seine; but, as the government declined to extend its aid, he dropped the steamboat and returned to the army. Three years later, James Rumsey, of Virginia, constructed a boat which was propelled by using steam to draw water in at bow and force it out at the stern. So convinced was the State of Kentucky that Rumsey invented the steamboat that it gave a gold watch to his son for the sake of his father, who had "give the world the benefit of the steamboat." A year before Rumsey's experiment, Dr. Franklin and Oliver Evans suggested a method of propulsion precisely similarly to that used by Rumsey. In 1786 John Fitch came to the front with his steamboat, which he declared he invented without the knowledge that steam was being used as a motor. His first model has floats on an endless chain as the propelling mechanism; then he substituted oars operated by steam, and succeeded in navigating the Delaware at the rate of six miles an hour. He and Rumsey had some fierce quarrels as to priority in the use of steam; lawsuits were instituted, and Fitch was ruined.

From the time of Fitch there were steamboats without end, none of which, however, were permanent. In 1788, Symmington, of England, built a steamboat which ran five miles an hour. A year later, the famous Oliver Evans built a dredging-machine which he propelled over land and through the water by steam. In 1801, the Englishman Symmington, built the Charlotte Dundas for Lord Dundas, with a paddle-wheel at the stern, and which was a complete success. Robert Fulton saw this steamer, and all the other models in Europe and in this country, and in 1807 he launched the Clermont in the Hudson river. Since the launch of that vessel the use of the steamboat has been unbroken.

If anyone from the reading of these facts is prepared to say who is the inventor of the steamboat, he must be the possessor of more than human sagacity. If the Spanish accounts of the experiment of Garay were less remote as to time, the credit would rest, so far as the records cover the ground, with this Spanish adventurer. It is, however, agreed to regard the paper taken from the national archives as being apochryphal in its assertions. In fine, the facts show that the steamboat was not invented by any one man, but was gradually evolved during the last 150 years. —*Chicago Times.*

ELECTRIC LIGHTING IN AMERICA.

At a recent meeting of the Society of Arts held at London, the chair was taken by Sir F. Bramwell, and a paper was read by Mr. W. H. Preece, F.R.S., who described electric lighting as he saw it during his late visit to the United States. Electric lighting, he said, was flourishing in America much more than at home. There were probably 90,000 arc lamps alight every night in the States, and there were many central stations working regularly, both with arc and with glow lamps. Contrasting the brilliantly illuminated avenues of New York with the dull and dark streets of London, he stated that on the evening of October 21 he drove from the Windsor Hotel, New York, to the Cunard Wharf, a distance of about four miles, through streets entirely lighted by electricity. On the 30th of October, he drove from Euston to Waterloo, without seeing a single electric light. He visited Montreal, Philadelphia, Buffalo, Cleveland, Chicago, St. Louis, Indianapolis, Boston, and New York, and found in each city the principal streets and warehouses, as well as stores and places of public resort, lighted by arc lamps. It was with arc lighting that the greatest advances had been made in the States. One manufacturer told him that he was turning out 800,000 carbons for arc lamps per month; another said that his output of plant was 50 arc lamps and three dynamos per day; and while he was present at a third factory an order was received for an electric lighting plant of 330 arc lamps requiring 14 24-light dynamo machines, intended for an installation to light up a park in the environs of Chicago.

In that city the number of arc lamps installed had doubled, increasing from 1000 to 2000 during the past 12 months. More than one electric light company paid dividends to its shareholders, and all the manufacturers as well as the lighting companies seemed to be full of work. The principal system in use there, for arc lamps, the Brush, the Weston, and the Thomson-Houston; but they were other arc systems, not so well known on this side of the Atlantic, such as the Hochhausen, the Van de Poel, the Western Electric, the Fuller, the Sperry, etc.; for glow lamps, the Edison and the Weston. Mentioning a considerable improvement which had been made in the Brush dynamo machine, he gave some account of the Western system, which, looked at from a mechanical point of view, struck him as being probably the best in use in the States. Of the Thomson-Houston system, unknown at present in England, and containing some considerable and ingenious novelties, he gave a more detailed account. The Hochhausen system was known in this country from its recent use at the Health Exhibition.

Visiting central stations in various towns, he found 164 Thomson-Houston arc lamps alight in the public streets and