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VOL. X.

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BOSTON:  
HILLIARD, GRAY, AND CO.  
LONDON:  
RICHARD JAMES KENNETT.  
1839.

**LIVES**  
**OF**  
**ROBERT FULTON,**  
**JOSEPH WARREN,**  
**HENRY HUDSON,**  
**AND**  
**FATHER MARQUETTE.**

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LIFE  
OF  
ROBERT FULTON,

BY  
JAMES RENWICK, LL. D.

VOL. X.

1

# ROBERT FULTON.

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## CHAPTER I.

### *Introduction.*

THE gratitude of mankind has not failed to record with honor the names of those, who have been the inventors of useful improvements in the arts. However quiet and unassuming they may have been in their lives; however strong the influence of prejudice, or interested opposition, in robbing them of all direct benefit from their discoveries; posterity has never failed to reverse the judgment of their contemporaries, and award the deserved, although perhaps tardy, meed of praise.

In the early history of our race we find, that such acknowledgments for important discoveries did not stop short of the attribution of divine honors to the shades of the illustrious benefactors, who had advanced the progress of civilization, or increased the comforts and the conven-

iences of social life. Although veiled by the mist of unnumbered ages, and shrouded in the obscurities of fabulous narration, the records of authentic history disclose to us the time, when the inventors of letters and the plough were revered as divinities; and such honors did not cease to be rendered, until the influence of revealed religion put an end to all idolatrous worship among civilized nations. If there can ever be an excuse, in the absence of the divine light, by which alone the path of true piety can be directed, for ascribing to the creature honors due to the Creator alone, that idolatry is the least worthy of blame, which canonizes those who have proved themselves benefactors of our race.

In remote times, when the means of improving the faculties of the mind, which are now familiar to us, were wanting, to invent was the attribute of superior and lofty genius alone. As society made progress, and the means of education were extended, minds of a more ordinary character might be made to grasp some particular subject, to detect the deficiencies of existing processes, and study the means of improving them. Hence even inventions acknowledged to be original, and attended with the most happy consequences, no longer raise the author to such preëminence among his fellow men, or entitle him to so large a portion of posthumous renown.



At the present day, the stock of mechanical and practical knowledge, handed down by tradition, or preserved by means of the press, has become so enormous, that the most brilliant discovery in the useful arts bears but a small proportion to the whole extent of human knowledge. In remote times, the aids, which modern inventors derive from the records of the reasonings, the combinations, and even the abortive attempts of others, were wholly wanting; and, if no one of the inventions of antiquity, when taken by itself, can rank in apparent importance with some of modern date, the former were in many instances far more conspicuous as steps in the progress of human improvement. In many cases, too, they must have produced an almost magical effect upon the comforts, the happiness, and even on the means of sustaining the lives, of men at the time.

While the rights of property, even of a material character, were imperfectly understood, and those of an immaterial nature unknown, he, who by his inventions had made himself a benefactor of his species, sought no other reward than public consideration and popular applause. Thus it may, and no doubt did, often happen, that the early improvers of the arts derived not only present reputation, but power and influence from their discoveries, as surely as they became entitled to the gratitude of posterity. The wants

which grow upon man at each step towards high civilization, were not yet made manifest ; and it was neither necessary to keep processes in the arts secret, lest others should anticipate the due reward of their discovery, nor to seek the protection of laws for the security of an exclusive use to the inventor. Those who reaped the benefit of a new art, or enjoyed the advantages of an important discovery, were not called upon to pay in money for the use of them ; and thus reaped all these benefits and advantages, without being compelled to furnish an equivalent. Honor, praise, and posthumous fame are of no cost to those who award them, and are, therefore, willingly allowed ; while pecuniary compensation is often dispensed with a niggard hand, and the demand of it creates anger, or arouses opposition.

In the dawn of civilization, inventions were usually unexpected, and, although often calculated to supply the most pressing wants, excited surprise, because the wants themselves had not been perceived. At the present day, discoveries often appear as the almost inevitable result of previous improvements. Several projectors are oftentimes in pursuit of the same object, and this, one which the admitted wants of society point out as important to be attained ; and he, who finally achieves success, is exposed to the envy,

the competition, and the detraction of his less fortunate rivals. Inventions often derive their highest merit from their peculiar adaptation to the circumstances of the times; the very method, which comes at a given instant into immediate and successful operation, may have floated in the minds of earlier inquirers, or even have assumed the form of a working model; and yet, for the want of some collateral improvement, or through the absence of public demand, may have fallen into neglect, and been wholly forgotten. But, no sooner has the successful step in invention been taken, and at a fitting time, than all forgotten, neglected, or abortive attempts at the same great end, are raked from the oblivion to which they had been consigned, and blazoned to the world as the types or originals of the improvement.

In addition to the annoyance and opposition, which may thus arise from rivals and detractors, inventors are subjected to inconvenience from the policy of the legislative provisions by which it is attempted to secure their due reward. In most countries, this is made to assume the odious form of a monopoly; and the public feeling is thus speedily enlisted in opposition to the chartered or patented privileges. An expensive lawsuit, determined resistance, or cunning evasion, is often the sole reward, with which the most

important inventions are attended during the lifetime of their authors.

The highest degree of merit is to be awarded, in the present age, to those, who, aware of the wants of a community, or of the world at large, set to themselves as a task, the discovery of the means of supplying these wants. In such pursuits, great learning and research must be united to high mechanical skill. All the attempts which have been previously made to attain the same object must be carefully studied ; the causes of their failure inquired into ; and whatever may exist in them of good and applicable, separated and recombined. Such inquiries often demand the united exertion of high ingenuity and profound science ; yet those, who pursue them, taking for the foundation of their researches the discoveries and ineffectual attempts of others, often appear to be wholly wanting in ingenuity.

When, however, we examine to whom we are actually indebted for the practical benefits we enjoy, no possible comparison can exist between the merits of those who have thrown out the original, crude, and, in their hands, impracticable ideas, and those who, by a happy union of mechanical skill and scientific knowledge, have brought the plans to a successful application. Yet to this most valuable class of improvers of the arts it is difficult, if not impossible, to as-

sign, by legal enactment, any adequate remuneration. There are few instances in which they have not been deprived of their just meed of recompense, if they have attempted to secure it by patent. The shades, which separate the incomplete and abortive attempt from the finished and successful invention, are often almost insensible, and admit of no technical specification. A remedy has at last been found for this defect. The calling of the civil engineer has taken its just station, in point of honor and emolument, among the learned professions; and it has become almost disreputable for its members to attempt to appropriate their mental riches by patent rights. They in return reap no inadequate reward in the direct emoluments to which their advice and services are now considered as entitling them.

In the days of the subject of our memoir, this profession was hardly known by name among us; its value was not understood by the community; and the proper means of rewarding it unknown. It was, therefore, his misfortune, that he sought, although ineffectually, to secure by exclusive legislative grants, and the monopoly held out by the patent laws, that reward which in a more happy state of things would have been attained in a more efficient and less obnoxious manner.

If we consider Fulton as an inventor, it may

be difficult to say, in what exact particular his merits consist. As the blow of the mallet, by which the mighty mass of a ship of the line is caused to start upon its ways, in the act of launching, is undistinguishable among the numerous strokes by which that mass is gradually raised, so the minute particulars, in which his labors differ from former abortive attempts, may almost escape research. But, if we contemplate him in the light of a civil engineer, confidently building a finished and solid structure upon the incomplete foundation left by others, we must rank him among the first of his age, and place him, in the extent of his usefulness to mankind, as second to Watt alone.

## CHAPTER II.

*Birth of Fulton.—He chooses the Profession of a Painter.—His early Taste for Mechanics.—He settles in Philadelphia.—Embarks for England.—Resides in the Family of West.—Removes to Devonshire.*

ROBERT FULTON was born at Little Britain, in Lancaster County, Pennsylvania, in the year 1765. His parents were respectable, although far from affluent; his father a native of Ireland, his mother descended from an Irish family. From his name it appears probable, that his more remote ancestors were of Scottish origin, which is in some degree confirmed by their profession of the Presbyterian faith. Fulton himself attached no importance to circumstances of birth, and took pride in being the maker of his own fortune, the probable founder of a family. Indeed, except so far as an elementary education is concerned, he was under little obligation to his progenitors; being left without patrimony at the death of his father, which occurred when he was but three years old.

Aware that he was to trust entirely to his own exertions, even for the means of subsist-

ence, he cultivated from an early age a taste for drawing, in the hope of qualifying himself for the profession of a painter. To these exertions he was probably stimulated by the reputation and honors acquired by West, who, with advantages of education and connexion little superior to his own, had raised himself to the first rank, not only among the painters of England, but of the civilized world.

From a familiar acquaintance with his performances as an artist, at a later date, when he applied to the easel merely as a relaxation, it may be stated, that there is little doubt, that, had he devoted himself to the profession of painting, he must have become highly distinguished as a professor of that art.

Painting, although chosen by him as a profession, had less charms for him than the pursuits of practical mechanics; and it is recorded of him, that, while yet a mere child, he spent hours, usually devoted at that age to play, in the workshops of the mechanics of Lancaster.

At the early age of seventeen he proceeded to Philadelphia, for the purpose of practising as a painter of portraits and landscapes, and was so successful, as not merely to support himself, but to lay up a small amount of money. His first savings were devoted to the comfort of his widowed mother; and, before he reached the age



of twenty-one, he had, by the joint aid of strict economy and persevering labor, acquired sufficient funds to purchase a small farm in Washington County, Pennsylvania.

The journey to that region, for the purpose of establishing his mother upon this purchase, opened new views to him for the occupation of his future life. His patrons in Philadelphia had been among the humbler classes; and, although he must have sighed for an opportunity of visiting those regions in which alone good models of taste, and specimens of excellence in painting, were then to be found, yet, friendless and alone, he could hardly have hoped that such aspirations would be realized.

On his return, however, from Washington County, in the unrestrained intercourse of a watering-place, he found acquaintances, who were both able to appreciate his promise as an artist, and to facilitate his plans of improving himself as a painter. By these he was advised to proceed immediately to England, and throw himself upon the protection of West; and the means of favorable introduction to that distinguished artist were tendered and supplied. It is to be recorded to the honor of West, that he was the zealous and efficient promoter of the interests of all his countrymen, who desired to study the art in which he himself excelled.

To Fulton even more than usual liberality was vouchsafed; he was at once invited to become an inmate of the house of the great artist, and remained his guest and pupil for several years.

The wealth and taste of the British nobility have gradually accumulated in that island many of the finest specimens of the pictorial art. Although many of these are now assembled in collections at their residences in the metropolis, a still greater number are distributed through the numerous and magnificent baronial residences, with which the agricultural regions of England abound. At the period of which we speak, the formation of collections in London had hardly been thought of; and he who wished to profit by the treasures which the superiority of British wealth had drawn from the continent, or which munificent patronage had commanded from the artists themselves, was compelled to perambulate the kingdom.

In order to avail himself of these scattered riches, Fulton, on leaving the family of West, procured introductions to the stewards and agents to whom the care of their estates and collections are committed by the nobility, and commenced a tour. We find him, in consequence, a short time after he left London, at Exeter, in the County of Devon. He was for a time domiciliated, as we have been informed, at Pow-

derham Castle, the chief seat of the Courtenays. This family draws its proud lineage from the Merovingian kings, the emperors of Constantinople, and the Plantagenets. In wedding an heiress of the family, a Capet assumed the name as more distinguished than his own; and the pretensions of the English branch to the throne of that kingdom, roused the vengeful jealousy of the Tudors. The fatal consequences of such lofty claims had confined the ambition of the succeeding possessors of Powderham to the cultivation of the arts, and the castle became filled with masterpieces.

Fulton seems to have entitled himself to the patronage of the possessor of the title. He at any rate was for a time an inmate of this magnificent baronial residence, and was occupied in copying the pictures it contains. Affecting on their own domains a state little less than that of royalty, the barons of Powderham left the entertainment of guests undistinguished by rank to their steward, himself a gentleman by connexion and education. It is, therefore, no derogation to Fulton, however repugnant it may be to our notions of equality, that, in enjoying the advantages which this rich collection afforded him as an artist, he was the associate, not of the lord of the mansion, but of one whom we may consider as his upper servant. Envy has not failed to point at this period of Ful-

ten's life as a matter of reproach, and to treat him as having been at this time the companion of menials, if not actually so himself.

Whatever may have been the nature of Fulton's obligations to this noble family, he did not hesitate to express his gratitude for them; and, in the height of his subsequent reputation, he had an opportunity of repaying them. The heir of the title and the fortunes of the Courtenays became a refugee in our land, under circumstances of disgrace and humiliation, even more terrible than those which led to the assumption of the mournful motto of his race.\* Suspected and accused of an infamous crime, his birth and title, which have in many other instances served as passports even for vice and frivolity to American hospitality, did not avail him, and every door was closed against him except that of Fulton. The feelings of Fulton were probably those, which lead the benevolent to minister to the comforts, and to soothe the mental anguish of the last hours of the condemned criminal; but, in the instance we allude to, it required not only the existence of such feelings, but a high degree of courage, to exercise them, in the face of a popular impression, which, whether well or ill founded, was universally entertained.

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\* Ubi lapsus, quid feci?

## CHAPTER III.

*His Acquaintance with the Duke of Bridgewater and Earl Stanhope. — His Removal from Devonshire, and Residence in Birmingham. — He abandons Painting for the Profession of an Engineer. — His first Idea of a Steamboat communicated to Stanhope. — He makes the Acquaintance of Watt.*

FULTON remained for two years in the neighborhood of Exeter, where his intelligence and ability obtained for him many useful and interesting acquaintances. Among these, the most important were the Duke of Bridgewater and Earl Stanhope. The first of these noblemen fills a large space in the history of the internal improvements of Great Britain; and he was in fact the father of the vast system of inland navigation, which has spread its ramifications over every accessible part of that island. Born to the inheritance of an extensive estate, abounding in mineral wealth, he was, notwithstanding, comparatively poor, because that estate was unimproved; and his mines were useless, because inaccessible.

At that moment, no better mode of supplying the growing town of Manchester with coal had

been introduced, than to convey it in sacks upon pack-horses. The Duke of Bridgewater was not slow to perceive the vast advantages which might be derived from the introduction of a better and cheaper mode of carriage. English writers have not hesitated to ascribe the plans of canal navigation, which he adopted and carried into successful operation, to the unassisted native genius of his engineer, Brindley. Yet it cannot be believed that the Duke was wholly ignorant of the celebrated canal of Languedoc, in which the structure of canals and all their accessory works had attained, in the hands of Riquet, the projector, and by the improvements of Vauban, a degree of perfection, which has hardly been surpassed even at the present day. It is not within the limits of our subject to inquire, whence the ideas, which directed the Duke's operations, were derived. Suffice it to say, that, after a series of appalling difficulties, after having been brought to the verge of ruin, and after having narrowly escaped being confined as a lunatic, he succeeded in his enterprise.

At the moment that Fulton made his acquaintance, the Duke was in the full enjoyment of the vast wealth, which his success had created, a wealth at that time unexampled in annual amount, even in Great Britain; and of the high reputation, which, so often denied to talent and genius,

while struggling with difficulties, is liberally ascribed to successful projectors. His canals became the models for similar enterprises, and himself, from his rapid accumulation of capital, the largest proprietor of many new navigation companies. It appears to have been at the instance of this distinguished man, that Fulton abandoned painting as a profession, and entered into that of a civil engineer. We at any rate next find him residing in Birmingham, and engaged in the construction of the canals then making in that vicinity, by which that great workshop was brought into communication with the ports of London, Liverpool, and Bristol. Fulton's name does not, however, figure upon the list of the principal engineers engaged in these important works; and he, no doubt, filled no more than a subordinate station, as might, indeed, have been anticipated, from his inexperience and youth.

With Earl Stanhope, Fulton's intercourse was still more intimate, and probably of an earlier date. This nobleman was endowed by nature with high mechanical talent, which had been improved by an education very different from the mere classical routine to which the youth of the higher classes in Great Britain are usually confined. Had he been impelled by the stimulus of necessity, there is little doubt, that he

might have become distinguished as a successful inventor. As it was, he exhibited practical skill as a canal engineer; but here his reputation faded before the prior claims of the Duke of Bridgewater; while his inventions remained incomplete, and few of them have been carried into effect.

Among other projects, this peer entertained the hope of being able to apply the steam engine to navigation, by the aid of a peculiar apparatus, modelled after the foot of an aquatic fowl. On communicating this plan to Fulton, the latter saw reason to doubt its feasibility; and, in consequence, addressed a letter to his Lordship, in which the very views were suggested, that were afterwards successful upon the Hudson. This letter was written in 1793, immediately before the removal of Fulton from Devonshire to Birmingham. The justice of Fulton's objections to the plans of Earl Stanhope was afterwards demonstrated in an ineffectual experiment made by the latter in the London docks. It is to be regretted, that this experiment had not been made before he received the communication of Fulton. His Lordship might then have received it with the same feelings, which Chancellor Livingston afterwards exhibited, when marked failure had attended his own plans. In this event, the important invention of a successful steamboat might have been given to the world



ten years earlier than its actual introduction. Although prejudiced in favor of his own invention, Earl Stanhope did not fail to appreciate the ingenuity of Fulton, and became his warm friend on a subsequent occasion, when his influence with the British ministry enabled him to aid Fulton's views.

Fulton's residence in Birmingham brought him into communication with Watt, who had just succeeded in giving to his steam engine that perfect form, which fits it for universal application as a prime mover. That Fulton became intimately acquainted, not only with Watt himself, but with the structure of his engine, we learn from two facts in his subsequent life; for we find him entering into a confidential correspondence with that great improver of the application of steam, and actually superintending the construction of an engine, in a place where no aid was to be obtained.

To have become favorably known to such men as Bridgewater, Stanhope, and Watt, and to have received the patronage of the first of them, is no small proof of the talent and acquirements of Fulton at an early age. Those, who know the artificial structure of British society, understand the nice distinctions by which the several degrees of rank are separated from each other; and, although it is no doubt true, that those

who are possessed of the highest rank are not deterred from associating with any persons in whom they may take an interest, by the fear of losing caste, which has so powerful an influence upon those whose position in society is not firmly established, still the higher circles are fenced in by artificial barriers, which, in the case of an unfriended and humble foreigner, can be forced only by obvious merit. When, therefore, the detractors of Fulton's fame venture to characterize his productions as wanting in originality, "either of matter or manner," we may confidently appeal to this part of his early history for the refutation of their aspersions.

## CHAPTER IV.

*His Plan of an Inclined Plane. — Work on Inland Navigation. — His Torpedo. — His Removal to France, and Residence there.*

THE residence of Fulton in Birmingham is distinguished from the other parts of his early history by a number of patented inventions and several published works. The more level parts of Great Britain had now been rendered accessible by canals, and some projects were entertained for penetrating by the mode of artificial navigation into the mountainous regions.

In the primitive form of canals, of which a specimen still exists in the great canal of China, two methods of passing from one level to another had been practised,—the sluice and the inclined plane. An addition, probably growing out of an accidental circumstance, had converted the former into a lock; but the inclined plane had remained without improvement. It is, however, obvious, that, could it be rendered self-acting, as the lock is, it was susceptible of far more extended application. The lock is necessarily limited to small changes of level, while the inclined plane will adapt itself to every possible

variation in the surface of the ground. If, then, locks be taken as the basis of a plan of inland navigation, it will necessarily be confined to countries of little elevation; while one based upon the inclined plane may overcome considerable elevations.

Impressed with the advantages which would attend the introduction of the inclined plane in inland navigation, Fulton applied his fertile ingenuity to plan one. For this he took out a patent, in the year 1793, and in 1796 embodied it with other projects of a similar nature in a work on Inland Navigation. At the time when he wrote, the engineers of England were engaged in reducing their canals to the smallest practicable dimensions; for it had been ascertained, that the capacity for business of the large canals far exceeded any trade, which had yet made its appearance upon them. The object of Fulton's work appears to have been to show, that canals, of dimensions below the smallest which had yet been proposed, were capable of being successfully applied, and that such canals were not necessarily limited to countries of small differences of level. Considered in reference to this object, the work is a masterly one; but, if we test it by inquiring, whether canals of such small dimensions are adapted to general purposes, we shall find, that his argument rests upon an in-

sufficient foundation. This work is, therefore, to be quoted as exhibiting a high degree of originality, ingenuity, and talent, but as inapplicable to any useful purpose.

The war of the French revolution had broken out a short time before Fulton's removal to Birmingham. In him, as a native of a republican country, and deriving his earliest impressions from the events of the struggle between America and the mother country, there is little doubt that the cause of the French democracy must have excited a powerful sympathy. Such sympathy was felt not only by a majority of the American people, but by a large portion of the population of Great Britain. The crimes and excesses, with which that revolution was stained, speedily excited the indignation of Britons; and Pitt was enabled to apply that indignant feeling to the support of the war in which the two rival nations were speedily engaged.

It is probable that a similar revulsion of feeling took place in the breast of Fulton. But, in the year 1796, the excesses of the French revolution had ceased, while, at the same moment; a system of aggression and insolent exertion of her power upon the ocean, had been manifested by Great Britain. By this system, the United States were the greatest sufferers. Our flag afforded but little protection for prop-

erty, and none for personal liberty, against the license of British naval commanders. Fulton shared deeply in the resentment which this conduct excited in every American breast; a resentment which finally led to the war of 1812. The power of Great Britain resting to so great an extent upon her naval supremacy, the thoughts of Fulton were turned to the discovery of a method, by which the boasted skill of her seamen might be set at nought, and her numerous vessels rendered inefficient in maintaining her maritime superiority. Fulton was old enough to have heard of the abortive attempt of Bushnell upon the British fleet in the harbor of Philadelphia; and, although this had failed, from being planned upon erroneous principles, enough of alarm had been excited, and such a degree of confusion caused, as to encourage him to attempt to improve upon it. It was obvious, that no encouragement was to be hoped from the government of Great Britain towards experiments upon a mode of warfare whose success would destroy her principal arm; nor could Fulton with any propriety have asked aid from it. It was otherwise with France. The insolence, with which she also invaded the rights of neutrals, had not yet been clearly manifested; and Fulton, with many others, saw in her Directory the champions of the liberty of the seas. As such, he

felt justified in offering the fruits of his ingenuity to that government. Abandoning, therefore, his pursuits as a civil engineer, he proceeded to Paris, for the purpose of completing the detail of his plan, and of seeking assistance to bring it to the test of experiment.

To his instrument for destroying vessels of war, he gave the name of the *Torpedo*. It consisted of an oval copper case, charged with gunpowder. To this he proposed to attach a lock, regulated by clock-work, which, after any required time, might cause the lock to spring, and thus communicate fire to the charge.

It would be painful to follow Fulton through that period of life in which he appeared under the character of a projector, soliciting the patronage, first of the government of France, and subsequently, when he had been dismissed with contumely by Napoleon, from that of England. Without venturing to give an opinion on the influence that his *Torpedo* might have had upon warfare, it may be safely stated, that, in the hands of bold and determined men, it might be applied in a position where it would certainly act, and in acting insure the destruction of the stoutest vessel. As he himself well argues, "its use is attended with risks as great, but not exceeding those to which the crew of a fire-ship are exposed; and there are innumerable instances where

these dangers have been boldly confronted." His plan has the advantage over the fire-ship of being less expensive ; but, like that, is attended with such uncertainty, that it cannot be surely relied upon, and thus cannot be trusted to as the only means of offence.

His subsequent attempts to bring the Torpedo into use, during the war with Great Britain, and for the defence of his native country, although entertained with greater courtesy, were equally fruitless ; and, in the opposition of our own naval officers, he met with obstacles as great, as had stood in his way in the *bureaux* of France, and the public offices in England. It must, therefore, be admitted, that we cannot cite this invention as one which has been brought into successful action. Still, if the fears of an enemy may be received in proof of the value of the Torpedo, it would be easy to cite the sleepless nights and anxious days of many British commanders, who felt, that the vicinity of Fulton's operations was attended with dangers which could only be prevented by unremitting diligence and attention.



## CHAPTER V.

*His Inventions while residing in Birmingham. — His Letters to Washington, and the Governor of Pennsylvania. — His Submarine Vessel. — Experiment with it at the Mouth of the Seine. — He aids in introducing the Panorama into France.*

BEFORE we proceed to the history of the more important of the subjects, which attracted the attention of Fulton, and of which his residence in France was the epoch, we have to mention some other fruits of his ingenuity. While residing in Birmingham, he took out patents for a mill for sawing marble; a method of spinning flax and making ropes; and of excavators for digging canals. If none of these was introduced into extensive use at the time, and if the latter object still remains a desideratum in practical mechanics, the two former at least served as steps in the career of improvement, and have been guides and landmarks to subsequent inventors. These patents bear date in 1794.

Anxious that his views in respect to small canals might be productive of benefit to his native country, a copy of his work on Inland Navi-

gation was transmitted to General Washington, who still held the reins of the government of the United States. This was accompanied by a letter, explanatory of the advantages by which the introduction of his system into America might be attended. With the work itself was published a letter to the Governor of Pennsylvania, in which the same views were enforced, and a comparison drawn between the relative advantages of canals and turnpike roads.

Although the letter to Washington was honored with a reply, in which the merit of Fulton's inventions was admitted, no action followed; for the general government was at that time confined by the necessity of economy to a system of non-interference with local improvements; and it is useless to speculate upon what might have been done by so enlightened an administration, had it possessed the overflowing treasury, which the churlish policy of one of his successors locked up from public use. The letter to the Governor of Pennsylvania produced even less effect. That State adhered pertinaciously to its plan of turnpike roads; a plan, which, if it did create a better mode of communication than had before been enjoyed, was not less expensive than canals on Fulton's plan would have been, and far less beneficial.

Pennsylvania, after a lapse of more than forty

years, has at last seen the mistake which was then committed, and is now engaged in the creation of a system of internal improvement adapted to the great increase which has taken place in its wealth in the interim. But, by this very change, the whole of the capital invested in turnpike roads will be at once rendered unproductive; while, had small canals formed the original scheme, their gradual enlargement to meet the growing wants of the community might have been defrayed out of the income, and the whole capital preserved. It is not probable, indeed, that Fulton's own inventions, or canals of so small a size as he proposed, would have effected the desired object. They in fact could have been useful only in a few limited cases; but that the investment of the funds, which were expended upon turnpikes, in canal navigation, would have been more conducive to the prosperity of the country, is a fact, which will not now be questioned. Fulton, also, during his residence in Birmingham, wrote several tracts on subjects of a general political nature; but, as these do not appear to have been published, or, if published, to have attracted no more than an ephemeral notice, it is unnecessary that we should cite them by name.

In such occupations the time of Fulton was spent until he determined to proceed to France, for the purpose of laying his system of Torpedo

warfare before the government of that country. The investigations, into which he entered for the purpose of completing this system, led him to undertake the construction of a vessel, which might be capable of moving either at or beneath the surface of the water.. So far as the power of easily rising to the surface, and descending at pleasure to any required depth, is a valuable object, this attempt was attended with complete success. But the difficulty of governing a submarine vessel, and of giving to it such velocity as will enable it to move rapidly from place to place, or even to stem a rapid current, is insuperable by the aid of any prime mover which has hitherto been applied. This difficulty is of the same character as that which opposes the management of balloons; and, if any mode of directing the one should be discovered, the power, which will be efficient in the one case, will probably be applicable to the other.

In a boat of this construction, the passage over the wide and stormy estuary of the Seine was safely and easily accomplished, and Fulton with his assistants remained several hours under water. In this position they were supplied with a sufficient quantity of wholesome air, not only for their own respiration, but for lights also. But the actual passage may be said to have been performed wholly on the surface of the water;

for the progress, after the whole vessel was immersed, was so slow as to have no material effect upon the passage. This experiment, then, confirmed the truth of the received opinion, that a body wholly immersed in a single fluid cannot carry the machinery necessary for its own propulsion, and that the valuable properties of ships are due to the circumstances of their position, partly supported upon one fluid, and having the greater part of their bulk buoyed up into a fluid of a different character, and less density. In this position they are easily guided, and the prime movers act with great energy in their propulsion.

The account, which Fulton occasionally gave his friends of his experiments at the mouth of the Seine, was full of thrilling interest. Those, who, in calm weather and in a land-locked harbour, have descended for the first time in a common diving-bell, have not failed to experience the sensations of sublimity which such an enterprise is calculated to awaken. But in this, assured of a supply of air by a perfect and efficient machinery, supported by strong chains, and confident in the watchful attention of an active crew, trained to obey a set of preconcerted signals, the danger is trifling, or rather can hardly be said to exist. How far such sensations must have been increased, may be imagined, when it

is considered, that, in the experiment of Fulton, all the means of safety, and even of insuring respiration, were shut up with him in a narrow space, and that any failure in the action of his machinery would have been followed by speedy suffocation, or by the loss of the power of ever again revisiting the light of day.

Fulton, on leaving England for the continent, carried with him some of the improvements in the arts which had appeared in that country after all commercial intercourse with France had ceased. A short time before, a wealthy American had become the purchaser of a part of the national domain, consisting of a large piece of ground in a central position in the city of Paris. Upon this he was in the act of erecting a number of shops, arranged along the sides of covered passages. In addition, at the suggestion, it is believed, of Fulton, two lofty circular buildings were constructed for the exhibition of Panoramas. These still exist and are applied to their original purpose. It has also been stated, that, in the first exhibitions with which they were opened, much of the attraction was due to the good taste and graphic skill of the subject of our memoir.

## CHAPTER VI.

*Steam Navigation. — Watt. — Eoans. — Fitch.  
— Rumsey. — Miller, of Dalswinton. — Sym-  
ington.*

THE art with which Fulton's name is inseparably connected, as the principal agent in its creation, is that of navigation by steam. That this subject had attracted his attention at an early period, we have already seen; it now remains for us to inquire in what state he found it, and to what extent he carried it.\*

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\* In the first volume of Navarrete's *Coleccion de los Viages y Descubrimientos, &c.*, published at Madrid, in 1825, there is a remarkable statement, in which the invention of the steamboat is ascribed to a Spaniard, three hundred years ago. The particulars were derived from the public archives at Simancas. The following is a translation of a part of this statement.

"Blasco de Garay, a sea captain, exhibited to the emperor and king, Charles the Fifth, in the year 1543, an engine by which ships and vessels of the larger size could be propelled, even in a calm, without the aid of oars or sails. Notwithstanding the opposition, which this project encountered, the emperor resolved, that an experiment should be made, as in fact it was with success, in the harbor of Barcelona, on the 17th of June, 1543.

"Garay never publicly exposed the construction of

Until Watt had completed the structure of the double-acting condensing engine, the application of steam to any but the single object of pumping water, had been almost impracticable. It was not enough, in order to render it applicable to general purposes, that the condensation of the water should take place in a separate vessel, and that steam should itself be used, instead of atmospheric pressure, as the moving power; but it was also necessary, that the steam

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his engine; but it was observed at the time of the experiment, that it consisted of a large caldron or vessel of boiling water, and a movable wheel attached to each side of the ship. The experiment was made on a ship of two hundred tons, arrived from Colibre to discharge a cargo of wheat at Barcelona; it was called the *Trinity*, and the captain's name was Peter de Scarza.

“By order of Charles the Fifth, and the prince, Philip the Second, his son, there were present at the time, Henry de Toledo, the governor Peter Cardona, the treasurer Ravago, the vice-chancellor Francis Gralla, and many other persons of rank, both Castilians and Catalonians; and, among others, several sea captains witnessed the operation, some in the vessel, and others on the shore. The emperor and prince, and others with them, applauded the engine, and especially the expertness with which the ship could be tacked. The treasurer, Ravago, an enemy to the project, said it would move two leagues in three hours. It was very complicated and expensive, and exposed to the constant danger of bursting the boiler. The other commission-



should act as well during the ascent, as during the descent, of the piston. Before the method of paddle wheels could be successfully introduced, it was in addition necessary, that a ready and convenient mode of changing the motion of the piston, into one continuous and rotary, should be discovered. All these improvements upon the original form of the steam engine are due to Watt, and he did not complete their perfect combination before the year 1786.

Evans, who, in this country, saw the possi-

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ers affirmed that the vessel could be tacked twice as quick as a galley, served by the common method, and that, at its slowest rate, it would move a league in an hour. The exhibition being finished, Garay took from the ship his engine, and, having deposited the wood work in the arsenal of Barcelona, kept the rest himself.

“Notwithstanding the difficulties and opposition thrown in the way by Ravago, the invention was approved; and, if the expedition, in which Charles the Fifth was then engaged, had not failed, it would undoubtedly have been favored by him. As it was, he raised Garay to a higher station, gave him a sum of money (200,000 maravedies) as a present, ordered all the expenses of the experiment to be paid out of the general treasury, and conferred upon him other rewards.

“Such are the facts collected from the original registers, preserved in the royal archives at Simancas, among the public papers of Catalonia, and those of the secretary of war for the year 1543.”—See *North American Review*, Vol. XXIII. p. 488.

bility of constructing a double-acting engine, even before Watt, and had made a model of his machine, did not succeed in obtaining funds to make an experiment upon a large scale before 1801. We conceive, therefore, that all those who projected the application of steam to vessels before 1786, may be excluded, without ceremony, from the list of those entitled to compete with Fulton for the honors of invention. No one, indeed, could have seen the powerful action of a pumping engine, without being convinced, that the energy, which was applied so successfully to that single purpose, might be made applicable to many others; but those, who entertained a belief, that the original atmospheric engine, or even the single-acting engine of Watt, could be applied to propel boats by paddle wheels, showed a total ignorance of mechanical principles. This is more particularly the case with all those whose projects bore the strongest resemblance to the plan, which Fulton afterwards carried successfully into effect. Those, who approached most nearly to the attainment of success, were they, who were farthest removed from the plan of Fulton. His application was founded on the properties of Watt's double-acting engine, and could not have been used at all, until that instrument of universal application had received the last finish of its inventor.

In this list of failures, from proposing to do what the instrument they employed was incapable of performing, we do not hesitate to include Savary, Papin, Jonathan Hulls, Perier, the Marquis de Jouffroy, and all the other names of earlier date than 1786, whom the jealousy of the French and English nations have drawn from oblivion, for the purpose of contesting the priority of Fulton's claims. The only competitor, whom they might have brought forward, with some shadow of plausibility, is Watt himself. No sooner had that illustrious inventor completed his double-acting engine, than he saw, at a glance, the vast field of its application. Navigation and locomotion were not omitted; but, living in an inland town, and in a country possessing no rivers of importance, his views were limited to canals alone. In this direction, he saw an immediate objection to the use of any apparatus, of which so powerful an agent as his engine should be the mover; for it was clear, that the injury, which would be done to the banks of the canal, would prevent the possibility of its introduction. Watt, therefore, after having conceived the idea of a steamboat, laid it aside, as unlikely to be of any practical value.

The idea of applying steam to navigation was not confined to Europe. Numerous Americans entertained hopes of attaining the same object;

but, before 1786, with the same want of any reasonable hopes of success. Their fruitless projects were, however, rebuked by Franklin; who, reasoning upon the capabilities of the engine in its original form, did not hesitate to declare all their schemes impracticable; and the correctness of his judgment is at present unquestionable.

Among those, who, before the completion of Watt's invention, attempted the structure of steam-boats, must be named with praise Fitch and Rumsey. They, unlike those whose names have been cited, were well aware of the real difficulties, which they were to overcome; and both were the authors of plans, which, if the engine had been incapable of farther improvement, might have had a partial and limited success. Fitch's trial was made in 1783, and Rumsey's in 1787. The latter date is subsequent to Watt's double-acting engine; but, as the project consisted merely in pumping in water, to be afterwards forced out at the stern, the single-acting engine was probably employed. Evans, whose engine might have answered the purpose, was employed in the daily business of a mill-wright; and, although he might, at any time, have driven these competitors from the field, took no steps to apply his dormant invention.

Fitch, who had watched the graceful and rapid way of the Indian pirogue, saw in the oscillating

motion of the old pumping engine the means of impelling paddles, in a manner similar to that given them by the human arm. This idea is extremely ingenious, and was applied in a simple and beautiful manner; but the engine was yet too feeble and cumbrous to yield an adequate force; and, when it received its great improvement from Watt, a more efficient mode of propulsion became practicable, and must have superseded Fitch's paddles, had they even come into general use.\*

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\* Fitch had sanguine expectations of success; and it appears by the following extract from a letter to Dr. Franklin, dated October 12th, 1785, that he anticipated some of the important advantages of steam navigation, which have since been realized. He says, in writing to Dr. Franklin;

"The subscriber begs leave to trouble you with something further on the subject of a steamboat. His sanguine opinion in favor of its answering the purpose, to his utmost wishes, emboldens him to presume this letter will not give offence. And, if his opinion carries him to excess, he doubts not but your Excellency will make proper allowance.

"It is a matter, in his opinion, of the first magnitude, not only to the United States, but to every maritime power in the world; and he is full in the belief, that it will answer for sea voyages, as well as for inland navigation, in particular for packets, where there may be a great number of passengers. He is also of opinion, that fuel for a short voyage would not exceed the weight of water for a long one, and it would pro-

In the latter stages of Fitch's investigations, he became aware of the value of Watt's double-acting engine, and refers to it as a valuable addition to his means of success; but it does not appear to have occurred to him, that, with this

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duce a constant supply of fresh water. He also believes, that the boat would make head against the most violent tempests, and thereby escape the danger of a lee shore; and that the same force may be applied to a pump, to free a leaky ship of her water. What emboldens him to be thus presuming, as to the good effects of the machine, is, the almost omnipotent force by which it is actuated, and the very simple, easy, and natural way by which the screws or paddles are turned to answer the purpose of oars."

Rittenhouse, after seeing repeated experiments, entertained a favorable opinion of Fitch's machine, as is proved by the following certificate to that effect, given more than two years after the above letter was written.

*"Philadelphia, 12 December, 1787.*

"These may certify, that the subscriber has frequently seen Mr. Fitch's steamboat, which, with great labor and perseverance, he has at length completed; and has likewise been on board when the boat was worked against both wind and tide, with a very considerable degree of velocity, by the force of steam only. Mr. Fitch's merit, in constructing a good steam engine, and applying it to so useful a purpose, will, no doubt, meet with the encouragement he so justly deserves from the generosity of his countrymen, especially those who wish to promote every improvement of the useful arts in America.

*"DAVID RITTENHOUSE."*

improved power, methods of far greater efficiency, than those to which he had been limited before this invention was completed, had now become practicable.

When the properties of Watt's double-acting engine became known to the public, an immediate attempt was made to apply it to navigation. This was done by Miller, of Dalswinton, who employed Symington as his engineer. Miller seems to have been the real author; for, as early as 1787, he published his belief, that boats might be propelled by employing a steam engine to turn paddle wheels. It was not until 1791, that Symington completed a model for him, of a size sufficient for a satisfactory experiment. If we may credit the evidence, which has since been adduced, the experiment was as successful as the first attempts of Fulton; but it did not give to the inventor that degree of confidence, which was necessary to induce him to embark his fortune in the enterprise. The experiment of Miller was, therefore, ranked by the public among unsuccessful enterprises, and was rather calculated to deter from imitation, than to encourage others to pursue the same path.

Symington, at a subsequent period, resumed the plans of Miller, and, by the aid of funds furnished by Lord Dundas, put a boat in motion on the Forth and Clyde canal in 1801,

There can be little doubt that Symington was

a mechanic of great practical skill, and considerable ingenuity ; but he can have no claim to be considered as an original inventor ; for he was, in the first instance, no more than the workman, who carried into effect the ideas of Miller, and his second boat was a mere copy of the first. It is with pain, too, that we are compelled to notice a most disingenuous attempt, on his part, to defraud the memory of Fulton of its due honor.

In a narrative which he drew up, after Fulton's death, he states, that, while his first boat was in existence, probably in 1802, he received a visit from Fulton, and, at his request, put the boat in motion. Now it appears to be established, beyond all question, that Fulton was not in Great Britain between 1796 and 1804, when he returned to that country on the invitation of Mr. Pitt, who held out hopes that his torpedoes would be experimented upon by that government. At all events, we know, that Fulton could not have made the copious notes, which Symington says he took, and we have reason to believe, that he had never seen the boat of that artist ; for the author of this memoir, long after the successful enterprise of Fulton, actually furnished him, for the purpose of reference, with a work containing a draft of Symington's boat, of which he could have had no need, had the assertions of the latter been true.



## CHAPTER VII.

*Farther Attempts at Steam Navigation in the United States. — Stevens. — Livingston. — Roosevelt. — Livingston goes as Minister to France. — Becomes acquainted with Fulton. — Their Contract. — Experiments at Plombières. — Experimental Boat on the Seine. — Engine ordered from Watt. — Its Peculiarities.*

THE experiments of Fitch and Rumsey in the United States, although generally considered as unsuccessful, did not deter others from similar attempts. The great rivers and arms of the sea, which intersect the Atlantic coast, and still more, the innumerable navigable arms of the Father of Waters, appeared to call upon the ingenious machinist to contrive means for their more convenient navigation.

The improvement of the engine by Watt was now familiarly known; and it was evident, that it possessed sufficient powers for the purpose. The only difficulty which existed, was in the mode of applying it. The first person who entered into the inquiry was John Stevens, of Hoboken, who commenced his researches in 1791. In these he

was steadily engaged for nine years, when he became the associate of Chancellor Livingston and Nicholas Roosevelt. Among the persons employed by this association was Brunel, who has since become distinguished in Europe, as the inventor of the block machinery used in the British navy yards, and as the engineer of the tunnel beneath the Thames.

Even with the aid of such talent, the efforts of this association were unsuccessful, as we now know, from no error in principle, but from defects in the boat to which it was applied. The appointment of Livingston as ambassador to France broke up this joint effort; and, like all previous schemes, it was considered as abortive, and contributed to throw discredit upon all undertakings of the kind. A grant of exclusive privileges on the waters of the State of New York was made to this association without any difficulty, it being believed that the scheme was little short of madness.

Livingston, on his arrival in France, found Fulton domiciliated with Joel Barlow. The conformity in their pursuits led to intimacy, and Fulton speedily communicated to Livingston the scheme, which he had laid before Earl Stanhope in 1793. Livingston was so well pleased with it, that he at once offered to provide the funds necessary for an experiment, and to enter into

a contract for Fulton's aid in introducing the method into the United States, provided the experiment were successful.

Fulton had, in his early discussion with Lord Stanhope, repudiated the idea of an apparatus acting on the principle of the foot of an aquatic bird, and had proposed paddle wheels in its stead. On resuming his inquiries, after his arrangements with Livingston, it occurred to him to compose wheels with a set of paddles revolving upon an endless chain, extending from the stem to the stern of the boat. It is probable, that the apparent want of success, which had attended the experiments of Symington, led him to doubt the correctness of his own original views.

That such doubt should be entirely removed, he had recourse to a series of experiments upon a small scale. These were performed at Plombières, a French watering place, where he spent the summer of 1802. In these experiments, the superiority of the paddle wheel over every other method of propulsion, that had yet been proposed, was fully established. His original impressions being thus confirmed, he proceeded, late in the year 1803, to construct a working model of his intended boat, which model was deposited with a commission of French *savans*. He at the same time commenced building a vessel sixty-six feet in length and eight feet in width. To this

an engine was adapted ; and the experiment made with it was so satisfactory, as to leave little doubt of final success.

Measures were therefore immediately taken, preparatory to constructing a steamboat on a large scale in the United States. For this purpose, as the workshops of neither France nor America could at that time furnish an engine of good quality, it became necessary to resort to England for the purpose. Fulton had already experienced the difficulty of being compelled to employ artists unacquainted with the subject. It is indeed more than probable, that, had he not, during his residence in Birmingham, made himself familiar, not only with the general features, but with the most minute details of the engine of Watt, the experiment on the Seine could not have been made. In this experiment, and in the previous investigations, it became obvious, that the engine of Watt required important modifications in order to adapt it to navigation. These modifications had been planned by Fulton ; but it now became important, that they should be more fully tested. An engine was therefore ordered from Watt and Bolton, without any specification of the object to which it was to be applied ; and its form was directed to be varied from their usual models, in conformity to sketches furnished by Fulton. As this engine was in fact the type of many of

those used in the steam navigation of both Europe and America, it may not be uninteresting to inquire into its original form.

The cylinder having the usual proportions, the capacity of the condenser was increased, from one eighth of that of the cylinder, to one half. By this fourfold increase of capacity, the necessity of a cold water cistern was done away with. The water of injection was supplied by a pipe intended to be passed through the bottom of the boat. Instead of the parallel motion of Watt, the piston rod had a cross head, and worked in guides. From the cross head was suspended, by connecting rods, two lever beams, whose centres were no more elevated above the floor timbers of the vessel than was sufficient for their free oscillation. As these would lie in an unfavorable position to work the wheels, the beam was made nearly in the form of an inverted J; and, from the upper end of the stem, a connecting rod proceeded to a crank formed upon the axle of each wheel. This connecting rod lay, while passing the centre, in a horizontal position. On the same axle with the cranks were toothed wheels, which gave motion to pinions, and to the axles of these pinions was adjusted a heavy fly wheel. Provision was made for throwing either wheel out of gear, and it was even proposed to cause the two wheels to revolve

at pleasure in opposite directions. These two adjustments were intended to aid in turning the vessel.

In his subsequent experience, Fulton soon discovered that this engine was unnecessarily complicated; he therefore suppressed the working beam in his next vessel, making the connecting rods apply themselves to the cranks of the wheels without any intervening machinery. The possibility of backing either wheel, while the other continued its motion was thus dispensed with; but the fly wheel, and the gear for driving it, were retained. A small lever was used to supply that office of the working beam, which consists in giving motion to the bucket of the air pump. This last construction, with the omission of the fly wheel, is still the most usual form of boat engines in the United States; but the proportions of the cylinder have been changed, and the length of stroke much increased. By the latter change, the crank is made to act much more favorably in giving motion to the wheel.

Among the workmen sent out from Soho for the purpose of putting up the engine purchased from Watt and Bolton, was one of the name of Bell. This person, after performing his task, returned to Europe. The success of Fulton's experiment being known, Bell was employed to build a steamboat. This he did not do until

the year 1812, four years after Fulton's boats had been in active operation upon the Hudson.

The vessel built by Bell, it may be stated from actual inspection, is obviously a copy of that of Fulton. The engines subsequently constructed in England have, with little variation, followed the original model. The lever beam is still placed near the keelson of the vessels, but is usually suspended by a parallel motion; the wheels are moved by cranks attached to the beam by connecting rods, which in passing the centre are vertical. But, while the American engineers have sought to obtain a more favorable position for the impelled point of the crank, by increasing the stroke of the piston, the English have worked for an advantage of another description, namely, that of greater stability, in the opposite practice of diminishing the height of the cylinder, until it may work wholly beneath the deck.

The advantage gained in the latter way is at best problematical; for it by no means follows, that a vessel is rendered safer by every increase of stability; and, as a suppression of a part at least of the masts and sails, increases the stability also, it appears more than probable, that vessels, whose lading is thus purposely lowered, must labor much more in heavy seas, than those in which the centre of gravity is higher. By lessening the stroke of the piston, the action of

the crank is rendered unfavorable ; and it is no doubt owing to this structure of the engine, that, with equal power, and more accurate workmanship in the engine, the steamboats of Great Britain fall far short of the speed attained by those of America.



## CHAPTER VIII.

*Application of Livingston to the State of New York for exclusive Privileges. — Fulton revisits England. — Returns to the United States. — First Steamboat built and tried. — First Voyage to Albany. — Transactions of the Summer of 1807.*

THE order for an engine, intended to propel a vessel of large size, was transmitted to Watt and Bolton in 1803. Much about the same time, Chancellor Livingston, having full confidence in the success of the enterprise, caused an application to be made to the legislature of New York, for an exclusive privilege of navigating the waters of that State by steam, that granted on a former occasion having expired.

This was granted with little opposition. Indeed, those who might have been inclined to object, saw so much of the impracticable and even of the ridiculous in the project, that they conceived the application unworthy of serious debate. The condition attached to the grant was, that a vessel should be propelled by steam at the rate of four miles an hour, within a prescribed space of time. This reliance upon the reserved rights

of the States proved a fruitful source of vexation to Livingston and Fulton, embittered the close of the life of the latter, and reduced his family to penury. It can hardly be doubted, that, had an expectation been entertained, that the grant of a State was ineffectual, and that the jurisdiction was vested in the general government, a similar grant might have been obtained from Congress. The influence of Livingston with the administration was deservedly high, and that administration was supported by a powerful majority; nor would it have been consistent with the principles of the opposition to vote against any act of liberality to the introducer of a valuable application of science. Livingston, however, confiding in his skill as a lawyer, preferred the application to the State, and was thus, by his own act, restricted to a limited field.

Before the engine ordered from Watt and Bolton was completed, Fulton visited England. Disgusted by the delays and want of consideration exhibited by the French government, he had listened to an overture from that of England. This was made to him at the instance of Earl Stanhope, who urged upon the administration the dangers to be apprehended by the navy of Great Britain, in case the invention of Fulton fell into the possession of France. After a long negotiation, protracted by the difficulty of communicating

on such a subject between two hostile countries, he at last revisited England. Here, for a time, he was flattered with hopes of being employed for the purpose of using his invention. Experiments were made with such success, as to induce a serious effort to destroy the flotilla lying in the harbor of Boulogne by means of torpedoes. This effort, however, did not produce much effect; and finally, when the British government demanded a pledge that the invention should be communicated to no other nation, Fulton, whose views had always been directed to the application of these new military engines to the service of his native country, refused to comply with the demand.

In these experiments, Earl Stanhope took a strong interest, which was shared by his daughter, Lady Hester; whose talents and singularity have since excited so much attention, and who now almost reigns as a queen among the tribes of the Libanus.

Although the visit of Fulton to England was ineffectual, so far as his project of torpedoes was concerned, it gave him the opportunity of visiting Birmingham, and directing, in person, the construction of the engine ordered from Watt and Bolton. It could only have been at this time, if ever, that he saw the boat of Symington; but a view of it could have produced no effect upon his own

plans, which had been matured in France, and carried, so far as the engine was concerned, to such an extent as to admit of no alteration.

The engine was at last completed, and reached New York in 1806. Fulton, who returned to his native country about the same period, immediately undertook the construction of a boat in which to place it. In the ordering of this engine, and in planning the boat, Fulton exhibited plainly, how far his scientific researches and practical experiments had placed him before all his competitors. He had evidently ascertained, what each successive year's experience proves more fully, the great advantages possessed by large steamboats over those of smaller size; and thus, while all previous attempts were made in small vessels, he alone resolved to make his final experiment in one of great dimensions. That a vessel, intended to be propelled by steam, ought to have very different proportions, and lines of a character wholly distinct from those of vessels intended to be navigated by sails, was evident to him. No other theory, however, of the resistance of fluids was admitted at the time, than that of Bossut, and there were no published experiments except those of the British Society of Arts. Judged in reference to these, the model chosen by Fulton was faultless, although it will not stand the test of an examination founded upon a better theory, and more accurate experiments.

The vessel was finished and fitted with her machinery in August, 1807. An experimental excursion was forthwith made, at which a number of gentlemen of science and intelligence were present. Many of these were either skeptical, or absolute unbelievers. But a few minutes served to convert the whole party, and satisfy the most obstinate doubters, that the long-desired object was at last accomplished. Only a few weeks before, the cost of constructing and finishing the vessel threatening to exceed the funds with which he had been provided by Livingston, he had attempted to obtain a supply by the sale of one third of the exclusive right granted by the State of New York. No person was found possessed of the faith requisite to induce him to embark in the project. Those, who had rejected this opportunity of investment, were now the witnesses of the completion of the scheme, which they had considered as an inadequate security for the desired funds.

Within a few days from the time of the first experiment with the steamboat, a voyage was undertaken in it to Albany. This city, situated at the natural head of the navigation of the Hudson, is distant, by the line of the channel of the river, rather less than one hundred and fifty miles from New York. By the old post road, the distance is one hundred and sixty miles, at which

that by water is usually estimated. Although the greater part of the channel of the Hudson is both deep and wide, yet, for about fourteen miles below Albany, this character is not preserved, and the stream, confined within comparatively small limits, is obstructed by bars of sand, or spreads itself over shallows. In a few remarkable instances, the sloops, which then exclusively navigated the Hudson, had effected a passage in about sixteen hours, but a whole week was not unfrequently employed in this voyage, and the average time of passage was not less than four entire days. In Fulton's first attempt to navigate this stream, the passage to Albany was performed in thirty-two hours, and the return in thirty.

Up to this time, although the exclusive grant had been sought and obtained from the State of New York, it does not appear, that either he or his associate had been fully aware of the vast opening which the navigation of the Hudson presented for the use of steam. They looked to the rapid Mississippi and its branches, as the place where their triumph was to be achieved; and the original boat, modelled for shallow waters, was announced as intended for the navigation of that river. But, even in the very first attempt, numbers, called by business or pleasure to the northern or western parts of the State of New York, crowded into the yet untried vessel, and,

when the success of the attempt was beyond question, no little anxiety was manifested, that the steamboat should be established as a regular packet between New York and Albany.

With these indications of public feeling, Fulton immediately complied, and regular voyages were made at stated times until the end of the season. These voyages were not, however, unattended with inconvenience. The boat, designed for a mere experiment, was incommodious, and many of the minor arrangements by which facility of working, and safety from accident to the machinery, were to be insured, were yet wanting. Fulton continued a close and attentive observer of the performance of the vessel; every difficulty, as it manifested itself, was met and removed by the most masterly as well as simple contrivances. Some of these were at once adopted, while others remained to be applied while the boat should be laid up for the winter. He thus gradually formed in his mind the idea of a complete and perfect vessel; and, in his plan, no one part, which has since been found to be essential to ease of manœuvre or security, was omitted. But the eyes of the whole community were now fixed upon the steamboat; and, as all, of competent mechanical knowledge, were as alive to the defects of the original vessel as Fulton himself, his right to priority of invention of various important accessories has been disputed.

## CHAPTER IX.

*Steamboat rebuilt. — Occupations of the Summer of 1808. — Causes of Opposition to Fulton's Rights. — Rival Boats upon the Hudson.*

THE winter of 1807-8, was occupied in remodelling and rebuilding the vessel, to which the name of the *Clermont* was now given. The guards and housings for the wheels, which had been but temporary structures, applied as their value was pointed out by experience, became solid and essential parts of the boat. For a rudder of the ordinary form, one of surface much more extended in its horizontal dimensions was substituted. This, instead of being moved by a tiller, was acted upon by ropes applied to its extremity, and these ropes were adapted to a steering wheel, which was raised aloft towards the bow of the vessel.

It had been shown by the numbers, who were transported during the first summer, that, at the same price for passage, many were willing to undergo all the inconveniences of the original rude accommodations, in preference to encountering the delays and uncertainty to which the



passage in sloops was exposed. Fulton did not however take advantage of his monopoly, but, with the most liberal spirit, provided such accommodations for passengers, as, in convenience and even splendor, had not before been approached in vessels intended for the transportation of travellers. This was, on his part, an exercise of almost improvident liberality. By his contract with Chancellor Livingston, the latter undertook to defray the whole cost of the engine and vessel, until the experiment should result in success; but, from that hour, each was to furnish an equal share of all subsequent investments. Fulton had no patrimonial fortune, and what little he had saved from the product of his ingenuity was now exhausted. But the success of the experiment had inspired the banks and capitalists with confidence, and he now found no difficulty in obtaining, in the way of loan, all that was needed. Still, however, a debt was thus contracted, which the continued demands made upon him for new investments never permitted him to discharge. The *Clermont*, thus converted into a floating palace, gay with ornamental painting, gilding, and polished woods, commenced her course of passages for the second year in the month of April.

The first voyage of this year was of the most discouraging character. Chancellor Livingston,

who had, by his own experiments, approached as near to success as any other person, who, before Fulton, had endeavoured to navigate by steam, and who had furnished all the capital necessary for the experiment, had plans and projects of his own. These he urged into execution in spite of the opposition of Fulton. The boiler furnished by Watt and Bolton, was not adapted to the object. Copied from those used on the land, it required that its fireplace and flues should be constructed of masonry. These added so much weight to the apparatus, that the rebuilt boat would hardly have floated had they been retained. In order to replace this boiler, Livingston had planned a compound structure of wood and copper, which he insisted should be tried.

It is only necessary for us to say, that this boiler proved a complete failure. Steam began to issue from its joints a few hours after the *Clermont* left New York. It then became impossible to keep up a proper degree of tension, and the passage was thus prolonged to forty-eight hours. These defects increased after leaving Albany on the return, and the boiler finally gave way altogether within a few miles of New York. The time of the downward passage was thus extended to fifty-six hours. Fulton was, however, thus relieved from all further interference ;

this fruitless experiment was decisive as to his superiority over his colleague in mechanical skill. He therefore immediately planned and directed the execution of a new boiler, which answered the purpose perfectly ; and, although there are many reasons why boilers of a totally different form, and of subsequent invention, should be preferred, it is for its many good properties extensively used, with little alteration, up to the present day. But a few weeks sufficed to build and set this boiler, and in the month of June the regular passages of the *Clermont* were renewed.

In observing the hour appointed for departure, both from New York and Albany, Fulton determined to insist upon the utmost regularity. It required no little perseverance and resolution to carry this system of punctuality into effect. Persons, accustomed to be waited for by packet boats and stages, assented with great reluctance to what they conceived to be a useless adherence to precision of time. The benefits of this punctuality were speedily perceptible ; the whole system of internal communication of the State of New York was soon regulated by the hours of arrival and departure of Fulton's steamboats ; and the same system of precision was copied in all other steamboat lines. The certainty of conveyance at stated times being thus secured, the number of travellers was instantly augmented ; and, before the end of

the second summer, the boat became far too small for the passengers, who crowded to avail themselves of this novel, punctual, and unprecedentedly rapid method of transport.

Such success, however, was not without its alloy. The citizens of Albany and the River towns saw, as they thought, in the steamboat, the means of enticing their customers from their ancient marts, to the more extensive market of the chief city; the skippers of the river mourned the inevitable loss of a valuable part of their business; and innumerable projectors beheld with envy the successful enterprise of Fulton.

Among the latter class was one, who, misled by false notions of mechanical principles, fancied that in the mere oscillations of a pendulum lay a power sufficient for any purpose whatever. Availing himself of a well constructed model, he exhibited to the inhabitants of Albany a pendulum, which continued its motions for a considerable time, without requiring any new impulse, and at the same time propelled a pair of wheels. These wheels, however, did not work in water. Those persons, who felt themselves aggrieved by the introduction of steamboats, quickly embraced this project, prompted by an enmity to Fulton; and determined, if they could not defeat his object, at least to share in the profits of its success.

It soon appeared from preliminary experiments, made in a sloop purchased for the purpose, that a steam engine would be required to give motion to the pendulum; and it was observed, that the water wheels, when in connexion with the pendulum, had a very irregular motion. A fly wheel was therefore added, and the pendulum was now found to be a useless incumbrance. Enlightened by these experiments, the association proceeded to build two boats; and these were exact copies, not only of the hull and all the accessories of the *Clermont*, but the engine turned out to be identical in form and structure with one, which Fulton was at the very time engaged in fitting to his second boat, *The Car of Neptune*.

The pretence of bringing into use a new description of prime mover was of course necessarily abandoned, and the owners of the new steam-boats determined boldly to test the constitutionality of the exclusive grant to Fulton. Fulton and Livingston, in consequence, applied to the Court of Chancery of the State of New York for an injunction, which was refused. On an appeal to the Court of Errors this decision of the chancellor was reversed, but the whole of the profits which might have been derived from the business of the year, were prevented from accruing to Livingston and Fulton, who, compelled to contend in price with an opposition supported by popular feeling

in Albany, were losers rather than gainers by the operations of the season.

As no appeal was taken from this last decision, the waters of the State of New York remained in the exclusive possession of Fulton and his partner, until the death of the former. This exclusive possession was not, however, attended with all the advantages, that might have been anticipated. The immense increase of travel, which the facilities of communication created, rendered it imperative upon the holders of the monopoly to provide new facilities by the construction of new vessels. The cost of these could not be defrayed out of the profits. Hence new and heavy debts were necessarily contracted by Fulton, while Livingston, possessed of an ample fortune, required no pecuniary aid, beyond what he was able to meet from his own resources.

## CHAPTER X.

*Fulton's Marriage.—His Success speedily clouded by Opposition.—Nature and Sources of the Opposition.—Claims derived from Fitch.—Fulton's two Patents.—Simplicity of his Methods.*

THE success of Fulton's first experiment, was speedily followed by his marriage. On his arrival in the United States, his connexion in business with Chancellor Livingston brought him in contact with the relatives and friends of that gentleman. Of this circle Miss Harriet Livingston, the niece of the Chancellor, was, at that time, the ornament. Preëminent in beauty, grace, and accomplishments, she speedily attracted the ardent admiration of Fulton; and this was returned by an estimate of his talent and genius, amounting almost to enthusiasm.

The epoch of their nuptials, the spring of 1808, was that of Fulton's greatest glory. Every thing, in fact, appeared to concur in enhancing the advantages of his position. Leaving out of view all questions of romance, his bride was such as the most impartial judgment would have selected; young, lovely, highly educated, intelligent,

possessed of what, in those days, was accounted wealth. His long labors in adapting the steam-engine to the purposes of navigation, had been followed by complete success; and that very success had opened to him, through the exclusive grant of the navigation of the Hudson, the prospect of vast riches. Esteemed and honored, even by those who had been most incredulous while his scheme was in embryo, he felt himself placed on the highest step of the social scale. Nothing, in short, seemed wanting to complete the blessings of his lot.

We have seen, in a former chapter, how speedily his apparently well-grounded hopes of immediate profit from his invention, were frustrated by the opposition steamboats constructed in Albany, and how slow was his legal remedy for the damage he thus incurred. This opposition was, as we have stated, supported by those who anticipated injury from his success. When it was clearly to be seen, that any such anticipation was groundless, and that Albany, so far from being injured, was to be largely benefited by the steam navigation of the Hudson, other causes of discontent and opposition speedily arose; and, however important were the services conferred upon travellers, and the community in general, by the introduction of steamboats,



those of Fulton and Livingston speedily ceased to enjoy popularity.

In the early part of the enterprise, before its rapidity and certainty had actually created a traffic beyond the capacity of the vessels to accommodate, nothing could be imagined more agreeable than a summer passage to Albany in the steamboats. Gliding along, at a steady, but by no means rapid rate, the passenger had leisure to dwell upon the beauties of a scenery almost unrivalled in beauty, and to view it in all its aspects and under every variety of light. The time had not yet arrived when prudence would require a separation of one's self from all unknown persons; for the very fact of being a steamboat passenger, was, for a time, almost a guaranty of respectability. A society, therefore, existed on board, of the most easy and polished character. Rudeness and vulgarity, if accidentally present, were controlled by a preponderating force of good manners and refinement.

Such happy influences, however, continued but a few months, and the steamboats were speedily crowded by persons of every description, in such numbers as to defy all attempts on the part of the owners to render them comfortable. Most of the additions to the number, were of that class, who, from calculation, found that the saving of time in the steamboat was

more than equivalent to its additional cost. These nice calculators also speedily found, that the cost of the provisions they consumed, and of the fuel which conveyed them, was far less than the sum they paid ; and, leaving out of account the vast cost and labor expended on the preliminary experiments, they not only grumbled at the inconveniences arising from their own unexpected numbers, but complained of the extortions of which they conceived themselves the victims.

Of such impressions, each passenger became in his turn the vehicle ; and those, to whom the steamboats were known only by name, were speedily aware of all their discomforts. The crowded sleeping-rooms, the decks strewn with couches, the confined and offensive air, meals scrambled for, food ravenously swallowed, were all laid to the charge of the exclusive privileges of the owners. These feelings it was attempted to counteract by the most liberal, nay, profuse, expenditure ; but this liberality produced no other good effect than to enrich the stewards and purveyors ; in the hands of some of whom, the wealth gained in his service, was made the most efficient means of depriving his family of the rights Fulton bequeathed them. Thus, while with the intelligent, the educated, and the high-minded, the name of Fulton was regarded with esteem and reverence, it became hateful to the ignorant and

selfish, of whom, even in our more enlightened times, the majority is made up.

It is, however, to be admitted, that the opposition to Fulton's monopoly was not wholly confined to persons of the latter description. In the legal disputes which arose out of the attempts to set aside the exclusive privileges granted to Fulton, and in the debates which arose in the legislatures of several of the States, there were men enlisted on the side of the opposition, who were not mere professional advocates, but had the firmest reliance upon the justice of the cause they espoused. They believed, conscientiously, that Fulton had arrogated to himself the merit of discoveries, which had been made by others. To these pure and disinterested gentlemen we must allow the praise of proper and patriotic motives.

The most formidable opposition which was made to the privileges of Fulton, was founded upon the discoveries of Fitch. We have seen, that he had constructed a boat, which made some passages between Trenton and Philadelphia; but the method, which he used, was that of paddles, which are far inferior to the paddle-wheel. Of the inferiority of the method of paddles, had any doubt remained, positive evidence was afforded in the progress of this dispute; for, in order to bring the question to the test of a

legal decision, a boat propelled by them was brought into the waters of the State of New York. The result of the experiment was so decisive, that, when the parties engaged in the enterprise had succeeded in their designs, they made no attempt to propel their boats by any other method than that of wheels.

Fulton, assailed in his exclusive privileges derived from State grants, took, for his further protection, a patent from the general government. This is dated in 1809, and was followed by another, for improvements upon it, in 1811. It now appeared, that the very circumstance in which the greatest merit of his method consists, was to be the obstacle to his maintaining an exclusive privilege. Discarding all complexity, he had limited himself to the simple means of adapting paddle-wheels to the axle of the crank of Watt's engine; and, under the patent laws, it seems hardly possible that such a simple, yet effectual method, could be guarded by a specification. As has been the case with many other important discoveries, the most ignorant conceived that they might themselves have discovered it; and those acquainted with the history of the attempts at navigation by steam were compelled to wonder, that it had been left for Fulton to bring into successful operation.

## CHAPTER XI.

*Conflicting Claims of the States of New York and New Jersey. — Attempt to obtain a Repeal of the Grant from the State of New York. — Fulton's Steam Ferryboats. — Boat for the Navigation of the Sound. — Boats planned by Fulton, and left unfinished at the Time of his Death.*

IN considering the history of the remaining years of Fulton's life, it is impossible not to be struck with the obvious fact, that he had made a false step in forming a partnership with Livingston, and in looking to exclusive legislative grants for his remuneration. Had he acted simply as Livingston's engineer, and kept aloof from all more intimate connexion, he would have been consulted, as a matter of course, by all those who embarked in the enterprise of extending steam navigation.

From such professional service, fortune and popularity could not fail to have followed. But becoming, as he did, the partner in a monopoly, every new extension of the method he had brought into successful use, and every improvement made in it, was hostile to his interests, and

those, who, under other circumstances, would have been his firmest supporters became his opponents and enemies.

The State of New York, at the time when its grant to Fulton and Livingston was in force, claimed jurisdiction over the whole of the waters lying between its own shores and those of New Jersey. The latter State resisted this claim; but, in the intercourse by ferries between the two States, the influence of individual interests had prevented any inconvenience arising from the conflicting jurisdictions.

It is probable, that, had Fulton himself been the sole proprietor of the grant from the State of New York, a spirit of compromise with the citizens of New Jersey would have governed him. But the partnership, instead of treating on fair terms with the parties holding ferry rights in that State, transferred the whole of the rights they held under the State of New York to a near relation of Chancellor Livingston. The boat constructed under this grant, on commencing its passages, came into immediate competition with the ferry owners in New Jersey, and left them no option except between the total abandonment of their property in the ferries and a competition by means of steamboats.

For this latter object, grants made to Fitch by the State of New Jersey, which, although

never acted upon, were still in force, were resorted to. Not content with an opposition upon the debatable waters, the parties engaged in this attempt resolved to try the validity of the grant to Livingston within the acknowledged jurisdiction of the State of New York. With this view an application was made in the winter of 1808-9 for a repeal of the law. This application, being referred to a committee of the Legislature, was favorably received, and a bill for the repeal was reported. Fulton and Livingston, however, having obtained permission to be heard by counsel at the bar of the House of Assembly, succeeded in preventing this bill from becoming a law.

The action of the State of New Jersey was effectual in causing the steamboat, constructed by virtue of the grant from Fulton and Livingston, to suspend her passages; and, in retaliation, her proprietors, in opposition, as is believed, to the wishes of Fulton, brought the law of the State of New York to bear upon a ferryboat belonging to John Stevens, of Hoboken, which was in consequence prevented from plying.

It thus happened, that the persons, who were entitled to all the merit of introducing steam successfully into the service of navigation; were the greatest sufferers by the contest. Fulton lost the income for which he had stipulated out of the profits of the steamboats plying to New Jersey;

while Stevens, who had constructed and set in motion a steamboat of unobjectionable construction, within a few weeks after Fulton's successful experiment, was prevented from using it.

We may here pause to remark, on what small circumstances the claim to original invention may rest. Stevens had now been engaged for seventeen years in attempts to apply the steam engine to the purposes of navigation, and was on the very eve of success, when forestalled by Fulton, while the latter was entitled to his right of priority by no more than a few weeks. It is, however, to be remarked, that the engine, with which Fulton's successful experiment was made, had been planned and constructed several years before; and it appears probable, that the exertions of Stevens, and of his son, who had now come forward as his father's engineer, were stimulated by the knowledge of Fulton's confidence in a successful issue of his experiments. If, however, it were necessary for us to decide to whom, of all the rivals of Fulton, any share of the honors of success were due, there could be no hesitation in awarding them to Stevens.

This controversy with the State of New Jersey, which embarrassed, and often interrupted wholly, the communication by steam between Philadelphia and New York, was not adjusted during the life of Fulton, and may indeed be said



to have continued until the grant of the State of New York was finally decided to be unconstitutional by the Supreme Court of the United States.

Although thus harassed by litigation, Fulton did not permit his mind to be wholly diverted from mechanical pursuits. The insular position of the City of New York, however favorable to commerce, both domestic and inland, subjected it to great difficulty in its communications with the adjacent country, and diminished materially the value of the lands situated on the opposite shores of its rivers and bay. From the magnitude of these masses of water, row-boats were an unsafe mode of communication, which, if attempted by them, was subject to continual interruptions; and large sail-boats, although more safe, were, in consequence of the rapidity of the tides and the irregularity of the winds, liable to great uncertainty in their passage. That these difficulties might be overcome by steam was now obvious, and Fulton tasked himself to contrive the most appropriate means of applying that mover to the object.

It appeared necessary that the vessels should be so constructed, that carriages might be driven into them without difficulty. He was in consequence led to adopt the plan of twin boats, having the paddle-wheels between them, and connected by a deck, sufficiently strong to bear the feet of

horses and the weight of loaded carriages. It is probable, that he now, for the first time, availed himself of the experiment of Symington, whose boat was of similar structure; and it was at this period, that he consulted the work which contains a drawing of that vessel. The assistance he derived from an inspection of this draft was however but small; for there is not the slightest resemblance in the arrangement and distribution of the two inventions, with the exception of both being twin boats, and both moved by a single paddle-wheel set in motion by a steam engine. Fulton had found no difficulty in the navigation of rivers, in the direction of their length, by a single boat with wheels on each side; but the circumstances of the case were far different, when a movable road, bearing both foot passengers and carriages, was to be employed to cross a stream. So far as the theory then received of the resistance of fluids could be a guide, the form selected by Fulton was a good one; but it is now determined, by observations upon the ferryboats constructed by him and others, that twin boats are retarded by a resistance of a more powerful character than single ones.

This increase of resistance, to an amount far greater than is pointed out by theory, appears to be due to a wedge of water which lies between the two conjoined boats, and which must be removed

as the vessel advances. Of this Fulton could not have been aware, as no observations or experiments existed by which it could have been determined. With this exception, the ferryboat of Fulton is to be classed with the very few machines, which come perfect, on the first trial, from the hands of the inventor; and, with the substitution of a single hull for the twin boat, it has in its arrangement and distribution undergone little or no change.

Steam ferryboats were first established upon the ferry between New York and Brooklyn, and a short time afterwards, between the former city and Paulus Hook. The latter were completed shortly after the breaking out of the war between Great Britain and the United States. An immediate opportunity was afforded to prove the importance of the invention. It became necessary to transport a troop of flying artillery, with its battery of guns and other carriages. The whole were conveyed across this ferry, whose breadth is about a mile, in less than an hour, by a single boat, although comprising upwards of a hundred mounted men, and more than twenty carriages, each drawn by four horses.

A difficulty existed, on account of the ebb and flow of the tide, in making his ferryboats answer the purpose of a movable road, into and from which carriages might be driven without delay

or danger. This was obviated, in a simple and ingenious way, by means of a floating bridge; and the danger to the wharves and the vessel itself arising from the shock attending their contact, was prevented by an apparatus governed by a floating counterpoise. These exhibited much skill in practical mechanics, and knowledge of the laws of hydrostatics. The latter part of his invention has, however, been rendered useless by the dexterity, which the ferrymen have attained in the management of the boats, but was at first of the utmost importance to prevent injury, not only to the machines themselves, but to the passengers.

The steamboats on the Hudson River were increased in number, before the death of Fulton, to five. A sixth was built under his direction for the navigation of the Sound; and, this water being rendered unsafe by the presence of an enemy's squadron, the boat plied for a time upon the Hudson. In the construction of this boat, he had, in his own opinion, exhausted the power of steam in navigation, having given it a speed of nine miles an hour; and it is a remarkable fact, which manifests his acquaintance with theory and skill in calculation, that he in all cases predicted, with almost absolute accuracy, the velocity of the vessels he caused to be constructed. The engineers of Great Britain came long after to a similar conclusion in respect to the maximum of speed.

It is now, however, well known, that with a proper construction of prows, the resistance to vessels moving at higher velocities than nine miles an hour, increases in a much less ratio than had been inferred from experiments made upon wedge-shaped bodies; and that the velocity of the pistons of steam engines may be conveniently increased beyond the limit fixed by the practice of Watt.

For these important discoveries, the world is indebted principally to Robert L. Stevens. That Fulton must have reached them in the course of his own practice can hardly be doubted, had his valuable life been spared to watch the performances of the vessels he was engaged in building at the time of his premature death. These were, a large boat, intended for the navigation of the Hudson, to which the name of his partner, Chancellor Livingston, was given, and one planned for the navigation of the ocean. The latter was constructed with the intention of making a passage to St. Petersburg; but this scheme was interrupted by his death, which took place at the moment he was about to add to his glory, as the first constructor of a successful steamboat, that of being the first navigator of the ocean by this new and mighty agent.

## CHAPTER XII.

*Fulton's Torpedoes. — His Submarine Guns. — Steam Frigate. — Submarine Vessel. — He is called before the Legislature of New Jersey as a Witness. — Is detained on the Hudson by the Ice. — His Illness. — Death and Character.*

THE prime of Fulton's life had been spent in ineffectual attempts to introduce a novel mode of warfare. In these efforts, he was encouraged by the hope, that, were its efficacy once established, his native country would be safe from the aggressions of European powers. The war of 1812 promised an opportunity of applying his carefully matured schemes to the purpose for which they were originally intended, and of realizing his long-cherished hopes. He had, almost immediately after his return to the United States, instituted a set of experiments with his torpedo; these were successful in destroying a vessel anchored in the bay of New York. The attention of the general government being thus awakened, he had received instructions to perform another set of experiments, in which he was to receive the aid of officers of the navy;

or, rather, was to attempt the application of his torpedoes to a vessel, which they were to defend.

It is no dishonor to Fulton, that, in the course of these experiments, he was foiled. The officers of the navy, fully aware of the manner of his approach, took such measures as prevented all access to the vessel to be attacked. It is, however, obvious, that the very necessity of taking such precautions as they found indispensable, was a proof of the greatness of the danger; and it was evident, that, had they not had weeks for preparation, and all the means, both in men and material, furnished by a large navy yard at their disposal, some one or other of the means proposed by Fulton must have been successful.

In spite, then, of the advantage which the highest degree of naval skill, and the command of means, that could not be within the reach of an enemy's vessel upon our shores, gained over Fulton's embryo scheme, we must conclude, that it would have been a powerful and efficient means of annoyance against an enemy anchoring in our waters. It was viewed in this light by the government, not as a substitute for the ordinary modes of warfare, but as a useful and powerful addition to the means of harbor defence.

When, therefore, the entrances of our harbors

were blockaded, Fulton's talents were called into the service of the government; but, as his enterprises were conducted with the most profound secrecy, little was said of them at the time. It is now, however, well known, that, although no actual injury was done to the British fleet, yet the motions of the squadron in Long Island Sound, were paralyzed, although commanded by the favorite captain of Nelson, and its crews kept in a state of continual alarm, by a fear of the invention of Fulton.

It is not to be wondered, that his motions were watched by spies, and regularly reported to the British commander; who, on one occasion, landed a strong party, which invested the house at which Fulton had intended to sleep. By a lucky accident, he was prevented reaching his intended quarters, or he would certainly have been made prisoner.

In the course of his experiments upon the mode of attaching the Torpedo, he had planned an instrument, by which a cable was to be cut. This consisted of an arrow, projected beneath the surface of the water, by a small piece of ordnance. A trial of this instrument showed the practicability of firing artillery beneath the surface of the water, and doing execution with it, at moderate distances. Upon this observation, he founded a method of arming vessels



with submarine guns ; by the use of which, they would, in close action, have acquired a vast superiority over those armed in the usual manner.

His attention was next directed to the construction of a vessel of war, to be propelled by steam ; and he succeeded in producing perhaps the most formidable engine of naval war, which has ever been planned. Viewed in the light of a floating battery, intended solely for the defence of harbors, this vessel left little to be desired ; but he had no intention of fitting it for the general purposes of navigation ; and hence we have no right, in estimating its value, in comparison with that of subsequent constructions of the same sort, to take its fitness for any other object into account.

When death arrested the career of Fulton, he was busily engaged in constructing an improved form of the submarine vessel, which he had used in France. Aware, by experience, of the difficulty of moving a vessel when wholly submerged, he limited his views, in this case, to bringing the deck to a level with the surface of the water. This deck was to be rendered ball-proof. In this position, a large wheel, intended as the propelling apparatus, would have worked partly in air and partly in water. Such were the obvious features of the plan ; but, of

many accessory parts, the idea was confined to his own breast; and thus, upon his demise, no person was to be found able or willing to undertake the completion of the unfinished invention. The object of this vessel was to furnish a safe and convenient mode of using his torpedoes and submarine guns.

The energies of Fulton's mind were arrested by death, in the midst of these active and interesting pursuits. The controversy, in which the parties holding under him were engaged with the owners of the monopoly granted by the State of New Jersey, had never been closed. A favorable opportunity seemed to present itself for obtaining a repeal of the law of that State, which was seized by the former party. Fulton, having no direct interest in the question, was a competent witness, and was summoned, as such, to attend the legislature of New Jersey, in January, 1815. On his return, the Hudson River was found to be filled with floating ice, which put a stop to the usual means of passage. Fulton, anxious to rejoin his family, attempted the passage in an open row-boat, and was thus exposed for several hours to the inclemency of the weather. The consequence was a severe attack of illness.

Before he had wholly recovered, his anxiety in relation to the steam frigate and his subma-

rine vessel was such as to induce him, in defiance of the suggestions of prudence, to visit the Navy Yard at Brooklyn, and expose himself for some hours upon the decks of the former. The result of this imprudence was a relapse of such violence, that his constitution, enfeebled by constant labors and anxieties, was unable to resist it. His death took place on the 24th of February, 1815.

Rarely has it happened, that the natural death of any citizen excited so general mourning as that of Fulton. Cut off in the very height of his usefulness, and in the zenith of his reputation, his countrymen felt it as a loss almost irreparable.

Fulton was in person considerably above the middle height; his countenance bore marks of intelligence and talent. Natural refinement, and long intercourse with the most polished societies both of Europe and America, had given him grace and elegance of manners. His great success, and the belief that his invention had secured the certainty of great wealth, however unfounded this belief was proved to be after his death, never, for a moment, rendered him arrogant or assuming. Fond of society, he was the soul of the intelligent circle in which he moved, and of which his hospitable mansion was the centre. The fine arts, once his chosen profes-

sion, were his recreation and delight in after life; and he not only practised them himself, but bountifully encouraged the efforts of others.

Our memoir has exhibited the extent of his mechanical knowledge and ingenuity; and, in the midst of the most prolific creations of American industry, the services rendered by Fulton are at length admitted to be superior to those of any other inventor, with the sole exception of Whitney. This rank is now awarded him, not only by the tardy justice of his own countrymen, but by the almost universal suffrage of the whole civilized world, the bonds of whose union are daily drawn closer and closer, by an invention which, however long sought and nearly attained by others, was at last introduced into use by his talent and perseverance.

In forming this estimate of his services, it is not necessary that we should undervalue the efforts of those, who preceded him in the attempt to apply steam to navigation. It is very probable, indeed, that, had it not been for the experiments of Fitch, Fulton might never have applied his attention to steam navigation. But it is not less certain, that, had he not been successful, the merits of Fitch would have been forgotten, and unknown to the present generation. It may even be questioned, whether the public would have believed in the success of

Stevens, and afforded him the encouragement necessary to carry on his enterprise, had not conviction been forced upon it, by the more brilliant and conspicuous experiment of Fulton. Compared with these two names, the superiority of reputation, which the future historian will not fail to ascribe to Fulton, may be as much due to good fortune as to actual merit; but, with this exception, he has no competitor for the glory of having introduced one of the most useful applications of mechanics, with which the civilized world has yet been favored.