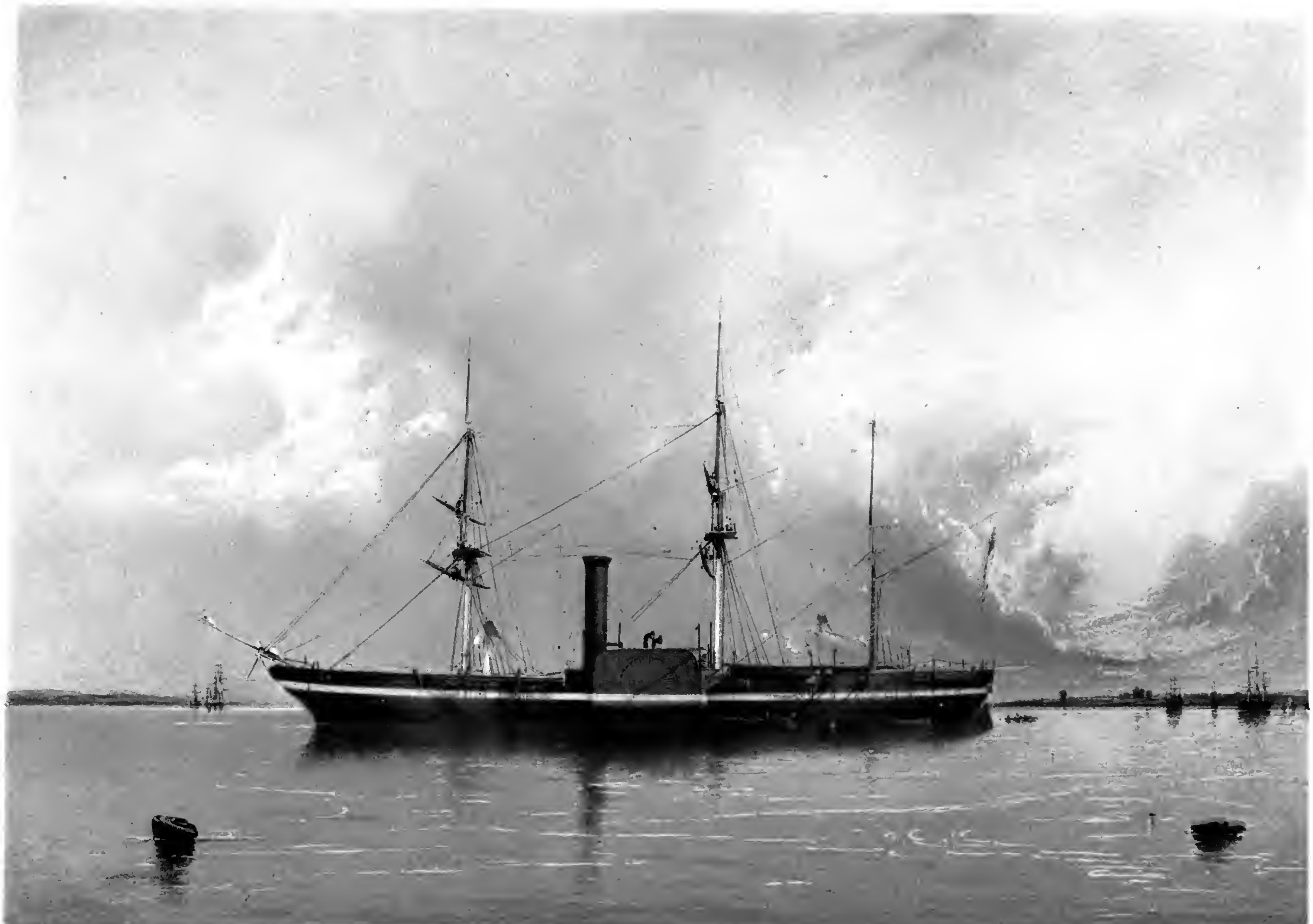

U. S. NAVAL STEAMER "POWHATAN"

THE

NAVAL AND MAIL STEAMERS

OF THE

UNITED STATES.

BY

CHARLES B. STUART,

ENGINEER IN-CHIEF OF THE UNITED STATES NAVY,

AUTHOR OF THE NAVAL DRY DOCKS OF THE UNITED STATES.

ILLUSTRATED WITH THIRTY-SIX FINE ENGRAVINGS.

SECOND EDITION.

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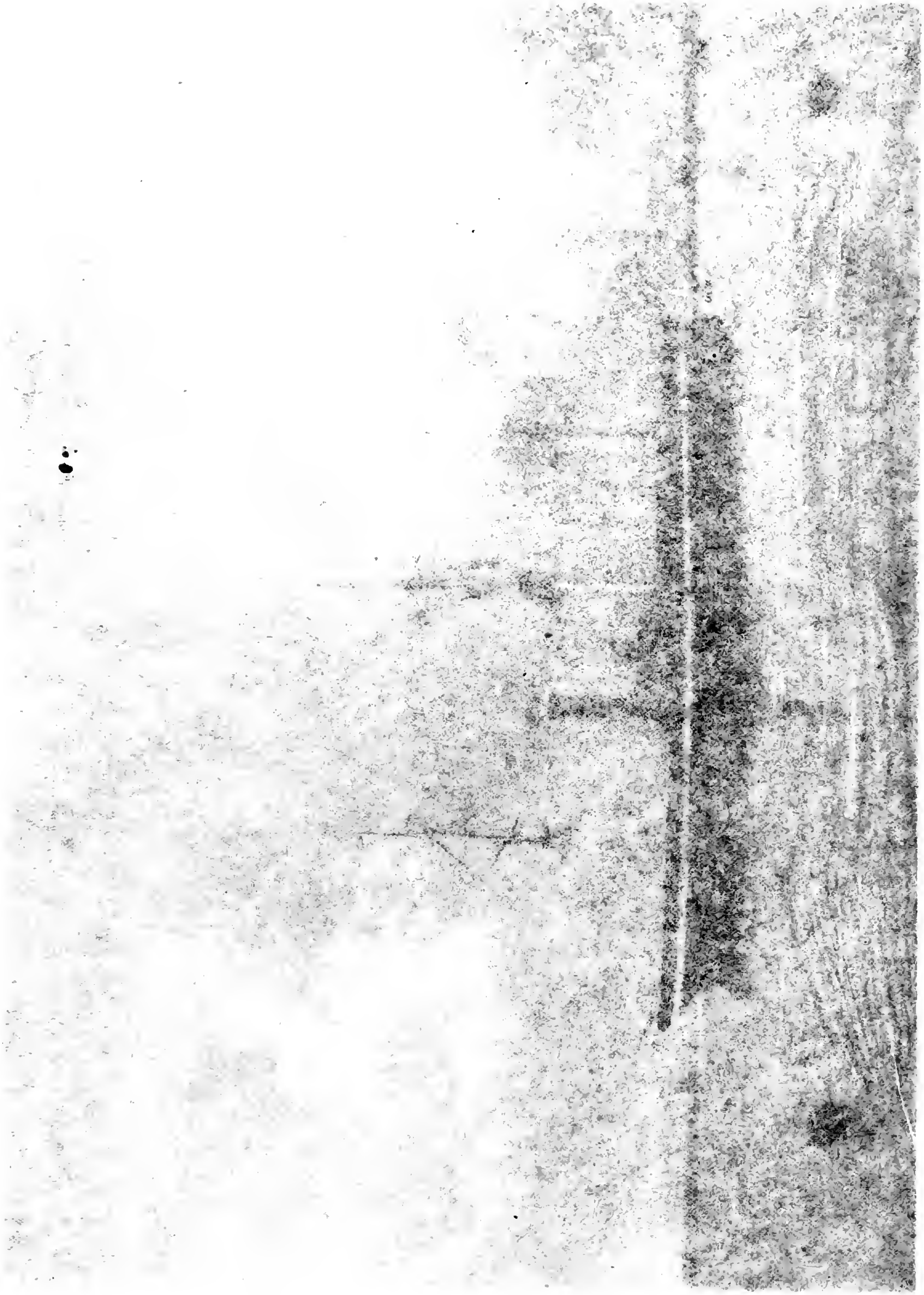

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BAKER, GODWIN & CO., Printers,
CORNER OF NASSAU AND SPRUCE STREETS, NEW YORK.

THIS VOLUME

IS

Dedicated,

WITH SENTIMENTS OF RESPECT AND ESTEEM,

TO

EDWARD K. COLLINS,

TO WHOSE GENIUS AND UNTIRING EFFORTS

OUR COUNTRY

Is greatly indebted for one of the Proudest Achievements of Science and Enterprise,

BY HIS FRIEND,

THE AUTHOR.

W. L. Ormsby Sc.

Charles B. Stuart

CIVIL ENGINEER.

PREFACE.

The nature of my professional engagements, and the great advancement made during the first half of the present century in Ocean Steam Navigation, have suggested to me the propriety of compiling, for future reference, the origin, rise, and progress of our National Steam Marine, with the hope that it will prove valuable to the profession, and interesting to the general reader.

Pre-eminent as our country has become in great achievements in every department of civil and mechanical engineering, none have been more marked and successful than those connected with our Naval and Mail Steamers; whereby our intercourse with distant nations has been vastly facilitated, our commerce promoted, and our means of national defence greatly strengthened. Truly has it been said, that science and the arts open the paths to true glory; and greater triumphs remain to be achieved in both than the world has yet witnessed, for a successful experiment has recently been made with a new motive power that promises another era in the history of navigation, and will place the name of ERICSSON with those of WATT, EVANS, [illegible] and FULTON. The time seems appropriate, therefore, to chronicle the triumphs of Steam, before the entire subjugation of a mightier element shall have so far spread over the civilized world, as to leave far behind all interest in the early history and successful progress of that untiring, though too often terrible, Engine of power.

Charles Reade

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PREFACE.

In after times, it will be both instructive and interesting to refer to this volume, and learn the lessons of experience and the trials recorded on its pages, and thus realize the efforts and struggles made by some of the master-spirits of this age, to conquer the stormy waves of the sea, and reduce the perilous voyage of months to a pleasure excursion of a few days, and the uncertainty of the passage, to that of the appointed day of arrival.

In collecting the materials for this volume, I have sought for information wherever I deemed it could be found most authentic; and although it is not expected, in collecting statistics of numerous vessels, many of which are not now in existence, and others in distant seas, that the particulars of each have, in all instances, been fully given; yet it is believed a great degree of accuracy has been attained. But if any omissions or errors should be hereafter found, they will be promptly noticed in future editions. I have also endeavored to give proper credit to whomsoever due; and the hope is indulged, that justice has been done to all, and that this effort to record the history of our national enterprise and skill, will be favorably received by the American public.

CHARLES B. STUART.

New York, *January*, 1853.

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NAVAL STEAMERS.

CONTENTS.

MAIL STEAMERS.

ILLUSTRATIONS.

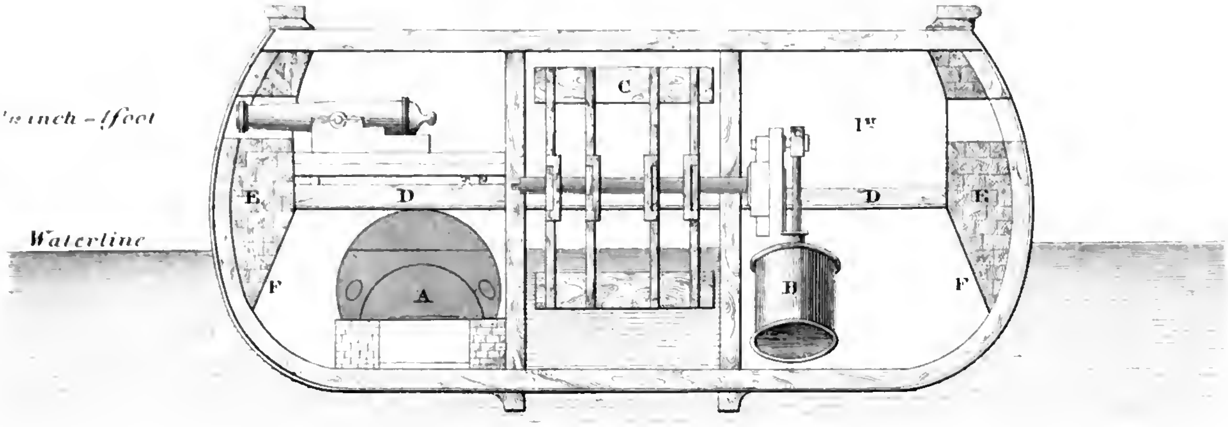
ILLUSTRATIONS.

NAVAL STEAMERS.

"DEMOLOGOS"

Figure 1st Transverse section A her Boiler B the steam Engine C the water wheel. E E her wooden walls 5 feet thick diminishing to below the waterline as at F F draught of water 9 feet D D her gun deck

Scale ½ inch – 1 foot



Scale 1/24 inch = 1 foot

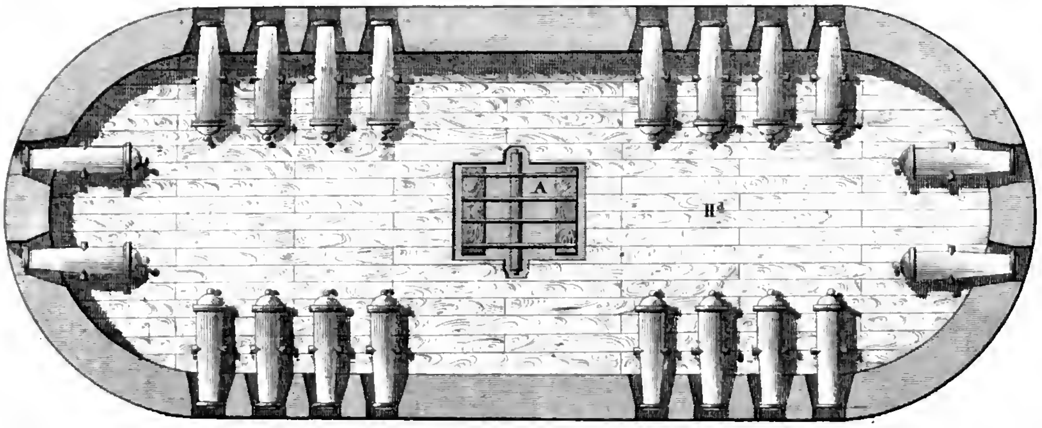
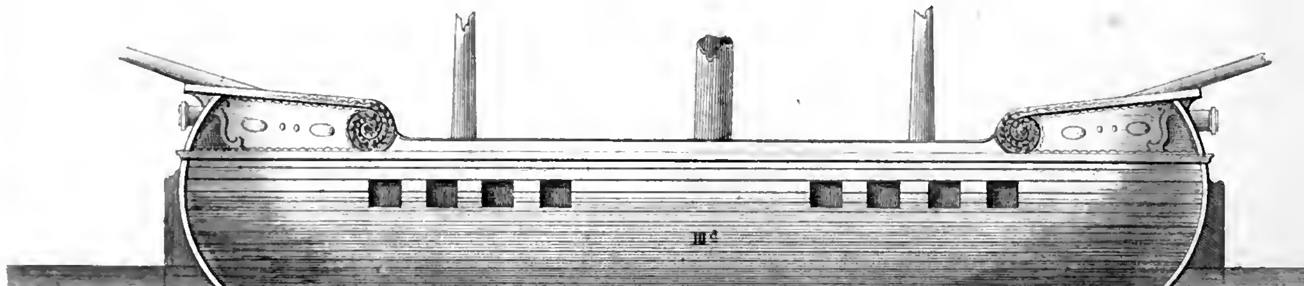


Figure IId This shews her gun deck, 140 feet long 24 feet wide, mounting 20 guns A the Water wheel

Figure IIId
Side View.



Scale 1/24 inch – 1 foot

ROBERT FULTON
November 1813

S. Mc Elroy del. "Stuart's Naval & Mail Steamers U.S." Sarony & Major. Eng. NY.

NAVAL STEAMERS.

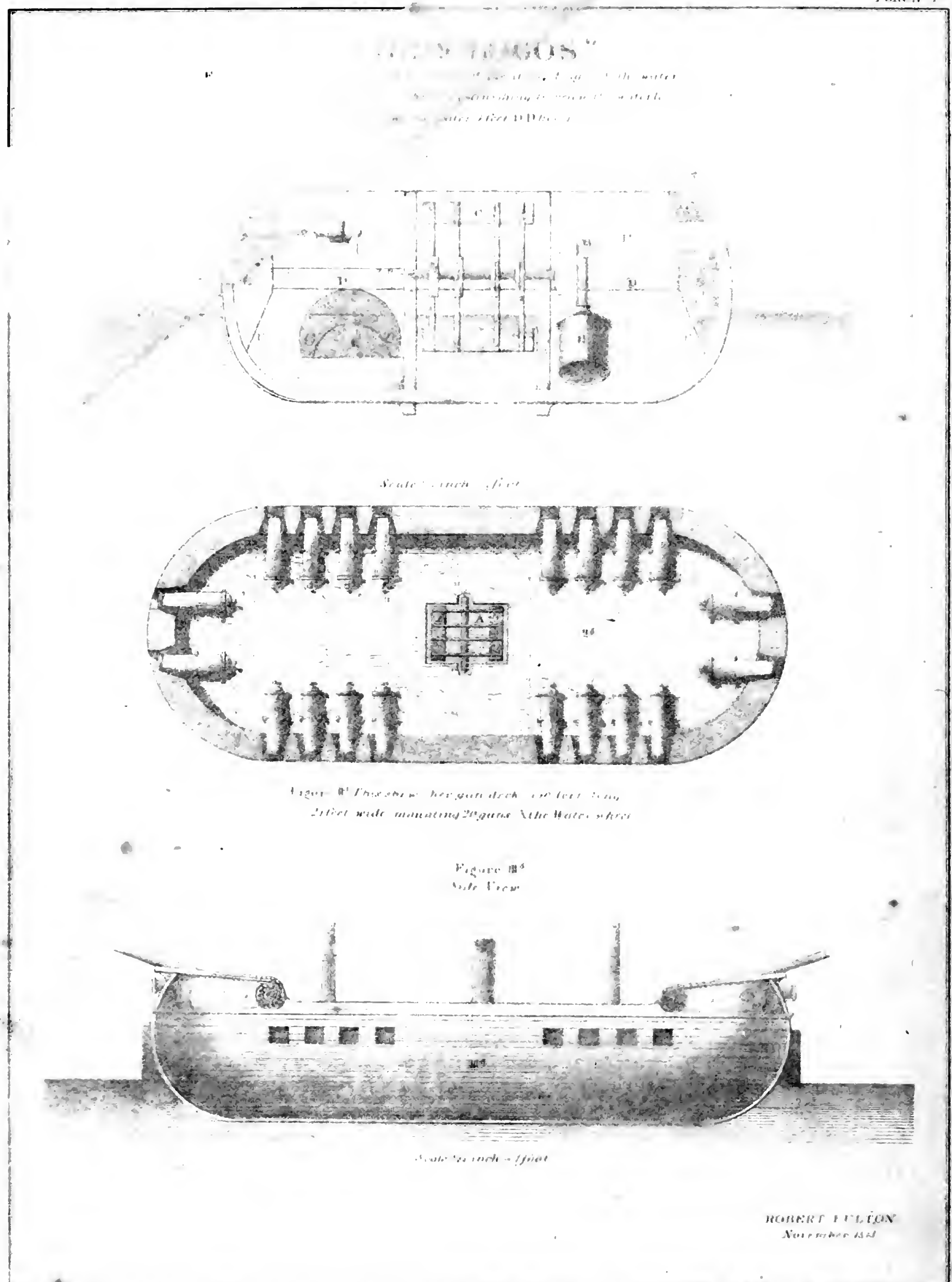
THE DEMOLOGOS; OR, FULTON THE FIRST.

At the close of the year eighteen hundred and thirteen, Robert Fulton exhibited to the President of the United States, the original drawing from which the engraving on Plate One is sketched, being a representation of the proposed war-steamer or floating-battery, named by him, the Demologos. This sketch possesses more than ordinary interest, from the circumstance that it is, doubtless, the only record of the *first war-steamer in the world*, designed and drawn by the immortal Fulton, and represented by him to the Executive, as capable of carrying a strong battery, with furnaces for red hot shot, and being propelled by the power of steam, at the rate of *four* miles an hour.

It was contemplated that this vessel, besides carrying her proposed armament on deck, should also be furnished with submarine guns, two suspended from each bow, so as to discharge a hundred pound ball into an enemy's ship at ten or twelve feet below her water-line. In addition to this, her machinery was calculated for the addition of an engine which would discharge an immense column of water upon the decks, and through the port-holes of an enemy, making her the most formidable engine for warfare that human ingenuity has contrived.

The estimated cost of the vessel was three hundred and twenty thousand dollars, nearly the sum requisite for a frigate of the first class.

The project was zealously embraced by the Executive, and the national legislature in March, eighteen hundred and fourteen, passed a law, authorizing the President of the United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NAVAL STEAMERS.

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States to cause to be built, equipped, and employed, one or more floating batteries, for the defense of the waters of the United States.

The building of the vessel was committed by the Coast and Harbor Defense Association, to a sub-committee of five gentlemen, who were recognized by the Government as their agents for that purpose, and whose interesting history of the Steam Frigate is copied in Note A, of the Appendix to this volume.

Robert Fulton, whose soul animated the enterprise, was appointed the engineer; and on the twentieth day of June, eighteen hundred and fourteen, the keel of this novel steamer was laid at the ship-yard of Adam and Noah Brown, her able and active constructors, in the city of New York, and on the twenty-ninth of the following October, or in little more than four months, she was safely launched, in the presence of multitudes of spectators who thronged the surrounding shores, and were seen upon the hills which limited the beautiful prospect around the bay of New York.

The river and bay were filled with steamers and vessels of war, in compliment to the occasion. In the midst of these was the enormous floating mass, whose bulk and unwieldy form seemed to render her as unfit for motion, as the land batteries which were saluting her.

In a communication from Captain David Porter, U. S. Navy, to the Hon. Secretary of the Navy, dated New York, October 29, 1814, he states,—"I have the pleasure to inform you that the "FULTON THE FIRST," was this morning safely launched. No one has yet ventured to suggest any improvement that could be made in the vessel, and to use the words of the projector, '*I would not alter her if it were in my power to do so.*'

"She promises fair to meet our most sanguine expectations, and I do not despair in being able to navigate in her from one extreme of our coast to the other. Her buoyancy astonishes every one, she now draws *only eight feet three inches* water, and her draft will only be *ten* feet with all her guns, machinery, stores, and crew, on board. The ease with which she can now be towed with a single steamboat, renders it certain that her velocity will be sufficiently great to answer every purpose, and the manner it is intended to secure her machinery from the gunner's shot, leaves no apprehension for its safety. I shall use every exertion to prepare her for immediate service; her guns will soon be mounted, and I am assured by Mr. Fulton, that her machinery will be in operation in about six weeks."

On the twenty-first of November, the Steam Frigate was moved from the wharf of Messrs. Browns, in the East River, to the works of Robert Fulton, on the North River, to receive her machinery, which operation was performed by fastening the steamboat "Car of Neptune," to her larboard, and the steamboat "Fulton," to her starboard side; they towed her through the water from three and a-half to four miles per hour.

The dimensions of the "Fulton the First" were:—

Length, one hundred and fifty-six feet.
Breadth, fifty-six feet.
Depth, twenty feet.
Water-wheel, sixteen feet diameter.
Length of bucket, fourteen feet.
Dip, four feet.
Engine, forty-eight inch cylinder, and five feet stroke.
Boiler, length, twenty-two feet; breath, twelve feet; and depth, eight feet.
Tonnage, two thousand four hundred and seventy-five.

By June, eighteen hundred and fifteen, her engine was put on board, and she was so far completed as to afford an opportunity of trying her machinery. On the first of June, at ten o'clock in the morning, the "Fulton the First," propelled by her own steam and machinery, left the wharf near the Brooklyn ferry, and proceeded majestically into the river; though a stiff breeze from the south blew directly ahead, she stemmed the current with perfect ease, as the tide was a strong ebb. She sailed by the forts and saluted them with her thirty-two pound guns. Her speed was equal to the most sanguine expectations; she exhibited a novel and sublime spectacle to an admiring people. The intention of the Commissioners being solely to try her enginery, no use was made of her sails. After navigating the bay, and receiving a visit from the officers of the French ship of war lying at her anchors, the Steam Frigate came to at Powles' Hook ferry, about two o'clock in the afternoon, without having experienced a single unpleasant occurrence.

On the fourth of July, of the same year, she made a passage to the ocean and back, and went the distance, which, in going and returning, is fifty-three miles, in eight hours and twenty minutes, without the aid of sails; the wind and tide were partly in her favor and partly against her, the balance rather in her favor.

In September, she made another trial trip to the ocean, and having at this time the weight of her whole armament on board, she went at an average of five and a half miles an hour, with and against the tide. When stemming the tide, which ran at the rate of three miles an hour, she advanced at the rate of two and a-half miles an hour. This performance was not more than equal to Robert Fulton's expectations, but it exceeded what he had promised to the Government, which was that she should be propelled by steam at the rate of from three to four miles an hour.

The English were not uninformed as to the preparations which were making for them, nor inattentive to their progress. It is certain that the Steam Frigate lost none of her terrors in the reports or imaginations of the enemy. In a treatise on steam vessels, published in Scotland at that time, the author states that he has taken great care to procure *full* and *accurate* information of the Steam Frigate launched in New York, and which he describes in the following words:—

"Length on deck, *three hundred feet;* breadth, *two hundred feet;* thickness of her sides, *thirteen feet* of alternate oak plank and cork wood—carries forty-four guns, four of which are *hundred pounders;* quarter-deck and forecastle guns, forty-four pounders; and further to annoy an enemy attempting to board, can discharge *one hundred gallons of boiling water in a minute,* and by mechanism, brandishes *three hundred cutlasses* with the utmost regularity over her gunwales; works also an equal number of heavy iron pikes of great length, darting them from her sides with prodigious force, and withdrawing them every quarter of a minute"!!

The war having terminated before the "*Fulton the First*" was entirely completed, she was taken to the Navy Yard, Brooklyn, and moored on the flats abreast of that station, where she remained, and was used as a receiving-ship until the fourth of June, eighteen hundred and twenty-nine, when she was blown up. The following letters from Commodore Isaac Chauncey (then Commandant of the New York Navy Yard) to the Honorable Secretary of the Navy, informing him of the distressing event, concludes this brief history of the *first steam vessel of war ever built.*

U. S. Navy Yard, New York,
June 5th, 1829.

Sir:

It becomes my painful duty to report to you a most unfortunate occurrence which took place yesterday, at about half past two o'clock, P. M., in the accidental blowing up of the Receiving Ship Fulton, which killed twenty-four men and a woman, and wounded nineteen; there are also five missing. Amongst the killed I am sorry to number Lieutenant S. M. Brackenridge, a very fine, promising officer, and amongst the wounded are, Lieutenants Charles F. Platt, and A. M. Mull, and Sailing-Master Clough, the former dangerously, and the two last severely; there are also four Midshipmen severely wounded. How this unfortunate accident occurred I am not yet able to inform you, nor have I time to state more particularly; I will, as soon as possible, give a detailed account of the affair.

I have the honor to be, Sir,

Very respectfully,

J. CHAUNCEY.

Hon. John Branch,
Secretary of the Navy, Washington.

U. S. NAVY YARD, NEW YORK,
June 8th, 1829.

SIR:

I had been on board the "Fulton" all the morning, inspecting the ship and men, particularly the sick and invalids, which had increased considerably from other ships, and whom I had intended to ask the Department permission to discharge, as being of little use to the service. I had left the ship but a few moments before the explosion took place, and was in my office at the time. The report did not appear to me louder than a thirty-two pounder, although the destruction of the ship was complete and entire, owing to her very decayed state, for there was not on board, at the time, more than two and a-half barrels of damaged powder, which was kept in the magazine for the purpose of firing the morning and evening gun. It appears to me that the explosion could not have taken place from accident, as the magazine was as well, or better secured, than the magazines of most of our ships, yet it would be difficult to assign a motive to those in the magazine for so horrible an act, as voluntarily to destroy themselves and those on board. If the explosion was not the effect of design, I am at a loss to account for the catastrophe.

I have the honor to be, Sir,

Very respectfully,

J. CHAUNCEY.

HON. JOHN BRANCH,
Secretary of the Navy, Washington.

THE FULTON.

(THE SECOND.)

After the destruction of the "Demologos," or "Fulton the First," the next essay of the Government in building war-steamers, was the construction of the "Fulton the Second," in eighteen hundred and thirty-seven and eight, at the New York Navy Yard. This vessel (represented in Plate Two) was intended for a floating battery for the defense of New York harbor, as a substitute for the first one, destroyed in eighteen hundred and twenty-nine. With machinery of great power, she attained, for that time, a high rate of speed, but was totally unadapted for an ocean steamer, although she made one trip to the West Indies and back.

HULL.

Her hull was built solid of the best live oak. Strength rather than speed was consulted in its lines, her midship cross-sections being the same for one-third her length, with a bluff bow (partially relieved by a hollow line), and finer lines aft, as shown in Plate Three. Heavy wooden ramparts or bulwarks were built up from her decks for the protection of her crew, battery, &c., beveled in all directions to glance off an enemy's shot. She had three masts, and was rigged as a top-sail schooner.

The materials of the hull, cost	$78,673 00
Labor on ditto, ...	66,276 43

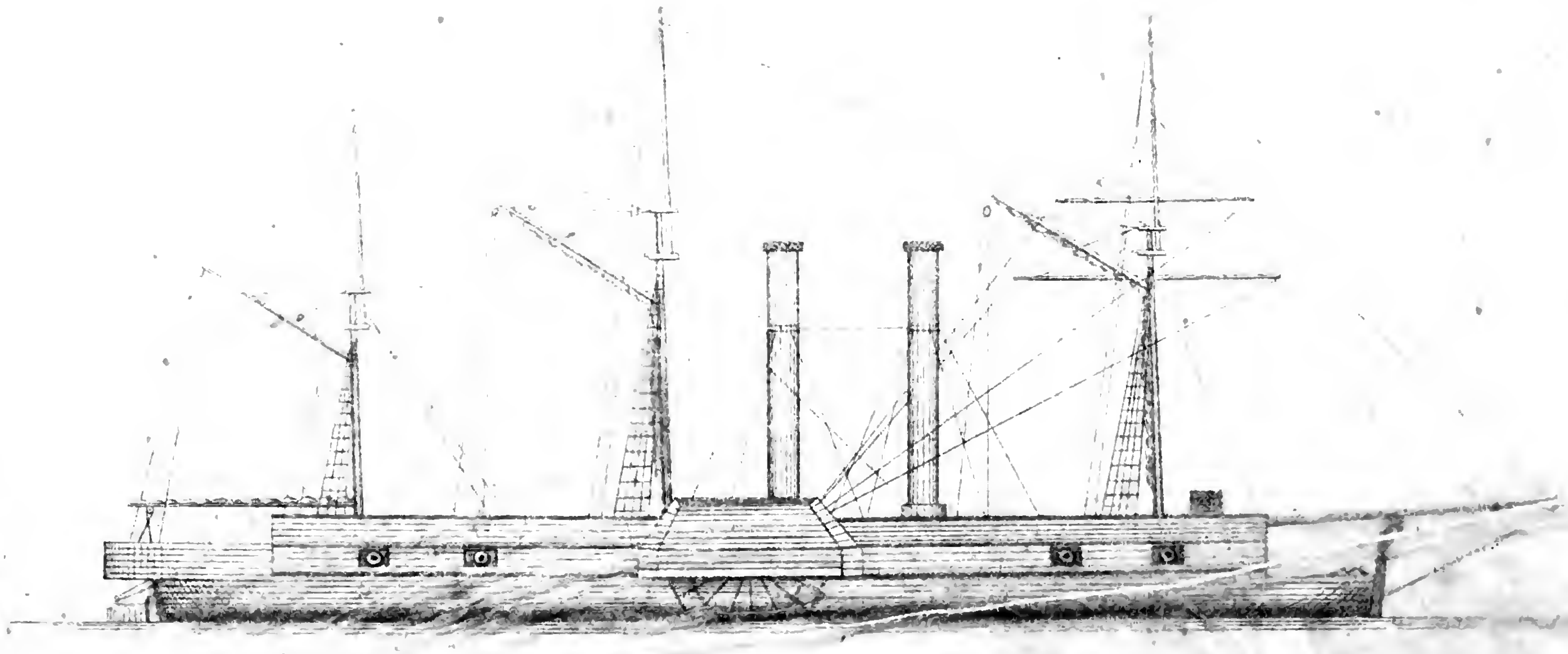
EQUIPMENTS.

Water tanks, ...	$976 97
Cables and anchors, ...	6085 36
Rigging, and fitting the same, ...	4375 42
Gun Carriages, ...	668 00
	$157,055 18

Plate No. [illegible]

U. S. STEAMER FULTON,

(THE SECOND.)



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enemy's shot. She had three masts, and

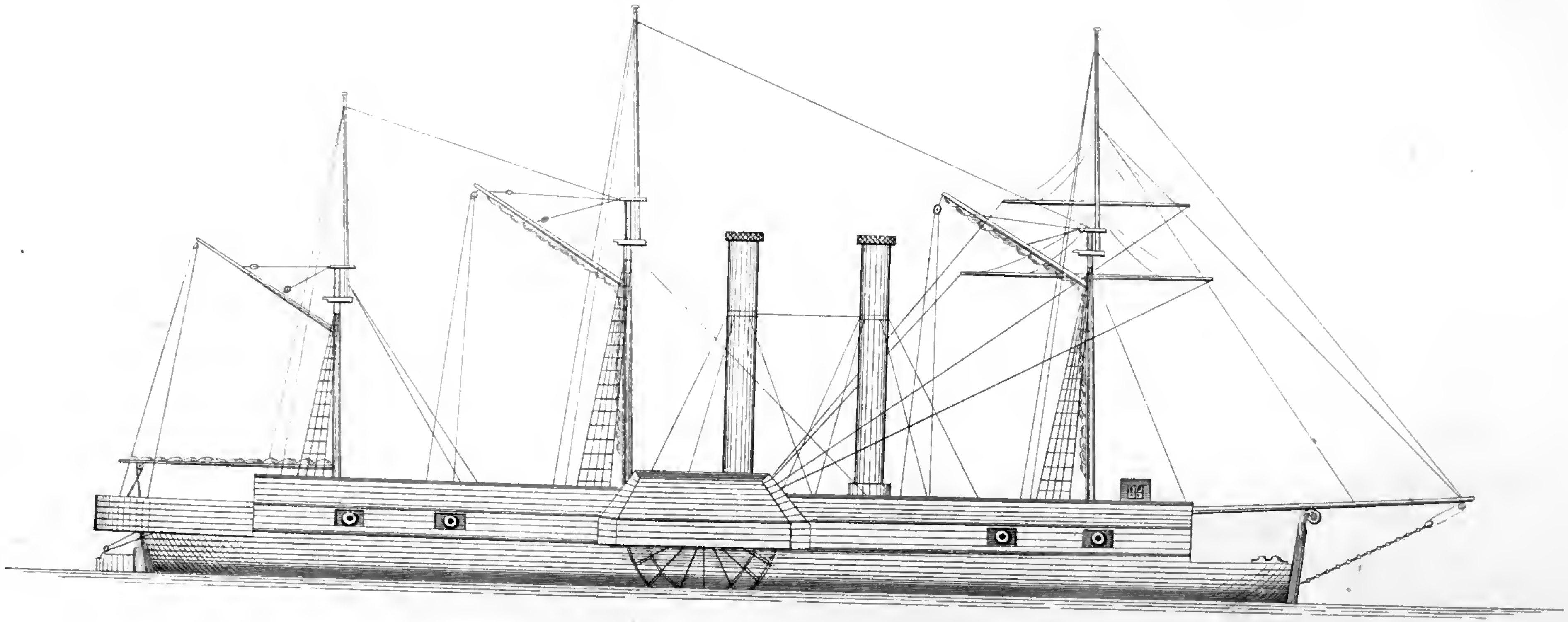
built cost	$[illegible],673 00
. . . .	66,276 43

EQUIPMENTS.

. . . .	$976 97
. . . .	6085 36
. . . .	4375 42
. . . .	668 00
	$157,055 18

Plate No. 2.

U.S. STEAMER FULTON,
(THE SECOND.)

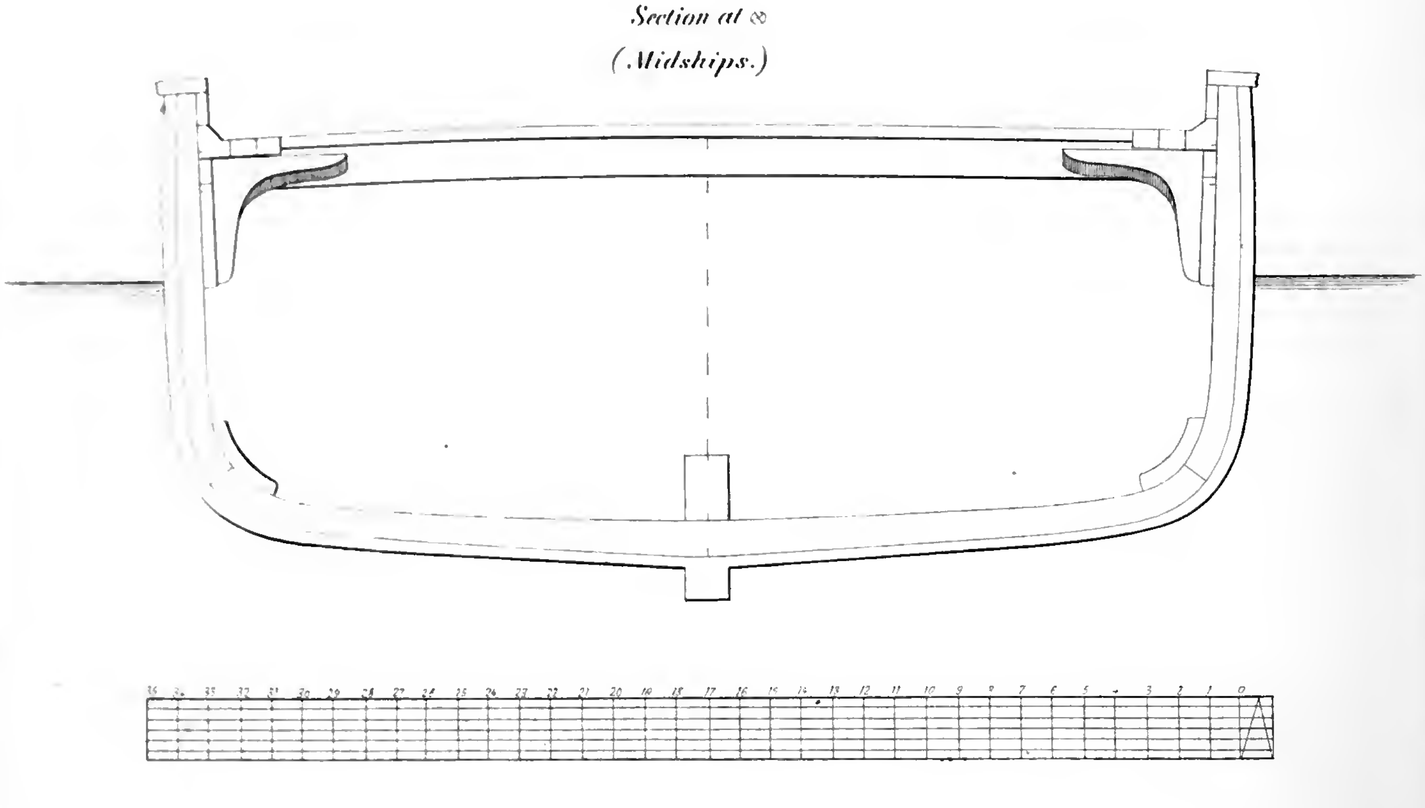


Sam.l McElroy C.E. del.

Engraved for Stuart's "Naval & Mail Steamers U.S."

FULTON.

(SECOND & THIRD.)



Engraved for Stuart's Naval & Mail Steamers, U. S.

Sarony & Major Engr. N.Y.

Displacement [illegible]

Draft from bottom of keel	Tons of sea water of 2240 lbs.	[illegible]	[illegible]	[illegible]
2	55.6	[illegible]	[illegible]	[illegible]
3	132.3	[illegible]	[illegible]	[illegible]
4	232.4	[illegible]	[illegible]	[illegible]
5	345.4	[illegible]	362.4	[illegible]

Length of the vessel between perpendiculars, [illegible]
[illegible] (extreme) [illegible]
[illegible]
[illegible]
[illegible]
[illegible] midship section at 10 feet 6 inches [illegible]
Weight of hull, [illegible]
[illegible]
[illegible] tonnage [illegible]

ENGINES.

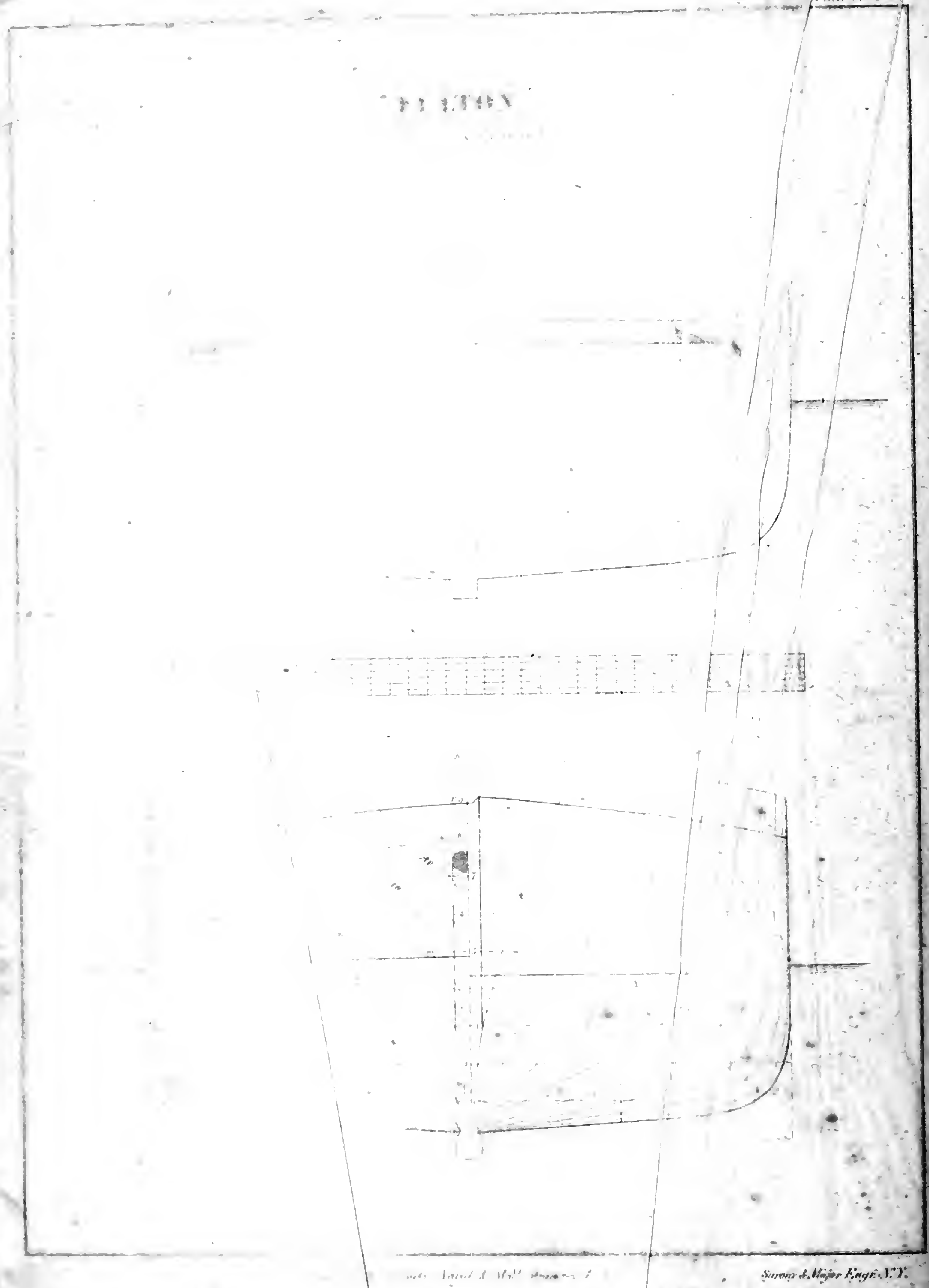
She had two horizontal condensing engines [illegible] valves. The water-wheel shafts [illegible]

Cost [illegible] contract, [illegible]
Subsequent additions and alterations [illegible]

Weight of engines [illegible]
Stroke of piston, [illegible]
Diameter of cylinders, [illegible]

The boilers were [illegible] number, with [illegible]
Length, [illegible] 18 feet.
Breadth, [illegible] 1[illegible] feet [illegible] inches.
[illegible]

Plate No 3.



Sarony & Major Engrs N.Y.

Displacements of the FULTON *at the following drafts of water.*

Draft from bottom of keel.	Tons of sea water of 2240 lbs.	Draft from bottom of keel.	Tons of sea water of 2240 lbs.	Draft from bottom of keel.	Tons of sea water of 2240 lbs.
2	55.6	6	467.8	10	1001.0
3	132.3	7	593.9	11	1143.5
4	232.4	8	726.	12	1286.3
5	345.4	9	862.4	13	1433.3

Length of the vessel between perpendiculars, ...	180 feet.
Beam on deck, (extreme)	34 " 8 inches.
Depth of hold, ...	12 " 2 "
Burthen, ...	1011 tons.
Mean draft, ...	10 feet 6 inches.
Immersed midship section at 10 feet 6 inches draft, . .	308 square feet.
Weight of hull, ...	470 tons.
Depth of keel, ...	12 inches.
Estimated tonnage, ...	973 tons.

ENGINES.

She had two horizontal condensing engines placed on the spar-deck, and supported by wooden frames. The water-wheel shafts were disconnected. They were built at the West Point Foundry.

Cost per contract, ...	$40,000 00
Subsequent additions and alterations, ...	198 57
	$40,198 57

Weight of engines, ...	81 tons.
Stroke of piston, ...	9 feet.
Diameter of cylinders, ...	50 inches.

BOILERS.

The boilers were common "return flue," made of copper, wagon-shaped, and originally four in number, with a separate smoke-pipe to each.

Length, ...	16 feet.
Breadth, ...	10 feet 6 inches.
Height, ...	9 " 3 "

	WEIGHT.	COST.
Boiler copper,	154,876 lbs.	$52,206 42
Rod and bolt copper,	47,711 "	13,224 97
Composition castings,	10,668 "	4,071 48
Cost of making boilers,		17,093 95
Labor in alterations and additions,		549 88
Boiler and flue iron,	27,376 "	2751 18
Cast iron beams and bars,	23,287 "	931 48
Other appendages,	3,000 "	2,566 70
	266,918 lbs.	$93,396 06

Weight of water in boilers, ... 41 tons.

These boilers were afterwards altered, and reduced to two in number, of the following dimensions:—

Length,	25 feet 9 inches.
Breadth,	10 " 6 "
Height,	9 " 3 "

PADDLE WHEELS.

Diameter at outside of paddles,	22 feet 10 inches.
Length of paddles,	11 " 6 "
Breadth of paddles,	3 " 0 "
Cost of wheels,	$9,000 00.

WEIGHT

Of spars, tackling, boats, cables, anchors, machinery, crew, armament, stores, and every article on board.

Spars, including lower masts,	6 tons,	2 cwt.,	0 qrs.,	8 lbs.
Rigging, (iron)	5 "	11 "	1 "	6 "
Sails,	2 "	12 "	2 "	0 "
Tanks,	2 "	15 "	1 "	15 "
Water,	22 "	6 "	1 "	20 "
Wood, (four cords)	6 "	16 "	1 "	24 "
Iron,	13 "	6 "	1 "	18 "
Copper,			3 "	23 "
Anchors,	2 "	14 "	3 "	4 "

Kedges,	0 tons,	9 cwt.,	1 qrs.,	20 lbs.
Chain cables,	20 "	4 "	0 "	3 "
Stream and tow rope,	1 "	7 "	3 "	12 "
Boats, spars, and sails,	2 "	10 "	3 "	16 "
Guns, shot, and powder,	12 "	0 "	1 "	10 "
Boatswains', gunners', and carpenters' stores,	3 "	5 "	1 "	7 "
Provisions for 130 men, for 30 days,	2 "	16 "	3 "	7 "
Crew and baggage,	15 "	7 "	2 "	0 "
Engines,	81 "	1 "	2 "	18 "
Boilers, steam, and smoke-pipes,	119 "	3 "	0 "	22 "
Extras,	15 "	11 "	1 "	2 "
Stores and tools,	13 "	5 "	1 "	7 "
Water in boilers,	41 "	2 "	3 "	2 "
Coal,	101 "	2 "	0 "	25 "
Pine wood, (thirty-five cords)	46 "	17 "	2 "	0 "
Wood around water tanks,	1 "	9 "	1 "	21 "
Total,	539 tons,	19 cwt.,	2 qrs.,	10 lbs.

ARMAMENT.

Her armament consisted of eight long forty-two pounders, and one twenty-four pound chase gun, traversing about the deck.

RECAPITULATION OF COST.

Hull and equipments,	$157,055 18
Engines and wheels,	49,198 57
Boilers,	93,396 06
	$299,649 81

PERFORMANCE.

There are no logs extant of the performance of this vessel, but in a letter to Captain M. C. Perry, dated February 15, 1838, from Charles H. Haswell, the chief engineer, the speed in smooth water in New York bay, is given at fifteen statute miles per hour, with a boiler pressure of thirty pounds per square inch, cutting off at three-eighths the stroke from the commencement, with the old fashioned camboard cut off, the engines making twenty-six double strokes of piston, per minute. The average draft of water was ten feet six inches. Area of immersed midship section, three hundred and eight square feet. The coal-bunkers contained sufficient coal for two days' consumption.

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In March, eighteen hundred and forty-two, Lieutenant W. W. Hunter, U. S. Navy, took out a patent for a submerged wheel, to be employed for the propulsion of steamers. The first essay was made in the canal at Washington, on a small boat called the "Germ," and the results obtained were represented to the Government in so favorable a manner, that it was determined to build a wooden vessel of one thousand tons burthen, in order to test this method of propulsion on a large scale. This vessel was built at the Norfolk Navy Yard in eighteen hundred and forty-two, and named the "Union," and had the following dimensions:

HULL.

Length on deck, ...	184 feet 6 inches.
Beam on deck, ...	33 " 6 "
Beam at wheels, ...	26 " 0 "
Depth of hold, ...	16 " 9 "
Average draft of water, ...	11 " 6 "
Deep draft of water, ...	13 " 0 "
Immersed amidship section ($11\frac{1}{2}$ feet draft)	254 square feet.
Launching draft, ...	6 feet.
Launching weight of hull, ...	400 tons.
Displacement at 11 feet draft, ...	900 tons.

ENGINES.

Two non-condensing horizontal, disconnected, engines, which were built at the Washington Navy Yard in eighteen hundred and forty-two.

Diameter of cylinders, ...	28 inches.
Stroke of piston, ...	4 feet.

HUNTER WHEELS.

Exterior diameter of wheel,	14 feet.
Height of paddle,	4 feet.
Width of paddle,	10 inches.
Number of paddles in each wheel,	20.

The Hunter wheel consists of a plain drum revolving in a horizontal plane beneath the level of the water, upon the sides or periphery of this drum; the paddles are placed vertically, and radially from the centre; they are composed of plane surfaces like the paddles of ordinary side-paddle wheels. In Hunter's wheel the paddles act precisely in the same manner as in the common paddle wheel, excepting that the latter is revolved in a vertical, while the former is revolved in a horizontal plane—a difference not in the least affecting the principle of action.

In order that the Hunter wheel may propel when submerged, it is enclosed in a closely fitting case, (there being a play of about two inches allowed in every direction,) except at the side of the vessel where the interior of the case communicates with the outside water, and where the paddle at right angles to the keel, projects its whole width from the side of the vessel. The case is of course water-tight, and with its contents occupies a place in the hold of the vessel.

The object of this construction is easily understood. If such a wheel were immersed in the water without its case, and revolved, the action of opposite paddles would neutralize each other, and no progressive motion result; but by enclosing all the paddles except the one or two in action, the reaction of the remaining enclosed paddles is against the case, and their influence is only felt in the loss of the labor expended in sweeping around within the case, a mass of water equal to the capacity of the space between the drum and case, which loss goes to increase the slip of the wheel, and is estimated by such increase of slip.

As its mode of action is identical with that of the common paddle wheel, it will, like the common paddle wheel, have losses by slip and oblique action, which must be calculated for both kinds of wheels in the same manner. In making this calculation the side of the vessel occupies the same position relatively to Hunter's wheel, that the surface of the water does to the common paddle wheel. But as the paddles of Hunter's wheel revolve, they sweep within the case the mass of water included between the paddles on entering, and throw it out on leaving: there are then the additional losses of the momentum of this water so carried around (which increases the slip) and its friction on the top, bottom and sides of the case, and on the top and bottom of the drum.

BOILERS.

There were three iron boilers of the common tubular variety, placed side by side, across the vessel, and containing two thousand eight hundred square feet of fire surface. The combustion was urged by a fan-blast. Each boiler was eighteen feet long, and six feet six inches diameter; area of chimney, fifty-two inches.

RIG AND SAILS.

The rig of the steamer "UNION" was that of a three-masted schooner, having square-sail, jib, fore-sail, main-sail, and mizzen. Area of sails, five thousand one hundred and sixty-nine square feet. Proportion of surface of sail to area of immersed midship section, two hundred and three to one.

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After an experimental cruise of about a year on the coast of the United States, in which her average speed was about five knots an hour, and the slip of the wheels from fifty to seventy per cent., it was determined by the Department to substitute larger boilers with return flues, in order to obtain an increase of steam room, and facilities for scaling them, it being found impossible to prevent the rapid accumulation of scale, at sea, working one hundred pounds of steam to the square inch. Also, to block up between the paddles so as to reduce them to one foot by four feet.

With these alterations, she was employed on the coast, and in the Gulf of Mexico about eighteen months, when the boilers again failed, owing to the high pressure to which they were subjected, and the consequent impossibility of keeping them tight and free from scale. Her speed was not materially augmented, while the consumption of fuel was at the rate of eighteen tons of coal each twenty-four hours, cutting off at half stroke of piston.

In eighteen hundred and forty-six, the "Union" was again altered and repaired. Condensing engines, with cylinders forty inches in diameter, and four feet stroke, and inclined air pumps, were put in. The flues, furnaces, &c., of boilers renewed, and steam space increased. The blocks were taken out of the wheels, and every other paddle cut out, leaving ten paddles four feet by two feet.

On the trial trip, from Washington to Norfolk, it was found that the efficiency of the wheels was not increased, and that the ends of the water-wheel shafts had worn off three-fourths of an inch, which could not be remedied without taking her into dock and removing the wheels, as had been done twice before. She was therefore laid up for the time, and finally sent around to the Philadelphia Navy Yard, her machinery and boilers taken out and sold, and the hull turned into a Receiving Vessel, for which purpose she is yet used by the Government.

There is no log of the performance of the "Union," on file, in the Navy Department, but the particulars contained in Note B, of the Appendix, are taken from a steam log, kept on board by one of the assistant engineers, during the last trip from Pensacola to Norfolk, December 12th to 27th, (both inclusive) 1844. From this log, it will be observed, that the speed of the vessel, under steam alone, with ordinary circumstances of sea and weather, did not exceed *four* knots per hour, with the large consumption of nearly twenty tons of coal per day.

The sums expended on the "Union," have been as follows, viz.:—

Constructed in 1843, at a cost of	$113,909 94
Alterations, repairs, &c., to July, 1844, ...	19,738 66
Additions, " " May, 1847, ...	36,300 00
Do. " " " 1848, ...	2,529 00
Total cost was	$172,477 60.

ARMAMENT.

Four sixty-eight pounders, mounted in the centre of the vessel, on swivels.

THE MICHIGAN.

THE "MICHIGAN" was built in eighteen hundred and forty-three, for cruising on the Northern lakes. Since that period she has been kept constantly in commission, making about eight years of uninterrupted service, except when the winter months compelled her to be laid up, in common with all vessels navigating those waters.

HULL.

The hull is built of iron, and as the lakes are composed of fresh water, the objection to iron vessels, of the rapid failing of their bottoms when employed in sea water, does not apply to the "Michigan."

The total weight of the hull, is five hundred and seven thousand, three hundred and eighty-seven pounds; the iron frames of T iron, are $4\frac{1}{2} \times 4 \times \frac{5}{8}$ inch; distance from centre to centre of frame, two feet. The plates are three-quarters of an inch thick at bottom, tapering to three-eighths of an inch thick at top, clincher built. The machinery and fuel, occupy sixty feet in length of the central part of the vessel.

Length between perpendiculars, ...	162 feet 6 inches.
Beam on deck, (extreme)	27 "
Depth of hold, ...	12 "
Burthen, ...	561 tons.
Displacement at 7 feet 7 inches draft, ...	570 "
Mean draft of vessel, ...	7 feet 7 inches.
Deep draft of vessel, ...	8 " 3 "
Light draft of vessel, ...	6 " 11 "
Immersed midship section at 7 feet 7 inches draft, ...	183 square feet.

ENGINES.

Two inclined direct action condensing engines, placed side by side, at an inclination of twenty and a-half degrees from the keel. They have oak frames, and the air-pumps work with a solid piston at the same inclination of the cylinders. The cylinder valves are of the double balance puppet kind, two discs to a valve; diameters of discs eight and a-quarter and nine and a-quarter inches. Total weight of engines and frames, one hundred and ninety-six thousand pounds. Average cost, per pound, of engine, twenty-four cents.

Diameter of cylinders, ...	36 inches.
Stroke of pistons, ...	8 feet.
Space displacement of both steam pistons per stroke, . .	113.088 cubic feet.
Diameter of air-pumps, ...	$29\frac{1}{2}$ inches.
Stroke of air-pump pistons, ...	$31\frac{1}{2}$ "
Space displacement of both air-pump pistons, per stroke, .	$24\frac{5}{10}$ cubic feet.
Capacity of condenser, ...	21 " "
Capacity of hot well, or reservoir, ...	$21\frac{1}{2}$ " "
Diameter of feed-pump, ...	$5\frac{1}{2}$ inches.
Stroke of feed-pump piston, ...	$31\frac{1}{2}$ "

BOILERS.

Two iron boilers with single return ascending flues. The boilers are placed side by side, with one smoke-chimney in common.

Length of each boiler, ...	19 feet.
Breadth of each boiler, ...	8 " 6 inches.
Height of each boiler, (exclusive steam chimney) . . .	9 " 3 "
Area of the total heating surface in the two boilers, . .	1976 square feet.
Area of the total grate surface in the two boilers, . .	84 " "
Aggregate cross area of the lower flues at bridge in both boilers, ...	20 " "
Aggregate cross area of the lower flues at back of boiler in both boilers, ...	14,848 " "
Cross area of the smoke-chimney, ...	14,186 " "
Height of smoke-chimney above grates, ...	37 feet 3 inches.
Capacity of steam room in the two boilers, ...	430 cubic feet.
Number of furnaces in the two boilers, ...	4.
Width of each furnace, ...	$44\frac{1}{2}$ inches.
Weight of the two boilers, chimney, &c., ...	68,000 pounds.
Weight of water in both boilers, ...	50,000 "

PADDLE WHEELS,

Of the common radial kind.

Diameter from outside to outside of paddles, ...	21 feet.
Length of paddles, ...	7 " 6 inches.
Width of paddles, ...	26 inches.
Immersion of lower edge of paddle at 7 feet 7 inches draft, .	3 feet 1 inch.
Number of paddles in one wheel, ...	16.
Number of paddles in water in one wheel, ...	3.
Area of two paddles, ...	32.5 square feet.
Area of all immersed paddle surface, ...	97.5 " "

PERFORMANCE.

The mean speed of the "Michigan," between September, 1845, and August, 1847, taken from her log, and computing the distances from "Mitchell's Map of the Lakes," that being the latest authority, is 10.4 statute miles, per hour. Mean revolutions of the wheels, per minute, 18⅓. Slip of the centre of pressure of the paddle, 20.1 per centum. Oblique action of the paddle on the water, 13.1 per centum. The mean effective pressure on the steam pistons, per square inch, 18.44 pounds. Horse power developed by the engines, 333.66.

LOSS OF POWER BY THE AIR-PUMP.

From indicator diagrams, taken from the air-pump, it is found that the mean effective pressure on the air-pump pistons for the stroke, was 6.625 pounds per square inch. The pump pistons make one delivering stroke to each double stroke of the steam pistons, and the space displacement, per stroke, of the pump, and steam pistons, is 1000 to 4.616, which latter multiplied, becomes 9.232, and $6.625 \div 9.232 = 0.718$. It therefore requires a pressure of 0.718 pounds per square inch, on the pistons of the steam cylinders, to overcome the resistance opposed to the air-pump pistons, exclusive, of course, of the friction of the air-pump and its connections.

ARMAMENT.

One sixty-eight pounder, on pivot.

Kedges,	0 tons,	9 cwt.,	1 qrs.,	20 lbs.
Chain cables,	20 "	4 "	0 "	3 "
Stream and tow rope,	1 "	7 "	3 "	12 "
Boats, spars, and sails,	2 "	10 "	3 "	16 "
Guns, shot, and powder,	12 "	0 "	1 "	10 "
Boatswains', gunners', and carpenters' stores,	3 "	5 "	1 "	7 "
Provisions for 130 men, for 30 days,	2 "	16 "	3 "	7 "
Crew and baggage,	15 "	7 "	2 "	0 "
Engines,	81 "	1 "	2 "	18 "
Boilers, steam, and smoke-pipes,	119 "	3 "	0 "	22 "
Extras,	15 "	11 "	1 "	2 "
Stores and tools,	13 "	5 "	1 "	7 "
Water in boilers,	41 "	2 "	3 "	2 "
Coal,	101 "	2 "	0 "	25 "
Pine wood, (thirty-five cords)	46 "	17 "	2 "	0 "
Wood around water tanks,	1 "	9 "	1 "	21 "
Total,	539 tons,	19 cwt.,	2 qrs.,	10 lbs.

ARMAMENT.

Her armament consisted of eight long forty-two pounders, and one twenty-four pound chase gun, traversing about the deck.

RECAPITULATION OF COST.

Hull and equipments,	$157,055 18
Engines and wheels,	49,198 57
Boilers,	93,396 06
	$299,649 81

PERFORMANCE.

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Area of the total heating surface in the two boilers, . .	1976 square feet.
Area of the total grate surface in the two boilers, . .	84 " "
Aggregate cross area of the lower flues at bridge in both boilers, ...	20 " "
Aggregate cross area of the lower flues at back of boiler in both boilers, ...	14,848 " "
Cross area of the smoke-chimney, ...	14,186 " "
Height of smoke-chimney above grates, ...	37 feet 3 inches.
Capacity of steam room in the two boilers, ...	430 cubic feet.
Number of furnaces in the two boilers, ...	4.
Width of each furnace, ...	$44\frac{1}{2}$ inches.
Weight of the two boilers, chimney, &c., ...	68,000 pounds.
Weight of water in both boilers, ...	50,000 "

PADDLE WHEELS,

Of the common radial kind.

Diameter from outside to outside of paddles, ...	21 feet.
Length of paddles, ...	7 " 6 inches.
Width of paddles, ...	26 inches.
Immersion of lower edge of paddle at 7 feet 7 inches draft, .	3 feet 1 inch.
Number of paddles in one wheel, ...	16.
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ARMAMENT.

One sixty-eight pounder, on pivot.

THE GENERAL TAYLOR.

This small steamer was bought by the War Department, and used as a transport for troops, supplies, &c., during the Seminole war in Florida. At the termination of that war, she was transferred to the Navy Department, and used for a time in the Gulf of Mexico, to prevent the spoliation of the Government live oak preserves. In eighteen hundred and forty-five, the "General Taylor" was converted into a tug steamer, and stationed at the Pensacola Navy Yard, in Florida.

As this vessel was built for a commercial steamer, intended to navigate land-locked bays, she was unfitted for ocean navigation, and had neither hull, machinery, or spars proper for a naval steamer.

The following are the dimensions of the "General Taylor":—

HULL.

Length on deck, ...	105 feet.
Beam on deck, ...	17 " 6 inches.
Depth of hold, ...	8 " 6 "
Burthen, ...	152 tons.
Mean draft of water with half fuel in and other weights full,	5 " 6 inches.
Immersed amidship section at 5 feet 6 inches draft, . .	87.5 square feet.

ENGINE.

One vertical, cross head, condensing engine, with two connecting rods.

Diameter of cylinder, ...	25¼ inches.
Stroke of piston, ...	6 feet.
Space displacement of piston, per stroke, ...	20.86 cubic feet.

PADDLE WHEELS.

Diameter from outside to outside of paddles, . . .	16 feet.
Length of paddles, ...	4 " 10 inches.
Width of paddles, ...	22 inches.
Immersion of lower edge of paddle at 5 feet 6 inches draft,	2 feet 3 inches.

Number of paddles in one wheel, ...	14.
Number of paddles in water in one wheel, . .	3.
Area of two paddles, ...	17.722 square feet.
Area of all immersed paddle surface, . . .	53.166 " "

BOILER.

One iron boiler with arches below and single return ascending flues.

Length of boiler, ...	15 feet.
Breadth of boiler, ...	6 "
Height of boiler, ...	8 "
Area of the total heating surface, ...	499 square feet.
Area of the total grate surface, ...	21.25 " "
Aggregate cross area of the lower arches *over* bridge wall,	6.267 " "
" " " " " " behind " " .	10.600 " "
Aggregate cross area of upper flues, ...	3.142 " "
Cross area of smoke-chimney, ...	7.876 " "
Height of smoke-chimney above grate, ...	39 feet.
Capacity of steam room in the boiler, ...	140 cubic feet.

PERFORMANCE.

When steaming in Pensacola Bay, the mean speed of the vessel was 9.443 knots of $6082\frac{2}{3}$ feet, or 10.88 statute miles of 5280 feet. Steam pressure in boiler per guage, twenty pounds per square inch above atmosphere, cut off at half stroke. Number of double strokes of piston per minute, twenty-five. Consumption of southern pine wood, three-eighths of a cord per hour. Slip of the centre of pressure of the wheels, 18 per centum. Oblique action of the paddles, 11.94 per centum.

In eighteen hundred and forty-six, the "GENERAL TAYLOR" was accidentally burned to the water's edge, alongside the wharf at the Navy Yard, Pensacola, and she was rebuilt at once of the same dimensions of hull as before, but with new paddle wheels, engine and boiler, the dimensions of which were as follows:

PADDLE WHEELS.

Diameter from outside to outside of paddles, .	17 feet.
Length of paddle, ...	5 "
Breadth of paddle, ...	20 inches.
Number of paddles in one wheel, ...	13.

THE GENERAL TAYLOR.

ENGINE.

One of the same kind as before.

Diameter of cylinder	36 inches.
Stroke of piston, ...	6 feet.
Space displacement of piston, per stroke, ...	42.411 cubic feet.

BOILER.

Total area of grate surface, ...	30 square feet.
Total area of heating surface, ...	720 " "
Steam room.	215 cubic feet.

This boiler furnished steam of twenty-two pounds boiler pressure above atmosphere, per square inch, cut off half-stroke, the engine making twenty-five double strokes of piston per minute. Consumption of Southern pine wood, three-quarters of a cord per hour.

The performance of this vessel has never been accurately ascertained, but was about twelve miles per hour. The vessel continued in the Navy till April, eighteen hundred and fifty-two, but being in need of extensive repairs, she was considered as not worth the cost, and sold at public auction, at Pensacola Navy Yard.

THE COL. HARNEY AND THE POINSETT.

These two steamers were purchased by the War Department, and used for transports, until the end of the Florida war, at which time they were also transferred to the Navy Department and used in the Gulf for a short period, when they were sold out of the service.

They were constructed alike in their hulls and paddle wheels, but had different kinds of engines and boilers.

Of the "Poinsett," there is no record in the Department, either of her boilers or performance. She had one condensing engine, with cylinder of thirty-eight inches diameter, and eight feet nine inches stroke of piston. The dimensions of the "Colonel Harney," were as follows:—

HULL.

Length on deck, ...	133 feet.
Beam, ...	22 "
Depth of hold, ...	9 "
Burthen, ...	305 tons.
Mean draft of water, with half coal, and all other weights,	6 feet.
Immersed amidship section (6 feet draft)	108 square feet.

ENGINE.

One beam or top-vertical condensing engine.

Diameter of cylinder, ...	34¾ inches.
Stroke of piston, ...	8 feet.
Space displacement of piston, per stroke, ...	52.688 cubic feet.

PADDLE WHEELS.

Diameter from outside to outside of paddles, ...	20 feet.
Length of paddles, ...	7 "
Width of paddles, ...	24 inches.
Immersion of lower edge of paddles at 6 feet draft, . .	3 feet 3 inches.

Number of paddles in one wheel,	14.
Number of paddles in water, in one wheel,	3.
Area of two paddles,	28 square feet.
Area of all immersed paddle surface,	84 " "

BOILER.

One iron boiler, with arches below and flues above.

Length of boiler,	18 feet.
Breadth of boiler,	8 " 6 inches.
Height of boiler,	8 " 9 "
Area of total heating surface,	608 square feet.
Area of total grate surface,	40 " "
Aggregate cross area of arches over bridge,	$10\frac{2}{3}$ " "
" " " " behind "	18 " "
" " " " upper flues,	8.72 " "
Cross area of smoke-chimney,	8.30 " "
Height of chimney above grates,	54 feet.
Capacity of steam room in boiler,	230 cubic feet.

PERFORMANCE.

With a steam boiler pressure of twenty pounds above the atmosphere per square inch, cut off at half stroke, the piston made seventeen double strokes per minute, and gave the vessel, at sea, a mean speed of eight knots of $6082\frac{2}{3}$ feet, or 9.216 statute miles per hour. Consumption of Southern pine wood, three-quarters of a cord per hour Slip of the centre of pressure of the paddles, 19.14 per centum. Oblique action of the paddles, 14.55 per centum. Mean effective pressure on the piston, per square inch, twenty-four and a-half pounds. Horse power developed by the engine, 202.79.

ARMAMENT.

The "COLONEL HARNEY" and the "POINSETT," carried, each, a long thirty-two pounder on pivot.

THE SCOURGE AND THE IRIS.

The steamers "Scourge" and "Iris," were purchased by the Navy Department, from the merchant service, in eighteen hundred and forty-seven, and used for a short cruise in the Gulf, and then sold out of the service, having been found unadapted for Naval purposes.

The "Scourge" had two of "Loper's" *flat bladed* propellers, and the "Iris," radial paddle wheels. There is no record of the dimensions and performance of the "Scourge," to be found, those of the "Iris," are as follows, viz.:—

HULL.

Length on deck,	145 feet.
Breadth of beam,	27 "
Depth of hold,	11 "
Burthen,	388 tons.
Immersed midship area of hull,	229 square feet.
Mean draft of water,	9 feet 9 inches.

ENGINE.

One piston rod, condensing, steeple engine.

Diameter of cylinder,	54 inches.
Stroke of piston,	6 feet.
Space displacement of piston, per stroke,	95.244 cubic feet.

BOILERS.

The boilers were of iron, two in number, of the double-return drop-flue variety, of the following dimensions:—

Length of each boiler,	23 feet.
Breadth " "	6 " 10 inches.
Height " "	8 " 3 "
Height of smoke-chimney above grate,	40 "
Cross area of smoke-chimney,	11.54 feet.
Area of heating surface in the two boilers,	1420 square feet.
Cross area of each of the three rows of flues, (14½ in diameter) in the two boilers,	9.17 feet.

PROPORTIONS.

Proportion of heating to grate surface, ...	17.75 to 1,000.
" " grate surface to cross area of each of the three rows of flues in the two boilers, . .	8.724 " 1,000.
" " heating surface to cross area of smoke-chimney, .	6.932 " 1,000.
" " " " cubic foot of space displacement of piston, . .	14.881 " 1,000.
" " " " per double stroke of piston, per minute, . . .	1.191 " 1,000.
Consumption of bituminous coal, per hour, with natural draft, per square foot of grate surface, ...	12.812 pounds.
Consumption of anthracite, with fan blast, per square foot, of grate surface, ...	11.825 "
Sea water evaporated by one pound of bituminous coal, per hour, ...	5.118 "

PADDLE WHEELS,

Were of the common radial kind.

Diameter of wheel, ...	23 feet.
Number of paddles in each wheel, ...	20.
Length " "	6 feet.
Breadth " "	2 " 4 inches.
Area of one "	14 square feet.
Mean immersion of lower edge of paddle, ...	3 feet 3 inches.
With centre paddle vertical, in water, at once, ...	4½ paddles.

PERFORMANCE.

The logs of the vessel give her performance for four hundred and forty-five hours' steaming, using anthracite coal, with a fan blast; and for five hundred and fifty-two hours' steaming, using bituminous coal, with natural draft. The mean speed of the vessel in the entire nine hundred and ninety-seven hours, was 6.718 knots per hour; the double strokes of piston, per minute, 12.054. The steam was cut off at half stroke of piston; the boiler pressure was twelve and a-half pounds above the atmosphere.

ARMAMENT.

The "Iris" carried one long thirty-two pounder, on a pivot.

THE MISSISSIPPI.

A VERY correct view of this celebrated Naval steamer, is given in Plate Four, engraved from a beautiful daguerreotype, taken by Messrs. Beckers & Piard, Daguerrean Artists, Broadway, New York, the day before she sailed, as the Flag Ship of Commodore Perry, for Japan.

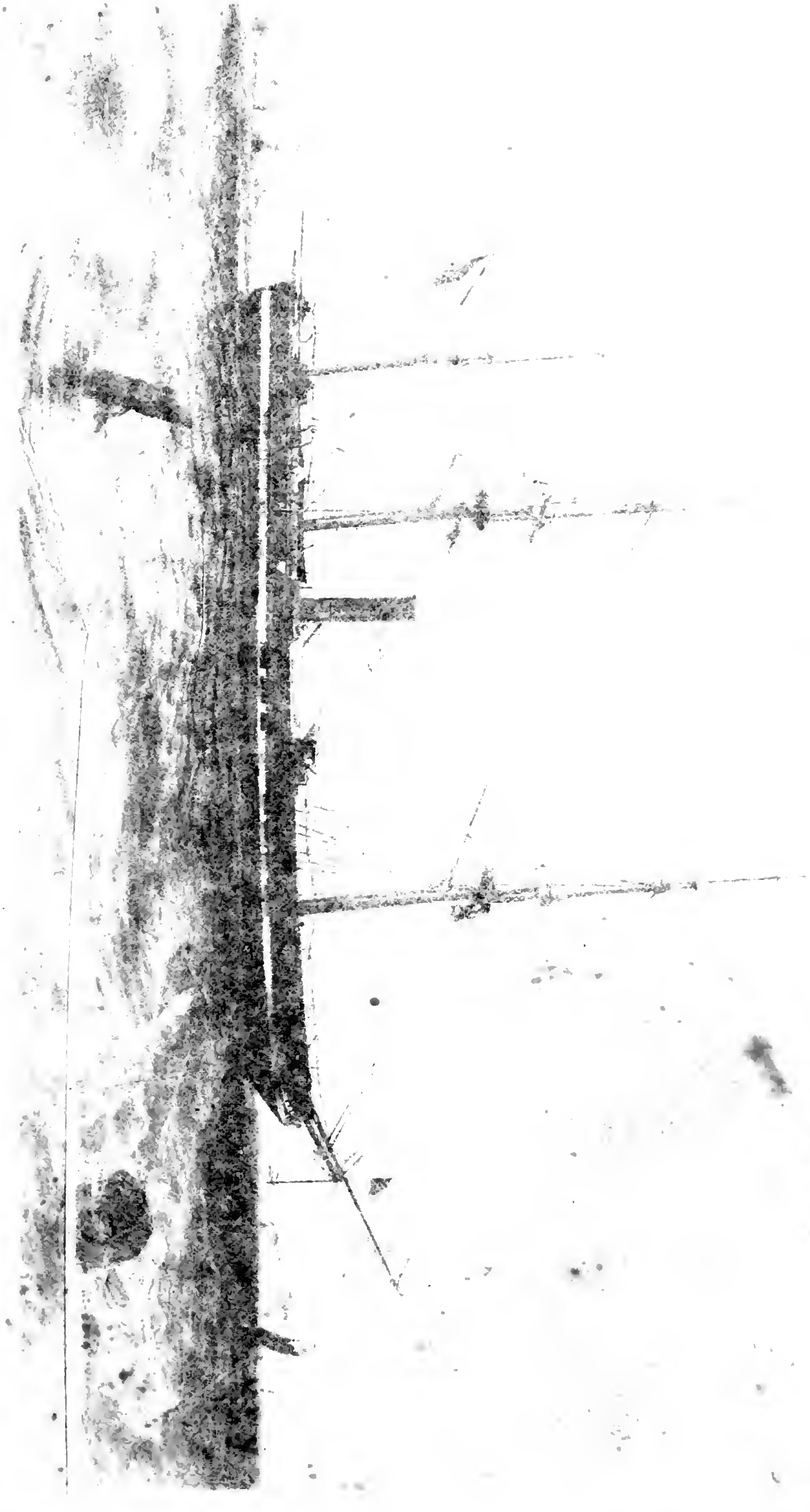
It will be remembered, that this steamer was the Flag Ship of the same gallant Commodore, in the Home Squadron, during the late Mexican war; and, that subsequently, she conveyed Kossuth from Turkey to France, and landed him at Gibraltar, and then brought his comrades in exile to this country.

During the past summer, she visited the fishing banks of Nova Scotia and New Brunswick, to look after the interests of the fishermen in that quarter, and returned to New York in September last, and the following month left for Annapolis, to join the steamer "Princeton," before leaving in her company for Japan, in the month of December. The hull was built in eighteen hundred and forty, at the Navy Yard, Philadelphia, and the machinery was constructed at the large Iron works of Messrs. Merrick & Town, of that city. During the past year, this steamer was placed in dock, and thoroughly repaired, and her engines and boilers put in good order, at the same works at which they were built, now owned by Messrs. Merrick & Son, of which B. H. Bartol, Esq., is the Engineer. It was found necessary to put in two new cylinders, and thoroughly repair the copper boilers, which were much injured by the salt water and the use of bituminous coal. The cost of the repairs to the machinery and wheels, was seventy-two thousand, nine hundred and fifty-one dollars and eighty-one cents.

She has, however, been altogether the most useful and economical side-wheel steamer in the Navy, and has, it is believed, steamed a greater distance than any war-steamer now afloat.

HULL.

Length over all,	229 feet.
Length between perpendiculars,	220 "
Beam,	40 "
Moulded,	39 "



[illegible] PPI.

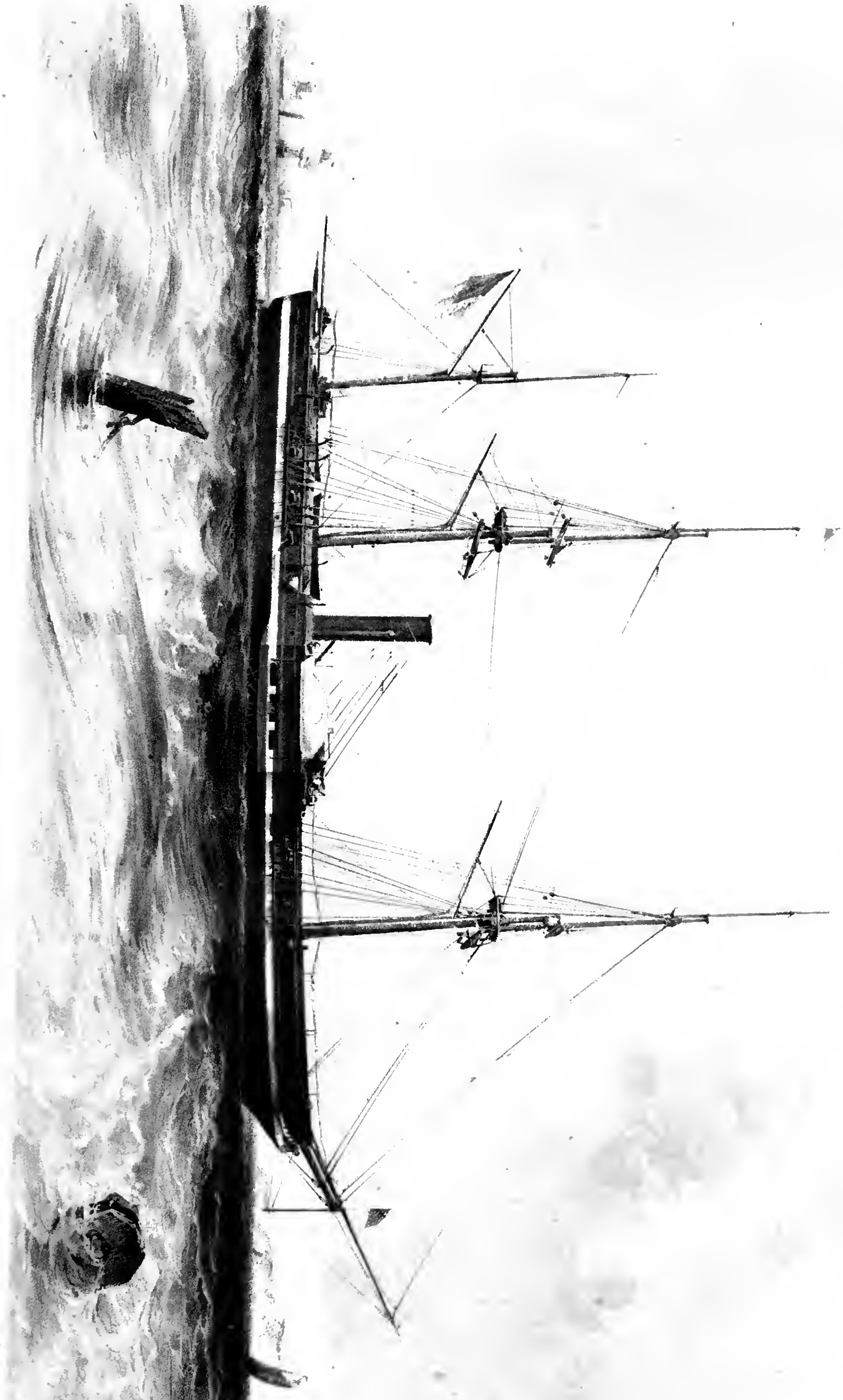
[illegible] Plate Four, engraved [illegible] Artists, Broad- [illegible] Commodore Perry, for Japan. [illegible] flag [illegible] same gallant Commo- [illegible] subsequently, she con- [illegible] at [illegible] then brought his

[illegible] banks of Nova Scotia [illegible] New Brunswick, [illegible] New York in [illegible] "Princeton," [illegible] company for Japan [illegible] December [illegible] was built in [illegible] forty, at the Navy Yard [illegible] Philadelphia, and the [illegible] constructed [illegible] Iron works of Messrs. Merrick & [illegible] that city. During the past year, this [illegible] placed in dock, and thoroughly repaired [illegible] her engines and boilers put in good [illegible] same work at which they were built [illegible] by Messrs. Merrick & Son, of [illegible] Esq., is the Engineer. It was found necessary to put in two new cylinders, [illegible] the copper boilers, which were much [illegible] by the salt water, and the [illegible] The cost of the repairs to the machinery and wheels, was seventy-two [illegible] and fifty-one dollars and eighty [illegible]

[illegible] altogether the most useful and economical side-wheel steamer in [illegible], steamed a greater distance than any [illegible] steamer now afloat.

HULL.

[illegible]	229 feet.
Length [illegible] bearings,	220 "
[illegible]	46 "
[illegible]	[illegible] "



Depth of hold,	$23\frac{1}{2}$ feet.
Displacement at mean draft,	3,220 tons.
Launching weight of hull,	1,280 "
Immersed amidship area at mean draft,	684 square feet.
Draft ready for sea, except coal,	18 feet.
Deep load draft,	20 "

Draft in feet.	*Displacement in tons.*
10	1332.
12	1724.
14	2133.
16	2557.
18	2992.
20	3421.

RIG.

Barque-rigged; amount of surface in plain sails, to top-gallant sails inclusive, nineteen thousand square feet.

ENGINES.

Two side-lever engines.

Diameter of cylinders,	75 inches.
Stroke,	7 feet.
Displacement of both pistons,	$429\frac{5}{10}$ feet.
Diameter of upper steam, and lower exhaust valves,	$14\frac{3}{4}$ inches.
" lower " " upper " "	$13\frac{3}{4}$ "
" lifting air-pump,	$46\frac{1}{2}$ "
Stroke of piston,	3 feet 4 inches.

Displacement of pistons of both pumps, $86\frac{5}{10}$ cubic feet, or, $20\frac{4}{10}$ per cent. of that of the steam pistons.

Capacity of condenser, 150 cubic feet, or, 35 per cent. of that of the steam pistons.

Feed pumps (two to each engine) $7\frac{1}{4}$ inches in diameter, by 44 inches stroke.

From the relative dimensions of the cylinders and valves, it will be seen that there is one square inch of valve opening to one thousand, one hundred and sixty-two cubic inches of steam piston displacement. Steam room, one thousand, seven hundred and seventy cubic feet. Total weight of engines, two hundred and eleven tons.

BOILERS.

The boilers are three in number, of the double-return ascending-flue variety, constructed of copper, and with three furnaces in each. They contain in the aggregate, six thousand square feet of heating surface, and two hundred and forty square feet of grate surface. The proportion of grate to heating surface, is therefore, one to twenty-five, and the proportion of heating surface to space displacement of piston, is nearly fourteen square feet to one cubic foot.

Weight of boilers, chimney connections, &c., one hundred and twenty tons.

Weight of water in boilers, (full) eighty-two tons.

Weight of wheels, bunkers, tools, duplicate pieces of engine, stores of the engine department, &c., two hundred and eighty-eight tons—total, four hundred and ninety tons—to which add bunkers half full of coal, (three hundred tons) makes seven hundred and ninety tons, devoted to the engine department at mean draft, or equal to sixty-nine per cent., of the whole available displacement of the vessel, at mean draft.

PADDLE WHEELS,

Of the common radial kind.

Diameter from outside, ...	28 feet.
Length of paddles, ...	11 "
Breadth of paddles, ...	30 inches.
Number of paddles in each wheel, ...	21.
Distance apart at periphery, ...	4.19 feet.
Mean immersion of lower edge of paddles, . . .	5 feet 6 inches.
Number of paddles of each wheel in water, ...	5.
Weight of paddles, ...	47 tons.

They were first constructed a split paddle, the surface being in two parts, bolted on back and front of arms. Area of two paddles, fifty-five square feet, or one-tenth of the immersed amidship section of the vessel.

This form of paddle was used on the Mississippi until last summer, when the part on the front of the arms was taken off, four inches taken from its width, and then bolted on the back side of the arm adjoining the other part. This simple change added to the speed of the vessel of over one knot an hour, with the same pressure as used formerly.

ARMAMENT.

The battery consists of two *ten* inch (one hundred and twenty pounders) Paixhan guns, mounted one on each bow, on pivots; and eight, eight inch (sixty-eight pounders) Paixhan guns, mounted abaft the wheels, in broadside.

THE MISSISSIPPI.

PERFORMANCE.

The mean performance of the "Mississippi," under steam alone, cruising in the Atlantic and Gulf of Mexico, from October, eighteen hundred and forty-five, to March, eighteen hundred and forty-seven, during thirty days, with light breeze ahead, was seven and one-third knots per hour. Double strokes of piston, 10.65 per minute. Mean effective pressure on piston by indicator, fourteen pounds per square inch. Consumption of bituminous coal, per hour, 3078 pounds, or 36.936 tons per day. The sea-knot is usually taken at 6082⅔ feet, which would make the speed of the vessel equal to 8.45 statute, or land miles, per hour.

The mean of the entire amount of steaming, done under steam and canvas, between the periods of time above named, was as follows:—

Speed of vessel, per hour, ...	7.06 knots.
Revolutions of wheels, per minute, ...	10.4 "
Steam pressure in boilers, above the atmosphere, per square inch,	10.5 pounds.

Cut off at three-eighths of the stroke from the commencement; consumption of coal, per hour, 2,877 pounds, or 68,948 pounds per day of twenty-four hours.

From the time the "Mississippi" left Gibraltar, the seventh day of July, eighteen hundred and forty-nine, to the day of her arrival at Naples, the seventeenth day of April, eighteen hundred and fifty, the Engineer's Log, shows that she had steamed forty-one days, thirteen and one-half hours; during which time there were *head* winds *thirty-six days and twenty-three hours*, and a *fair* wind *only three days, nine hours and three-quarters;* and that sail had been set *only two days four hours and three-quarters;* the remaining time, of seven days and five hours, the wind was light and variable, and when fair, too light to assist the ship, by making sail!

Note D, of the Appendix, shows the views of the Chief Engineer of this vessel, respecting the value of sails to a side-wheel steamer, and Note E, contains the Steam Log, furnished for this work, by the same engineer, of two days' performance at sea, last October, with two indicator cards, on Plate Thirty.

COST.

Original cost of hull, rigging, &c., ...	$306,683 00,
" " machinery and wheels, ...	243,571 00,
Repairs in 1852, ...	94,954 00,
Total cost, ...	$645,208 00.

THE MISSOURI.

This steamer was built at the New York Navy Yard in eighteen hundred and forty and forty-one, of the same proportions and after the same lines as the "Mississippi," though much her superior in internal arrangement and finish. Her machinery was constructed at the West Point Foundry, Cold Spring, from designs of Charles W. Copeland, Esq., Civil and Mechanical Engineer, (who also designed the engines of the Mississippi,) under the superintendence of Charles H. Haswell, Esq., formerly Engineer-in-Chief of the United States Navy.

Her engines were double, inclined, condensing, with inclined air-pumps, and supported on wooden frames. The cubic contents of her cylinders were identical with those of the "Mississippi," a difference being made in the length of stroke, to test the relative merits of "long" or "short stroke" engines. For the dimensions of her water-wheels, boilers, &c., see the preceding description of the "Mississippi."

ENGINE.

Diameter of cylinders,	$62\frac{1}{2}$ inches.
Length of stroke,	10 feet.
Cubic contents of cylinder,	371,000 cubic inches.
Estimated horse-power of engines,	600.
Weight of engines and boilers,	847,331 pounds.

COST.

Engines and wheels,	$134,425 21
Boilers,	85,669 91
Coal bunkers,	6,768 75
Extras and duplicate pieces,	9,083 15
Hull (complete, exclusive of armament,)	126,589 74
Total (except armament,)	$598,483 78

THE MISSOURI.

PERFORMANCE.

From some memorandums of her performance on the coast in experimental trips, her average speed is ascertained to be eight knots per hour, and her maximum nine to ten knots. After completion, a trial of speed was made with the "Mississippi," from New York to Washington, but as the journals of the "Mississippi" became heated, and obliged her to slacken her speed, and the "Missouri" ran aground in the Potomac River, no definite result was obtained.

I am indebted to the courtesy of Charles W. Copeland, Esq., for a copy of a letter from John Faron, Esq., Chief Engineer of the "Missouri" on her passage to Gibraltar, from which the following synopsis has been prepared:—

August 6, 1843.—At 10½ P. M., off Cape Henry; at 11, discharged pilot and got under way. Draft of vessel, 20 feet 6 inches forward, 21 feet 9 inches aft.

Steam, 9½ pounds; vacuum, 25 inches; revolutions, 10¼ per minute. Engines in operation 17 hours 25 minutes. Coal consumed, 29.7 tons Cumberland. Cut-off, nearly two-sevenths from commencement.

7th.—Engines in operation 23 hours. Steam, 8½ pounds. Vacuum, 25 inches. Revolutions, 9½ per minute. Consumption of coal, 34.6.

8th.—Engines in operation 23 hours 5 minutes. Steam, 8¾ pounds. Revolutions per minute, 10. Cut-off, one-seventh. Consumption of coal, 29.9 tons. Thermometer in after fire-room, 138°. Fore and aft sails set, but of little use. Throttle nearly closed.

9th.—Engines in operation 24 hours. Steam, 10½ pounds. Revolutions per minute, 9½. Coal consumed, 27.7 tons.

10*th.*—Engines in operation 24 hours. Steam, 11 pounds. Revolutions, 11. Coal consumed, 28.9 tons. Light head wind.

11*th.*—Engines in operation 23 hours 30 minutes. Steam, 10 pounds. Revolutions, 11. Coal consumed, 31.56 tons.

12*th.*—Engines in operation 24 hours. Steam, 10¼ pounds. Revolutions, 10⅔. Coal consumed, 29.81 tons.

13*th.*—Engines in operation 24 hours. Steam, 11¾ pounds. Revolutions, 11. Coal consumed, 34.52 tons. Fresh head wind.

14*th.*—Steam, 11 pounds. Revolutions, 11¼. Coal consumed, 34.5 tons. Cut-off, one-seventh. Throttle half open. Fresh head wind. Engines working 24 hours.

15*th.*—Engines in operation 24 hours. Steam, 11½ pounds. Revolutions, 11. Throttle one-third open. Coal consumed, 31.42 tons. Ashes hoisted out the last 24 hours, 6 tons.

16*th*.—Engines in operation 24 hours. Steam, $11\frac{1}{2}$ pounds. Revolutions, 12. Coal consumed, 31.5 tons. Ashes hoisted out, $7\frac{1}{2}$ tons. Wind still ahead.

17*th*.—Engines in operation 24 hours. Steam, $10\frac{1}{4}$ pounds. Revolutions, $11\frac{1}{2}$. Coal consumed, 35.4 tons. Ashes, $7\frac{1}{2}$ tons.

18*th*.—At 3 h. 38 min. P. M., slowed engines. Came to anchor at .6 P. M., off Fayal. Steam, $10\frac{1}{4}$ pounds. Revolutions, $11\frac{1}{4}$. Engines in operation 17 hours 30 minutes. Coal consumed, 21.37 tons. Ashes, $6\frac{1}{8}$ tons.

Actual running time under steam, 280 hours; distance, 2500 statute miles; average speed per hour, 8.92 miles. Total amount of coal consumed, 400.88 tons; average per hour, 1.431 tons. The occasional stoppages noticed were necessary to refit the cut-off, which was of the "cam" arrangement.

The "Missouri," then under the command of Captain John J. Newton, of the United States Navy, arrived safely at Gibraltar. On the evening of the twenty-third of August, a quantity of spirits of turpentine fell on the felting of the steam-pipe, and took fire from a lamp. The flames spread so rapidly that all hope of saving her was speedily abandoned; and in a few hours nothing remained of this splendid vessel save a sinking and blackened hulk. The utmost exertions of her officers were of no avail; her commandant was the last one to leave the ship, and every thing was lost.

THE PRINCETON.

Screw propulsion was first introduced into the United States Navy, and indeed, it may be said into the United States, in eighteen hundred and forty-three, by the construction of the "Princeton," a steam-ship, classing as a second rate sloop of war.

This vessel was designed by, and constructed under the superintendence of the celebrated Engineer, Captain John Ericsson, of New York.

HULL.

Length on deck, ...	164 feet.
Length between perpendiculars, ...	156 "
Extreme beam on deck, ...	30 " 6 inches.
Depth of lower hold to berth-deck, ...	14 "
Depth from berth to spar-deck, ...	7 " 6 "
Total depth of vessel, ...	21 " 6 "
Measurement burthen, ...	673 tons.
Launching weight of hull, ...	418 "
Displacement at 16½ feet draft, ...	954 "
Displacement at 18 feet draft, ...	1046 "
Immersed midship section at 16½ feet draft, ...	346 square feet.
" " " 18 " "	390 " "
Draft of water, at deepest load, with 200 tons of coal on board, ...	19 feet 4 inches.
Draft of water, with 100 tons of coal in, after bunkers and provisions, and water for the crew, half out, . . .	Forward, 14¾ feet. Aft, . . 18¼ "
Mean draft of water with half coal out, and all other weights full, ...	17 feet.

The peculiarity of model consisted in a very flat floor amidships, with great sharpness forward, and excessive leanness aft, the run being remarkably fine, with a great extent of dead-wood terminating in a stern-post of the unusual thickness of twenty-six inches at the centre of the propeller-shaft, but tapering above and below. This dead-wood and stern-post was pierced by a hole thirteen inches diameter, for the passage of the propeller-shaft. The stern, measuring from a perpendicular from the aft end of the spar-deck, overhung the stern-post, fifteen and one-half feet, and depending from it was a false stern-post, leaving a space of six feet, fore and aft, between it and the true stern-post. The propeller was placed within this space. The false stern-post, or rudder-post, was composed of a wrought iron bar, covered with half inch thick copper plate; it was attached at top by brass flanges to a strong oak knee, securely bolted to the counter of the vessel; the lower part of it was attached by similar flanges, to a solid oak timber placed as a continuation of the keel beyond the true stern-post; this timber was fourteen inches deep, and securely bolted to the keel and dead-wood. The metallic false stern-post was five and three-eighths inches broad athwart ship, and two feet long fore and aft; the forward part was brought to an acute angle to diminish its resistance to the water, while its after part was square, to receive the attachment of the rudder. The rudder was also composite in its construction, being formed of a wrought iron frame, the interstices of which were filled in with pieces of five inch thick pine plank, the whole cased over with a copper plate, three-sixteenths of an inch thick. The thickness of the rudder athwart ship was the same as that of the false stern-post, viz.: five and three-eighths inches.

RIG.

The "Princeton" was ship-rigged, and spread fourteen thousand, four hundred and thirteen square feet of canvas in plain sails.

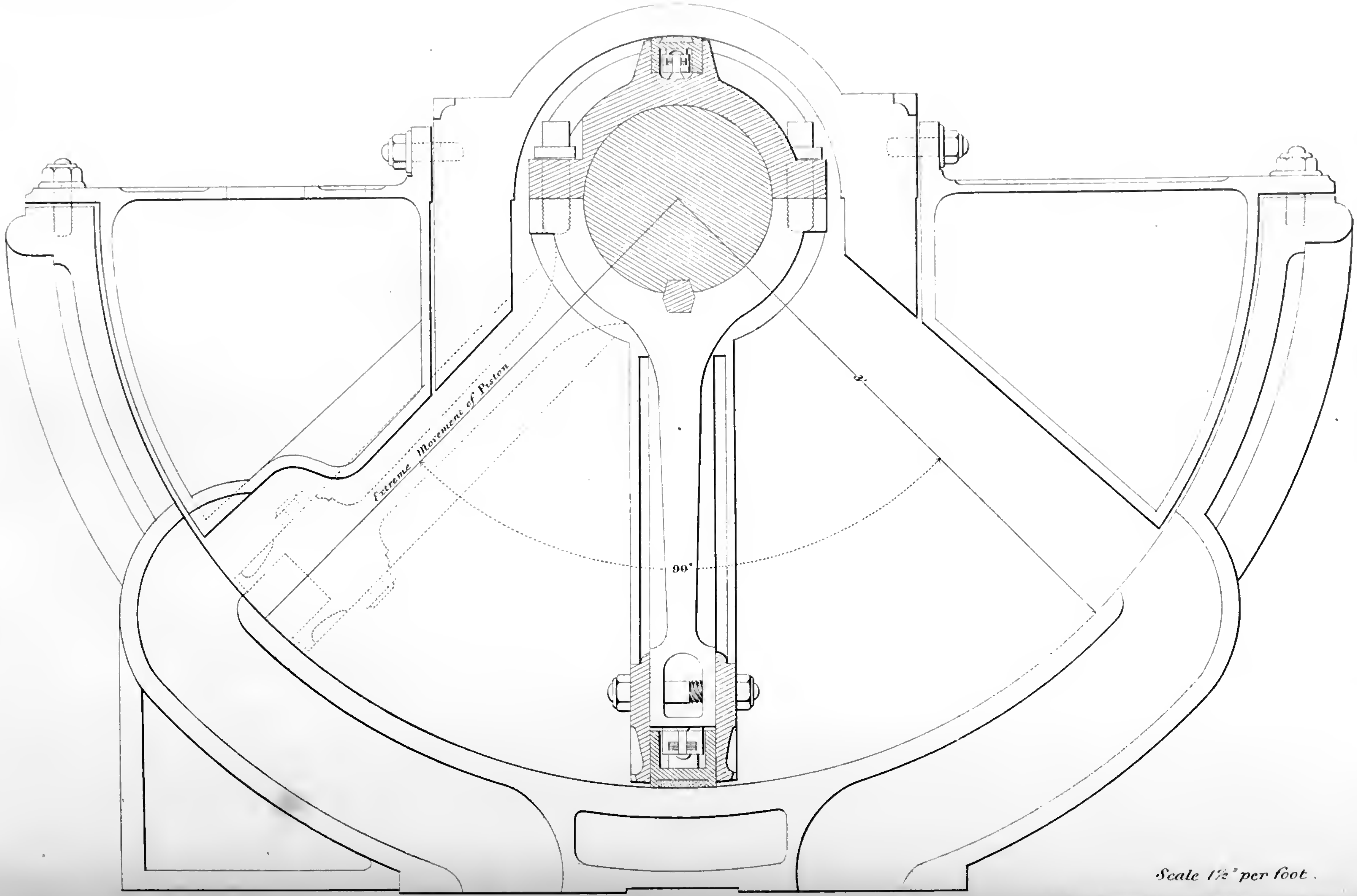
ENGINES.

The semi-cylinder engine of the "Princeton," is unquestionably the most remarkable modification of the steam engine that has ever been carried into successful practice. A vibrating piston of a rectangular form moving in a semi-cylinder, is an old mechanical device. Mr. Watt, in his celebrated patent, embraced this plan for transmitting the motive force of steam to machinery. Since his time, several engineers have attempted to build engines on this plan, but without success. In common with Mr. Watt, they have adopted the single semi-cylinder with packing against the piston-shaft. Ericsson's plan differs materially from these various attempts, he having introduced double or compound semi-cylinders of different diameters, with double pistons placed in opposite directions on the piston-shaft, both being acted upon by the steam at the same time, their differential force being the effective motive power of the engine. The combination of two such double semi-cylinders, arranged so as to transmit their power in directions nearly rectangular to a crank-pin common to both, also contributes to the complete success of this singular engine.

PISTON MOVEMENT

U.S.S. PRINCETON.

(Ericsson's Patent)



Scale 1½" per foot.

Sam¹ M^c Elroy C.E. del

Engraved for Stuart's Naval & Mail Steamers U.S.

Sarony & Major Eng. N.Y.

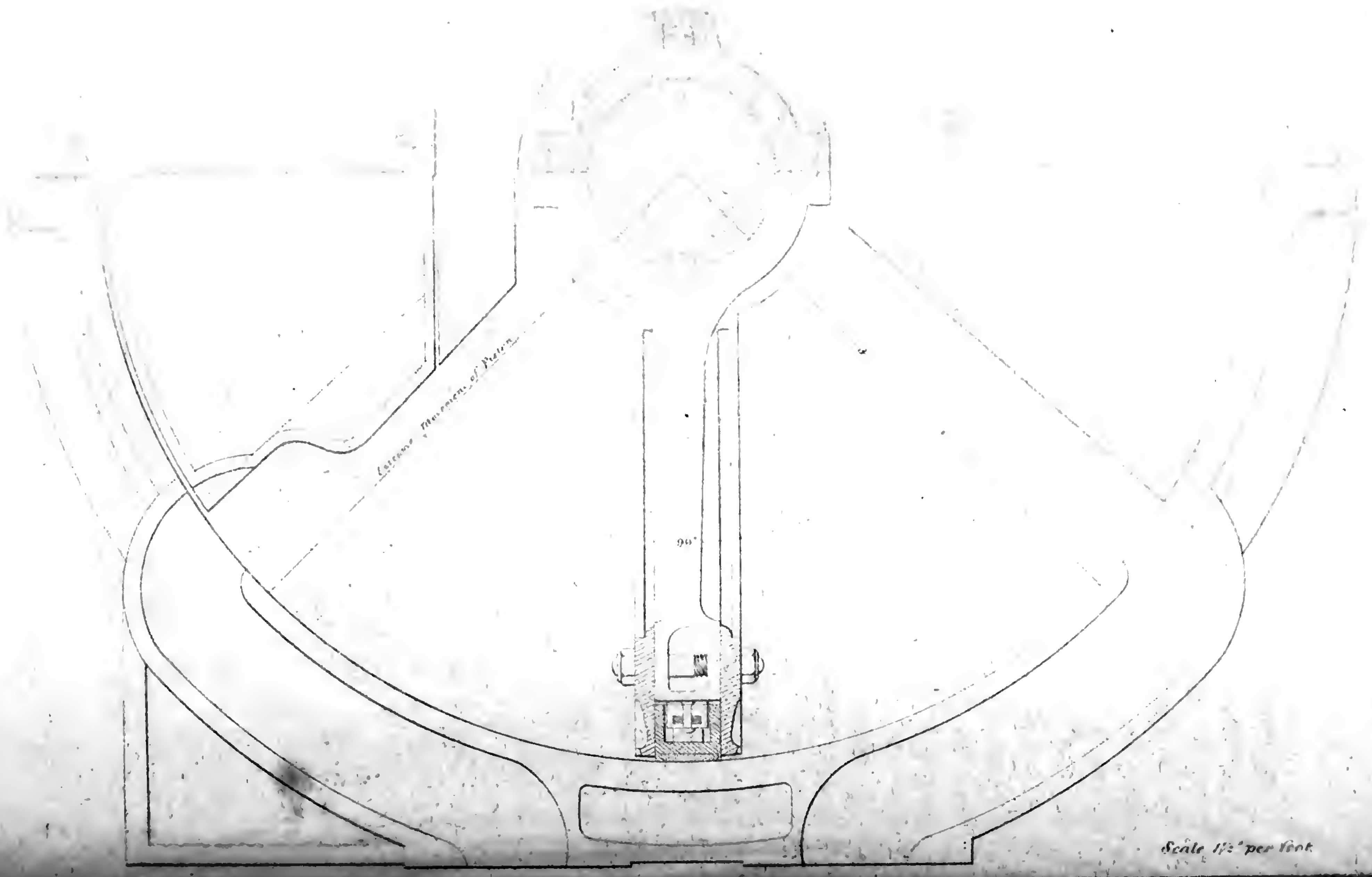
By reference to Plate [illegible] the reacting piston is twenty inches [illegible] seventy-two inches diameter, both [illegible] reacting piston being deducted from that [illegible] effective width of piston with its centre [illegible] of the piston-shaft. The active piston [illegible] moving at a mean distance of twenty-three inches from the [illegible]

On close examination, this engine will be found [illegible] of which merit particular notice. The vibration of the [illegible] pond nearly to the beat of the pendulum, and thus [illegible] movement of the piston at each termination of the [illegible] of gravity. An undue accumulation of condensed water [illegible] in the ordinary engine, presents no inconvenience here, as the inclined [illegible] allows the condensed water to flow gradually down into the steam passage [illegible] reaches the termination of the stroke. The outward tendency of the packing [illegible] trifugal force, assists materially in forming tight joints, the main packing being [illegible] by force of gravity. The lateral yielding of the piston-shaft, caused by the pressure [illegible] steam on opening the inlet-valve, tends to give additional tightness to the packings, the pistons being forced into reduced radial limits by the yielding alluded to. The crank-levers attached to the piston-shafts, being placed nearly in the same position with the main-pistons, it will be found that the crank-journals of those shafts are relieved from pressure, on principles analogous to the relieving of water-wheel journals, by transmitting the power at some point near the centre of pressure. The increase of force imparted to the crank-pin at each half turn of the main crank, owing to the angular position of the piston-rod cranks, and happening, as it does, when the former presents short leverage, is a marked feature of this engine.

The small angular movement (ninety degrees) of the main piston also [illegible] A greater motion, while it would augment the power of any given sized cylinder, would [illegible] undue strain on all the principal bearings, as the force of the piston [illegible] in the inverse ratio of the sines of the angles of the piston-shaft cranks, with reference to the position of the connecting rod. A very moderate increase of diameter makes up the loss consequent on the short arc through which the piston vibrates. Very deep cylinder-covers, giving great strength to resist the upward pressure of the steam, may also be named as an advantage resulting from the short vibration.

As an instrument of producing, by *direct means*, the high speed requisite for screw propellers, this engine commends itself to the engineer. In its fitness for screw vessels, it seems to

PISTON MOVEMENT



Drawn by Mr. Gray ... del. Engraved for Stuart's Naval & Mail Steamers U.S. Sarony & Major Lith. N.Y.

By reference to Plate Six, it will be seen that the upper semi-cylinder which contains the re-acting piston is twenty inches in diameter, the lower or working semi-cylinder being seventy-two inches diameter, both ninety-six inches long in the clear. The radius of the re-acting piston being deducted from that of the working-piston, leaves twenty-six inches *effective* width of piston with its centre of pressure placed $10 + 13 = 23$ inches, from the centre of the piston-shaft. The active piston area will thus be $26 \times 96 = 2{,}516$ superficial inches, moving at a mean distance of twenty-three inches from the centre through an arc of ninety degrees.

On close examination, this engine will be found to possess very peculiar properties, some of which merit particular notice. The vibration of the working-piston will be found to correspond nearly to the beat of the pendulum, and thus, unlike the ordinary engine, the return movement of the piston at each termination of the stroke, is materially assisted by the force of gravity. An undue accumulation of condensed water on the piston, so difficult to carry off in the ordinary engine, presents no inconvenience here, as the inclined position of the piston allows the condensed water to flow gradually down into the steam passages, before the piston reaches the termination of the stroke. The outward tendency of the packings, induced by centrifugal force, assists materially in forming tight joints, the main packing being further held out by force of gravity. The lateral yielding of the piston-shaft, caused by the pressure of the steam on opening the inlet-valve, tends to give additional tightness to the packings, the pistons being forced into reduced radial limits by the yielding alluded to. The crank-levers attached to the piston-shafts, being placed nearly in the same position with the main-pistons, it will be found that the crank-journals of those shafts are relieved from pressure, on principles analogous to the relieving of water-wheel journals, by transmitting the power at some point near the centre of pressure. The increase of force imparted to the crank-pin, at each half turn of the main crank, owing to the angular position of the piston-rod cranks, and happening, as it does, when the former presents short leverage, is a marked feature of this engine.

The small angular movement (ninety degrees) of the main piston, also deserves attention. A greater motion, while it would augment the power of any given sized cylinder, would cause undue strain on all the principal bearings, as the force of the piston obviously increases in the inverse ratio of the sines of the angles of the piston-shaft cranks, with reference to the position of the connecting rod. A very moderate increase of diameter makes up the loss consequent on the short arc through which the piston vibrates. Very deep cylinder-covers, giving great strength to resist the upward pressure of the steam, may also be named as an advantage resulting from the short vibration.

As an instrument of producing, by *direct means*, the high speed requisite for screw propellers, this engine commends itself to the engineer. In its fitness for screw vessels, it seems to fulfil every condition. The very limited number of working parts, and the small amount of matter to be kept in motion, are self-evident advantages, best understood by reference to Plate Five. It is important to notice, that the piston-shaft journals are supported by bearings placed *outside* of the heads of the semi-cylinders, and that the brasses admit of adjustment in every direction. The exact position of the centre of the piston-shaft, with relation to the centre of the semi-cylinders, being indicated by an external index, enabling the engineer at all times to keep the shaft in line.

The main packing is rendered accessible by lifting up one of the covers, and removing the nearest side plate forming the packing groove. The upper packing becomes accessible by lifting up the centre piece which forms the upper semi-cylinder. It may be stated, with regard to the packings, that the "Princeton," after having served during the war with Mexico, was dispatched on a cruise to the Mediterranean without requiring new packings.

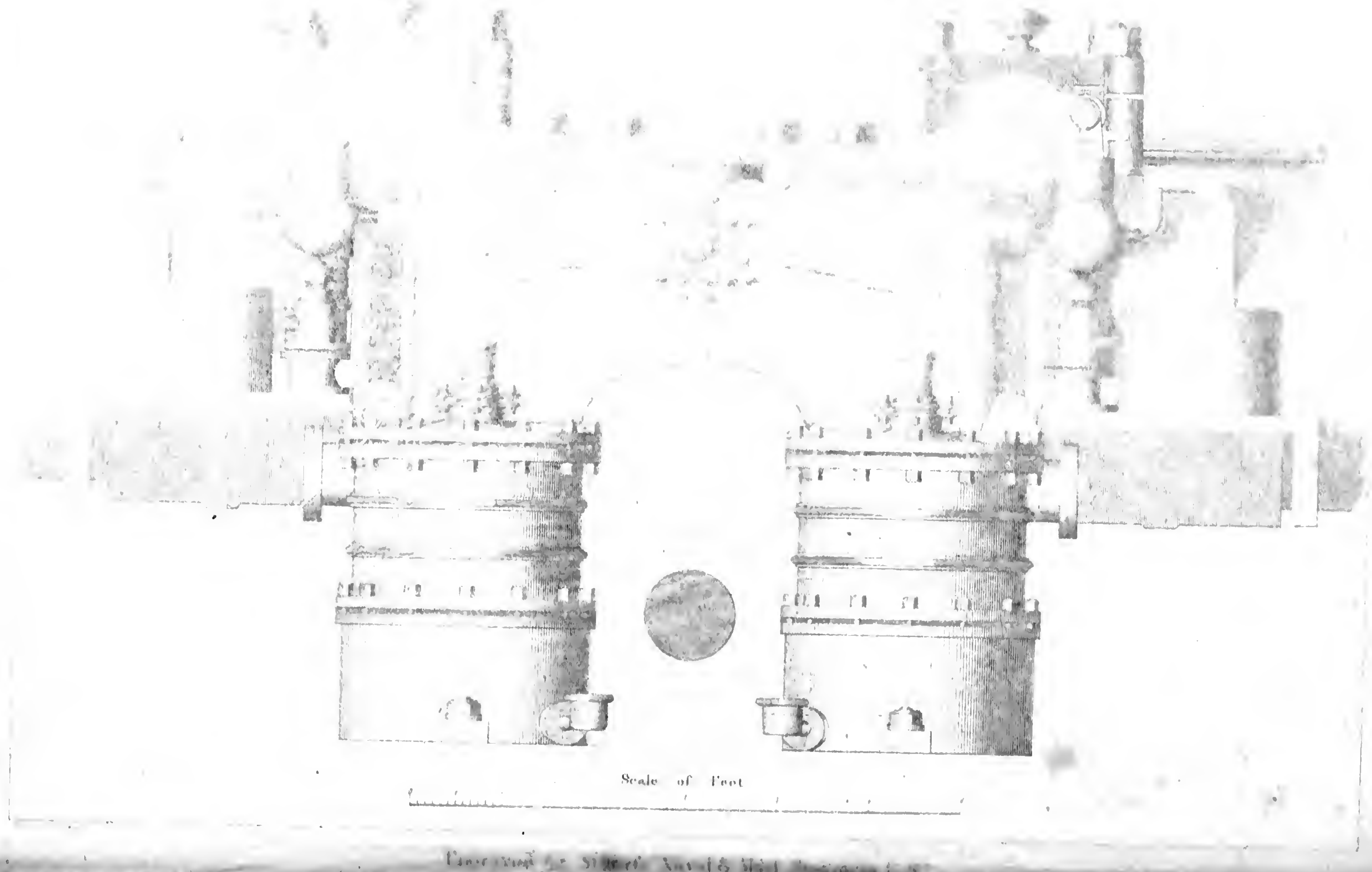
The steam valves are made like those of ordinary locomotive engines: the starting, stopping, and reversing, being effected by means of a screw movement, which gives very complete command of the engines.

The space occupied by the two engines would be circumscribed by a parallelopipedon, $17 \times 17 \times 6$ feet high. The nominal horse-power of the engines is two hundred and fifty. They weighed one hundred and ninety-three thousand and twenty-four pounds, and cost, complete, sixty-five thousand, six hundred and twenty-eight dollars.

BOILERS.

The original boilers of the "Princeton," designed by Ericsson, were of iron, three in number, and intended for the consumption of anthracite coal, with blowers, or a fan blast. See Plate Seven.

Height of each boiler, ...	9 feet 4 inches.
Width " "	7 "
Length " "	26 "
Heating surface in the three boilers, ...	2420 square feet.
Grate " " " "	134 " "
Capacity of steam room in three boilers, ...	1222 cubic feet.
Cross area of flues in three boilers at bridge, ...	27.12 square feet.
" " " " " chimney, ...	15.71 " "
Cross area of chimney.	13.64 " "
Height of chimney above grate, ...	32 feet.
Weight of water in three boilers, ...	92,500 pounds.
Weight of three boilers, ...	114,240 "


Scale of Feet

[illegible] limited number of working parts, and the small amount of [illegible] self-evident advantages, best understood by reference to Plate [illegible] important to notice that the piston-shaft journals are supported by bearings [illegible] the heads of the semicylinders, and that the bearings admit of adjustment in [illegible] direction. The exact position of the centre of the piston-shaft with relation to the centre of the semicylinders, being indicated by an external index, enabling the engineer at all times to keep the shaft in line.

The main packing is made [illegible] by lifting up one of the covers, and removing the nearest side plate [illegible] The upper packing becomes accessible by lifting up the centre [illegible] upper semi-cylinder. It may be stated, with regard to the packing [illegible] having served during the war with Mexico, was [illegible] without requiring new packings.

[illegible] of ordinary locomotive engines: the starting, stopping [illegible] by means of a screw movement, which gives very complete [illegible]

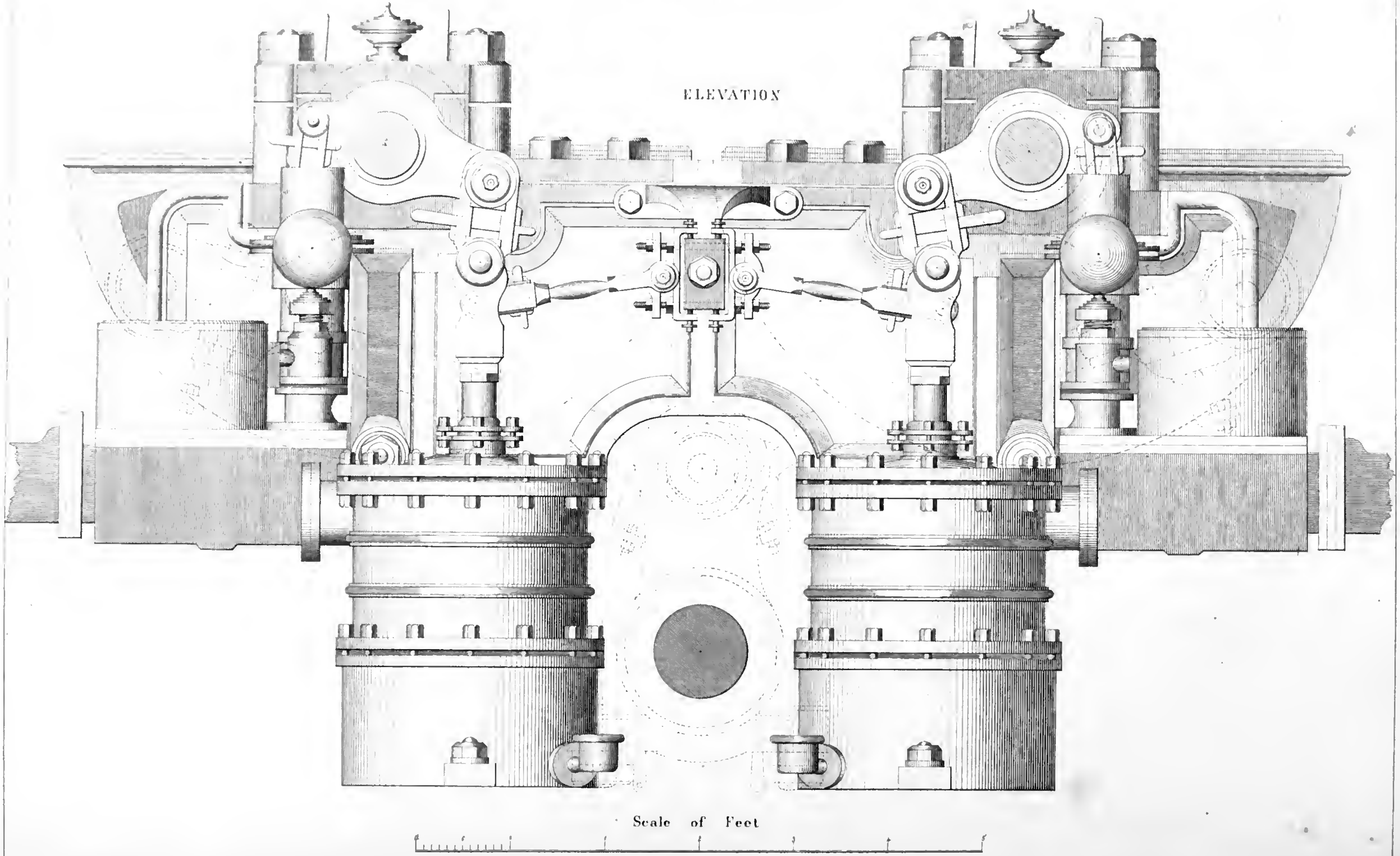
The space [illegible] engines would be circumscribed by a parallelopipedon, [illegible] The [illegible] horse-power of the engines is two hundred and fifty. The [illegible] thousand and twenty-four pounds, and cost, complete, [illegible] thousand [illegible] hundred and twenty-eight dollars.

BOILERS.

The [illegible] of the "Princeton," designed by Ericsson, were of iron, three in [illegible] intended for the consumption of anthracite coal, with blowers, or a fan blast. [illegible]

[illegible] each boiler,	9 feet 4 inches.
[illegible]	7 "
[illegible]	26 "
[illegible] three boilers,	2420 square feet.
[illegible] "	434 " "
[illegible] in three boilers,	1222 cubic feet.
[illegible] flues in three boilers at bridge,	27.12 square feet.
" " " chimney,	15.71 " "
[illegible] chimney,	13.64 " "
Height of chimney above grate,	32 feet.
Weight of water in three boilers,	92,500 pounds.
[illegible] boilers,	[illegible]4,240 "

ENGINES OF U. S. STEAMER PRINCETON.

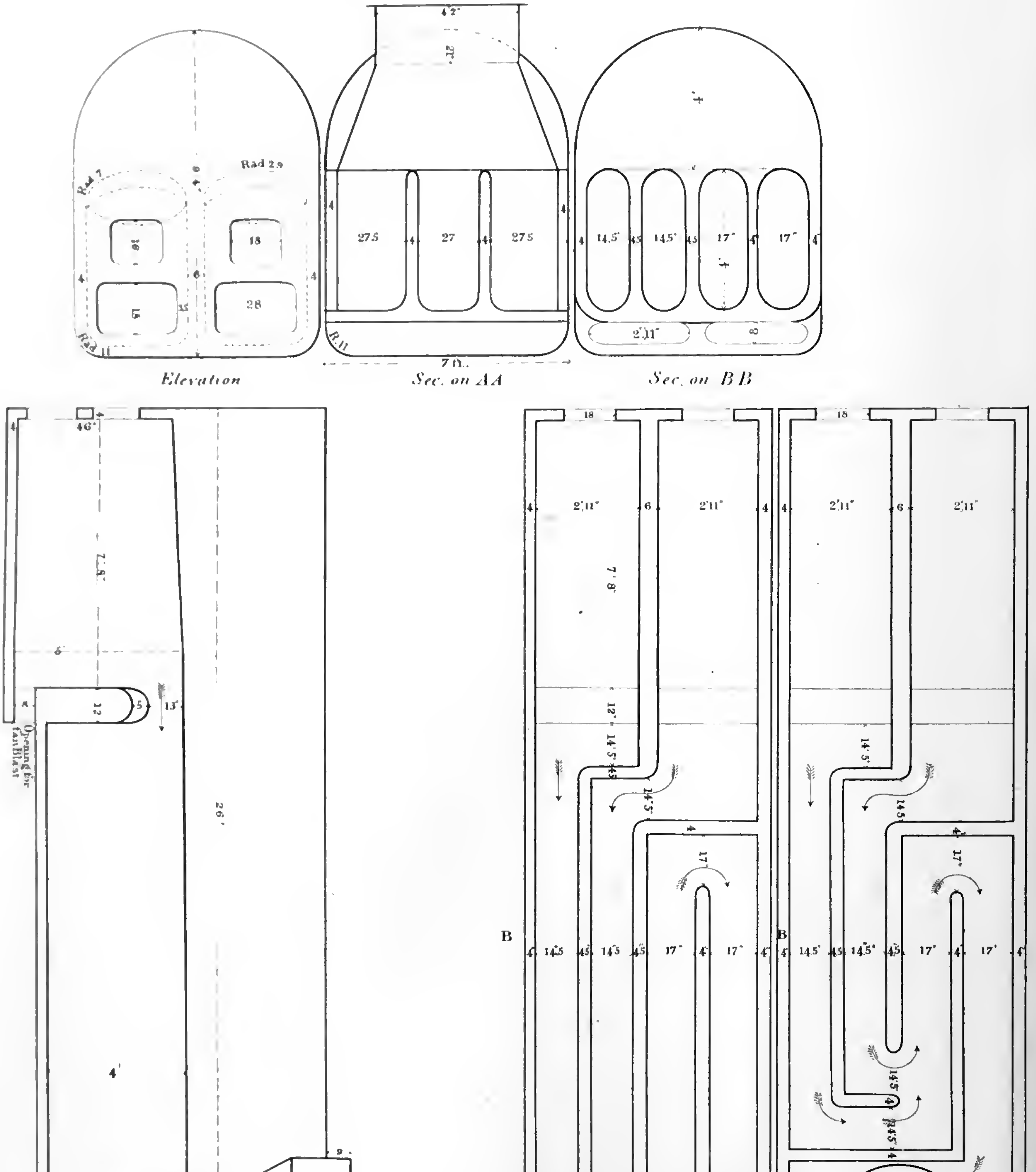


Engraved for Stuart's "Naval & Mail Steamers U.S."

"PRINCETON"

Ericsson's boiler.

Scale ¼ inch = 1 foot



R. H. Long U. S. N. del — *"Stuarts" Naval & Mail Steamers U. S."* — *Sarony & Major. Eng.*

The smoke-pipe was in two pieces [illegible] the manner of a telescope. With the [illegible] bulwarks, and the fuel, (*Anthracite coal*) [illegible] guished, at sea, from an ordinary sailing sloop [illegible]

SCREW PRO[illegible]

The original propeller of the "Princeton," [illegible] was composed of a cast brass hub, and six arms [illegible] drum of copper, on which were riveted six brass blades [illegible] helicoidal twist. The propeller was of the following dimensions: [illegible]

Diameter extreme,	[illegible]
Thickness of drum,	[illegible]
Diameter of hub,	[illegible]
Pitch of screw,	[illegible]
Length of hub and arms, in direction [illegible]	[illegible]
Length of blades,	[illegible]
Weight of screw,	[illegible]

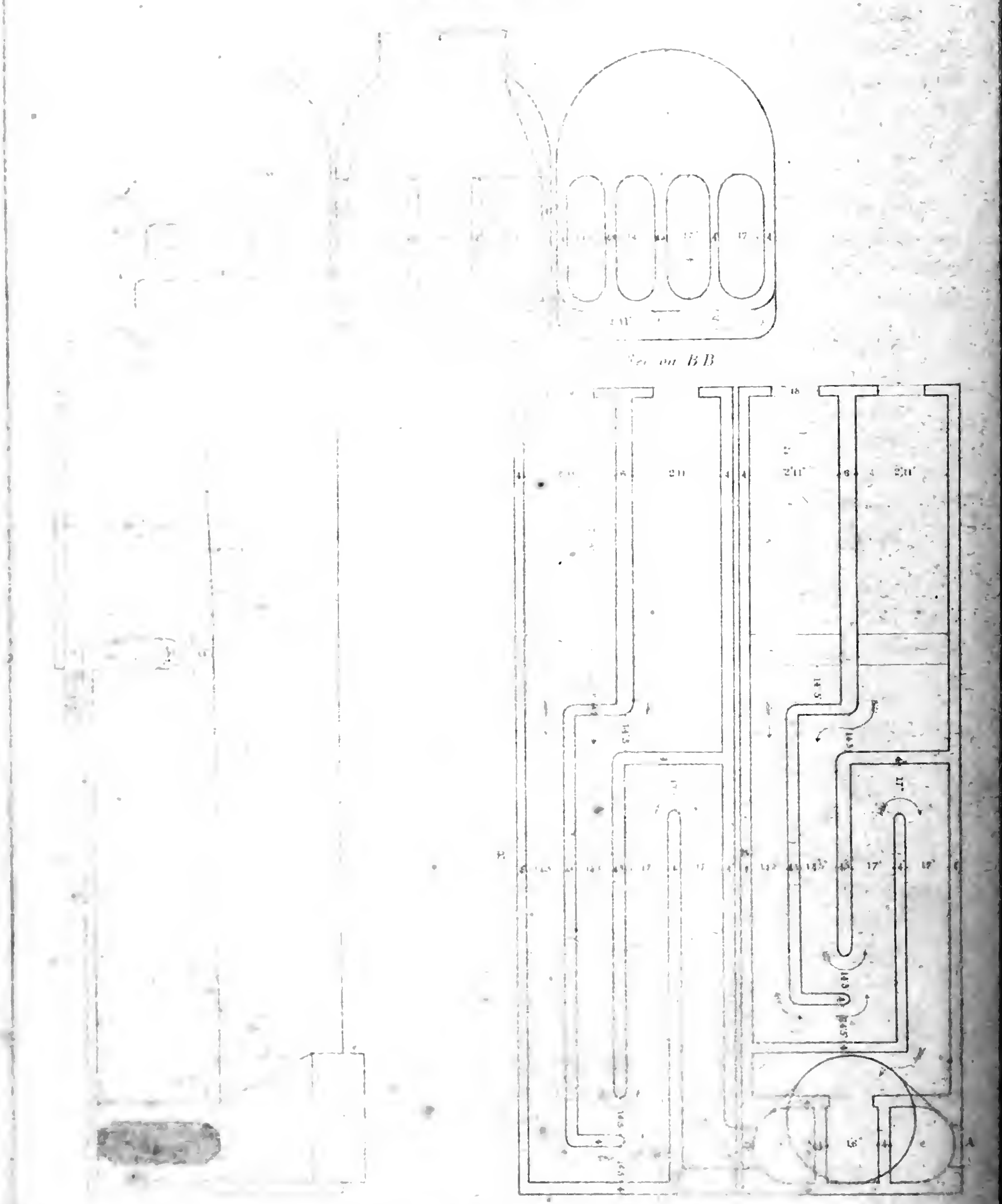
Of the sea-going performance of [illegible] sent. In eighteen hundred and fifty [illegible] "Ericsson" propeller was removed, and [illegible]

Diameter extreme,	[illegible]
Diameter of hub,	[illegible]
Pitch of screw,	[illegible]
Length of hub in direction [illegible]	[illegible]
Length of screw at 3 feet radius [illegible]	[illegible]
Length of screw at 4½ " [illegible]	[illegible]
Length of screw at periphery [illegible]	[illegible]
Number of blades,	[illegible]
Total helicoidal area [illegible]	[illegible] square feet.
Total area of screw [illegible]	[illegible]
Weight of the propeller [illegible]	15,270 pounds.

In order to obtain the [illegible] the following experiments were made. The [illegible]

Plate N° 7

"PRINCETON"



Naval & Mail Steamers U. S.

Sarony & Major Eng

The smoke-pipe was in two pieces, the upper part drawing into the lower part, after the manner of a telescope. With the upper part lowered *no chimney was visible above bulwarks*, and the fuel, (*Anthracite coal*) giving off *no smoke*, the vessel could not be distinguished, at sea, from an ordinary sailing sloop of war.

SCREW PROPELLER.

The original propeller of the "Princeton," was of the form known as "Ericsson's." It was composed of a cast brass hub, and six arms; the six arms were surrounded by a band or drum of copper, on which were riveted six brass blades. The arms and blades were of a true helicoidal twist. The propeller was of the following dimensions:—

Diameter extreme, ...	14 feet.
Diameter of drum, ...	8 "
Diameter of hub, ...	$1\frac{2}{3}$ "
Pitch of screw, ...	35 "
Length of hub and arms, in direction of axis, ...	2 "
Length of blades, ...	4 " 1 inch,
Weight of screw, ...	12,000 pounds.

Of the sea-going performance of this propeller, there are no records in the Navy Department. In eighteen hundred and forty-five, at the instance of Commodore Stockton, the "Ericsson" propeller was removed, and one of the following dimensions substituted, viz.:

Diameter extreme, ...	$14\frac{1}{4}$ feet.
Diameter of hub, ...	$1\frac{5}{6}$ "
Pitch of screw, ...	$32\frac{44}{100}$ "
Length of hub in direction of axis, ...	$3\frac{1}{8}$ "
Length of screw at 3 feet radius, in direction of axis, . .	$3\frac{1}{8}$ "
Length of screw at $4\frac{3}{4}$ " " " " . .	$4\frac{1}{4}$ "
Length of screw at periphery, in direction of axis, . . .	$4\frac{1}{4}$ "
Number of blades, ...	6.
Total helicoidal area of the screw, ...	176.713 square feet.
Total area of screw projected as a plane at right angles to axis,	113.517 " "
Weight of the propeller, ...	15,970 pounds.

In order to obtain the comparative efficiency of these two propellers, the following experiments were made. The vessel being brought to a draft of fifteen feet seven inches forward, and eighteen feet eight inches aft, was tried at a measured statute mile of 5.280 feet, at Norfolk, Va., the mile being run forwards and backwards, three times each way, to neutralize the effects of currents, winds, &c. The "Ericsson" propeller was experimented with, on the fourth day of March, eighteen hundred and forty-five, and gave the following results:—

Steam pressure in boiler above atmosphere, ...	18 pounds.
Cut off at from commencement of stroke, ...	$\frac{3}{8}$.
Throttle open, ...	$\frac{1}{2}$.
Vacuum in starboard condenser, ...	25 ins. mercury.
" port "	27 " "
Average time of running one mile, ...	5 min. 30 sec.
Average number of revolutions of screw and double strokes of piston, made per mile, ...	163.
Average revolutions per minute, ...	29.37.

On the twenty-second day of March, eighteen hundred and forty-five, with the vessel precisely in the same circumstances, at the same place, and with every thing in the same condition, except that the vacuum in the starboard condenser was twenty-six inches of mercury instead of twenty-five, the vessel was tried with the other propeller, and the following results obtained, as the average of running the measured mile, twice each way, forwards and backwards.

Average time of running one mile, ...	5 min. $2\frac{1}{4}$ sec.
Average speed, per hour, ...	11.911 statute miles.
Average number of revolutions of screw and double stroke of engines, per hour, ...	177.
Average revolutions, per minute, ...	35.14.

Taking, now, the number of revolutions as the exponents of the powers, and the cubes of the speeds as the result, the two propellers compare as follows:—

	Powers.	*Speeds.*	*Results.*
Ericsson screw,	29.37 or 1.000,	10.811 or 1.000 and 1.0000^3,	1.0000,
Common screw,	35.14 or 1.1965,	11.911 or 1.1018 and 1.1018,	1.3375,
	and $\frac{1.0000}{1.0000} = 1.0000$ and	$\frac{1.3375}{1.1965} = 1.118$,	

or, the common screw was $11\frac{8}{10}$ per cent better than the Ericsson screw.

The remainder of the steaming done by the "Princeton," was with the common screw.

THE PRINCETON.

ARMAMENT.

Battery, when first built, two twelve-inch wrought iron pivot-guns, and ten forty-two pound carronades. During the Mexican war, one eight-inch Paixhan pivot-gun, fifty-five hundred weight, and eight forty-two pounder carronades.

PERFORMANCE.

The mean results from the "Princeton," when under steam alone, in the Gulf of Mexico, from April, eighteen hundred and forty-five, to March, eighteen hundred and forty-seven, was as follows:—

Mean pressure of steam above atmosphere, per square inch in boiler,	$11\frac{3}{4}$ pounds.
Mean initial pressure above atmosphere in cylinder, (throttle $\frac{1}{5}$ open) per square inch, ...	6.3 "
Double strokes of piston, per minute, ...	22.58.
Consumption of anthracite coal, per hour, with fan blast used moderately, ...	1,293 pounds.
Mean effective pressure throughout stroke, per square inch, .	9 "
Horse power developed by engines, ...	191.893.
Speed of the vessel, per hour, in knots of $6{,}082\frac{2}{3}$ feet, . .	6.328.
Speed of the vessel, in statute miles, of 5,280 feet, per hour, .	7.290.
Slip of the screw, ...	10.38 per cent.
Sea water evaporated by one pound of anthracite coal, per hour,	6.64 pounds.

The propeller of the "Princeton" was so arranged with couplings on the shafts, that it could at will be disconnected from the engine, and the vessel sailed under canvas alone; of course, dragging the propeller through the water, the propeller turning by the re-action of the water on the blades. The speed of the "Princeton," thus sailed under canvas alone, and dragging her propeller, was of course less than it would have been, had there been no such drawback, but even with that, the speed was very respectable compared with other sailing vessels.

The mean performance of the "Princeton," for forty-seven hours, with fresh head wind, was four knots per hour; steam pressure in boiler $10\frac{8}{10}$ pounds per square inch, above the atmosphere, cutting off at three-eighths from commencement of stroke; revolutions of propeller, per minute, 18.45, throttle one-sixth open; consumption of anthracite coal, per hour, one thousand one hundred and seventy pounds; slip of propeller, thirty-two and one-quarter per cent.

COST.

Materials—construction,	$44,233 49
Labor, "	37,182 28
Materials—equipment,	26,829 00
Labor, "	3,132 48
Machinery, (engines, boilers, propeller, and bunkers,)	101,137 30
Total	$212,514 55.

In July, eighteen hundred and forty-seven, the "Princeton" having been fitted with new double return-drop circular-flue boilers, left the United States for a Mediterranean cruise.

The new boilers were of the same number and external dimensions as the old, but the arrangement and the amount of the fire surface was different and as follows, viz.:—

Total amount of heating surface,	3,000 square feet.
" " grate "	136 " "
Cross area of upper flues in the three boilers,	18.363 square feet.
" " middle " " " "	16.762 " "
" " lower " " " "	16.762 " "
" " chimney,	13.635 " "
Height of chimney above grates,	40 feet.

The mean performance with sail and steam, with a moderate wind and ordinary sea, was as follows. Speed of vessel, 7.801 knots; revolutions of screw, per minute, 25.678; steam pressure in boiler, per square inch, above atmosphere, 11.9 pounds, cut off three-eighths stroke from commencement, throttle one-sixth open; consumption of anthracite coal, per hour, twelve hundred and fifty-three pounds.

The mean performance with steam alone, against moderate head winds, and in ordinary sea, was as follows. Speed of vessel, 5.981 knots; revolutions of screw, per minute, 23.735; steam pressure in boiler, above atmosphere, per square inch, 11¼ pounds, cut off at three-eighths the stroke from commencement, throttle one-sixth open; consumption of anthracite coal, per hour, eleven hundred and thirty-one pounds.

On the return of the "Princeton" from this cruise, in eighteen hundred and forty-nine, she was found to be too rotten for repair, having been built of white oak, and was broken up. It is doubtful whether her performance, considered relatively with the fuel consumed, has ever been excelled by a screw-steamer.

At sea, she worked and steered admirably, either under sail alone or with sail and steam. She was a very dry vessel, but owing to the sharpness of her hull, fore and aft the amidship section, she pitched in a rough sea with great violence. With a fair amount of canvas and a moderate wind, she would careen to an unusual degree in a vessel of her class, but though she thus easily went down to her bearings, it took additionally a very large quantity of canvas and a strong wind to depress her sensibly further. In a heavy gale, clawing off a lee shore, she carried sail to a greater extent than was considered prudent by other sailing sloops of war in her company; all of whom, and some frigates, she beat out to windward, dragging her propeller.

THE WATER WITCH.

This vessel was built of iron, and originally intended for a steam water-tank to supply the vessels of the Portsmouth, Va., Station with water, to procure which she had to pass the locks of the Dismal Swamp Canal. On trial, however, she proved too large, and was then fitted for a harbor vessel and tug.

Her length was one hundred feet six inches, her beam on deck twenty-one feet four inches, and at the water line, sixteen feet nine inches. Her model was of the form advocated by Lieutenant Hunter, and she was fitted with a pair of his patent submerged wheels. Her machinery consisted of two non-condensing engines, with cylinders of four feet stroke and twenty-two inches diameter, driving two submerged horizontal wheels of sixteen feet diameter.

The vessel thus arranged, and drawing seven feet seven and a-half inches of water, was tried by a Board of Naval Engineers at Norfolk, Virginia, in May, eighteen hundred and forty-five, with the following results:—

Speed of vessel by chip log, ... $6\frac{1}{2}$ knots, or 7.54 statute miles.
Steam pressure in boilers per square inch, . 80 pounds.
Revolutions of wheels per minute, . . . 28.

The throttle being wide open, and the steam worked expansively.

This result was considered unsatisfactory, and the vessel was taken to Philadelphia, cut in two and lengthened thirty feet at the centre, the width being at the same time increased six inches. The whole machinery was taken out, and new engines of two feet stroke and twenty inches diameter substituted to operate a "Loper" propeller of eight feet diameter.

After the completion of these alterations the vessel was tried, October eighteenth, eighteen hundred and forty-five, by a Committee of the Franklin Institute, in the Delaware river, and the following results obtained. The draft forward was five feet four inches, aft six feet ten inches. Three trips were made with, and three against, the tide; the mean is given in the column of speed.

Trip No.	Steam pressure.	Average revolutions.	Speed per hour, statute miles.
1	60 lbs.	61.9	8.985
2	46 "	54.4	7.923
3	32 "	45.5	6.600

THE WATER WITCH.

New machinery was again substituted in this vessel in eighteen hundred and forty-seven, but without alteration of hull. It was as follows, constructed from designs furnished by Charles H. Haswell, Esq., then Engineer-in-Chief of the United States Navy, and under the superintendence of William M. Ellis, Esq., Superintending Engineer of the Washington Navy Yard.

ENGINE.

One inclined condensing engine.

Diameter of cylinder,	37½ inches.
Stroke of piston,	6 feet.

BOILER.

One iron boiler with horizontal tubes.

Length of boiler,	14 feet 6 inches.
Breadth of boiler,	7 " 6 "
Height (exclusive of steam-chimney),	9 " 5 "
Total heating surface,	920 square feet.
" grate "	36 " "
Capacity of steam room,	275 cubic feet.

PADDLE WHEELS.

Diameter,	17 feet.
Length of paddles,	6 "
Breadth " "	16 inches.
Dip " "	3 feet 1 inch.
Number " " (one wheel),	13.

PERFORMANCE.

The average performance at sea with the above machinery was as follows:—

Speed of vessel per hour,	6.5 knots.
Revolutions of wheel per minute,	16.5.
Steam pressure in boiler,	15 pounds.
Cut off (from commencement of stroke),	$\frac{3}{8}$.
Consumption of anthracite per hour with fan blast,	633 pounds.

This boiler making steam with difficulty, and in insufficient quantities, was replaced in eighteen hundred and fifty-one, with a "Montgomery" boiler of the following dimensions:—

Length, ...	16 feet 7 inches.
Breadth, ...	8 " 2 "
Height, (exclusive of steam-chimney), ...	9 " 6 "
Total heating surface, ...	1150 square feet.
" grate "	337 " "

It contained two hundred and seventy-four iron tubes, five feet long and one and three-quarter inches inside diameter, separated by spaces two and one-eighth inches in the clear across, and one and three-quarter inches lengthwise the boiler; divided into two partitions by a plate or diaphragm through which they passed, and which was placed at about half their vertical length. By this arrangement the heated gases are applied first at the upper and afterward at the lower part of the tubes, which are filled with water, connecting the upper and lower water-spaces of the boiler.

A short run at sea having proved this boiler also defective as a generator of steam, it was returned to the charge of the patentee for improvements and alterations suggested by him. These having been completed, a trial trip of the vessel by a Board of Naval Engineers was made from Baltimore to Washington, from whose report these results are deduced:—

Speed of vessel per hour, ...	5.08 knots.
Revolutions of wheels per minute, ...	15.1.
Steam pressure in boiler, ...	13 pounds.
Cut off, ...	$\frac{1}{3}$.
Consumption of anthracite (with blower), ...	717 pounds per hour.
Evaporation of water per pound of coal, ...	2.7 pounds.

The report of this board being adverse to the boiler, and a survey on the hull having been made, which resulted in its condemnation, the vessel was laid up at the Washington Navy Yard.

ARMAMENT.

The armament of this vessel during the Mexican war consisted of a pivot sixty-eight pounder forward, and two short thirty-twos aft.

THE SPITFIRE AND THE VIXEN.

THE "SPITFIRE" and "VIXEN" were two small war-steamers precisely alike, originally built for the Mexican Government by Messrs. Brown & Bell, of New York. These steamers, in an unfinished state, were at the commencement of the late war with Mexico, still in the hands of the builders, from whom they were then (eighteen hundred and forty-six) purchased by the United States, armed, and employed against their original owners. At the termination of the war, the "SPITFIRE" was sold, fitted out for a merchant steamer, and lost on her first voyage. The "VIXEN" is still retained in the Navy.

The vessels, as originally constructed, had duplicate engines, boilers, wheels, &c.

The following are the dimensions of the hull, machinery, &c.:—

HULL.

Length on deck,	118 feet.
Beam " "	22 " 6 inches.
Depth of hold,	9 " 3 "
Burthen,	241 tons.

ENGINE.

One half beam, horizontal, condensing engine, Lighthall's patent.

Diameter of steam cylinder,	36 inches.
Stroke of piston,	6 feet.

The main cranks were only two feet six inches between centres, the connecting rod being attached nearer to the centre of motion of the half beam than the piston was. The engine had a steam-piston valve eighteen inches diameter, packed by rings set out with screws. This valve was of the length of the cylinder, and had no lap. The steam was worked expansively by a separate slide cut-off, situated on the side of the cylinder opposite to the steam-valve, and cutting off at a little beyond half stroke from the commencement. The capacity of the steam space between the cut-off valve and the piston was one-seventh the space displacement per stroke of the piston. The engines had wooden frames, and were altogether very rudely constructed.

BOILERS.

Two iron boilers, with double-return drop-flues, one boiler on each side of the engine, and one smoke-pipe to both boilers.

Length of each boiler, ...	16 feet.
Breadth " " "	5 " 6 inches.
Height " " "	8 " 1 "
Total area of heating surface in each boiler, ...	750 square feet.
Total area of grate " " " "	47 " "
Capacity of steam-room in boiler, ...	584 cubic "
Diameter of flues, ...	12 inches.
Calorimeter of flues (both boilers), ...	6.3 square feet.
Height of smoke-pipe above grate, ...	43 feet 9 inches.
Cross area of smoke-pipe, ...	6.3 square feet.

PADDLE WHEELS.

Of the common radial kind.

Diameter from outside to outside of paddles, . . .	18 feet 6 inches.
Length of paddle, ...	6 " 4 "
Width " "	1 " 10 "
Number of paddles in each wheel, ...	14.
Immersion of lower edge of paddle at $7\frac{3}{4}$ feet draft, .	3 feet 4 inches.
Number of paddles in water in each wheel, ...	3.

PERFORMANCE.

The mean pressure of steam carried in the boilers above the atmosphere per square inch, was twelve pounds;—double strokes of piston per minute, thirteen and a-half, the steam being cut off at a little beyond half-stroke. Vacuum in condenser per guage, twenty-six inches of mercury. Consumption of Virginia bituminous coal per hour, six hundred and fifty-eight pounds. Speed of vessel, 6.39 knots of $6082\frac{2}{3}$ feet each. The slip of the centre of effort of the paddles was 13.34 per cent.

The bunkers carried about eighty tons of coal, which was stowed principally forward of the engine and boilers, clear across the vessel. With the bunkers full, the vessel was a little by the head; but when, by the consumption of the coal, the bow was so far lightened as to make the draft about one foot by the stern, which was the case when about twenty-five tons had been taken out of the forward bunkers, the speed increased nearly a knot per hour, with the same steam pressure.

BATTERY.

The battery of each vessel consisted of one long eight-inch Paixhan gun, (sixty-eight pounder) mounted forward, and two thirty-two pounder carronades in broadside aft. During the bombardment of Vera Cruz and other towns, where these vessels were engaged, all three guns were run out on one side, and fired in broadside together as rapidly as they could be loaded: yet, notwithstanding the great disproportion between the size of the battery and vessel, and the light scantling of the latter, the vessel did not sensibly feel the recoil.

The "Spitfire" and "Vixen" were two-masted fore-and-aft rigged vessels, the foremast carrying also a large square-sail; and although the proportion of sail to hull was as great as in ordinary sailing vessels, yet they were entirely *inefficient* under canvas alone, making when light, (all coal out of the bunkers) with a good working breeze abeam and smooth sea, only three knots per hour, and even then the lee-way nearly equaled the headway. Nor was the sail of any value as an auxiliary to the steam, except with a fresh breeze abaft the beam, and even then it gave but a very slight increase of speed. With the wind forward the beam, the sail was a disadvantage.

ALTERATION OF THE "VIXEN."

At the conclusion of the Mexican war, in eighteen hundred and forty-eight, the "Vixen" underwent extensive repairs and considerable alterations. The depth of hold was increased one foot, and the main shaft and engine raised one foot. Double balance puppet-valves and an independent cut-off was substituted in the engine, for the old piston-valve and slide cut-off. The vessel, as now fitted, had a deep-load draft of seven feet nine inches, forward, and seven feet eleven inches aft. Light mean draft with all coal out, six feet six inches. Mean draft with half coal in and all other weights, full seven feet two inches. Immersed amidship section of hull at seven feet four inches draft, one hundred and fifty-four square feet. The width of the paddles was increased to two feet; the immersion of their lower edges, was two feet eight inches at seven feet two inches draft. The quantity of coal carried was reduced to sixty-five tons, by suppressing the after bunkers. In other respects all things continued the same, except that for the former battery, one long thirty-two pounder forward was substituted.

The performance at sea was now as follows, steaming in the Gulf of Mexico. Steam pressure in boiler above atmosphere per square inch, twelve and a-half pounds; cut-off at twenty-six and one-third inches from commencement of stroke, giving a mean effective pressure by indicator of sixteen pounds per square inch on piston. Double strokes of engine, 86.266; speed of the vessel, 6.52 knots of $6082\frac{2}{3}$ feet per hour; slip of the centre of effort of the paddles, 14.28 per cent. Consumption of Pittsburg bituminous coal, five hundred and sixty-four pounds per hour.

MONTGOMERY BOILERS.

In eighteen hundred and fifty, the original boilers having become corroded, a pair of Montgomery boilers, made at the Washington Navy Yard, were substituted, of iron, and of the following dimensions:—

Length of each boiler, ...	13 feet 9 inches.
Breadth of each "	5 " 6 "
Height of each "	7 " 9 "
Total area of grate surface in both boilers, . .	53.60 square feet.
" " heating " " " "	1090 " "
Capacity of steam room, " " "	390 cubic feet.
Cross area of space between tubes below division plate or diaphragm in both boilers, ...	7.03 square feet.
Cross area of spaces between tubes above division plate or diaphragm in both boilers, ...	7.64 " "
Cross area of side flue in both boilers, ...	7.56 " "
Cross area of smoke-pipe, ...	8.73 " "
Height of smoke-pipe above grate, ...	48 feet.

The mean performance at sea, with the Montgomery boilers, was as follows:—Speed of vessel, 6.253 knots of $6082\frac{2}{3}$ feet per hour. Double stroke of piston, 14.6 per minute. Steam pressure in boiler per square inch above atmosphere, $13\frac{44}{100}$ pounds. Cut-off at thirty-two inches from commencement of stroke; throttle $\frac{45}{100}$ open. Consumption of coal, six hundred and forty-seven pounds of Cumberland bituminous coal per hour.

On the "Vixen's" return to Norfolk, last spring, the Montgomery boilers were condemned by a Board, composed of Messrs. Isherwood, Lenthall and Ellis, and boilers similar to those of the "Water Witch," (the second) but two feet shorter, recommended for her, and which will be completed this month, at a cost of $7,000. The paddle-wheels were increased six inches in diameter, and single buckets of twenty-four inches substituted.

THE ALLEGHANY.

THE "ALLEGHANY" was built like the "UNION," from the plans and under the superintendence of Lieutenant W. W. Hunter, U. S. Navy. She was constructed of iron, at Pittsburg, Pennsylvania, and finished in eighteen hundred and forty-seven. The following are the dimensions of hull, machinery, &c.:—

HULL.

Length on deck,	185 feet.
Length on keel,	171 "
Breadth of beam on deck,	33 " 4 inches.
" " at wheels,	25 "
Depth of hold,	19 "
Mean draft of water,	13 " 6 "
Burthen,	1,200 tons.
Immersed amidship section at mean draft of water,	335 square feet.

ENGINES.

Two horizontal condensing engines.

Diameter of cylinders,	60 inches.
Stroke of piston,	4 feet.
Space displacement of both pistons, per stroke,	157.08 cubic feet.

HUNTER WHEELS.

Diameter from outside to outside of paddles,	14 feet 8 inches.
Number of paddles in each wheel,	4.
Height of paddle,	3 " 6 "
Width of paddle,	2 " 2 "

BOILERS.

Two iron boilers, with single-return ascending-flues, placed side by side.

Length of each boiler,	26 feet 5 inches.
Breadth	10 " 2 "
Height, (exclusive of steam-chimney)	10 " 6 "
Total area of heating surface, in both boilers,	4,000 square feet.
" " grate " " "	109½ " "
Capacity of steam room in boiler,	1748 cubic feet.
Cross area of the two lower rows of flues, in both boilers,	29.644 square feet.
" " " " upper " " " "	23.584 " "
" " " smoke-pipe,	23.758 " "
Height of smoke-pipe, above grate,	58 feet.

WEIGHTS.

Weight of boilers,	63,838 pounds.
" chimney,	3,761 "
" " casing,	732½ "
" coal-bunkers,	15,282 "
" engines,	420,787½ "
" water in boilers,	122,600 "
" Wheel-cases, &c.,	68,580 "
Total weight of machinery,	695,581 lbs., or 310½ tons.

Bunkers, when filled, contained one hundred and ninety-five tons of coal, or, eight and one-half days' steaming.

COST.

The total cost of engines, boilers, coal-bunkers, wheels, extra pieces, tools, &c., was	$60,964 16
The total cost of the vessel, including equipments, ordnance, &c., exclusive of patent fee, up to March, 1848, when she sailed on her first cruise, was	220,769 56
Add cost of patent right for Hunter's Wheels,	10,320 00
Total,	$292,053 72.

DISPLACEMENT.

The total displacement of the "Alleghany" was about one thousand and twenty tons. The weight of hull, complete, was five hundred tons, leaving five hundred and twenty tons as the available displacement of the vessel, and the loss of buoyancy, caused by the wheel-cases, was 37.9 tons, or 7.3 per cent. of the available displacement.

ARMAMENT.

The "Alleghany," when originally completed at Pittsburg, carried four eight-inch Paixhan guns, weighing ten thousand pounds each, mounted on circles, but when she sailed from Norfolk, on her cruise to Brazil and the Mediterranean, she carried but two of them, one forward, and the other aft.

PERFORMANCE.

After the completion of the "Alleghany," at Pittsburg, she descended the Ohio and Mississippi rivers to New Orleans, and thence steamed around to Norfolk, Va. During this trip she had eight paddles in each wheel, but on arriving at Norfolk, it was concluded to cut out every intermediate paddle, leaving four in each wheel. With the original eight paddles in each wheel, on the trip from New Orleans to Norfolk, her results were as follows, being the mean of her best steaming in smooth sea and calms.

Mean pressure of steam in boiler, per square inch, above atmosphere, nine pounds; throttle five-eighths open; cut off at one-third stroke from the commencement. Consumption of Cumberland bituminous coal, per hour, two thousand pounds. Average revolutions of the wheels, per minute, twenty-four. Vacuum in condenser, per guage, twenty-five inches of mercury. Speed of the vessel, per log, 4.92 knots per hour.

After the alteration, by which the number of paddles were reduced to four, the mean of eighty-eight hours steaming at sea, in calms and smooth water, was as follows:—Mean pressure of steam, above atmosphere, per square inch, 12.7 pounds. Throttle, five-eighths open, cut off at $\frac{27}{100}$ stroke from the commencement. Consumption of bituminous coal, per hour, two thousand and ninety-six pounds. Average revolutions of the wheels, per minute, 29.7. Vacuum in condenser, per guage, twenty-five inches of mercury. Speed of the vessel, per log, 5.9 knots, per hour.

The mean results of one thousand one hundred and ninety hours' performance, under steam and sail, in the Atlantic and Mediterranean, from October, eighteen hundred and forty-seven, to September, eighteen hundred and forty-nine, were as follows, viz.:—Mean pressure of steam in boilers, per square inch, above atmosphere, 11.77 pounds. Throttle, one-half open; cut off at

$\frac{28}{100}$ stroke from the commencement. Consumption of bituminous coal, per hour, one thousand, nine hundred and forty pounds. Average revolutions of the wheels, per minute, 27.2. Vacuum in condenser, per guage, twenty-five inches of mercury. Speed of the vessel, per log, 5.883 knots, of $6082\frac{2}{3}$ feet per hour.

On the return of the "Alleghany" to the United States, in eighteen hundred and forty-nine, she was surveyed by a Board, composed of two Chief Engineers of the Navy, the Engineer of the Washington Navy Yard, the Chief Naval Constructor, and a Commander in the Navy: their report was a condemnation of Hunter's Wheel, and a recommendation to substitute for it, the common paddle wheel, as will be seen by reference to Note C, of the Appendix.

THE MASSACHUSETTS AND THE EDITH.

The steamers "Massachusetts" and "Edith" were purchased by the War Department in eighteen hundred and forty-seven, and were used as transports during the Mexican war. After its close, they were transferred to the Navy Department. The "Massachusetts" has been attached to the Pacific squadron for several years, and is now on her return home around the Horn. She was built at the yard of Samuel Hall, Boston, from the designs of R. B. Forbes, Esq., and under the immediate superintendence of Edward H. Delano, at present Naval Constructor of the Norfolk Navy Yard. She was designed for the New York and Liverpool trade, and was the pioneer of the line of auxiliary steam packets.

The dimensions of her hull are as follows:—

HULL.

Length of keel, one hundred and fifty-five feet; length on deck, one hundred and sixty feet; length from forward part of billet-head to after part of taffrail, one hundred and seventy-eight feet. Breadth of beam for tonnage, thirty-one feet eight inches; greatest breadth, thirty-two feet two inches. Depth of hold, twenty feet. Her stern rakes two and a-half inches to the foot, and is upright. She has fourteen inches dead-rise at half-floor, five inches swell on each side, and eighteen inches sheer. The keel is twenty-three inches deep by fourteen inches wide. The timbers are placed two inches apart, and average fifteen by twelve inches. Every alternate floor-timber is secured to the keel by an inch and a-quarter copper bolt. The keelson, which is five inches square, is bolted through the remaining floor-timbers, and the keel and the rider, which is fifteen by fourteen inches, through every naval-timber. Thus it will be seen, that each floor and naval-timber is bolted either through the keel or the keelson and its rider.

Her burthen is seven hundred and fifty tons, custom-house measurement.

RIG.

She is a full-rigged ship. Her foremast rakes one-half an inch per foot, mainmast three-quarters, and mizzen-mast one and a-quarter inch. The bowsprit is thirty-six feet outboard and twenty feet inboard, and two feet two inches in diameter. The jib-boom and flying jib-boom are in one spar; the latter is thirteen inches in diameter, twelve feet inside the cap, and eighteen feet outside, and the former is twelve feet long with an end of three feet. The distance from the stern to the centre of the fore-mast is thirty-one feet; thence to the centre of the main-mast fifty-seven feet, and thence to the centre of the mizzen-mast forty-two feet. The following table contains the dimensions of her masts and yards:—

MASTS.

	Diameter.	*Length.*	*Mast-heads.*
Foremast,	23 inches.	78 feet 11½ inches.	19 feet.
Fore-top-mast,	13 "	42 "	5 "
Top-gallant-mast,	8¼ "	15 "	—
Main-mast,	26 "	83 " 6 inches.	20 "
Main-top-mast,	13 "	46 "	6 "
Top-gallant-mast,	9 "	18 " 6 inches.	—
Royal-mast,	—	15 " 6 "	—
Mizzen-mast,	20 "	67 " 10½ "	17 "
Top-mast,	10 "	36 " 4 "	—
Top-gallant-mast,	6¼ "	12 "	—
Royal-mast,	—	9 "	—

YARDS.

	Diameter.	*Length.*	*Yard-arms.*
Fore-yard,	14 inches.	57 feet.	4 feet 0 inches.
Lower top-sail-yard	11 "	47 "	3 " 6 "
Upper " "	8 "	36 " 6 inches.	2 " 6 "
Top-gallant "	6 "	26 " 6 "	1 " 6 "
Royal-yard,	5 "	21 " 6 "	1 "
Main-yard,	16½ "	66 "	4 "
Lower top-sail-yard,	14 "	57 "	4 "
Upper " "	11 "	47 "	3 " 6 inches.
Top-gallant "	8 "	36 " 6 inches.	2 " 6 "
Royal "	6 "	26 " 6 "	1 " 6 "
Cross-jack,	11 "	47 " 0 "	3 " 6 "
Lower top-sail,	8 "	36 " 6 "	2 " 6 "
Upper "	6 "	26 " 6 "	1 " 6 "
Top-gallant-yard,	5 "	21 " 6 "	1 " 0 "
Royal "	4 "	18 " 0 "	— 10 "

Her main sky-sail-yard (she will only carry one sky-sail) is of the same dimensions as the mizzen royal-yard. The spanker-boom is forty-five feet long, and the gaff thirty-four feet, with three and a-half feet end. Her top-masts are fitted abaft the heads of the lower masts, and the top-gallant-masts abaft the heads of the top-masts. Her suit of standing sails contains three thousand eight hundred and thirty-three yards, each cloth twenty-two inches wide.

ENGINE.

The engines were condensing, with two cylinders working nearly at right angles to each other.

Diameter of cylinder, ...	2 feet 1 inch.
Length of stroke, ...	3 "
Cubic contents of each, ...	17.640 cubic inches.
Power of engines, ...	170 horses.

They were built by Messrs. Hogg & Delemater, New York, from designs of Captain John Ericsson, Engineer.

BOILERS.

She has two "wagon" boilers, each fourteen feet long, seven feet wide, and nine feet high, with one furnace to each: and provided with blowing engines and blowers, and two heaters made on the same principle with those of the "Princeton," described under that vessel. The chimney passes through the decks, and is surrounded by a ventilating trunk.

PROPELLER.

The "Massachusetts" has an "Ericsson" propeller, the extreme diameter of which is nine and a-half feet. The shaft passes *close* to the stern-post on the port side, resting in a socket which is imbedded in and bolted to the stern-post, and is further supported by a massive frame above. The propeller is made of wrought iron and composition, and can be raised out of the water, when the engine is not required to act.

The apparatus by which this is effected consists of a shaft which passes from the engine-room through the stern above and parallel with the propeller-shaft. By revolving, it raises the propeller, (which has been previously disconnected) and places it close against the flat of the stern, where it is secured with chains from either quarter. The whole process occupies but a few minutes, and renders her a complete sailing ship. A "shark's mouth" or opening, is cut across the backing of the rudder, so as to allow it to traverse clear of the shaft.

The location of the shaft one side of the stern-post, the slotted rudder, and the arrangement for raising the propeller, are included in Ericsson's patent.

The space occupied by the machinery and its appurtenances in the lower hold, is forty-seven feet long from the stern-post. Its cost was twenty-four thousand dollars; that of the hull and equipments, fifty-six thousand dollars; total, eighty thousand dollars. Her speed in smooth water is about eight knots per hour.

The "Edith" was a steam-barque built at Boston, in eighteen hundred and forty-four, by R. B. Forbes, Esq., (who also designed the "Massachusetts") and was similar to that vessel in her proportions and arrangement. Her hull was one hundred and twenty feet in length; in breadth, twenty-six feet, and fourteen feet in depth. Her burthen was about four hundred tons.

She had the same kind of propeller, and the same arrangement for disconnecting and hoisting it up from the water, as the "Massachusetts," her machinery being also designed by Captain Ericsson, and built by Messrs. Hogg & Delemater, of New York. Her engines were direct acting and condensing, with one tubular boiler.

Previous to the purchase of this vessel by the War Department, she made the quickest trip from Calcutta to Canton ever made previous to eighteen hundred and forty-six. After the Mexican war, she was sent round to the Pacific squadron, and was lost in that ocean in eighteen hundred and fifty.

THE SCORPION AND THE POLK.

In eighteen hundred and forty-six, the steamer "Scorpion" was running in the Gulf of Mexico, and in that year was purchased by the Navy Department. After being used in the Mexican war, and seeing some service on the coast of Mexico, she was sold out of the Navy in eighteen hundred and forty-eight. Her dimensions of hull, engine, &c., were as follows:—

HULL.

Length,	145 feet 9 inches.
Beam,	24 " 6 "
Depth of hold,	10 " 2 "
Mean draft,	8 "

ENGINE.

One inclined condensing engine.

Diameter of cylinder,	40 inches.
Stroke of piston,	8 feet.

PADDLE WHEELS.

Diameter,	21 feet 6 inches.
Length of paddles,	6 "
Width " "	2 "
Dip " "	2 " 9 inches.
Number " " (each wheel),	18.

PERFORMANCE.

The average performance of this vessel, when steaming in the Gulf of Mexico, in eighteen hundred and forty-six, was as follows:—Speed, seven and a-half knots; pressure of steam in boilers, eighteen pounds; number of revolutions, fifteen; cut-off at half-stroke.

The "Polk" was a small steamer, similar in size to the "Scorpion," and was originally built by the Treasury Department for a revenue cutter. In eighteen hundred and forty-six, during the Mexican war, she was transferred to the Navy Department, and fitted as a war-steamer, with one forward gun and two guns aft, at Norfolk, Va.

Her machinery, however, proved to be inefficient, and her hull unsafe. When one day out from Norfolk, on her way to the Gulf of Mexico, she was obliged to return in distress. A survey being made, she was condemned. Her machinery was taken out and sold, and the hull returned to the Treasury Department, and converted into a cutter, for which purpose it is now used on the coast.

THE ENGINEER.

The "Engineer" is a small tug steamer, attached to the Norfolk, Va., Navy Yard.

HULL.

Length between perpendiculars, 105 feet; beam, 17 feet 2 inches; depth of hold, 6 feet 11 inches; mean draft, 4 feet 6 inches; depth of keel, 6 inches; thickness of bottom plank, 2 inches; of wales, 3 inches; of siding frames, 4 inches at head, and 8 inches at heel. Area of immersed midship section, 61 square feet.

ENGINE.

One, beam engine. Diameter of cylinder, 25 inches; stroke of piston, 7 feet; space displacement of piston per stroke, 23.863 cubic feet.

PADDLE WHEELS.

Of the common radial kind. Diameter from outside to outside of paddles, 17 feet; length of paddle, 4 feet three inches; width of paddle, 1 foot 6 inches; thickness of paddle-board, 1¾ inch; number of paddles in each wheel, 14; wooden arms, 6½ inches; immersion of lower edge of paddles, 29 inches. Paddle-wheel shaft, of cast iron, 6⅝ inches diameter in main journal; area of one paddle, 6.375 square feet; number of paddles immersed in each wheel, 3.

BOILER.

One iron boiler of the "double-return-drop flue" variety, 17 feet long, 7¼ feet diameter, with a steam-chimney 5½ feet diameter, by 4 feet high above top of boiler; smoke-pipe, 2½ feet diameter, and 31 feet high above the top of steam-chimney; two furnaces, 3 feet by 5 feet each; total fire-grate surface, 30 square feet; heating surface in furnaces, 128 square feet; in flues, 326 square feet; in connections, 62 square feet; total heating surface, 564 square feet; proportion of grate to heating surface, 1 to 18.8; proportion of grate surface to space displacement of piston, 1.257 square feet per cubic foot; proportion of heating surface to space displacement of piston, 23.631 square feet per cubic foot; capacity of steam-room, 212 cubic feet, or 8.884 cubic feet per cubic foot of piston displacement.

Calorimeter or cross areas of flues at bridge,	5.936 square feet, or 1 to	5056 of grate.
" " " " " middle flues,	4.746 " " " "	6321 "
" " " " " back connections,	3.529 " " " "	8501 "
Area of smoke-pipe, ...	4.908 " " " "	6113 "

With these proportions, the boiler furnishes steam for 20.9 double strokes of piston per minute of 21.8 pounds boiler pressure above the atmosphere, with wide throttle, burning seven hundred and twenty-four pounds of Virginia bituminous coal per hour, with natural draft, cutting off at half stroke. Using dry Virginia pine wood, the boiler furnishes steam for twenty-five double strokes of piston per minute, of thirty pounds boiler pressure above the atmosphere, with wide throttle, burning half a cord per hour, cutting off at half stroke.

PERFORMANCE.

The "Engineer" ran in Chesapeake Bay, three hundred and sixty miles in thirty-nine and a-half hours, or at the rate of 9.057 miles per hour. Double strokes of engine per minute, 20.9. Steam pressure above atmosphere in boiler, 21.8 pounds; back pressure in condenser, 2.2 pounds; cut-off at half stroke of piston.

The area of the piston being 490.875 square inches, and its stroke seven feet, the horse-power developed by the engine was as follows:—$(490.875 \times 26.64 \times 41.8 \times 7) \div 33.000 = 115.95$ horse-power.

THE JOHN HANCOCK.

This vessel was constructed in eighteen hundred and fifty, at the Boston Navy Yard, to answer the double purpose of a steam-tug and water-tank for that yard. Her machinery was made at the Washington Navy Yard, under the direction of William M. Ellis, Esq., Chief Engineer of the yard, from the designs of Charles W. Copeland, Esq., of New York.

In the summer of eighteen hundred and fifty-one, the "John Hancock" was sent to Annapolis as a practice-steamer, for the benefit of the naval academy at that station, and remained on this duty for a short time, when she returned to New York. During the excitement of the Lopez expedition to Cuba, she was sent down to the Gulf, armed with a brass six-pounder on wheels, and returned from this duty (which the stormy weather had rendered perilous) to New York, whence she was ordered to Boston. She was brig-rigged. The form of her hull was adapted to the purpose of her original construction, being very lean aft, with very full lines and great buoyancy forward. Her dimensions were as follows:—

HULL.

Length between perpendiculars,		113 feet.
Beam (extreme),		22 "
Depth of hold,		9 "
Tonnage,		208 tons.
Draft of water, with half coal in, and all other weights full,	Forward,	6 feet.
	Mean,	$8\frac{1}{4}$ "
	Aft,	$10\frac{1}{2}$ "
Immersed midship section, at mean draft,		154 square feet.

ENGINES.

Two oscillating, non-condensing engines, suspended above the propeller-shaft, with slide-valves, and the "link-valve" motion.

Diameter of cylinder,	20 inches.
Stroke of piston,	21 "

Displacement of both pistons per stroke,	7.636 cubic feet.
Mean effective pressure per square inch,	28.3 pounds.
Cut-off from commencement,	$\frac{3}{4}$.
Space between cut-off and piston,	0.664 cubic feet.
Double strokes per minute,	$55\frac{1}{2}$.
Horse-power developed by engines,	79.25.

BOILER.

One iron boiler, with single-return ascending flues.

Length of boiler,	22 feet.
Breadth " "	6 " 3 inches.
Height " "	7 " 5 "
Circumscribing parallelopipedon,	1019.84 cubic feet.
Heating surface,	755 square feet.
Grate "	28 " "
Steam-room in boiler,	200 cubic "
" " " steam-pipe, &c.,	205 " "
Cross area of two lower rows of flues,	4.636 square feet.
" " " " upper " " "	4.276 " "
" " " smoke-pipe,	4.909 " "
Height of smoke-pipe above grate,	37 feet 9 inches.
Mean pressure of steam in boiler,	31 pounds.
Consumption of Cumberland coal per hour with natural draft,	598 "
Weight of sea-water in boiler,	22,700 "
" " boiler and smoke-chimney,	26,667 "
" " " grate bars,	2,260 "
Ashes, clinkers, &c.,	12.8 per cent.

PROPELLER.

One, of bronze, twist blade, but not a true screw, connected directly with the engines, with a disconnecting arrangement in the engine-room.

Diameter,	8 feet.
Length of periphery in direction of axis,	3 "
Pitch at "	18.04 feet.
" " hub,	6.31 "
Diameter of hub,	1.25 "

THE JOHN HANCOCK.

WEIGHT AND COST.

Weight of engine and propeller, ...		44,045 pounds.
Cost " " " "	\$5,622 59	
" " boiler, &c., (9.1 cents per pound), . .	2,428 13	
" " hull, ...	12,500 00	
Total cost, . . .	\$20,550 72	

PERFORMANCE.

Steaming partly with a light fair wind, and partly with a light head breeze, ordinary sea, and no sails set, the mean speed of this vessel was 6.411 knots per hour; with a boiler pressure of thirty-one pounds, revolutions fifty-five and a-half, and cutting off at three-quarters the stroke from commencement. Consumption of bituminous coal, five hundred and ninety-eight pounds per hour.

Taking the pitch of the propeller at 16.739 feet, the slip would be—

$16.739 \times 55\frac{1}{2} \times 60 = 55.740,87$ feet = speed of propeller per hour.

$6.411 \times 6028\frac{2}{3} = 38.995,97$ " " " vessel " "

16.744.994 feet, or 30.04 per cent. = slip of propeller.

THE SARANAC.

In the year eighteen hundred and forty-seven, by an act of Congress, and under the orders of the Navy Department, four steam-frigates were commenced: one, the "Saranac," at the Portsmouth Navy Yard, New Hampshire, and a sister vessel of the same lines and proportions, the "San Jacinto," at the New York Navy Yard; one, the "Susquehanna," at the Philadelphia Navy Yard, and a sister vessel, the "Powhattan," at the Norfolk Navy Yard. The "Saranac" was first completed, her hull being launched on the fourteenth day of November, eighteen hundred and forty-eight, and her trial trip from Portsmouth made on the tenth day of April, eighteen hundred and fifty.

The hull was built under the superintendence of B. F. Delano, Esq., Naval Constructor, and is a fine specimen of Naval architecture. The engines were built at the Iron Works of Jabez Coney, Boston, from the designs of Chas. W. Copeland, Esq., then Consulting Engineer of the Navy Department, and under the superintendence of Chief Engineer Daniel B. Martin, U. S. N. The appearance of these engines, and the large amount of service they have rendered, is highly creditable to their design and construction.

After going into commission, the "Saranac" was attached to the Home Squadron, and proceeded to the Gulf of Mexico, bearing the broad pennant of Commodore F. A. Parker, U. S. N., by whom she was used as the Flag Ship of the Squadron, until last Spring; he was then succeeded by Commodore J. T. Newton, U. S. N., and the "Saranac" proceeded to Philadelphia, where she was thoroughly refitted and repaired. In September last, she sailed from Philadelphia to join the Brazil Squadron, with the Brazilian Minister on board, as passenger, on which station she is at present cruising. Her qualities as a sea-steamer and man-of-war are very satisfactory, and she is an ornament to the service.

Her general dimensions are as follows:—

HULL.

Length between perpendiculars at load line, ...	210 feet.
Length from knight-head to taffrail, ...	220 "
Length over all, ...	233 "

Length of keel,	203 feet.	
Beam, moulded, at load line,	36 "	
Beam, extreme, at load line,	37 "	
Breadth from outside to outside of paddle boxes,	60 "	
Depth of hold,	23 "	
Height from lower edge of rabbet to top of plank-sheer,	25 "	6 inches.
Draft of water, forward, at load line,	16 "	8 "
" " aft, " "	17 "	4 "
Immersed amidship section at load line,	486 square feet.	
Displacement at 17 feet mean draft,	2,100 tons.	
Custom House tonnage,	1,463 "	
Top of port-sills above load line,	11 feet 9 inches.	

The frames of the hull are of live oak, placed two and a-half feet from centre to centre, and timbered solid as high as the first futtock-heads. The garboard strakes are nine inches thick, and their upper sides level and fair with the top of the keel, bolted edgeways through the keel every five feet, and through the frames, as are also the bottom plank. There are five keelsons running fore and aft. The centre one is of live oak, thirty inches deep by sixteen inches wide. The remaining four are the engine keelsons, of white oak, six inches deeper than the main keelson, on a level line across the hull. The keelsons are jogged over the futtocks, and bolted with two strong bolts through the keelson, and each floor timber, and riveted on the under side of the keel in the centre keelson, and on the outside of the plank in the bilge keelsons. The hull is also braced with diagonal iron braces, four inches wide, and three-quarters thick, placed at an angle of forty-five degrees on the inside of the frames, running from the upper edge of the gun-deck clamps to the lower edge of strakes at the first futtock-heads, and placed five feet apart, longitudinally, the whole length of the ship. Between the thick strakes, of which there are three at the first, and three at the second futtock-heads, are trusses of timber in an opposite direction to the iron braces. The berth-deck beams are kneed with one lodge and one dagger knee, to the end of each beam, whose arms are about five feet long, sided, seven inches. The dagger knees brace in a contrary direction to the iron braces. There are four breast hooks in the hold, sided, from ten to eleven inches, which are fayed to the timbers, whose arms are from eight and a-half to nine feet long. The deck hooks are of the same size. The gun-deck clamps are nine inches wide, and five and a-half thick, and jog that distance over the frames. There are two strakes of yellow pine plank, nine inches wide on the gun and berth-decks, next the water-ways, notched over the beams and ledges, and bolted through the water-ways and sides of hull, every five feet with strong iron bolts. The gun-deck beams are kneed with one lodge, one dagger, and one hanging knee, to the end of each beam, with arms five feet long, sided, seven to eight inches. There are on each side, eighteen strakes of white oak, seven and a-half inches wide, and five and a-half thick.

Two water tight bulk-heads divide the ship into three apartments, below the berth-deck. The half top timbers of the frame are of red cedar.

RIG.

The "Saranac" is rigged as a barque.

Length of fore-mast from base line, ...	84 feet.
" main-mast, " " "	89 "
" mizzen-mast, " "	76 "
" bowsprit, outboard, ...	24 "
" fore and main-top-mast, each, ...	43 " 6 inches.
" mizzen-top-mast, ...	37 "
" fore and main-yards, ...	73 " 6 "

ARMAMENT.

Two eight-inch pivot guns, weighing twenty-three thousand, seven hundred and eighty pounds; four eight-inch broadside guns, weighing twenty-five thousand and seventy-four pounds.

ENGINES.

There are two inclined, condensing engines, with inclined air-pumps, and wrought iron frames, formed of three-eighths inch plates, with angle-iron corners. The valves are "balance-puppet," and the cut-off is Stevens' arrangement, with double eccentrics and rock-shafts.

Diameter of cylinders, ...	60 inches.
Stroke of piston, ...	9 feet.
Diameter of air-pump, ...	43½ inches.
Length of stroke, ...	40 "
Power of engines, ...	605 horses.
Length of water-wheel shafts, ...	18 feet.
Length of centre shafts, ...	10 " 4 inches.
Diameter of journals, ...	15¾ inches.

BOILERS.

There are three copper boilers with double-return drop-flues.

THE SARANAC.

Length,	27 feet.
Width,	13 "
Height,	9 "
Grate surface,	188 square feet.
Heating surface,	5,127 " "
Calorimeter of first flues,	37 " "
" " second flues,	35 " "
" " third flues,	30½ " "
Aggregate weight,	193,961 pounds.
" cost,	$87,117 41.
Evaporation of water, per pound of coal,	6½ pounds.
Average pressure,	12 "

PADDLE WHEELS,

Of the common radial kind, with double floats, and bearings on the guards.

Diameter,	27 feet.
Length of floats, (22 arms)	9 "
Breadth " (double)	2 " 6 inches.
Dip " at load line,	4 " 7½ "

WEIGHT OF HULL AND EQUIPMENTS.

Weight of hull,	2,323,364 pounds.
" masts and spars,	50,045 "
" boats,	20,835 "
" rigging and blocks,	38,610 "
" sails, &c., (Sailmaker's Department)	13,492 "
" iron water tanks,	7,169 "
" water casks and chocks,	3,158 "
" anchors and cables,	127,230 "
" furniture,	5,976 "
" sundry stores,	241,656 "
" armament,	69,074 "
" shot, shells, and powder,	46,668 "
" gunners, equipment and stores,	13,534 "
" crew, baggage, &c.,	44,000 "
Total,	3,005,811 pounds.

Weight of engines, wheels, boilers, &c.,	765,813	pounds.
" water in boilers,	57,352	"
" coal in bunkers,	676,657	"
Total,	1,499,822	pounds.

COST.

Hull and equipments,	$198,706 31
Engines, boilers, &c.,	195,259 35
Repairs in 1850, (estimated)	20,000 00
" " 1852,	26,183 13
Total,	$440,148 79

PERFORMANCE.

The average performance of the "Saranac," with ordinary sea and weather, is as follows:—Effective cylinder pressure, 9.3 pounds; cut-off four feet from commencement; revolutions, twelve and a-quarter per minute; consumption of bituminous coal, two thousand, four hundred and sixty-six pounds, per hour; speed, 8.14 knots. For a more detailed description of her performance, reference is made to Appendix, Note F.

THE SAN JACINTO.

This vessel was constructed from the same lines as the "Saranac," and intended to be similar in all important respects except the mode of propulsion, which was varied to test the relative merits of paddle-wheels and propellers. She was built under the same act of Congress, at the New York Navy Yard, under the supervision of Samuel Hartt, Naval Constructor, her keel being laid simultaneously with that of the "Saranac," in August, eighteen hundred and forty-seven, and the vessel launched June, eighteen hundred and fifty.

The engines were constructed under the immediate supervision of Chief Engineer, Henry Hunt, of the United States Navy, at the works of Merrick & Son, Philadelphia, from the designs of Charles H. Haswell, Esq., then Engineer-in-Chief of the United States Navy. The equipments of the hull and erection of the engines being completed, December, eighteen hundred and fifty-one, a trial-trip was made in New York harbor, on the first of October. January first, eighteen hundred and fifty-two, she left New York for a trial-cruise to Norfolk, Virginia, and encountered heavy weather on the passage, during which one of her engines became disabled. She was detained at Norfolk for repairs until March third, when she sailed for the Mediterranean, to which squadron she is now attached. The symmetry of her hull, and her internal arrangements are worthy of commendation.

The general dimensions are as follows:

HULL.

Length of keel, ...	203 feet.
" between perpendiculars, ...	210 "
" over all, ...	234 "
Beam, moulded, ...	37 "
Depth of hold, ...	$23\frac{1}{3}$ "
" " keel and false keel, ...	$1\frac{1}{4}$ "
Displacement at $16\frac{2}{3}$ feet draft (load-line), ...	2150 tons.
" per inch in depth at load-line, ...	16 "
" at $17\frac{1}{4}$ feet draft, ...	$2240\frac{1}{3}$ "
American Custom House measurement, ...	1461 "
Immersed midship section at load-line, ...	477 square feet.

MASTS AND SPARS.

	Length.	Diameter.	Head and Arms.
Foremast,	83 feet 5 inches.	28 inches.	16 feet 0 inches.
Fore-top-mast,	49 " 4 "	15 "	5 " 9 "
Fore-top-gallant-mast,	31 " 0 "	8 "	5 " 6 "
Main-mast,	96 " 7 "	28 "	16 " 0 "
Main-top-mast,	49 " 4 "	15 "	5 " 9 "
Main-top-gallant-mast,	31 " 0 "	8 "	5 " 6 "
Mizzen-mast,	69 " 8 "	18 "	8 " 6 "
Mizzen-top-mast,	42 " 0 "	10 "	
Fore-yard,	83 " 6 "	18 "	3 " 3 "
Fore-top-sail-yard,	63 " 0 "	14 "	6 " 2 "
Fore-top-gallant-yard,	35 " 9 "	7.8 "	2 " 0 "
Main-yard,	83 " 6 "	18 "	3 " 3 "
Main-top-sail-yard,	63 " 6 "	14 "	6 " 2 "
Main-top-gallant-yard,	35 " 9 "	7.8 "	2 " 0
Main-gaff,	34 " 0 "		2 " 3 "
Mizzen-gaff,	40 " 4 "		4 " 8 "
Spanker-boom,	54 " 6 "	20 "	1 " 0 "
Bowsprit, (outboard)	25 " 6 "	24 "	
Jib-boom,	28 " 9 "	15 "	2 " 9 "
Fore-gaff,	34 " 0 "		2 " 3 "

RIG.

The "San Jacinto" is barque-rigged, and spreads sixteen thousand five hundred square feet of canvas.

ARMAMENT.

Her battery is similar to that of the "Saranac," consisting of two eight-inch pivot guns, and four eight-inch broadside guns.

ENGINES.

There are two "square" engines, with inclined cylinders and vertical air-pumps. The cylinders are above the propeller-shaft, which is centred twenty inches to port of the centre line of the vessel, and is connected direct by drag-links, double connecting-rods, and cross-heads working at the upper and outer end of the cylinders; the lower steam-chests of the cylinders being in contact. The cut-off is that of "Sickles," and momentarily adjustable. Counterbalances were placed on the propeller-shaft by the recommendation of the Board of Naval Engineers in charge of her trial-trip, to correct the irregular action of the machinery at different points of the stroke. The workmanship of these engines is superior, but their action is irregular, their friction is great, and they are constantly liable to fracture, and difficult to keep in order or repair.

Diameter of cylinders,	$62\frac{1}{2}$ inches.
Stroke of piston,	50 "
Displacement per stroke, (both pistons),	174.54 cubic feet.

BOILERS.

There are three copper boilers, with double drop-return flues.

Length,	27 feet.
Width,	13 "
Height,	9 "
Grate surface,	$195\frac{1}{2}$ square feet.
Heating "	5250 " "
Calorimeter of flues,	35 " "
Height of smoke-pipe above grate,	65 feet.
Average pressure per square inch,	11.8 pounds.

PROPELLER.

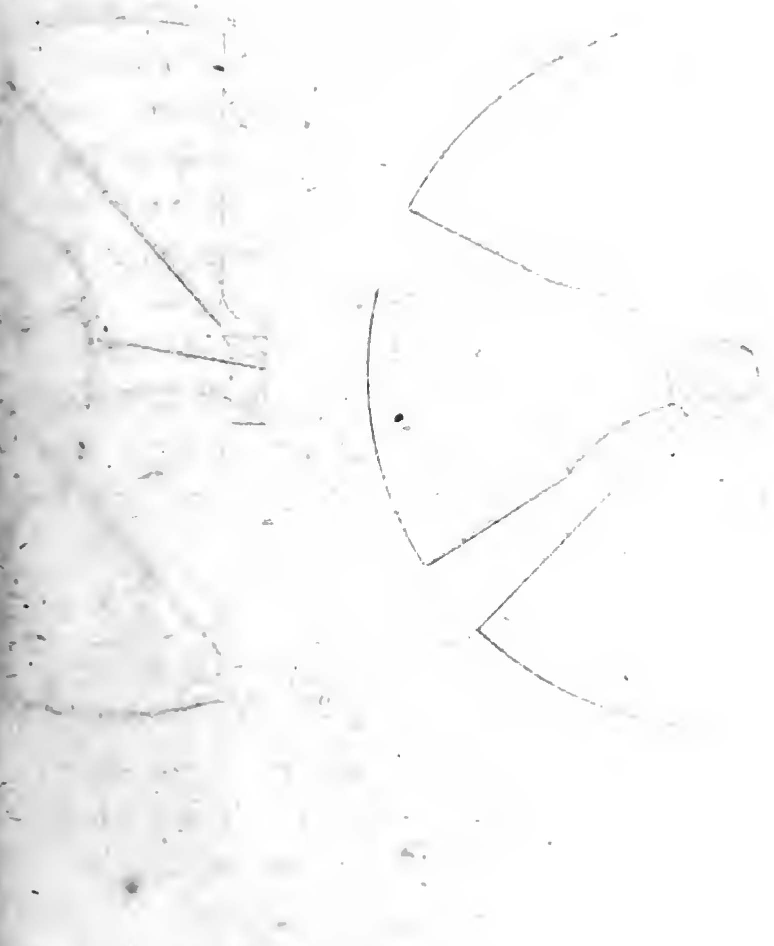
The original propeller of this vessel was designed by Charles H. Haswell, Esq., late Chief Engineer of the United States Navy, with six blades, being fourteen and a-half feet in diameter, four and three-quarter feet long on axis at periphery, with a pitch expanding from thirty-five to forty feet. Its weight was to be ten tons, and it was located abaft the rudder, five feet from the stern-post. The pattern was completed, ready for casting, in December, eighteen hundred and fifty, when the office of Engineer-in-Chief was conferred upon the author of this work. Having become satisfied from an examination of this proposed arrangement, that the leverage of so heavy a propeller endangered the stern-post and bearing of the shaft; that the number of blades was too large, and that it would not be safe to give the engines revolutions per minute sufficient to obtain the requisite speed, with a propeller of that pitch, it was recommended to the Department to change the form of the propeller to four blades, with the same diameter, and increased pitch, weighing about seven tons, and placed forward of the rudder, which was to be of metal, and properly curved. These recommendations having been endorsed by a Board of Naval Engineers, and approved by the Department, the changes were accordingly made, and the machinery thus completed. Both propellers are shown in Plate Eight. The shaft of the rudder is of wrought iron, covered with composition three-eighths of an inch thick; its form is suited to the propeller, and it is secured at the base in a step firmly bolted to the keel. It was very skillfully constructed, at the Washington Navy Yard, under the superintendence of William M. Ellis, Esq., Chief Engineer, from the designs of Chief Engineer B. F. Isherwood, of the United States Navy. The original arrangement, with the propeller-shaft one side the stern-post, the stern-bearing, and the slotted rudder, was covered by the claims of the Ericsson patent.

PERFORMANCE.

The passage of this vessel to Norfolk, and thence to Cadiz, has not furnished full records of her performance, in consequence of the accidents which disabled her machinery. Partial details are given in Appendix, Note F. In New York harbor, when trying her speed with the "Fulton," January first, eighteen hundred and fifty-two, she ran eighteen and a-half miles in two hours; on her trial-trip of October first, eighteen hundred and fifty-two, her maximum speed was about ten miles per hour.

WEIGHT AND COST OF MACHINERY.

	Weight.	*Cost.*
Engines, complete,	341,063 pounds.	$99,293 44
Boilers, "	213,256 "	77,908 14
" appurtenances,	60,034 "	12,347 22
Coal-bunkers and bulk-heads,	23,046 "	3,123 39
Propeller and stern-bearing,	14,894 "	9,431 03
Extra pieces and tools,	24,072 "	2,176 35
Patterns, lumber, &c.,		1,314 20
Total,	676,365 pounds.	$205,593 77



[illegible] pitch, weighing about [illegible] of metal, and properly [illegible] of Naval Engineers, and [illegible] the machinery thus [illegible] The shaft of the rudder is of [illegible] thick: its form is suited [illegible] bolted to the keel. It [illegible] Navy Yard, under the superintendence [illegible] Chief Engineer B. F. Isher- [illegible] the propeller-shaft one [illegible] was covered by the claims [illegible]

[illegible]

[illegible] has not furnished full [illegible] which disabled her machinery. [illegible] harbor, when trying her speed [illegible] she ran eighteen and a-half [illegible] hundred and fifty-two, her [illegible]

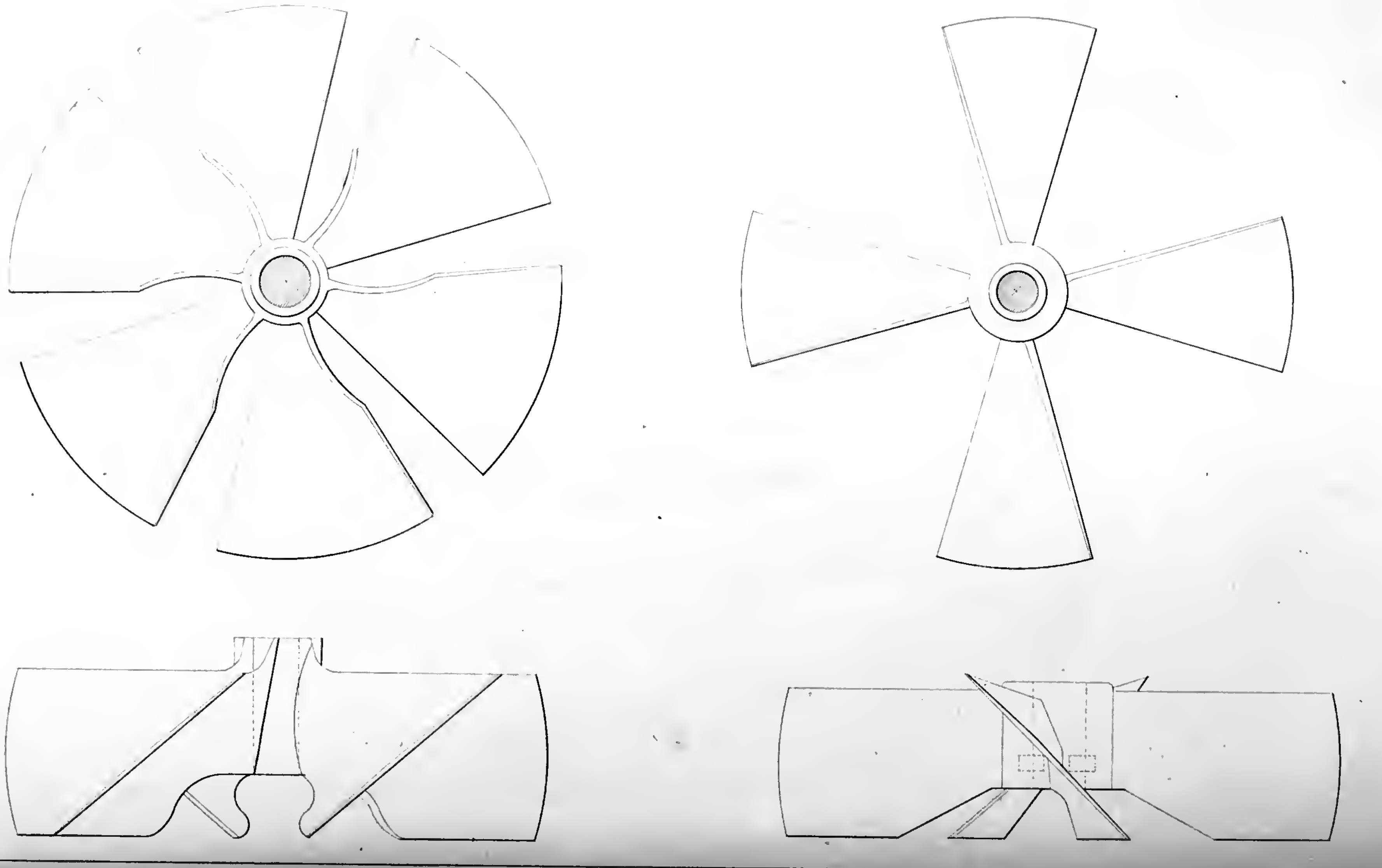
[illegible]

	Weight.	Cost.
[illegible]	[illegible]	$99,293 44
[illegible]	[illegible]	77,908 14
[illegible] appurtenances	[illegible]	12,347 22
[illegible] bulk-heads,	[illegible]	3,123 39
Propeller [illegible] bearing,	[illegible]	9,431 03
[illegible] tools,	[illegible]	2,176 35
[illegible] &c.,		1,314 20
Total	[illegible] pounds	$205,593 77

SAN JACINTO.

Proposed Propeller	
Diameter	14½ ft.
Pitch	35 to 39 "

Present Propeller	
Diameter	14½ ft.
Pitch	40 to 45 "



THE SUSQUEHANNA.

This steamer was commenced at the Philadelphia Navy Yard in eighteen hundred and forty-seven, the hull launched the sixth of April, eighteen hundred and fifty, and the machinery completed so far as to make a trial-trip from Philadelphia to Norfolk, in January, eighteen hundred and fifty-one, at which latter port she was entirely fitted out, and sailed in the spring of that year to the Pacific Ocean.

The hull and rigging were designed by John Lenthall, Esq., Chief Naval Constructor, and the engines and boilers, by Charles W. Copeland, Esq., Civil and Mechanical Engineer, of New York. The frame of the hull is built of live oak, planked with white oak, and braced with wrought iron, as described in Note G, of the appendix, for which note the author is indebted to the present able and experienced Naval Constructor, (Mr. Grice,) of the Philadelphia Navy Yard.

HULL.

Length, Custom House measurement, ...	257 feet.
" at 18½ feet draft of water, ...	250 "
Extreme breadth, ...	45 "
" " over guards, ...	69 "
Depth of hold, ...	26½ "
" " keel, ...	1½ "
Displacement of hull at 15½ feet draft, ...	2745 tons.
" " " " 17½ " "	3277 "
" " " " 19½ " "	3824 "

The vessel is barque-rigged, and spreads 21,230 square feet of canvas in the principal sails.

ENGINES.

These are two inclined, direct-acting, condensing engines, with inclined air-pumps, constructed at the iron works of Messrs. Murray & Hazelhurst, Baltimore, Md.

Diameter of cylinders, ...	70 inches.
Stroke of piston, ...	10 feet.
Space displacement of both pistons per stroke, ...	534.51 cubic feet.
Space occupied by the engines, fore and aft, in the vessel,	49 feet.

BOILERS.

There are four copper boilers, with double-return ascending flues.

Length of each boiler,	15¾ feet.
Breadth " "	15 "
Height " "	12¾ "
Fire surface in the four boilers,	8652 square feet.
Grate " " " " "	342 " "
Calorimeter of first flues in four boilers,	82 " "
" " second " " " "	52 " "
" " third " " " "	52 " "
" " chimney,	54 " "
Height of " above grates,	65 " "
Weight of boilers and appurtenances,	184 tons.

PADDLE WHEELS.

Of the common radial kind.

Diameter, from outside to outside,	$31\frac{1}{6}$ feet.
Length of paddles,	9½ "
Width " " (double),	34 inches.
Area of two paddles,	54 square feet.
Number of paddles in each wheel,	26.
Immersion of lower edge of paddles (at 18½ feet draft,)	64 inches.

WEIGHT AND COST.

	Weight.	*Cost.*
Hull and equipments,	2170 tons.	$380,989 00
Engine department (except coal),	726 "	324,681 00
Armament,	97 "	4,738 00
Coal in bunkers,	900 "	
Total,	3,893 tons.	$710,408 00

PERFORMANCE.

The steam log of the "Susquehanna," as given in Note H, of the Appendix, was tabulated by Chief Engineer, B. F. Isherwood, for the "Franklin Institute Journal," and also furnished by him for this work. The engineer's logs, on file in the office of the Engineer-in-Chief, at Washington, of this vessel, show her mean speed, for a number of days sailing in the Pacific, to be about six and a-half knots per hour, with all sail set, and paddles *removed*, the breeze moderate from north-east, and the course of the vessel south-west, half west. The maximum speed for three consecutive days, (as above) seven and three-quarter knots. The mean speed of the vessel for twenty days, under sail alone, with paddle-wheels turned by steam to prevent their dragging, with moderate breeze, ranging from abeam to aft, all sail set, with ordinary sea, and the vessel drawing eighteen and a-half feet of water, was eight and a-quarter knots per hour. The steam pressure on the boiler, seven pounds, cut off at one-half stroke. Five furnaces only in use, and the consumption of bituminous coal about nineteen tons per day. For her performance under steam alone, see Note H.

THE POWHATAN.

This vessel was built at the Norfolk Navy Yard, her keel being laid on the fourth day of July, eighteen hundred and forty-seven, and her hull launched on the fourteenth day of February, eighteen hundred and fifty. She was completed ready for sea on the third day of September, eighteen hundred and fifty-two, and left Norfolk for New York, on the fifteenth. Being ordered to the Gulf, she left New York the sixteenth day of October, and arrived at Havana on the twenty-second. On the twenty-sixth day of November, she returned to Norfolk, having in the meantime, visited Vera Cruz and Pensacola. She is now preparing to join the Japan Squadron.

Her hull was built under the immediate superintendence of Samuel Hartt, Naval Constructor, from designs furnished by Francis Grice, Naval Constructor, and her equipment completed under the direction of Edward H. Delano, the present Naval Constructor of the Norfolk Navy Yard.

Her machinery was made by A. Mehaffy & Co., Norfolk, under the supervision of Chief Engineer William Sewell, Jr., U. S. N., from designs furnished by Chas. H. Haswell, Esq., formerly Engineer-in-Chief, U. S. N.; several necessary alterations and improvements in the plan of the engines being made by the Superintending Engineer, during the progress of the work. This vessel is considered one of the finest specimens of a side-wheel steam-frigate afloat, and has proved a good sea-vessel. A view of her, engraved by Sarony, from a daguerreotype by Beckers & Piard, Daguerrean Artists, New York, taken previous to her cruise to Havana, is given in the Frontispiece.

Her dimensions are as follows:—

HULL.

Length of keel,	246 feet.	
" between perpendiculars,	250 "	
" at load line,	250 "	
" on deck,	251 "	6 inches.
" from taffrail to billet-head,	277 "	9 "

THE POWHATAN.

Breadth of beam, moulded,	44 feet.
" " extreme,	45 "
" " over guards,	69 " 6 inches.
Depth of hold,	26 " 6 "
" keel,	1 " 6 "
Draft at load line,	18 " 6 "
Displacement (with 800 tons of coal) at load line,	3765 tons.
" per inch, at load line,	22.9 "
American Custom House measurement,	2376 "

Built according to specifications for steam-frigates, given in Appendix, Note G.

MASTS AND SPARS.

	Length.	*Diameter.*	*Heads and Arms.*
Fore-mast	92½ feet,	30 inches.	16½ feet.
Main-mast,	97 "	30 "	16½ "
Mizzen-mast,	89⅛ "	20 "	10 "
Bowsprit, outboard,	29 "	27 "	— "
Fore-top-mast,	56 "	17 "	6 "
Main-top-mast,	56 "	17 "	6 "
Fore-pole,	6 "	— "	— "
Main-pole,	6 "	— "	— "
Mizzen-pole,	5 "	— "	— "
Fore-yard,	95 "	20½ "	3½ "
Main-yard,	95 "	20½ "	3½ "
Fore-top-sail-yard,	71½ "	16 "	7 "
Main-top-sail-yard,	71½ "	16 "	7 "
Fore-top-gallant-yard,	40 "	8½ "	2 "
Main-top-gallant-yard,	40 "	8½ "	2 "
Spanker-boom,	57 "	24 "	— "
Jib-boom,	27 "	17 "	3 "
Spanker-gaff,	44 "	— "	4 "
Fore-gaff,	38 "	— "	2 "
Main-gaff,	38 "	— "	2 "

Surface of plain sails, ... 18,000 square feet.

ARMAMENT.

Three ten-inch guns; six eight-inch guns in broadside.

ENGINES.

Two inclined, condensing engines, with frames in the box form, of cast and wrought iron combined, with angle-iron in the corners, and supported by wrought iron columns. See Plate Ten.

	Diameter of cylinders,	70 inches.
	Stroke of piston,	10 feet.
	Contents of condenser,	95 cubic feet.
Air-pump:—	Diameter of pump,	52 inches.
	Stroke of piston,	42 "
	Contents, (with one circular valve in piston,)	1½ cubic feet.
Feed-pumps:—	Diameter of plungers,	8 inches.
	Stroke " "	42 "

Pipes:—All the feed, blow, injection, and bilge-pipes, are of composition, three-eighths of an inch thick, connected by clasp coupling joints, (improved) accurately faced.

Bilge-pumps:—One to each engine.

Injections:—Three to each engine, side, bottom, and bilge; also, an injection connected with the upper part of the air-pumps.

Appendages:—Two of "Worthington's" steam-pumps; a small pair of engines for hoisting in coal, with a small boiler; a fresh water condenser.

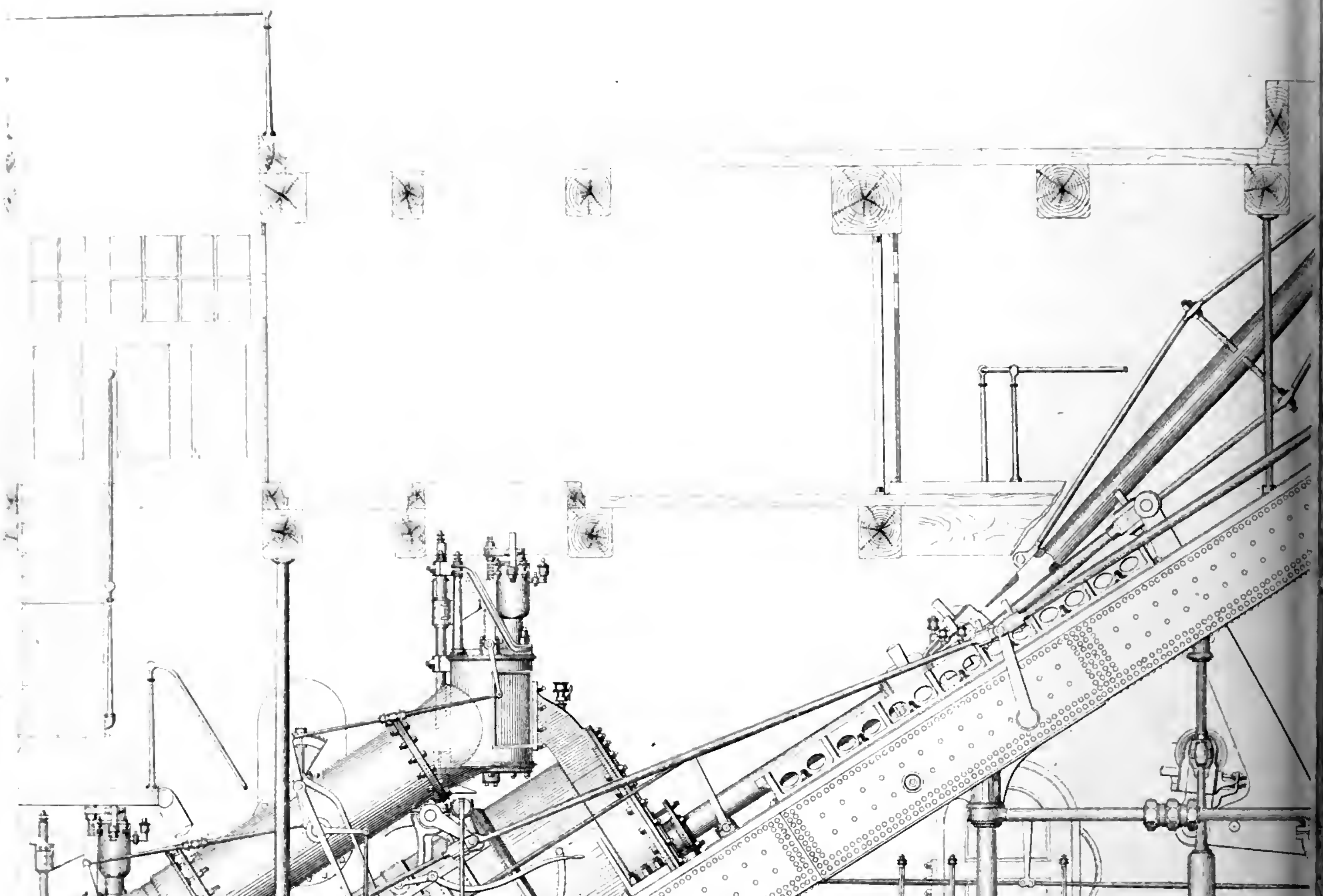
BOILERS.

Four, of copper, connected together with one steam-chimney. Three furnaces in each: three oval flues leading from each furnace, and returning twice upwards through circular flues to chimney.

Length,	16 feet.
Breadth,	15 " 3 inches.
Height,	13 "
Length of grate bars,	6 " 6 "
Grate surface,	354 square feet.
Heating "	7,884 " "

[illegible]

SIDE ELEVATION



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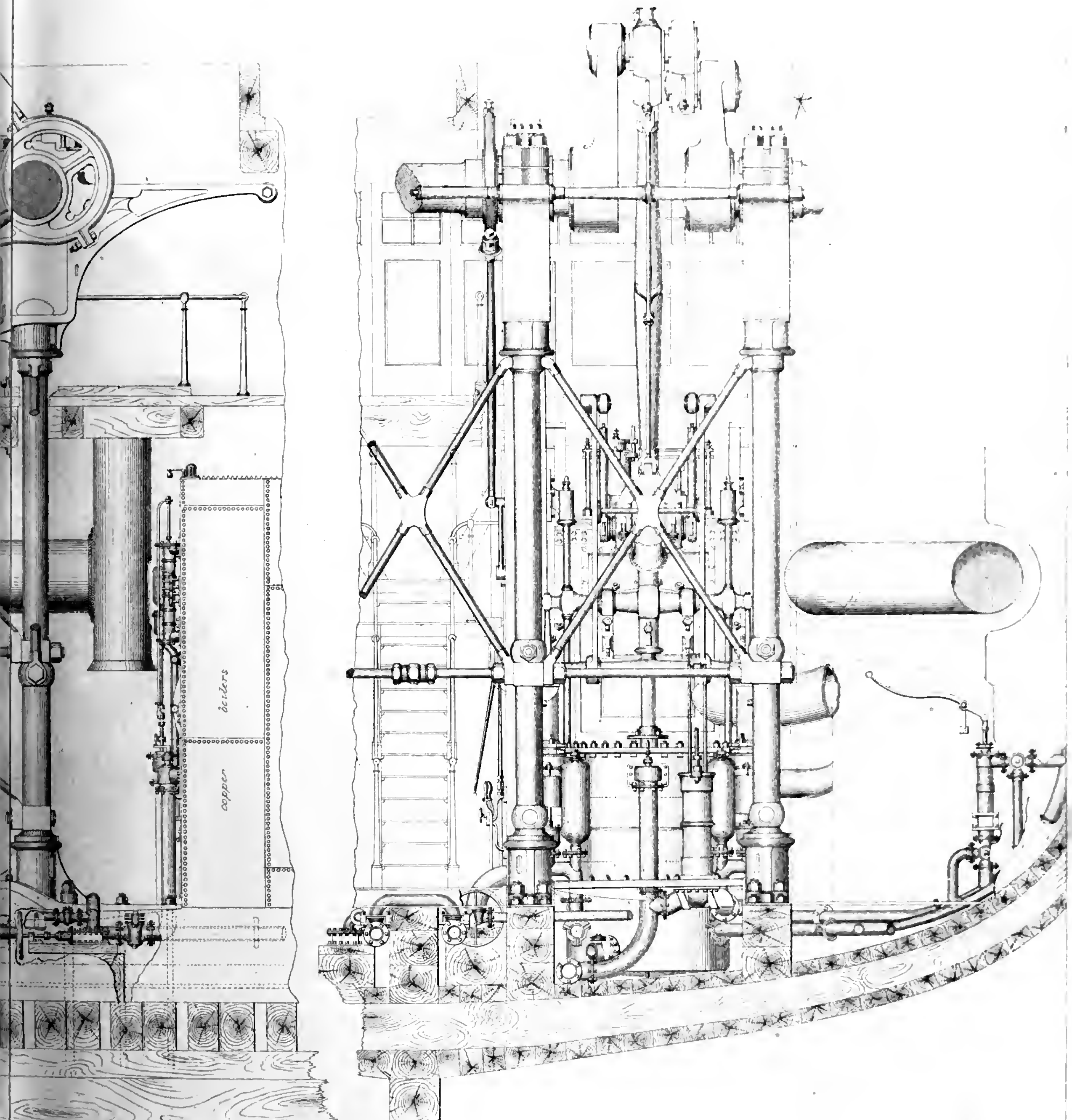
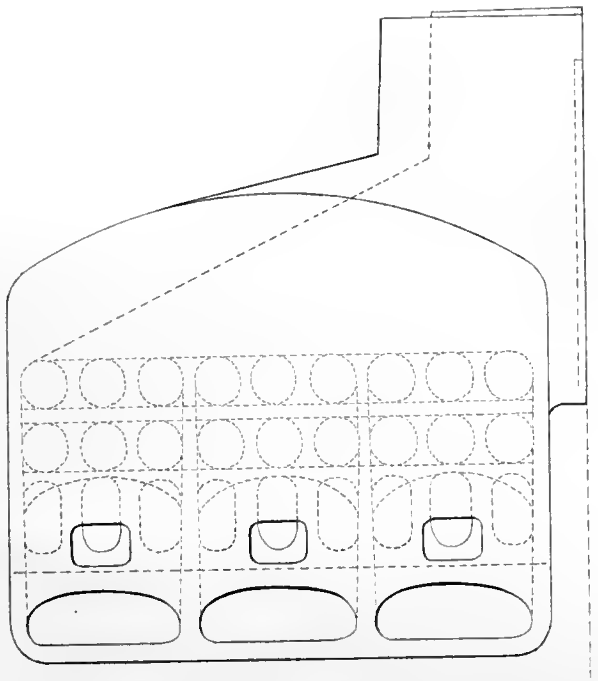
AL STEAMER

END ELEVATION

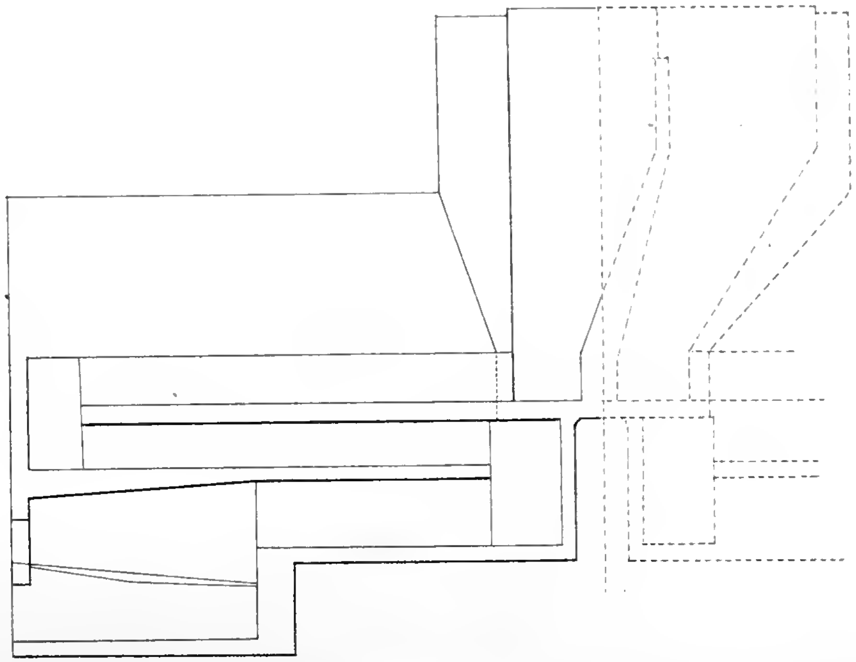


BOILERS

U.S. STEAMER POWHATAN.



FRONT ELEVATION.



SIDE ELEVATION.

Engraved for Stuart's Naval & Mail Steamers U.S.

Sarony & Major Eng. N.Y.

Steam room, ...
Calorimeter of first flues, ...
" " second and third flues, . .
" " pipe, ...
Height of pipe, above grate, ...
Diameter of pipe, ...
Distance from furnace to top of steam-chimney, . .

Each boiler is fitted with a stop-valve, a safety and air-valve. [illegible] attached, worked by the check-valves. Ordinary blow-valves and salinometers are also provided. Steam-cocks are provided for the coal-bunkers, to be used in case of fire. See Plate No. [illegible]

PADDLE WHEELS.

Diameter from outside to outside,	31 feet.		
Length of floats,	10 "		
Breadth " (double)	2 "	2 inches.	
Immersion " at 19 feet 7½ inches draft,	6 "	6 "	
Number "	23.		
Number of centres,	3.		

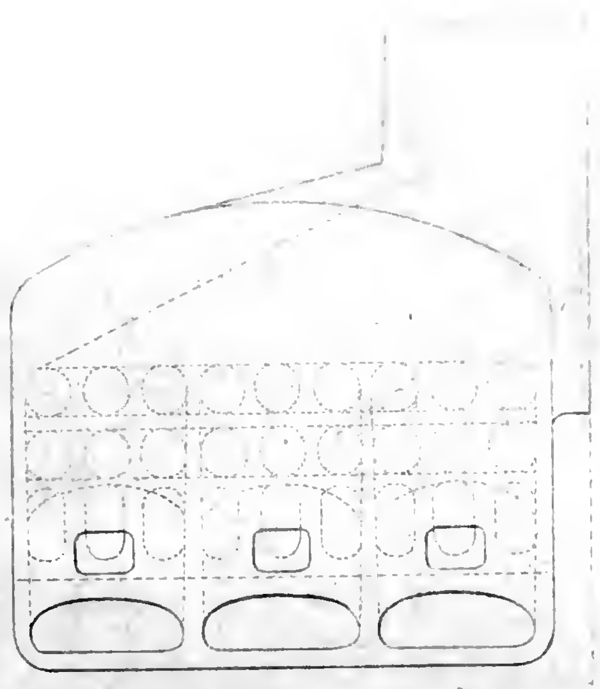
The double floats were altered from a breadth of sixteen inches each, to a joint breadth of twenty-six inches, in October last.

PERFORMANCE.

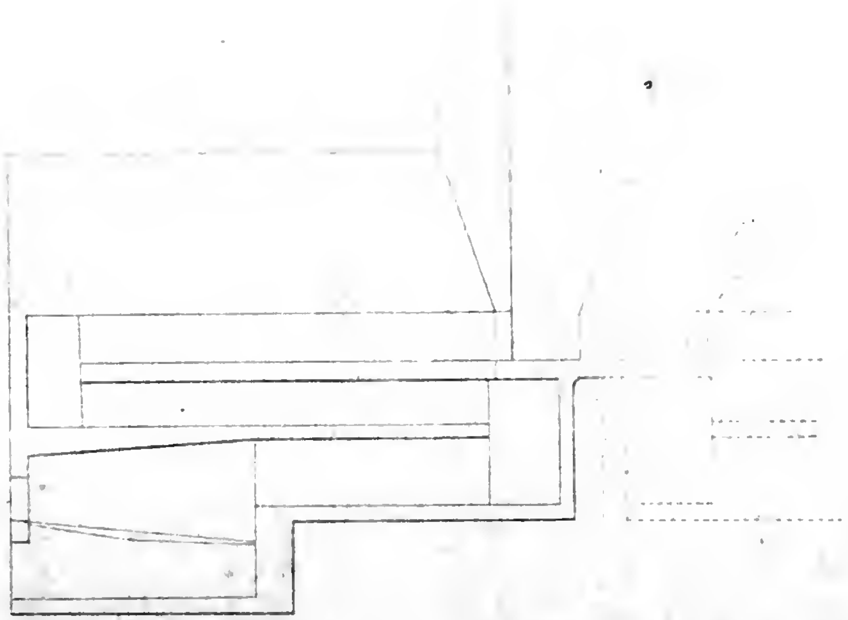
The performance of this vessel, running from New York to Havana, with smooth sea and light breeze in favor, was as follows:—Running time, under steam, one hundred and fifty-six hours; average boiler pressure, 11.6 pounds; average revolutions, per minute, 12.6; speed, per hour, 8.65 knots; consumption of coal, (bituminous) four thousand, four hundred and eight pounds, per hour, with half throttle, and cutting off at half stroke. From Havana to Vera Cruz:—Running time, ninety-seven and one-half hours, with fresh wind in favor; average steam, 10.12 pounds; revolutions, 12.06; speed, 9.81 knots; consumption of coal, three thousand, five hundred and forty-one pounds, per hour, throttle and cut-off at one-half. Dip of floats, at Vera Cruz, sixty-two inches. Details of her performance are given in Appendix, Note I, for which steam-log, the author is indebted to George Sewell, Chief Engineer of the "Powhatan," at this time.

BOILERS

U.S. STEAMER POWHATAN



FRONT ELEVATION.



SIDE ELEVATION.

Steam room,	2,300	cubic feet.
Calorimeter of first flues,	76	square feet.
" " second and third flues,	57	" "
" " pipe,	63½	" "
Height of pipe, above grate,	60	feet.
Diameter of pipe,	9	"
Distance from furnace to top of steam-chimney,	49	"

Each boiler is fitted with a stop-valve, a safety, and air-valve. Self-acting blow-valves are attached, worked by the check-valves. Ordinary blow-valves and salinometers are also attached. Steam-cocks are provided for the coal-bunkers, to be used in case of fire. See Plate Nine.

PADDLE WHEELS.

Diameter from outside to outside,	31	feet.
Length of floats,	10	"
Breadth " (double)	2	" 2 inches.
Immersion " at 19 feet 7½ inches draft,	6	" 6 "
Number "	23.	
Number of centres,	3.	

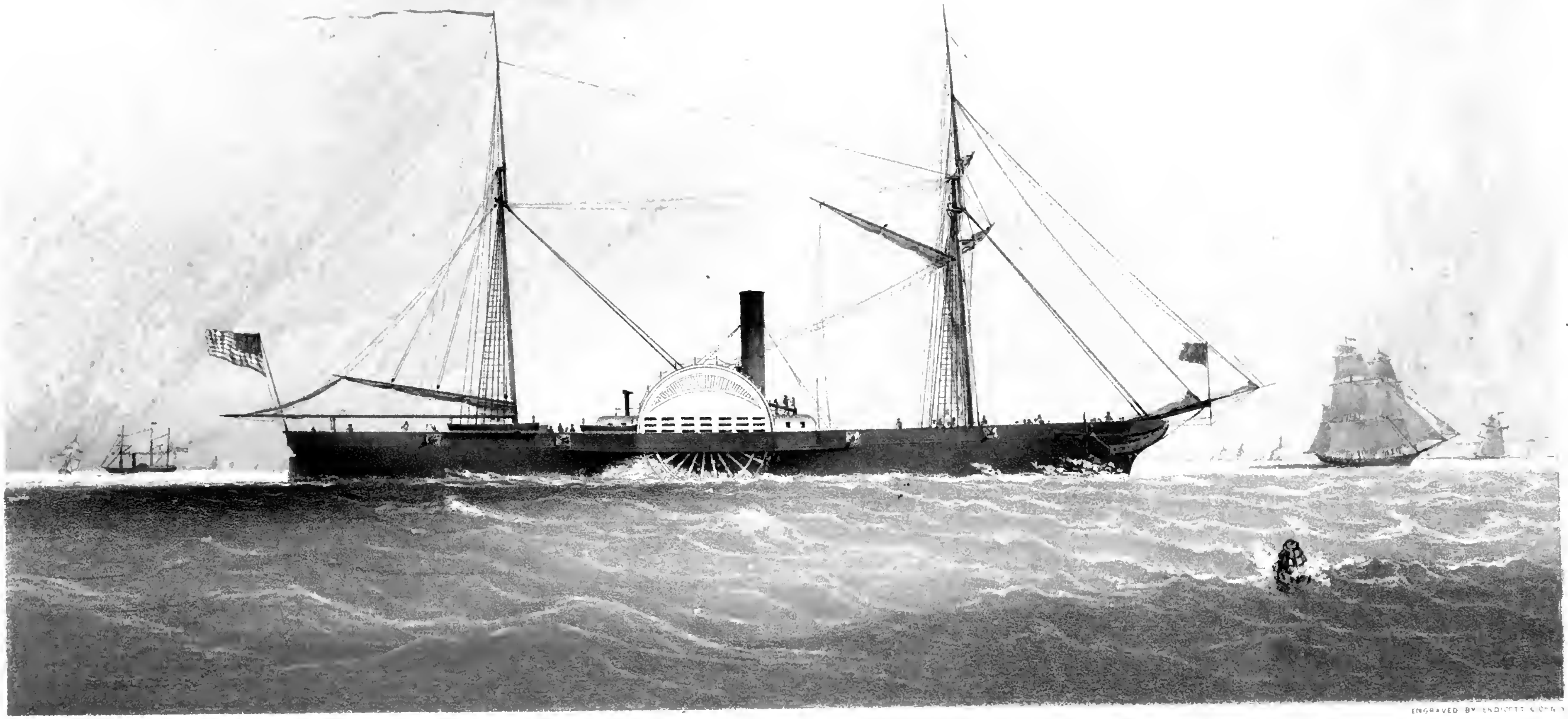
The double floats were altered from a breadth of sixteen inches each, to a joint breadth of twenty-six inches, in October last.

PERFORMANCE.

The performance of this vessel, running from New York to Havana, with smooth sea and light breeze in favor, was as follows:—Running time, under steam, one hundred and fifty-six hours; average boiler pressure, 11.6 pounds; average revolutions, per minute, 12.6; speed, per hour, 8.65 knots; consumption of coal, (bituminous) four thousand, four hundred and eight pounds, per hour, with half throttle, and cutting off at half stroke. From Havana to Vera Cruz:—Running time, ninety-seven and one-half hours, with fresh wind in favor; average steam, 10.12 pounds; revolutions, 12.06; speed, 9.81 knots; consumption of coal, three thousand, five hundred and forty-one pounds, per hour, throttle and cut-off at one-half. Dip of floats, at Vera Cruz, sixty-two inches. Details of her performance are given in Appendix, Note I, for which steam-log, the author is indebted to George Sewell, Chief Engineer of the "Powhatan," at this time.

WEIGHT AND COST.

	Weight.	*Cost.*	
Engines,	735,143¾ lbs.	$218,675 77¼	
" appendages,	5,777½ "	4,783 13	$223,458 90¼
Boilers,	311,909 "	113,730 52	
Grate bars and bearers,	31,931 "	964 09	
Appendages,	38,855¾ "	10,623 27	125,317 88
Coal-bunkers,	86,954½ "	10,664 23¾	
Bulk-heads,	30,239 "	3,728 73¼	
Appendages,	2,729½ "	683 35	15,076 32
Small boiler,		3,762 83	
Steam-pump,	15,385¾ "	2,126 62	
Hoisting engine,		1,513 00	7,402 45
	1,258,925¾ lbs.	Cost,	$371,255 55¼
Duplicate parts,	56,857 "		11,958 13
Total weight,	1,315,782¾ lbs.	Total cost,	$383,213 68¼.



S. McELROY, C.E. DEL. ENGRAVED BY ENDICOTT & CO. N.Y.

U. S. NAVAL STEAMER, FULTON.

Engraved for "Stuart's Naval and Mail Steamers U. S."

THE FULTON.

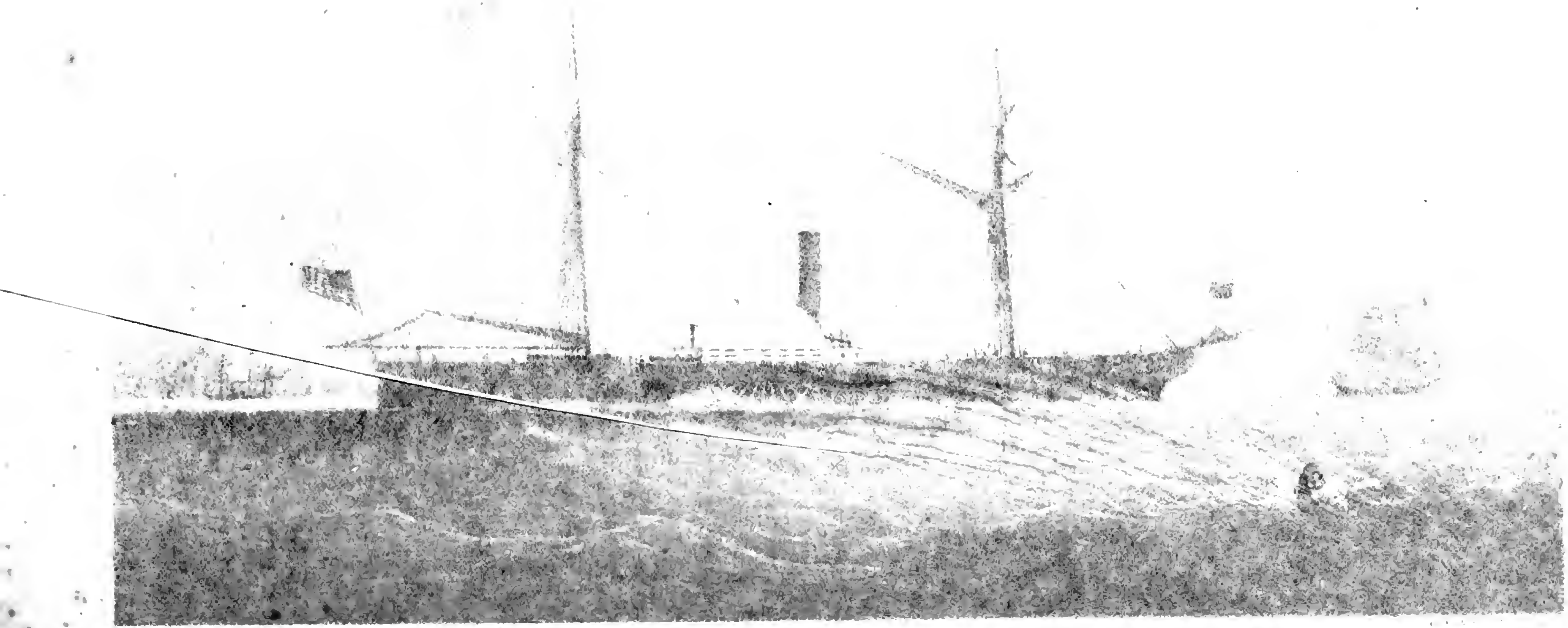
(THE THIRD.)

The Fulton (the second) lay at the New York Navy Yard for many years a useless hulk. In January, eighteen hundred and fifty-one, the author of this work was directed by the Bureau of Construction, &c., to reconstruct entirely the machinery of this vessel, so as to make an efficient steamer of her, with high speed, and capacity for carrying a large supply of fuel. From a survey made of the old machinery, it was deemed advisable to build an engine of different arrangement and almost entirely new, substituting for the old copper boilers, two of iron; and drawings were accordingly made, under his direction, for a single, inclined, condensing engine, with circular, double-drop return-flue boilers, and a contract for the work made with H. R. Dunham & Co., New York.

The hull was hauled up on the ways, and thoroughly repaired. The upper-deck and heavy bulwarks, as seen in Plate Two, were removed, and a complete change made in her internal arrangement; no change, however, was made in her lines. She was rigged as a "fore-top-sail schooner," with two masts, as shown in Plate Eleven.

Before any expenditures were made on the repairs of the hull, and with a view to make her not only an express and towing steamer, but also an efficient, safe, and commodious war-steamer, the author recommended to the Bureau, the propriety of cutting off thirty feet from her bow, replacing it with one of new and improved lines, fifty feet long, and raising her deck about three feet, for increased capacity of hold, and comfort to her men and officers; urging the additional advantage of greater buoyancy and speed, and corresponding increase of battery and crew. But this recommendation failing to meet the approval of the Bureau, the repairs were completed under the original design, and under the superintendence of B. F. Delano, Naval Constructor, at the New York Navy Yard.

The experience of the "Fulton," since she has been in commission, shows how valuable this alteration would have been to her, for, while the department of her machinery is probably the most effective and economical in the service, the want of comfort and convenience on board is so much felt by her crew and officers, that there have been numerous desertions



U.S. NAVAL STEAM

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The experience of the "Fulton," since she has been in commission, shows how valuable this alteration would have been to her, for, while the department of her machinery is probably the most effective and economical in the service, the want of comfort and convenience on board is so much felt by her crew and officers, that there have been numerous desertions among the former, and four tenders of resignation, with three "detachments" among the latter, principally attributable to this account, within the first seven months of her cruise.

The machinery was constructed at the Archimedes Works, under the superintendence of William K. Hall, Assistant Engineer U. S. Navy, assisted by E. S. De Luce, Assistant Engineer U. S. Navy, and (from June, eighteen hundred and fifty-one, to February, eighteen hundred and fifty-two,) by Samuel McElroy, Assistant Engineer U. S. Navy, in charge of erection at the Navy Yard. Chief Engineer Henry Hunt, being appointed Superintending Engineer, in October, eighteen hundred and fifty-one, and the entire work of construction and erection being under the immediate supervision of the author, then on duty at New York, in charge of the construction of the California Dry Dock. The very satisfactory action of the engine and boilers under steam, together with the speed of the vessel, and the economy of fuel, reflect high credit on the skill with which they were constructed and erected.

The vessel, as now finished, together with the machinery, has the following dimensions:—

HULL.

Length between perpendiculars,	$181\frac{1}{2}$ feet.
Beam, extreme,	$34\frac{5}{6}$ "
" moulded,	34 "
Depth of hold,	$12\frac{1}{4}$ "
Mean draft,	$10\frac{1}{2}$ "
Immersed midship section, (mean draft)	298 square feet.
Displacement, per inch, at 10 feet draft,	$8\frac{1}{2}$ tons.
Burthen,	800 "

RIG.

Her rig is that of a "fore-top-sail schooner," with two masts.

Area of canvas spread, ... 10,188 square feet.

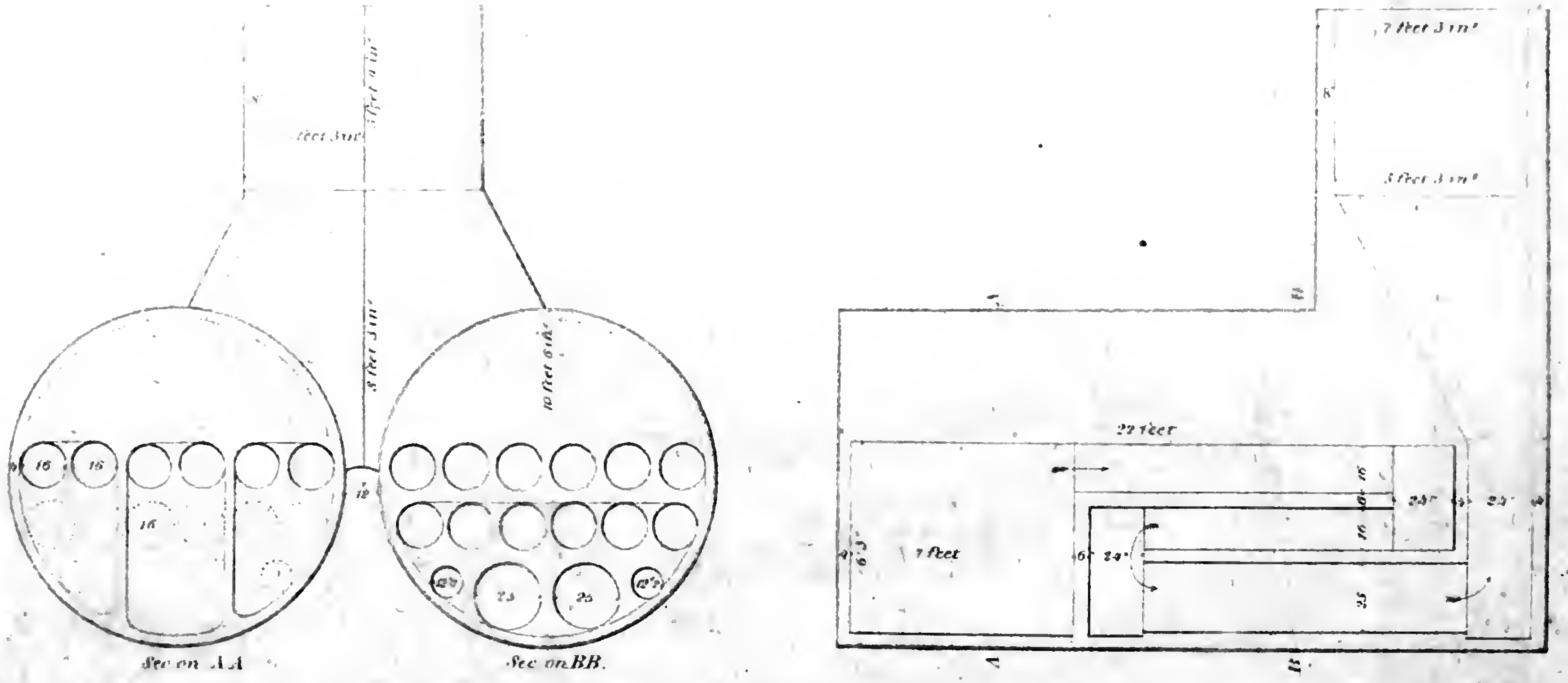
ARMAMENT.

One pivot, eight-inch Paixhan gun, forward; four thirty-two's (medium,) in broadside.

ENGINES.

There is one condensing engine, inclined at an angle of 17° 30′, and supported on a large wooden frame; as shown in Plate Twelve. The engine-house, and working-gear are on deck. The expansive arrangement is that of Sickels', differing from those formerly made, in having a single plunger instead of double pistons. The valves are "balance-puppet," worked by a single

BOILERS
of the
FULTON
(the Third)



Approved Dec^r 7 1836

Scale ¼ inch pr foot

[illegible] with three "detachments" among the [illegible] within the first seven months of her cruise.

[illegible] the Archimedes Works, under the superintendence of [illegible] U. S. Navy, assisted by E. S. De Luce, Assistant Engineer [illegible] hundred and fifty-one to February, eighteen hundred and [illegible] Assistant Engineer U. S. Navy, in charge of erection at the [illegible] Henry Hunt, being appointed Superintending Engineer, in October, [illegible] and the entire work of construction and erection being under the [illegible] the author then on duty at New York, in charge of the construction [illegible] Dry Dock. The very satisfactory action of the engine and boilers [illegible] the speed of the vessel, and the economy of fuel, reflect high credit on the skill [illegible] they were constructed and erected.

[illegible] together with the machinery, has the following dimensions:—

HULL.

Length between perpendiculars,	181½ feet.
Beam, extreme,	34⅚ "
" moulded,	34 "
Depth of hold,	12¼ "
Mean draft,	10½ "
Immersed midship section, (mean draft)	298 square feet.
Displacement, per inch, at 10 feet draft,	8½ tons.
Burthen,	800 "

RIG.

Her rig is that of a "fore-top-sail schooner," with two masts.

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BOILERS
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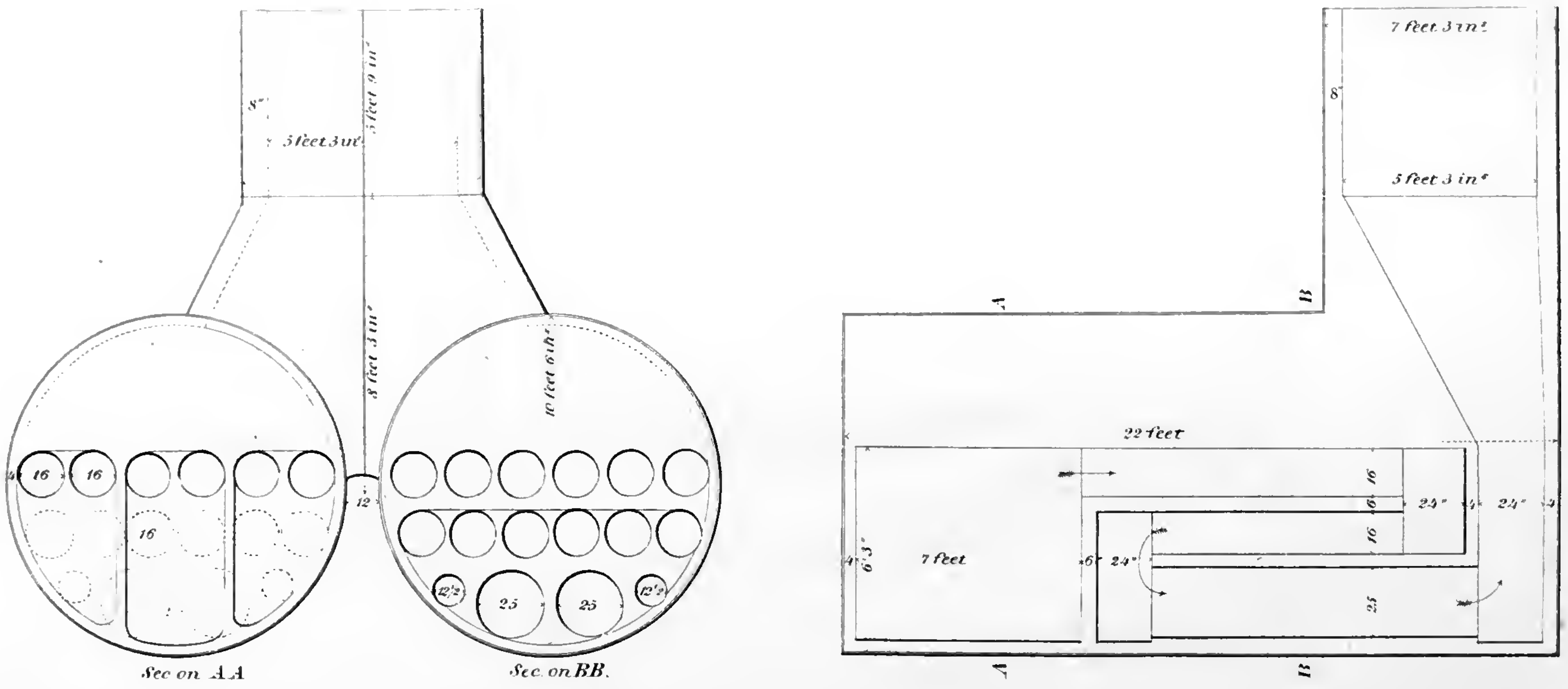


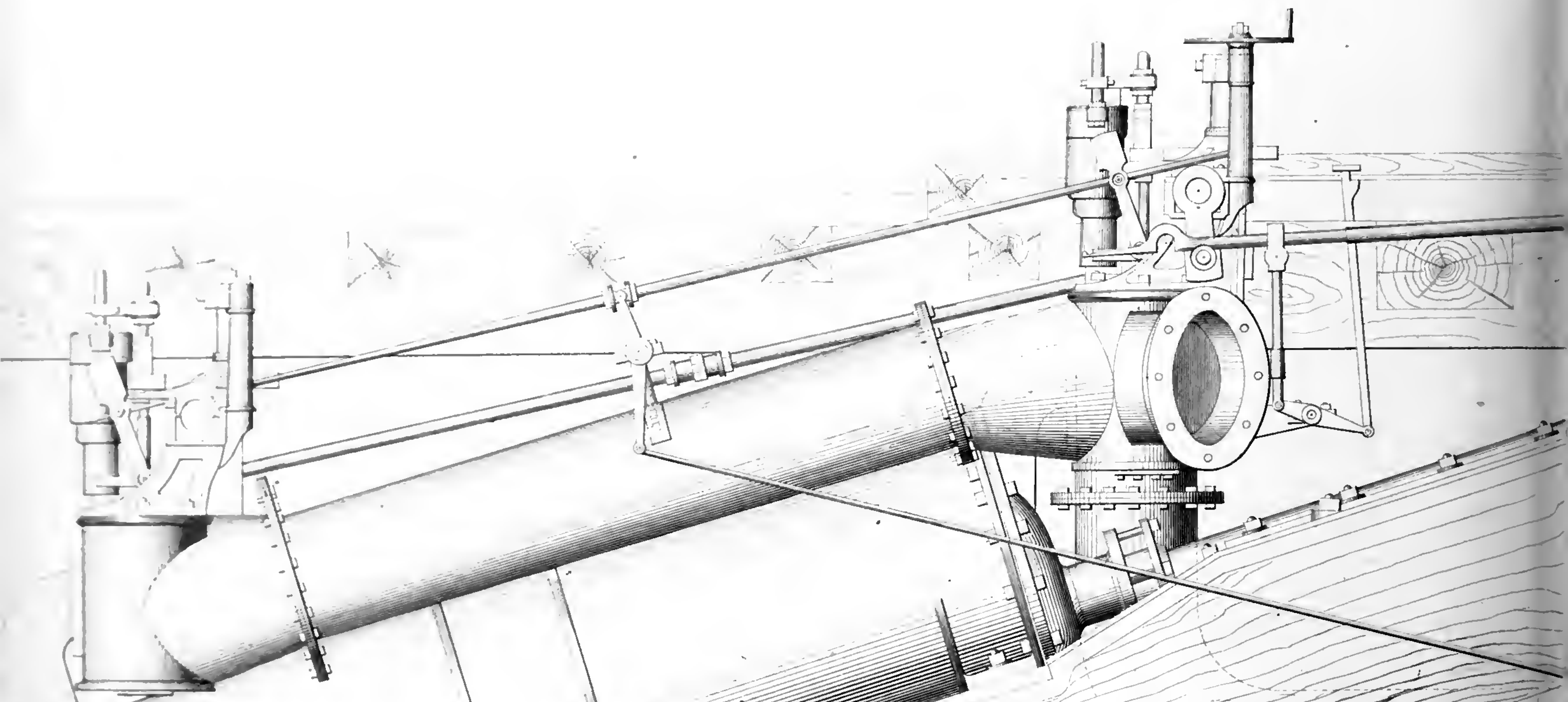
Approved Decr. 1850
Chas. B. Stuart
Engr. in Chief U.S.N.

Scale 3/16 inch pr. foot.

ENGINE OF U. S. STEAMER

FULTON

SIDE ELEVATION



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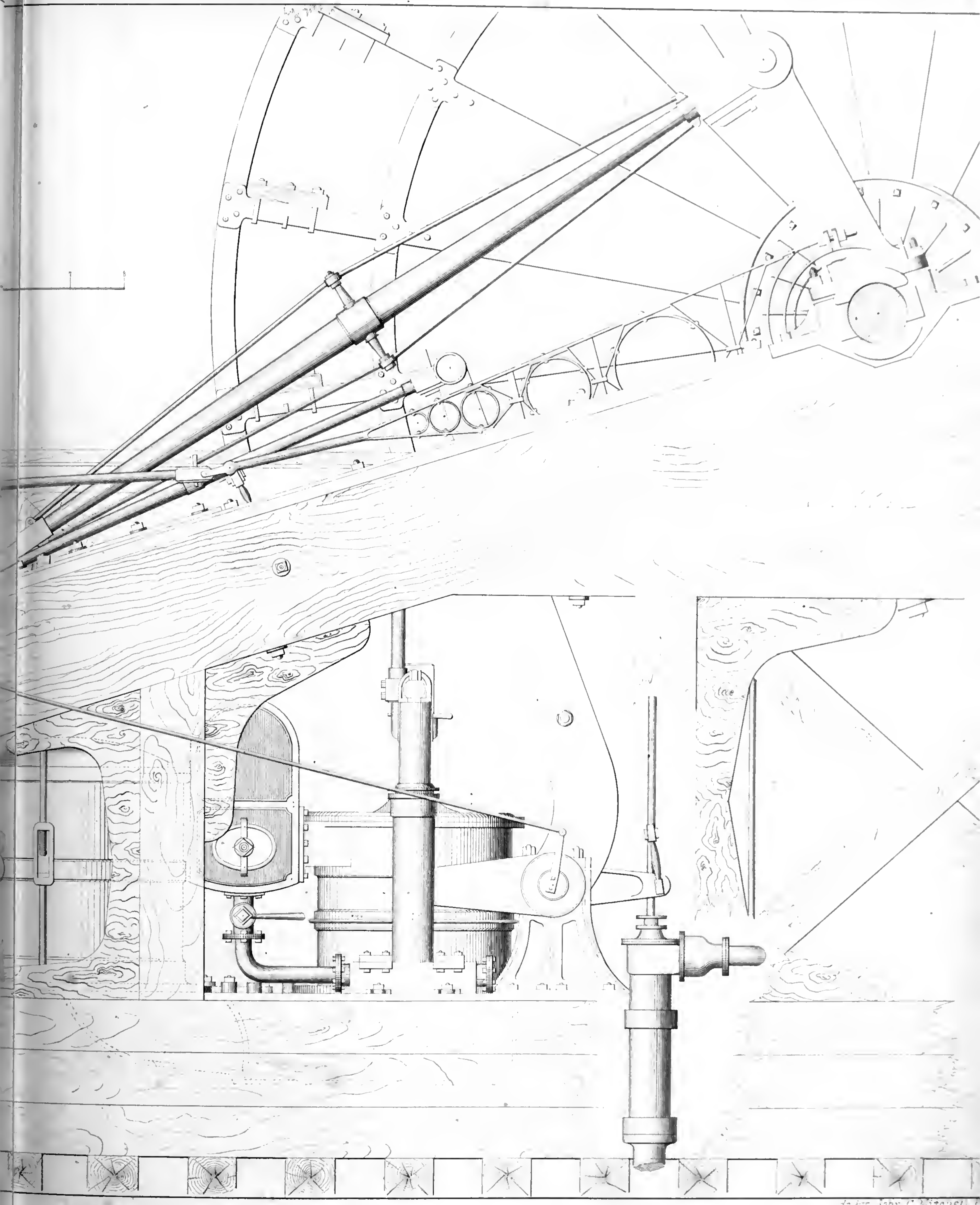


teamers U. S."

by John C. Mitchell

eccentric; the piston is packed by rings and springs; water-valves and indicator-nozzles are provided at each end of the cylinder, the lower end, with the steam-pipes, being provided with water-cocks.

The engine-room has a cast-iron floor, brass hand-rail, &c., and is provided with Stillman's steam and vacuum guages, counter, and indicator, and Sewell's self-acting salinometers.

Cylinder:—Diameter,	50 inches.
Stroke of piston,	$10\frac{1}{3}$ feet.
Cubic contents, including nozzles, &c.,	147.71 cubic feet
Air-pump:—Diameter,	44 inches.
Stroke of piston,	34 "
Piston of brass, with butterfly valves	—
Area of foot-valves,	300 square inches.
Feed-pumps:—Two, worked by air-pump cross-head.	
Stroke of plunger, (brass,)	34 inches.
Diameter,	7 "
Bilge-pumps:—Two, of brass, worked from air-pump motion.	
Diameter of large pump,	8 "
Stroke of piston,	25 "
Valves:—Diameter of upper steam-valves,	$12\frac{1}{2}$ "
" " lower " "	$11\frac{3}{4}$ "
" " upper exhaust "	$12\frac{1}{2}$ "
" " lower " "	$13\frac{1}{2}$ "

BOILERS.

There are two of wrought iron, of the double-return drop-flue variety, bedded in cement, and cylindrical in form, as more fully shown with their steam-chimneys, in Plate Thirteen.

Diameter of shells,	$10\frac{1}{2}$ feet.
Length "	22 "
Heating surface, (effective)	2,200 square feet.
Grate "	112 " "
Calorimeter of first and second flues,	2,410 inches.
" third flue,	2,454 "
" smoke-pipe,	3,117 "
Height of smoke-pipe, above grates,	43 feet.

Steam room,		1,210 cubic feet.
Weight of boilers,	111,356	
" pipe, &c.,	7,490	
" grates, (double set)	5,239	123,995 pounds.
Cost per pound, (boilers)		$12\frac{1}{2}$ cents.
Blowers, two, with auxiliary engines and feed-pumps.		
Capacity of coal-bunkers,		220 tons.
Total capacity for coal,		275 "

PADDLE WHEELS.

These are of the "radial" kind, with one single and one double centre each, the wheels being overhung, and supported on the main out-board bearings. These bearings rest on large curved gunwale-plates, firmly bolted to the side of the vessel.

Diameter at outside of rims,	$24\frac{5}{6}$ feet.
" " floats,	24 "
Length of floats,	$7\frac{3}{4}$ "
Breadth "	$1\frac{1}{2}$ "
Number "	20.
Length of shafts,	$22\frac{3}{4}$ feet.
" " (out-board)	64 inches.
Diameter of main journals.	17 "

SUMMARY OF COST OF ENGINES, &c.

Engine,	$36,807 17
Boilers and appendages,	18,620 27
Water-wheel shafts,	4,175 59
Water-wheels,	11,148 10
Blowing engines,	2,042 60
Coal-bunkers,	1,642 42
Iron flooring,	578 38
Deck plates,	174 35
Hand-rail, (engine-room,)	328 96
Sundries,	391 18
Total,	$75,909 02

Reference is made to Appendix, Note M., for the prices paid for the preceding work, together with those of the "Powhatan," "Susquehanna," "San Jacinto," and "Alleghany."

A question having been raised on the comparative cost and efficiency of the machinery of the Fulton (the second), and the Fulton (the third), in favor of the former, an investigation of the difference has been made, as follows:—

Cost of old machinery, not including the paddle wheels and shafts, blowing-engines, coal-bunkers, flooring, deck plates, &c., . .	$138,543 42
Estimated cost of omissions, ...	20,481 58
Total, . .	$159,025 00
Cost of new machinery, complete, ...	$75,909 00
In favor of Fulton (the third), ...	$83,116 00

This difference is more decisive from the fact, that the labor on the old machinery was thirty per cent. less than on the new: that the old shafts and cranks, were of *cast* iron, while the new are *wrought;* and that the old bunkers carried but two days' fuel, the new carrying sixteen days' coal, for average steaming.

The power of the *double* engines of the Fulton (the second), was estimated by her Chief Engineer, February fifteenth, eighteen hundred and thirty-eight, at six hundred and twenty-five horses. On the trial trip of the Fulton (the third), January first, eighteen hundred and fifty-two, her *single* engine worked up readily to 868.7 horse power, an increase of thirty-nine per cent.

If the new boilers had been of *copper*, assuming the relative cost of copper and iron, by the Fulton's contract as a basis, they would have cost in addition, $15,590 00, leaving the difference in favor of Fulton (the third), $67,526 00.

The hull was launched August thirtieth, and the engine reported ready for the trial trip, December first, but as the vessel was not completed, it was postponed one month. During this interval, the opportunity was embraced by the author, under the instructions of the Department, to make several experiments with anthracite and bituminous coal on the "Fulton," the results of which are embodied in the report on this subject, given in Appendix, Note K. The conclusions arrived at, from these and other experiments, are not in accordance with theories heretofore received, but as they are based upon facts, which are daily accumulating strength, and upon rigid analysis also, and as this is the first official report made to the Department in favor of the general use of anthracite coal, on the ground of its superior qualities, in cost, evaporative power, specific gravity, cleanliness, and safety, and the advantages of its use to the firemen, the furnaces, and the boilers of the service, it is deemed appropriate to this work, and has been accordingly inserted. It is proper also, to state in reference to the objection, that the boilers of the "Fulton" were peculiarly adapted to the consumption of anthracite coal, that the arrangement of their furnaces does not sustain this objection, and further, that since her arrival in the Gulf, and during nine months active service, she has used bituminous coal entirely, and with marked efficiency, as will be seen from the notes of her performance herewith given.

PERFORMANCE.

In working the engine under steam, December thirteenth, the piston (which formerly belonged to one of the old cylinders) broke: a new one being ordered, with spring-packing, was received on board and fitted to the cylinder, December twenty-first.

On the first of January, eighteen hundred and fifty-two, a trial trip was made under the command of Commodore William D. Salter, Commandant of the New York Navy Yard, in the harbor of New York, embracing a run of seventy-one and a-half miles, under steam, with the following results:—Average pressure of steam, twenty-five pounds; vacuum, twenty-six inches, cut-off at half-stroke; average revolutions, per counter, twenty-one; average speed, 13.34 miles per hour; maximum pressure, thirty-five pounds of steam; vacuum, twenty-seven and three-quarter inches; revolutions, twenty-three and one-third; speed, twenty miles, per hour; consumption of coal, two thousand, two hundred and eighty pounds. The official report of this trial trip, is given in Appendix, Note J.

The engine of the "Fulton" is one of the most perfect of its class, and the boilers are well adapted to the engine. The Chief and Assistant Engineers in charge, are unanimous in their commendation of the machinery, as it works up to its power smoothly, economically, and with little care. It is to be regretted, that the hull is not better fitted for the engine, and that the engine-frame is of wood. It has been objected that some of the details of the machinery, particularly the shafts and wheels, are too strong, but the experience of the vessel, under steam, during several months' trial, has shown the advantage of the large bearings of the shafts, and accurate movement of the cranks and wheels. The power and capacity of the boilers for generating steam, and their economical work, is shown in the previous statements; the action of the valves is shown by the indicator cards, given in Plate Thirty-One, and the proportions of the various parts are given in Plate Twelve, while their light friction and perfect action have been established by the test of practice. An engine which will stem an East River tide on a "vacuum," and which can be shut off to eight revolutions, in a heavy sea, without trembling on the centre, must be well proportioned and balanced.

In consequence of the inclemency of the season, and the obstacles to navigation, caused by the masses of ice which blocked up the East River, and the harbor of New York, orders were received at the Navy Yard, to fit the "Fulton" for sea, with all dispatch, on relief duty. The preparations were made by sheathing the bow and sides with plank and iron, and she left the Navy Yard, on the morning of the twenty-fifth of January, under the command of Commander T. G. Benham, U. S. N., Chief Engineer Henry Hunt, U. S. N., being in charge. After rendering important service to a number of distressed vessels, she returned on the evening of the twenty-eighth of January, to the Navy Yard, having the store-ship "Supply" in tow, and ran out to sea again on the following morning, Assistant Engineer William K. Hall, U. S. N., being in charge. She continued to cruise off New York harbor on this duty, until the weather had moderated sufficiently to make no farther need of her services. On her return to the Navy Yard, February fourth, the preparations for her cruising outfit were resumed, and rapidly completed. On the twenty-first day of February, she sailed from New York, to join the Home Squadron in the Gulf of Mexico, on which station she is at present employed.

Having been favored with the perusal of the log of one of the late Assistant Engineers, (S. McElroy) attached to her, I have made, with his permission, such extracts from it, as show her qualities as a steamer, with other notes of interest.

January 25, 1852.—Running outside with calm weather. Underwriter's schooner in tow, until 2 o clock, P. M. Heavy ice in bay. "Afternoon watch," 12 to 4, P. M.

Steam, 26 pounds; vacuum, 27 inches; revolutions, 15, per minute; cut-off, 3′; saturation, $1\frac{1}{2}$; coal, per hour, 1382 pounds. The movement of the engine is very smooth and regular. No tendency to heat in the bearings or slides. The boilers make more steam than is needed, and have to be cooled down occasionally by closing up the ash-pits, or opening the furnace doors.

Jan. 26*th.*—Afternoon watch. At $1\frac{1}{4}$, P. M, cast off a tow at Quarantine. "Winfield Scott" going out, about three miles distant. Put steamer about, and passed her in about 30 minutes.

At	1,	P. M.,	steam,	26;	vacuum,	27;	revolutions,	15;	coal,	per hour,	1500;	cut-off	3′.
"	2,	"	"	38;	"	27;	"	22;	"	"	1750;	"	3′.
"	3,	"	"	38;	"	27;	"	22;	"	"	1650;	"	3′.
"	4,	"	"	20;	"	27;	"	$16\frac{1}{2}$;	"	"	1400;	"	3′.

* * * * * * * * * *

Jan. 28*th.*—At $7\frac{3}{4}$, P. M., stopped engine off Navy Yard, store-ship "Supply" in tow Total running time, under steam, from January 25th, 71 hours; total consumption of coal, 69,480 pounds; average, per hour, 992.6 pounds.

* * * * * * * * * *

February 1st.—"Ran inside the Hook, and anchored in Horse-Shoe Bay. Weather quite stormy. There is a poetical majesty about a powerful steamer that has yet to be acknowledged in rhyme. There is no more noble thing in all the domain of art. In the midst of danger you feel secure; for there are giant energies at work for your protection—energies lion-like in their might, and yet lamb-like in their docility. A ship under full sail before the wind, is a sight full of grace; but when the storm-king has thrown his spell abroad over the waters, and the frightened vessels gather in their canvas, and send down their spars to hide themselves, as it were, from his fury, then it is that the qualities of the steamer shine out in their glory. There is not a thought of "scudding;" not a single artifice of weakness; but, right through the billowy mountains or over them—right in the very face and force of the gale, she plows her steady way on to her goal, with a determined purpose, which nothing can withstand. Let the frigates boast of their snowy clouds, and the clippers of their "heels," but there is a new element at work, and as yet, only in its infancy, which will surpass the one in power and grace, and leave the other far behind."

Feb. 2d.—"Had the mid-watch, the fires being banked, and the ship at anchor. The engine-room, which is on deck, was quite a comfortable retreat, and I sat there chatting with the officer of the deck, for some time. Suddenly he stopped with an exclamation of surprise. I listened and heard a heavy, hurtling sound approaching the ship, which burst upon her almost instantly, in a furious wind-squall. Outside, the night was dark as Erebus, and the rigging creaked and groaned in its ice-chains most dolefully. A heavy and grinding noise around the vessel attracted our attention, and looking over the bulwarks, we found that large cakes of anchor ice were gradually pressing around us, having been broken from the opposite shore, and driven across by the wind. When the morning broke, we found ourselves completely embayed in the ice, most of which was two feet in thickness. Nothing daunted, however, after breakfast, steam was run up, the anchor 'fished and catted,' and then commenced the struggle. I went on the bow to watch it. With the turning of the wheels, the ice around the bow began to pack and rise up, until it prevented our further progress. The steamer was then backed as far as possible, and came on with renewed impetus, forcing her way for some distance through the accumulating mass, until she again stopped. After backing a second time, however, sufficient headway was obtained to send her through obstacles of no ordinary character, and we left the baffled ice-king rapidly astern, as we ran again outside.

"The wheels of the 'Fulton' are admirably fitted for traveling through the ice. In addition to the advantage of their arrangement and weight, they have three wrought iron rims, five inches wide, projecting beyond the floats, which cut open and separate masses of ice, that would otherwise destroy them. The very slight repair needed to her wheels on her return from the relief trips, where she was obliged to run through field after field of heavy ice, for several days, tearing off the protection from her bows, is sufficient proof on this point."

* * * * * * * * * *

Feb. 11*th.*—"Ship at Navy Yard Block, coaling up, with anthracite. At 9, A. M., got up steam in port-boiler, and reported engine ready to start when the guage showed 10 pounds. Previous to this, when steam was made in the boilers up to this pressure, it commenced rapidly running up at about one pound per minute, but the fires in the boiler used being quite light, after starting to run around to the Yard, steam went down, until the guages showed two pounds "minus pressure," the ship in the meantime stemming the East River tide, with moderate speed."

* * * * * * * * * *

Feb. 28*th.*—"Off Florida, running from St. Augustine to St. Mary's. Distance, 60 knots; made it in 4¾ hours, or nearly 13 knots per hour. Engine doing well, but not pressed."

* * * * * * * * * *

March 31*st.*—"Ran into Pensacola, at 7, P. M., having left Havana on the 29th, at 9½, A. M. Stopped 2½ hours, to repack cylinder bottom. Coal, a mixture of anthracite and bituminous, taken on at Havana. Head wind and sea nearly all the way. Running time, 55 hours; distance, 550 knots, on air-line. Said to be the quickest trip ever made between these ports."

* * * * * * * * * *

April 30*th.*—"Made Mobile Point Light, and stopped for pilot, at 8, P. M., having left Vera Cruz on the 27th, at 5, P. M. Running time, 75 hours; distance, 820 knots. Bituminous coal used (from Pensacola Navy Yard) of poor quality. Head sea on starboard bow all the way."

* * * * * * * * * *

May 5*th.*—"Got under way at Mobile to run outside. Signals made from American barque, in Lower Bay, to speak us. Ran alongside, and were told that it would be *dangerous* for us to cross the Bar, on account of the wind and sea. Stood out, nevertheless, and made from Mobile Point to Pensacola, 8 knots per hour, in a heavy, head sea. "Lay-to" outside the Bay until morning. Found, during the mid-watch, that the engine would make as few as 8 revolutions without *hanging* on the centre, and kept it at that. So much for the argument against *single* marine engines."

* * * * * * * * * *

May 8*th.*—"Pensacola Bay. Dined on board the "Saranac." Found from inquiries of the officers, that she is as wet in a sea-way as the 'Fulton,' if not worse. *All fast war-steamers must be wet*, but they might be relieved by flaring more rapidly above the water-line. The *speed* of our ship is the topic of the day, throughout the squadron. No one who knows *our inconveniences*, can help regretting that she was not raised and lengthened."

* * * * * * * * * *

May 14th.—"Lying at village of Pensacola. Received Commodore Parker on board, and got under way at 7, A. M. Ran the 6½ miles to Navy Yard, in 22 minutes. Rate, 17.73 miles per hour. On watch and timed her myself; ascertained afterward that another person had made the time as I have it, and there is not much doubt as to the distance."

* * * * * * * * * *

May 20th.—"Running up the Mississippi River. Day, warm. Light draft in fire-room. Overhauled and passed the "Empire City," leading her at least 20 miles in the run from the sea to New Orleans."

* * * * * * * * * *

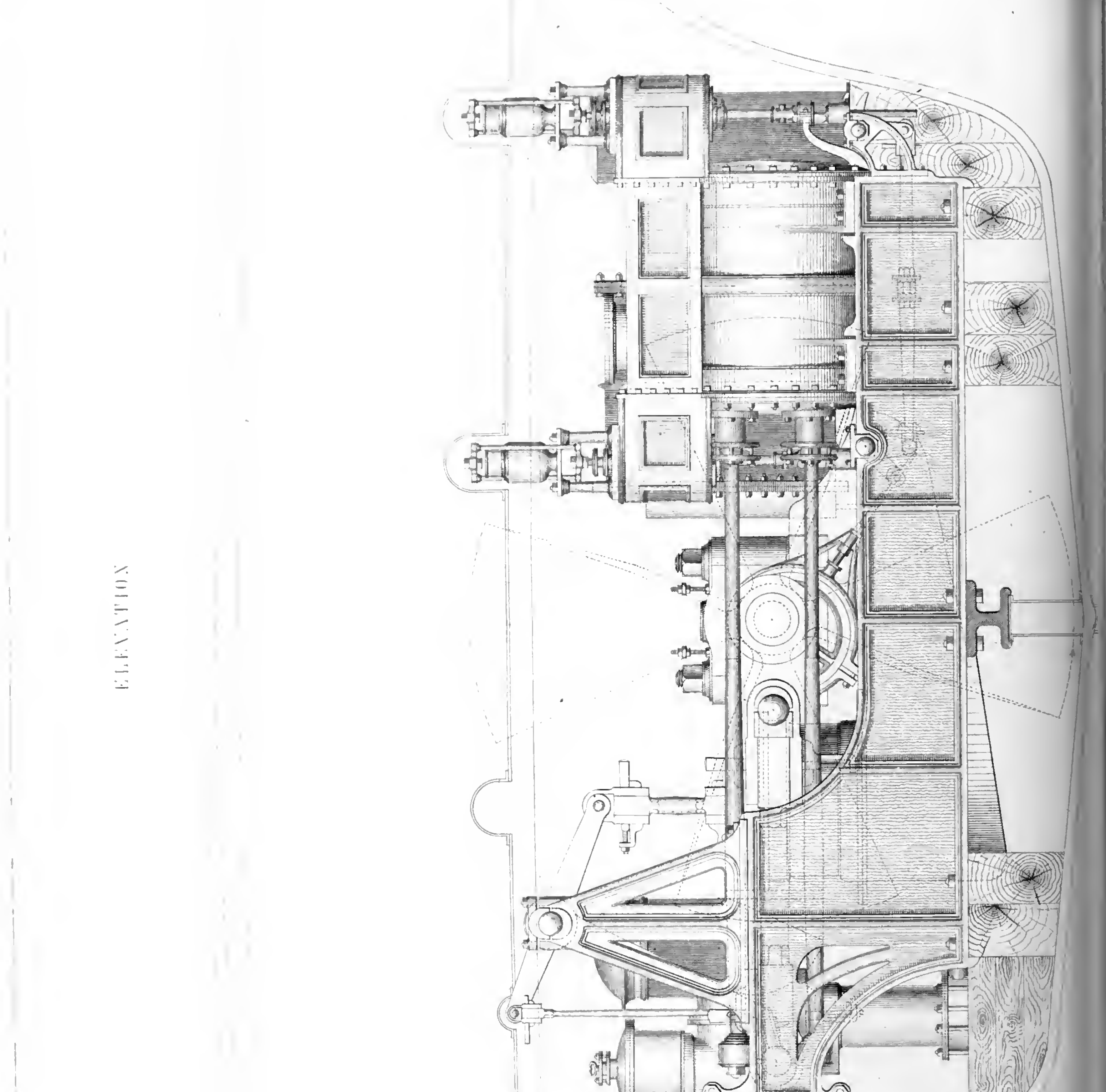
June 28th.—"First dog-watch. Towing barque "J. Denham" down to Tortugas, one of the economical operations of the service on which we started the 26th, and using the same villanous bituminous coal we have had to burn since our arrival at Pensacola. We are making from 8 to 9 knots, under orders to keep the engine easy. Steam, 28 pounds; vacuum, 25 inches; cut-off, 2 feet; revolutions, 17½; coal, per hour, 1520; ashes, &c., 33 per cent."

* * * * * * * * * *

June 30th.—"Tow cast off yesterday. On return to Pensacola. Steam, 14 pounds; vacuum, 25 inches; cut-off, 2 feet; revolutions, 16; coal, per hour, 1430; saturation, 1½ to 1¾."

ENGINES OF

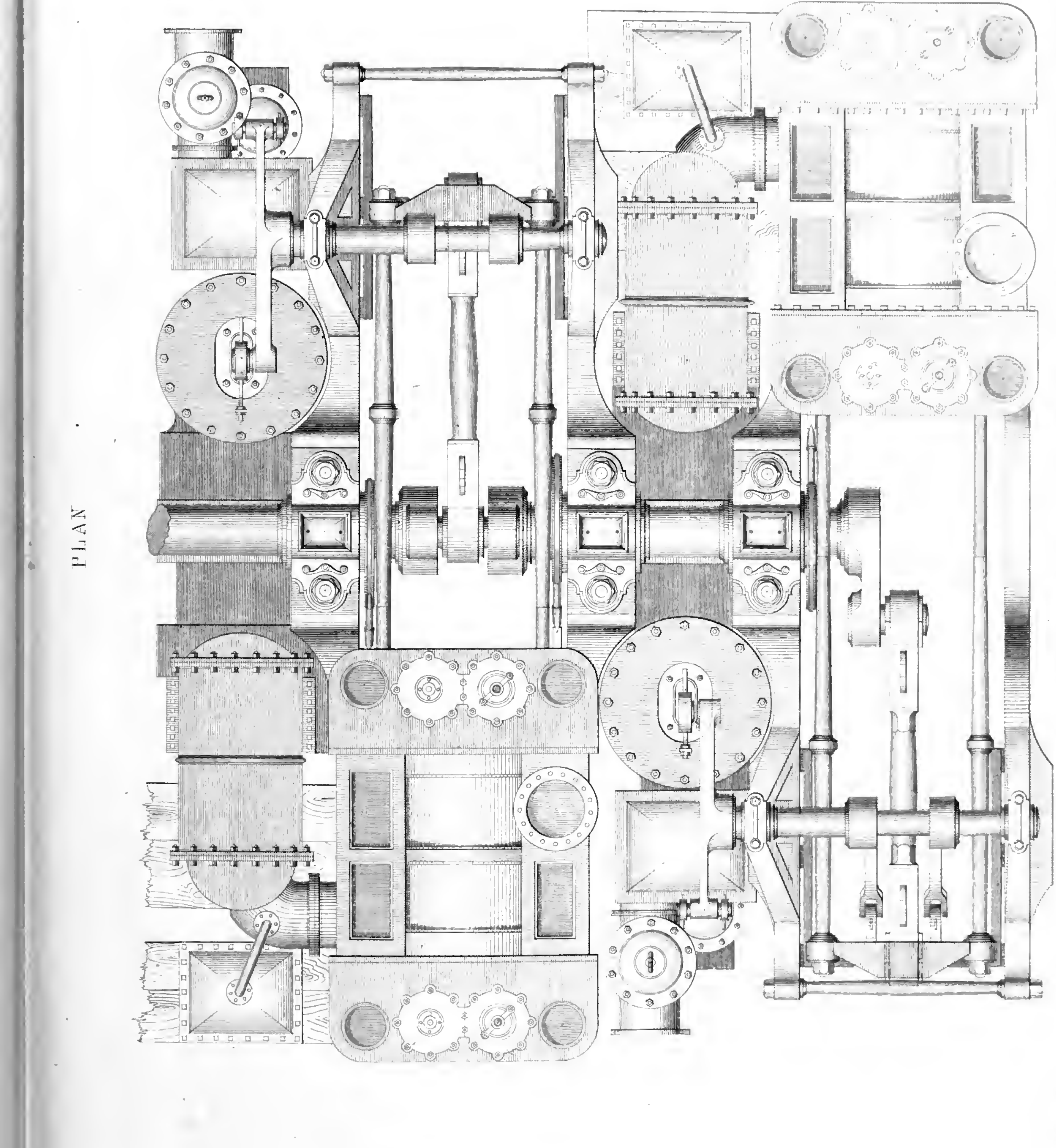
AL



Engraved for

S. STEAMER

ANY



ail Steamers U. S."

THE ALLEGHANY.

(THE SECOND.)

This steamer having been described as the "Alleghany" in this work, at the time she was propelled by the "Hunter wheels," it only remains to add the alterations and improvements made in her hull and machinery during the past year, by the order of the Navy Department, for the purpose of making her an efficient war-steamer of the second class.

ALTERATIONS ON HULL.

The hull having been constructed, (as already noticed) of iron, at a private ship-yard in the city of Pittsburg, too weak for a war-steamer, (several of the iron ribs in the central portion of the vessel being broken) it was strengthened by introducing additional ribs between the original ones, from the lower side of the berth-deck down to the dead-rise. Extra braces of iron were also put in the stern and bow of the vessel. The old stern-post was removed, and a suitable one, to admit the propeller-shaft, introduced. The openings in the bottom and sides of the hull, made for the "Hunter wheel," were closed, it having been determined to abandon their use, and substitute a stern-propeller of iron.

The dimensions of the hull have not been enlarged, its estimated weight is four hundred and sixteen tons; the launching draft was six feet forward and eight feet aft. Estimated draft at load line, fourteen feet forward and fifteen feet aft.

ALTERATIONS OF ENGINES.

In order to adapt the original engines of this vessel to the proposed mode of propulsion, very extensive and important alterations became necessary, as they formerly set, one on either side of the ship, the cylinders lying horizontal. The motion of the piston was fore and aft, or parallel with the keel, to conform to the action of the "Hunter wheels." The engines are now arranged athwart ship, one forward of the other; the cylinders on opposite sides of the vessel, the pistons working horizontally and athwart ship with engines connected, as will be seen by reference to Plate Fifteen; from which it will be observed that the arrangements are necessarily somewhat novel. The alterations (as ingeniously devised by Chief Engineer, B. F. Isherwood) were, *four* new piston rods, and *one* new piston to each engine, new cross-heads and guides. The old cylinder-covers were fitted to the four piston rods, by bolting stuffing boxes to them. The entire engine-frames are new, also the centre, intermediate, and propeller-shafts, and their pillow-blocks, caps, &c. The relative position of many of the parts of the engines being changed, required very many minor alterations, not enumerated, as will be seen by reference to the engravings of the engines. This work, together with the construction of the boilers, propeller, and alterations of the hull, have been under the immediate supervision of Wm. P. Williamson, U. S. Navy, at the works of A. Mahaffy & Co., Portsmouth, Va., where the machinery is now being completed, under contract, to be ready for a trial trip the middle of February, eighteen hundred and fifty-three.

BOILERS.

There are three new boilers of iron, with sheet water-spaces, arranged as shown in Plate Sixteen, weighing in all, one hundred and eighty-three thousand pounds.

Height of smoke-pipe, above grates,	57	feet.
Total amount of fire surface,	5,500	square feet.
" " grate "	200	" "
Space occupied by engines and boilers (fore and aft)	54	feet.
" " coal-bunkers,	11,000	cubic feet.
Amount of coal carried,	270	tons.
Estimated daily consumption,	18	"

PROPELLER.

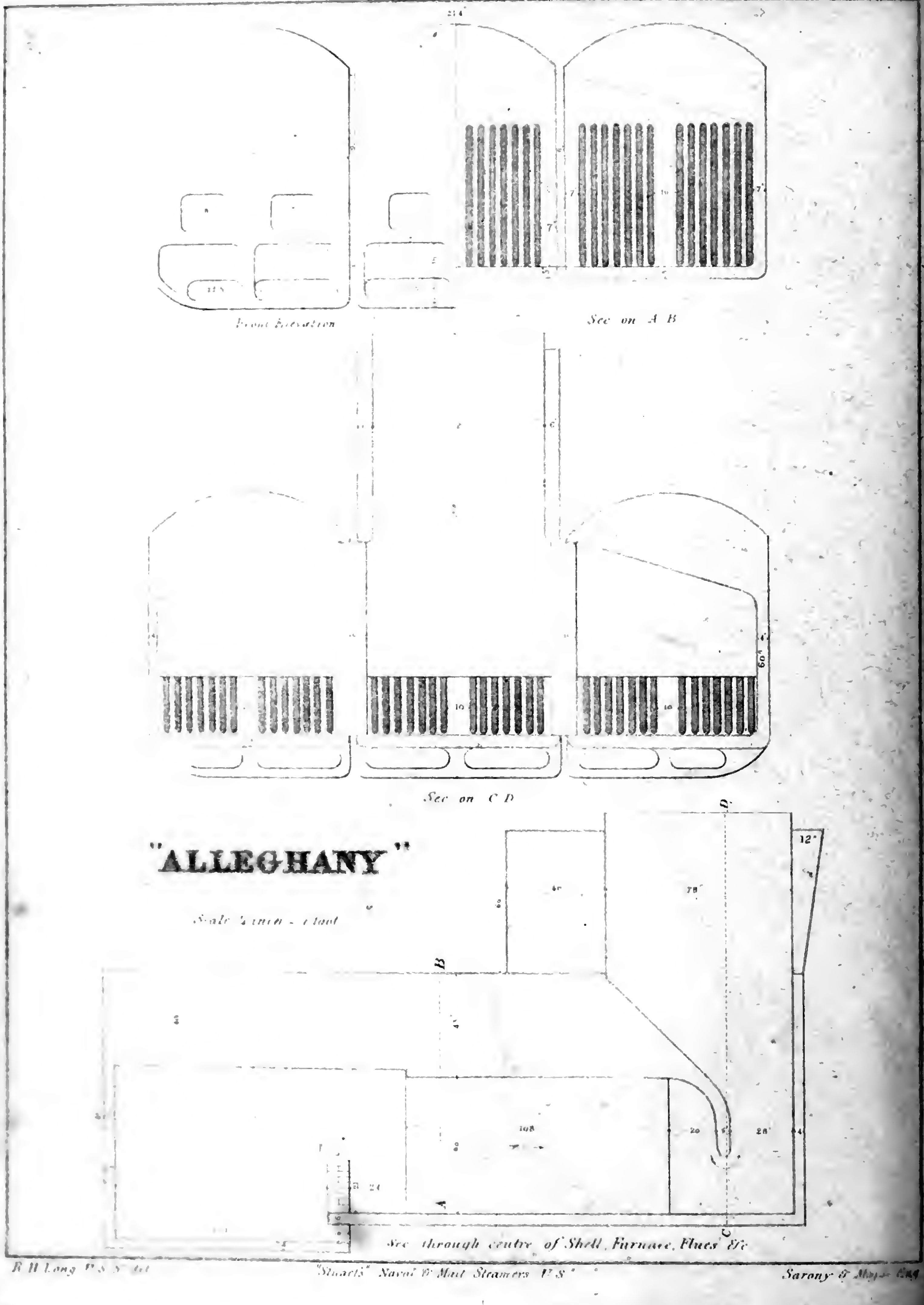
The propeller is made of cast-iron, thirteen and a-half feet in diameter, and three and a-half feet face, with four blades, having an initial pitch of twenty-seven feet, expanding to thirty-three feet, as seen in Plate Eighteen.

ARMAMENT.

Six thirty-two pounders, 42 cwt. each,	252	cwt.
Four sixty-eight pounders, 55 cwt. each,	220	"

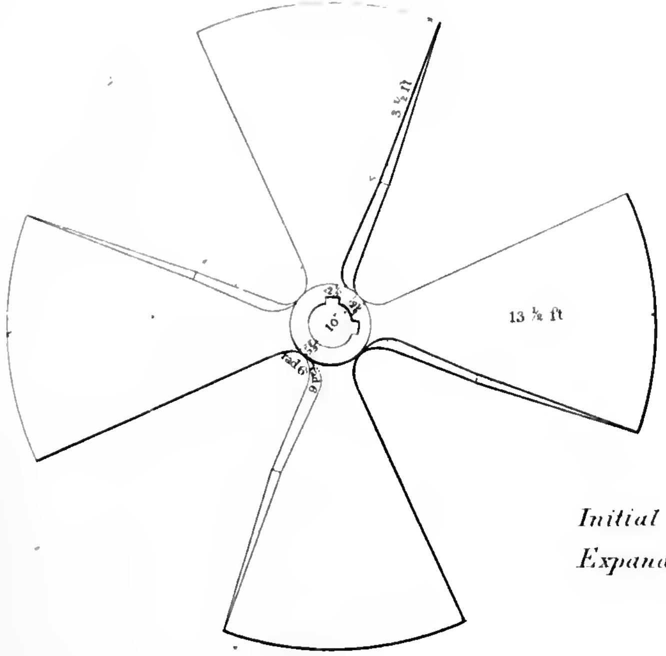
WEIGHTS.

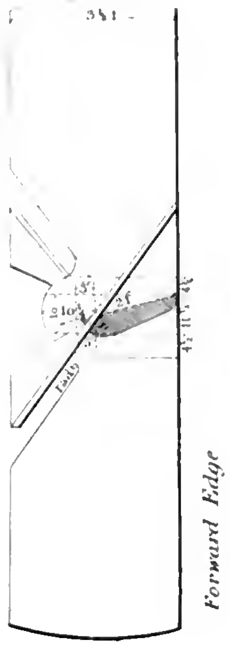
Estimated weight of hull, (exclusive of rig)	416	tons.
" " engines and condenser,	115	"
" " boilers and stack,	95	"
" " propeller,	5	"
" " bunkers,	9	"
Total,	640	tons.



E H Long U S N del. "Stuart's" Naval & Mail Steamers U.S. Sarony & Major Eng

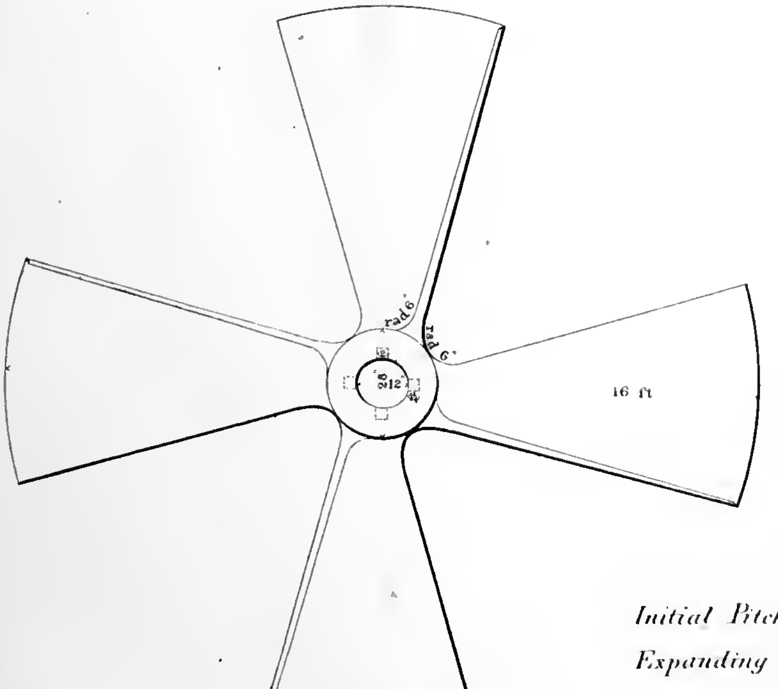
ALLEGHANY
PROPELLER

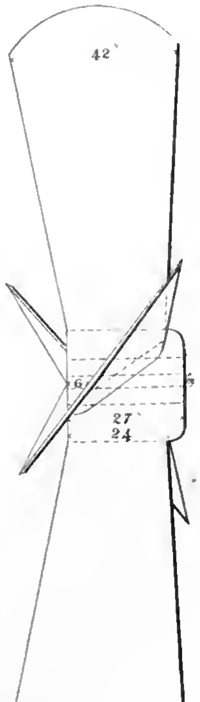




Initial Pitch 27 feet
Expanding to 33 feet

PRINCETON.
PROPELLER.





Initial Pitch 25 feet
Expanding to 31 feet

Scale ¼ inch pr foot

Fig. 1

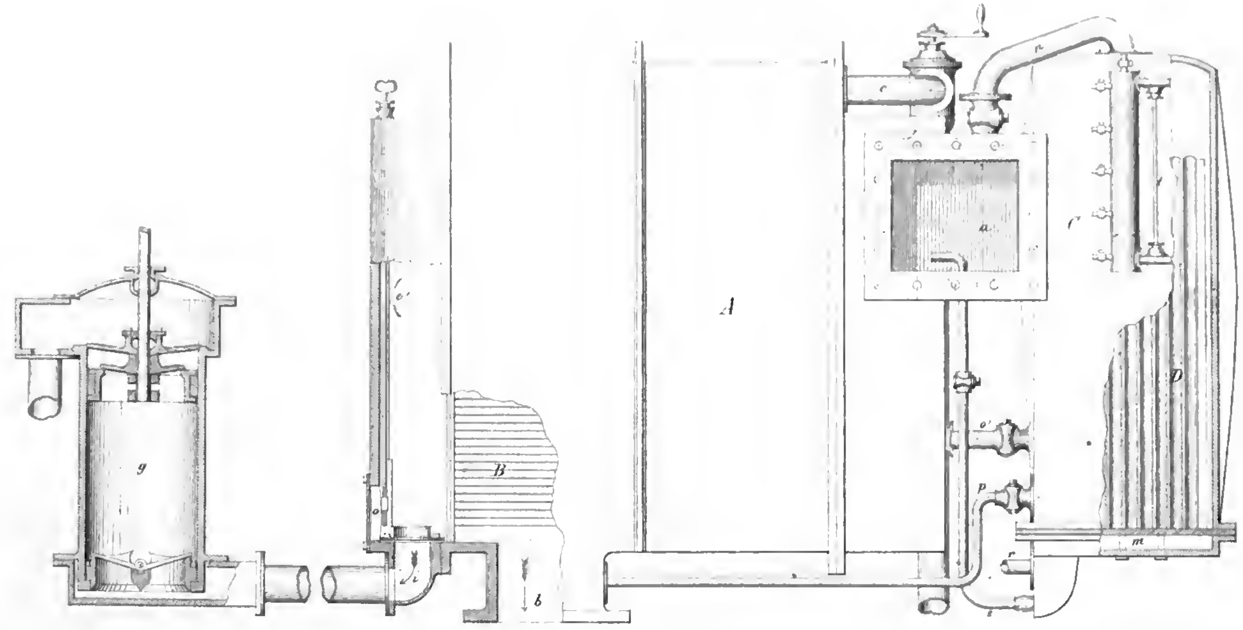
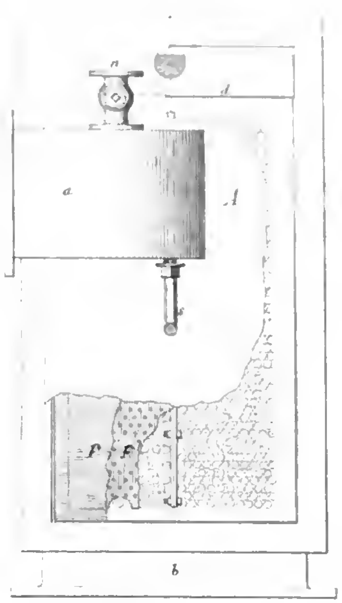
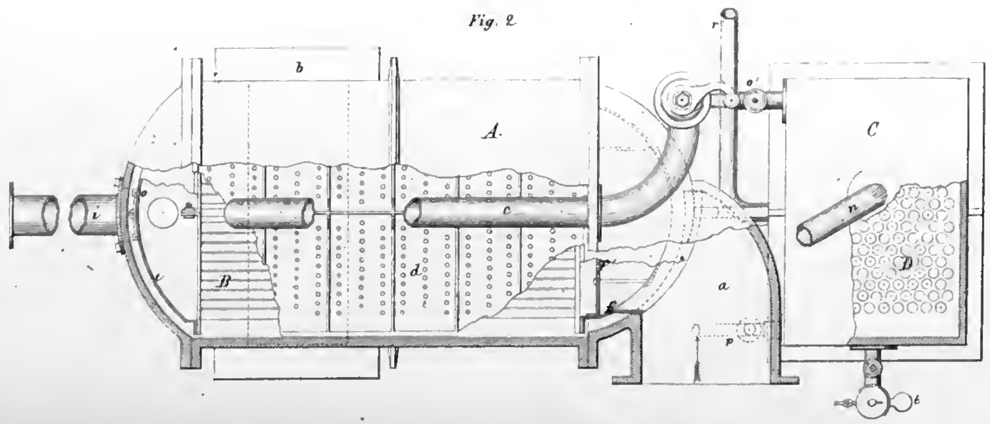


Fig. 3



Scale of Feet

Fig. 2



PIRSSON'S

PATENT

DOUBLE VACUUM

CONDENSER

FOR U.S. STEAM SHIP

ALLEGHANY.

Edw. Ducke engr   S H Maynard dr

FRESH WATER [illegible]

A double-vacuum Pirsson's condenser is attached [illegible] with fresh water, as also, the officers and crew. It is constructed [illegible] and fully described in Note L, of the Appendix.

RIG.

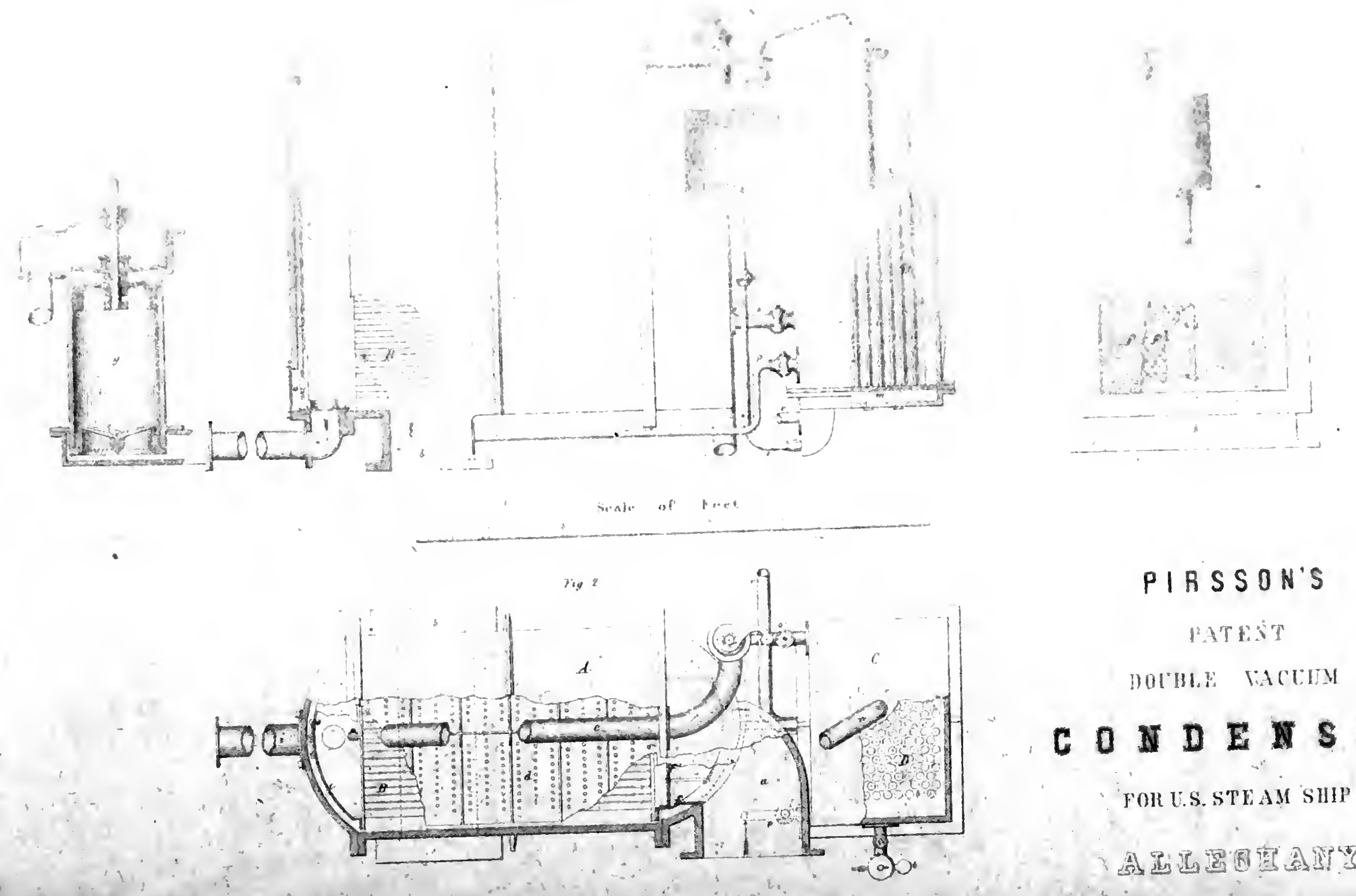
Full barque, with twelve thousand, three hundred and [illegible] square [illegible] plain sails.

MASTS AND SPARS.

	Length.		*[illegible]*		*Heads and Arms.*	
Fore-mast, (step'd in keelson)	62½	feet,	24	inches	[illegible]	[illegible]
Main-mast, (" berth-deck)	67	"	[illegible]		[illegible]	"
Mizzen-mast, (" ")	58½	"	18	"	[illegible]	"
Fore-top-mast, . .	40	"	14		[illegible]	"
Fore-top-gallant-mast, . .	[illegible]	"	10	"	—	"
Main-top-mast, . .	34	"	14	"	—	"
Main-top-gallant-mast, .	16½	"	12	"	—	"
Mizzen-top-gallant-mast, .	39	"	12	"	—	"
Fore-main-yard, ...	64	"	14		3	"
Main-yard, . . .	60	"	[illegible]	"	3	"
Fore-top-sail-yard, . . .	48	"	11	"	4½	"
Fore-top-gallant-yard, . .	32	"	8	"	2	"
Main-top-sail-yard, . .	42½	"	10	"	4	"
Main-top-gallant-yard, .	29	"	8	"	2	"
Spanker-boom, . . .	49	"	11	"	1½	"
" " gaff, .	37	"	7	"	5	"
Main-gaff-yard, . . .	31	"	7	"	2	"
Fore " " . .	31	"	7	"	2	"
Mizzen-gaff-top-yard, . .	16½	"	6	"	1	"
Bowsprit, outboard, .	20½	"	24	"	—	"
Jib-boom, . . .	20½	"	12	"	2	"

PERFORMANCE.

It is believed, that this vessel will attain a speed of nine knots per hour, in smooth water, with a boiler pressure of fifteen pounds to the square inch, cutting off at one-half stroke, and will average six knots, in ordinary weather, at sea.



PIRSSON'S

PATENT

DOUBLE VACUUM

CONDENSER

FOR U.S. STEAM SHIP

ALLEGHANY.

FRESH WATER CONDENSER.

A double-vacuum Pirsson's condenser is attached to this vessel, to supply the boilers with fresh water, as also, the officers and crew. It is constructed as drawn in Plate Seventeen, and fully described in Note L, of the Appendix.

RIG.

Full barque, with twelve thousand, three hundred and fourteen square feet of canvas, in plain sails.

MASTS AND SPARS.

	Length.	*Diameter.*	*Heads and Arms.*
Fore-mast, (step'd in keelson)	62½ feet,	24 inches.	11 feet.
Main-mast, (" berth-deck)	67 "	24 "	11 "
Mizzen-mast, (" ")	58½ "	18 "	9 "
Fore-top-mast,	40 "	14 "	7 "
Fore-top-gallant-mast,	20 "	10 "	— "
Main-top-mast,	34 "	14 "	— "
Main-top-gallant-mast,	16½ "	12 "	— "
Mizzen-top-gallant-mast,	39 "	12 "	— "
Fore-main-yard,	64 "	14 "	3 "
Main-yard,	60 "	14 "	3 "
Fore-top-sail-yard,	48 "	11 "	4½ "
Fore-top-gallant-yard,	32 "	8 "	2 "
Main-top-sail-yard,	42½ "	10 "	4 "
Main-top-gallant-yard,	29 "	8 "	2 "
Spanker-boom,	49 "	11 "	1½ "
" " gaff,	37 "	7 "	5 "
Main-gaff-yard,	31 "	7 "	2 "
Fore " "	31 "	7 "	2 "
Mizzen-gaff-top-yard,	16½ "	6 "	1 "
Bowsprit, outboard,	20½ "	24 "	— "
Jib-boom,	20½ "	12 "	2 "

PERFORMANCE.

It is believed, that this vessel will attain a speed of nine knots per hour, in smooth water, with a boiler pressure of fifteen pounds to the square inch, cutting off at one-half stroke, and will average six knots, in ordinary weather, at sea.

THE WATER WITCH.

(THE SECOND.)

The iron hull of the "Water Witch," as originally constructed, proving to be too weak and narrow for an efficient and safe war-steamer, a new one of wood, of enlarged proportions and greater strength, was ordered by the Department, to be constructed last year, at the Navy Yard at Washington, from designs by the Chief Naval Constructor, of the following dimensions:—

HULL.

Length on deck,	150 feet.
Beam on "	23 "
Depth of hold,	11½ "
Draft of water at load-line,	9 "

ENGINES.

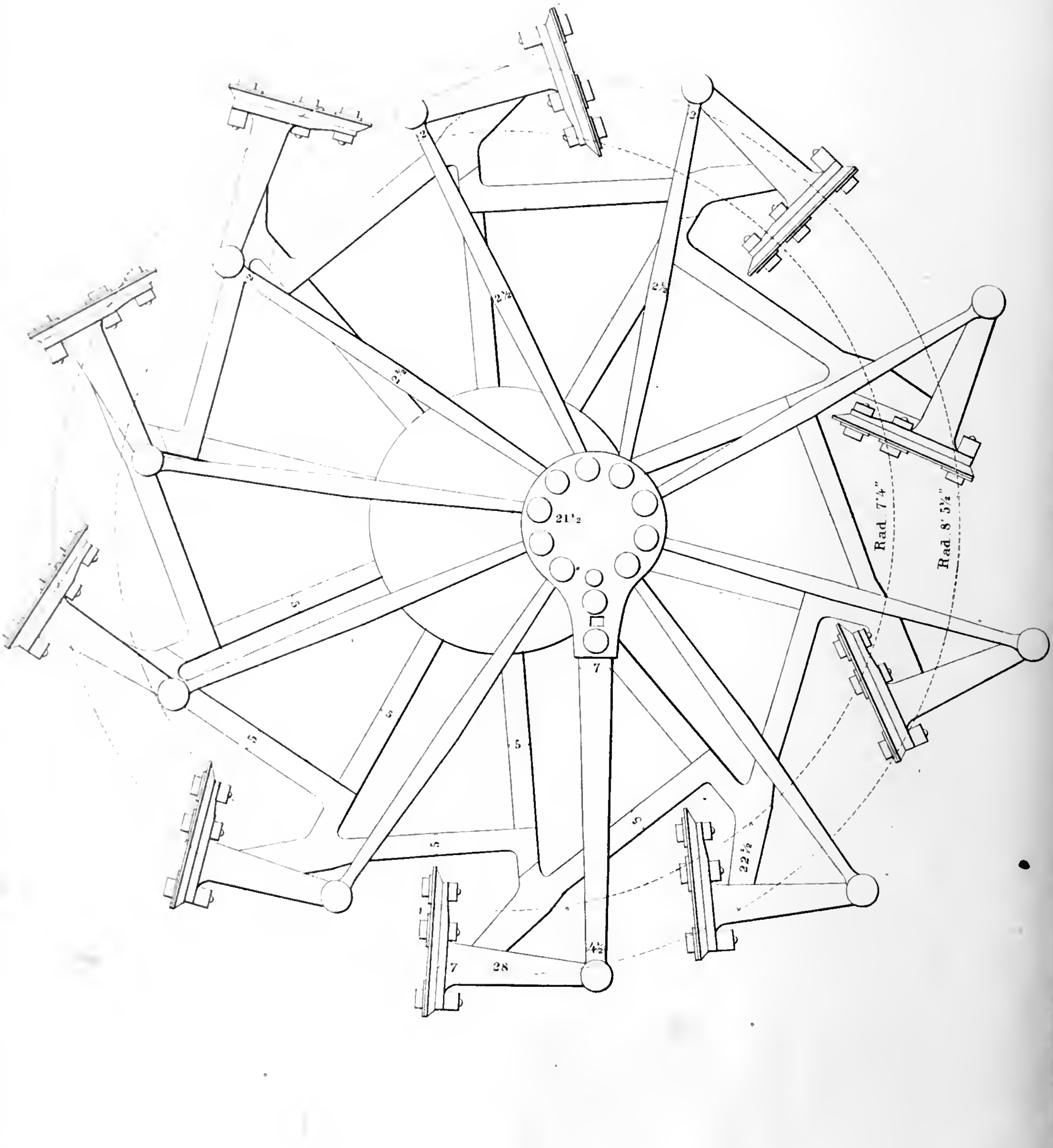
The engine taken from the old iron hull being an inclined, direct-acting, condensing engine, with wooden frames, having a cylinder of thirty-seven and a-half inches diameter, and three feet stroke, was repaired and placed in the new vessel, together with two new iron water-space boilers, and vertical paddle-wheels, constructed at the Washington Navy Yard, under the direction of the able Engineer of that station, (William M. Ellis,) from drawings made by Chief Engineer B. F. Isherwood. The engine having been originally constructed, from designs of C. H. Haswell, late Chief Engineer in the Navy, at the Navy Yard at Washington.

BOILERS.

Length of each boiler,	18 feet 9 inches.
Breadth " "	6 "
Height " "	9 "
Area of total heating surface in both boilers,	1831 square feet
" " grate " " "	70.583 " "
Cross area of flues " "	17.333 " "

WATER-WITCH

VERTICAL PADDLE WHEEL



Cross area of smoke-chimney in both boilers,	[illegible] square feet.
Height of " above grates,	[illegible] feet.
Weight of the two boilers,	[illegible] pounds.
" of sea-water in "	66[illegible]
Cost of boilers per pound,	13 cents.

They have each seven flues, of one-quarter inch iron, two inches [illegible] seven feet in length, and four feet in height, each, with water-spaces of [illegible] between them. The bunkers will hold eighty-five tons of coal, the estimated consumption of which is eight tons every twenty-four hours.

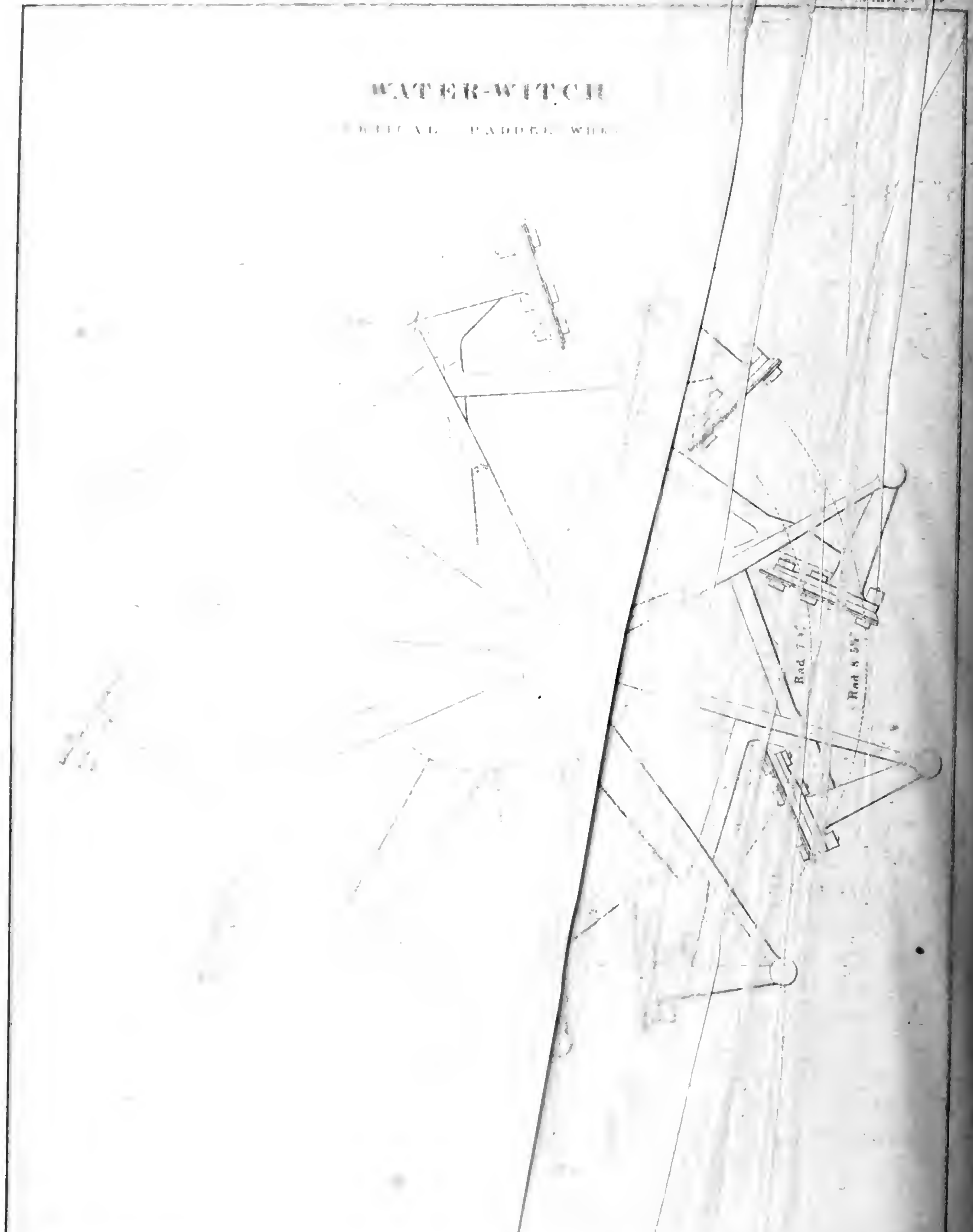
PADDLE WHEELS.

The vertical wheel, whose paddles enter and leave the water [illegible], has been introduced for the first time in the United States Navy in this [illegible], although it has been used in the English and French service for several years.

The object of this arrangement is to avoid, by the combined movement of an eccentric and a number of jointed levers, the loss of labor by the oblique action of the common radiating paddle-wheel, as will more readily be [illegible] by reference to Plate Nineteen.

Diameter of wheel,	19 feet.
Number of paddles,	10.
Length " "	5 feet.
Breadth " "	3 "
Total weight of the two wheels,	22 tons.
Cost " " " "	$13\frac{1}{2}$ cents per pound

The "Water Witch" is rigged as a top-sail schooner. A very successful trial-trip was made on the Potomac river. The distance run was from the Navy Yard to Fort Washington, sixteen miles and back, with the following results.—Average speed of vessel, $11\frac{7}{15}$ knots, or $13\frac{1}{2}$ statute miles per hour. Maximum revolutions of the wheels, 28 per minute; average revolutions, [illegible]. Slip of the centre of pressure of the paddles, 11 per centum. Steam pressure in boilers, 20 pounds per square inch, by gauge. Initial pressure in cylinder, per square inch, 8 pounds, by indicator. (See cards, plate 31.) Cut-off from commencement of stroke, $\frac{1}{4}$. Consumption of white-ash anthracite coal, 700 pounds per hour. Water evaporated per hour, with temperature of feed-water at 100° F., by one pound of coal, [illegible] pounds. Boilers, Lamb & Sumner's patent. Draft of vessel, $7\frac{1}{4}$ feet. Immersion of lower edge of paddle, 3 feet. The vertical wheels worked admirably, without unusual jar or noise.


WATER-WITCH

Cross area of smoke-chimney in both boilers, . . .	21.647 square feet.
Height of " above grates, . . .	43 feet.
Weight of the two boilers, ...	34000 pounds.
" of sea-water in "	66200 "
Cost of boilers per pound, ...	13 cents.

They have each seven flues, of one-quarter inch iron, two inches in width, seven feet in length, and four feet in height, each, with water-spaces of equal width between them. The bunkers will hold eighty-five tons of coal, the estimated consumption of which is eight tons every twenty-four hours.

PADDLE WHEELS.

The vertical wheel, whose paddles enter and leave the water perpendicularly, has been introduced for the first time in the United States Navy, in this steamer, although it has been used in the English and French service for several years.

The object of this arrangement is to avoid, by the combined movement of an eccentric and a number of jointed levers, the loss of labor by the oblique action of the common radiating paddle-wheel, as will more readily be exhibited by reference to Plate Nineteen.

Diameter of wheel, ...	19 feet.
Number of paddles, ...	10.
Length " "	5 feet.
Breadth " "	3 "
Total weight of the two wheels, ...	22 tons.
Cost " " " "	$13\frac{1}{2}$ cents per pound

The "Water Witch" is rigged as a top-sail schooner. A very successful trial-trip was made on the Potomac river. The distance run was from the Navy Yard to Fort Washington, sixteen miles, and back, with the following results:—Average speed of vessel, $11\frac{72}{100}$ knots, or $13\frac{1}{2}$ statute miles, per hour. Maximum revolutions of the wheels, 28 per minute; average revolutions, $25\frac{1}{4}$. Slip of the centre of pressure of the paddles, 11 per centum. Steam pressure in boilers, 20 pounds per square inch, by guage. Initial pressure in cylinder, per square inch, 18 pounds, by indicator. (See cards, plate 31.) Cut-off from commencement of stroke, $\frac{1}{3}$. Consumption of white-ash anthracite coal, 700 pounds per hour. Water evaporated per hour, with temperature of feed-water at 100° F., by one pound of coal, $6\frac{30}{100}$ pounds. Boilers, Lamb & Sumner's patent. Draft of vessel, $7\frac{1}{4}$ feet. Immersion of lower edge of paddle, 3 feet. The vertical wheels worked admirably, without unusual jar or noise.

THE JOHN HANCOCK.

(THE SECOND.)

The steam-tug already described as the "John Hancock," was last October hauled into the ship-house at the Boston Navy Yard, and a new bow and stern, of improved model, given to her, with suitable machinery, for the purpose of making a war-steamer of the third class, to be used as one of the squadron under the command of Captain C. Ringgold, in the survey of the Chinese seas.

The new hull was designed by the Chief Naval Constructor, and built under the supervision of Mr. Pook, Naval Constructor, at the Boston Navy Yard, of the following dimensions:

HULL.

Length over all, ...	165½ feet.
Length between perpendiculars, ...	151 "
Beam, moulded, ...	22 "
Depth, from upper deck to keelson, ...	14¾ "
Draft, at load-line, (500 tons)	10½ "

Barque-rigged, as seen in Plate opposite.

ENGINES.

The same as the first "John Hancock," altered to low-pressure, with "Pirsson's" double-vacuum fresh water condenser, attached.

Diameter of cylinders, ...	20 inches.
Length of stroke, (new)	2 feet.

Salt water air-pump,	19 inch	cylinder,	and	13	inch	stroke.
Fresh " "	8½ "	"		13	"	"
Force-pump	5½ "	"		8	"	"

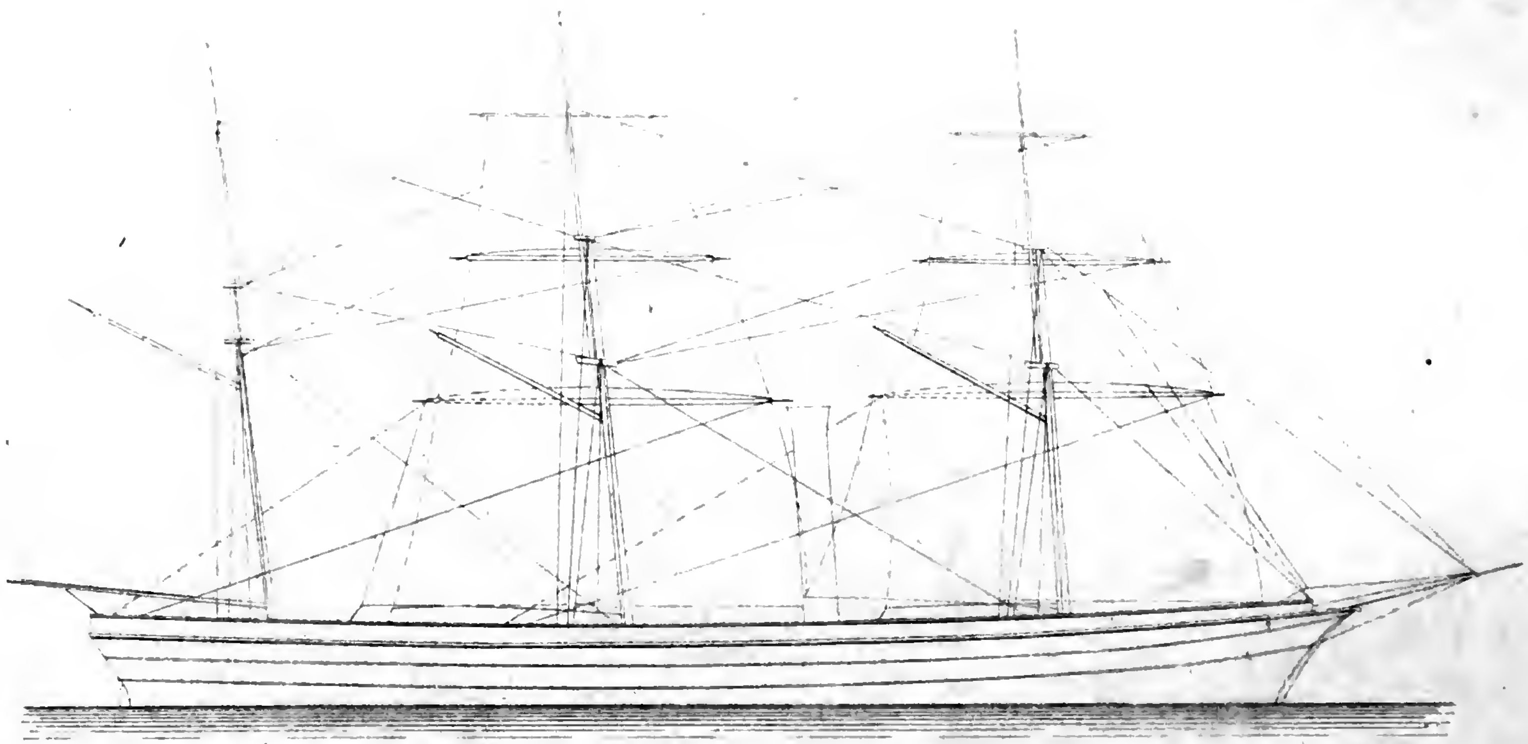
CONDENSER.

Number of copper tubes, of one inch diameter, nine hundred and forty-five; length of each tube, thirty-six and one-half inches, making over one-half a mile of tube having a condensing surface of seven hundred and fifty-three feet. Evaporator has a surface of two hundred and fourteen feet. For general design and description, see Plate Seventeen, and Note L.

Plate No. 14.

U. S. STEAMER JOHN HANCOCK.

(THE SECOND.)



THE JOHN HANCOCK.

[illegible]

The steam-tug already described [illegible] was last October hauled into the ship-house at the Boston Navy Yard, [illegible] bow and stern, of improved model, given to her, with suitable machinery, [illegible] making a war-steamer of the third class, to be used as one of the squadron [illegible] of Captain C. Ringgold, in the survey of the Chinese seas.

The new hull was [illegible] Naval Constructor, and built under the supervision of Mr Pook, [illegible] Boston Navy Yard, of the following dimensions:

HULL.

Length [illegible]	165½ feet.
Length [illegible]	151 "
Beam [illegible]	22 "
Depth [illegible]	14⅔ "
[illegible]	10½ "

[illegible]

ENGINES.

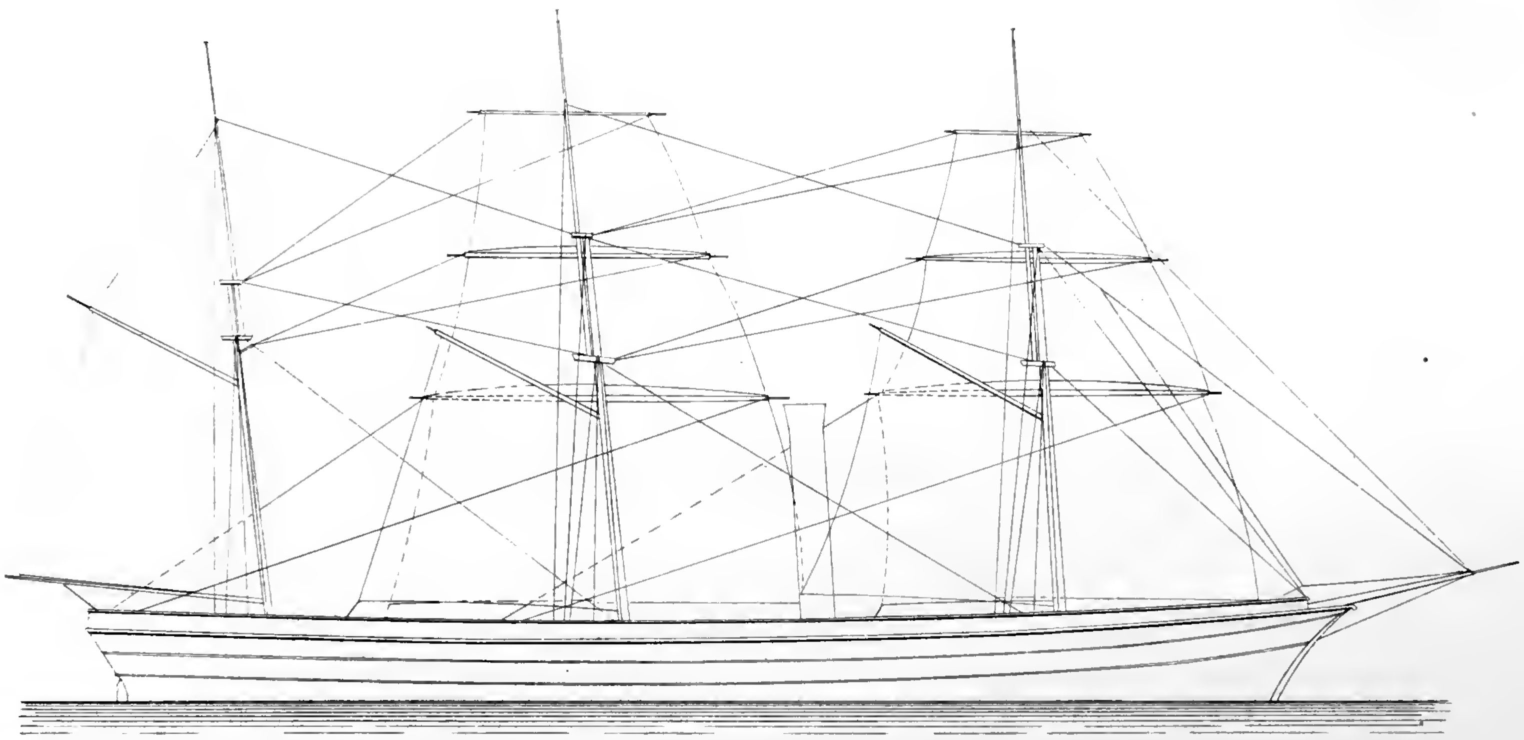
[illegible], altered to low-pressure, with "Pirsson's" double-[illegible]

[illegible]	20 inches.
[illegible]	2 feet.
[illegible] cylinder,	and 13 inch stroke.
[illegible]	13 " "
[illegible]	8 " "

CONDENSER.

[illegible] inch diameter, nine hundred and forty-five; length of [illegible], making over one-half a mile of tube having a con-[illegible] [illegible]-three feet. Evaporator has a surface of two hundred and fourteen feet [illegible] and description, see Plate Seventeen, and Note L.

U. S. Steamer JOHN HANCOCK,
(THE SECOND.)



THE JOHN HANCOCK.

BOILERS.

Two iron vertical tubular boilers, with tubes two inches diameter, and thirty inches long. The shells, each nineteen feet two inches long, by six feet six inches wide, and seven feet one inch high.

Chimney above grates,	33½	feet.
" " deck,	30	"
Fire surface of furnace,	280	square feet.
" " tubes,	2,000	" "
Grate "	70	" "

BUNKERS.

Main bunker, between engines and boilers, full width of vessel, and twenty-three feet eight inches in length, and seven feet in height. The side bunkers are each thirty-nine feet long, seven feet high, and three feet three inches wide. They contain in all, one hundred and twelve tons of coal. Estimated daily consumption, six and a-half tons.

PROPELLER.

Of composition, with two blades. Diameter, eight feet eight inches; face, twenty-four inches; pitch, fourteen feet, expanding to sixteen feet; weight of propeller, three thousand pounds.

COST.

Alterations of hull, (estimated)	$25,000 00
" engines, with condenser, boilers, propellers, &c.	18,000 00
Fixtures and equipments, (estimated)	7,000 00
Total,	$40,000 00

The alterations and additions were commenced the middle of last October, and the vessel is to be completed, ready for sea, by the first of January, eighteen hundred and fifty-three, under the immediate direction of Daniel B. Martin, Chief Engineer U. S. Navy.

PERFORMANCE.

It is estimated that thirty pounds pressure in the boilers, per square inch, cutting off at half stroke, full opening, will revolve the propeller at least sixty-five turns, per minute, and give a speed to the vessel, of eight knots per hour, in smooth water, and six knots, ordinary weather, at sea.

THE PRINCETON.

(THE SECOND.)

After the hull of the first "Princeton" was broken up, the machinery constructed for that vessel remained in store at the Boston Navy Yard, until the summer of eighteen hundred and fifty-one, when the Department ordered a new hull to be built at that Yard, of increased dimensions, and clipper build, to receive the "Ericsson semi-cylinder" engines, already described in this volume, and new boilers and propeller of suitable proportions, for the enlarged "Princeton."

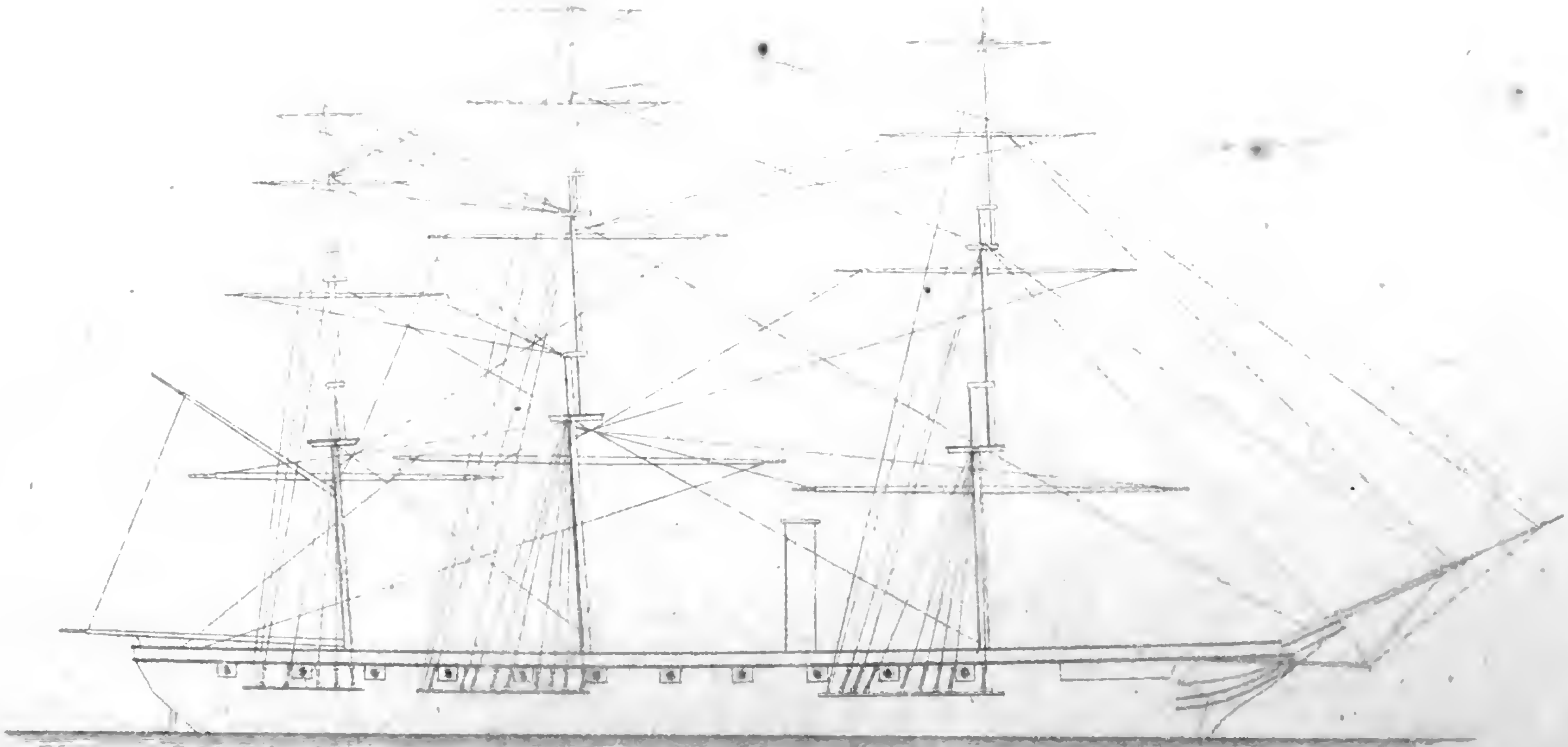
This vessel has been constructed, in a very superior manner, of the best materials, under the direction of Mr. Pook, the experienced Naval Constructor of the Navy Yard, at Boston, the keel having been laid in June, eighteen hundred and fifty-one, and the hull launched in October of that year. The original engines were carefully and accurately re-lined, and placed in the vessel by Messrs. Murray & Hazlehurst, of the "Vulcan Works," Baltimore, Md., who also construct the new iron boilers, and the composition propeller for the ship, from designs and drawings of B. F. Isherwood, Chief Engineer, U. S. Navy. The work of construction of the new machinery, and the erection of the whole on board the vessel, is under the immediate superintendence of William H. Shock, Chief Engineer of the "Princeton." The character of the work, so far as completed, reflects much credit on the Superintending Engineer and the Contractors.

The annexed engraving shows very perfectly the build and rig of the new "Princeton," from which it will be seen that she is truly "clipper built," and cannot fail to sail rapidly under canvas.

HULL.

Length of mean load floating-line, including stem and post, . .	177.5 feet.
Extreme breadth at mean load floating-line, ...	32.66 "
Depth from top of gun-deck beam to top of timber-streak, . .	25.75 "
" " " " " lower edge of rabbet of keel,	23.33 "
" " mean load floating-line " " " "	16.30 "

U. S. Steamer PRINCETON,
(THE SECOND.)



THE PRINCETON.

([illegible] SECOND.)

[illegible] the [illegible] of the first "P[illegible]" was broken up, the machinery constructed for that vessel remained [illegible] at the Boston Navy Yard, until the summer of eighteen hundred and [illegible], when the Department ordered a new hull to be built at that Yard, of increased dimensions, and [illegible] to receive the "Ericsson semi-cylinder" engines, already described in this [illegible] new boilers and propeller of suitable proportions, for the enlarged "Princeton."

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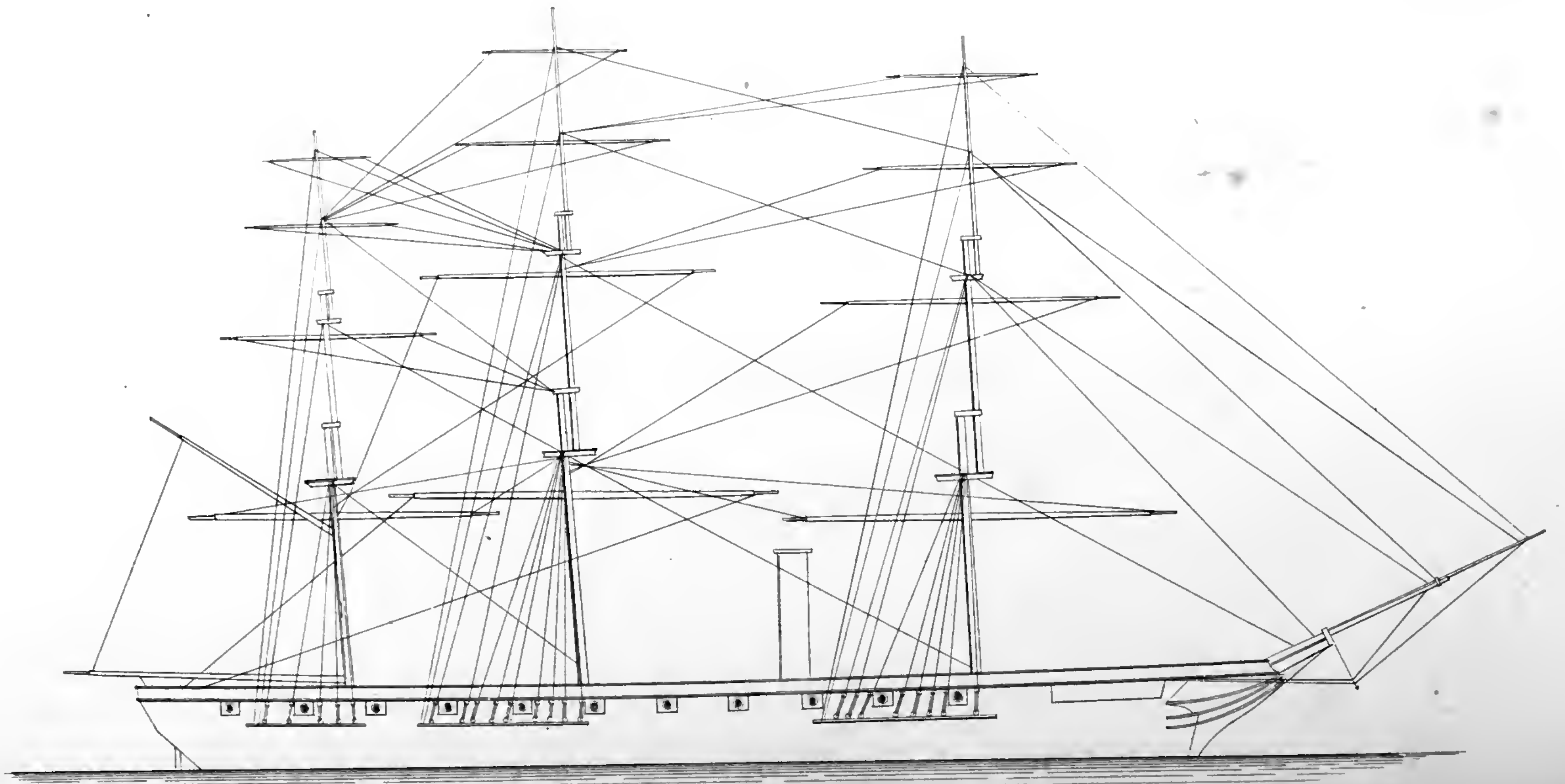
[illegible] mean load floating-line " " " "	16.30 "

U. S. STEAMER PRINCETON,
(THE SECOND.)



Depth of keel and false keel, clear of the plank of the bottom,	Forward,	1.33 feet.
	Aft,	3.50 "
Depth of mean load-line below port-sill midships,		8.80 "
Distance of greatest transverse section before the centre of mean load-line,		5 "
Area of greatest immersed transverse section to mean load-line,		413.40 square feet.
Area of mean load floating-line,		4421.79 " "
" vertical longitudinal section,		3074.76 " "
Displacement in sea-water to mean load-line,		1370 tons, of 2240 lbs.
" per inch, at the mean load-line,		10.8 "
Centre of gravity of displacement before the middle of the length of mean load floating-line,		1.61 feet.
Centre of gravity of displacement below mean load floating-line,		6.23 "
Height of meta-centre above the centre of gravity of displacement,		6.65 "

Built of live oak, and copper-fastened. Frames, two feet six inches asunder; timbers, sided, ten inches; moulded at floor-heads, ten and one-half inches, and at rail, five inches; wales, five inches thick; bottom plank, four inches; clamps, six inches; upper deck-beams, side and mould, thirteen inches; deck plank, four inches thick. All the articles of the old ship that could be used, were worked into the new one.

ENGINES.

There are two semi-cylindrical, condensing engines, formerly used in the first "Princeton," with the addition of Sickles' adjustable cut-off. Otherwise, their size and arrangement are as in the "Princeton" the first. They are equivalent to common cylinders, with a diameter of fifty-seven and one-half inches, and three feet stroke of piston.

PROPELLER.

Of composition metal, with four blades. See Plate Eighteen.

Diameter,	16 feet.
Initial pitch,	25 "
Expanding to final pitch of	31 "
Length of screw on axis at periphery,	3½ "
Number of blades,	4.
Helicoidal area of the four blades,	115.44 square feet.
Projected " " "	83.88 " "

BOILERS.

Three of iron, with "sheet water-spaces," as shown in Plate Sixteen.

Length,	24 feet 5 inches.
Breadth of centre boiler,	7 " 8 "
" each wing,	7 " 0 "
Area of total heating surface,	5,400 square feet.
" " grate "	140 " "
Forty-three flues in all, each 5 feet high, 2 inches broad, and 9 feet long.	
Weight of boilers,	176,648 pounds.
" smoke-pipe, &c.	17,087 "

MASTS AND SPARS.

	Length.	*Heads and Arms.*
Fore-mast,	73½ feet,	12 feet.
" above deck,	42 "	—
Fore-top-mast,	42 "	7½ "
Fore-top-gallant-mast,	22 "	— "
Fore-royal-mast,	14½ "	—
Fore-pole,	6 "	—
Main-mast,	77½ "	12 "
" above deck,	57 "	—
Main-top-mast,	42 "	7½ "
Main-top-gallant-mast,	22 "	— "
Main-royal-mast,	14½ "	— "
Main-pole,	9 "	— "
Mizzen-mast,	58½ "	10 "
" above deck,	51 "	— "
Mizzen-top-mast,	33 "	5½ "
Mizzen-top-gallant-mast,	18 "	— "
Mizzen-royal-mast,	11¾ "	— "
Mizzen-pole,	55 "	— "
Fore and main-yard,	68 "	4 "
Fore and main-top-sail-yard,	54 "	4½ "
Fore and top-gallant-yard,	37 "	2½ "

Fore and top-royal-yard,	25½ feet,		1½ feet.
Cross-jack-yard,	54 "		4½ "
Mizzen-top-sail-yard,	39 "		3½ "
Mizzen-top-gallant-yard,	26½ "		1¾ "
Mizzen-royal-yard,	19 "		1 "
Main-boom,	47½ "	Pole,	2 "
Main-gaff,	39 "	"	8 "
Bowsprit, outboard,	25⅓ "	"	— "
" entire,	40⅓ "	"	— "
Jib-boom,	24 "	"	3 "
Flying-jib-boom,	19 "	"	5 "

Steaves, five inches per foot.

Station of masts on main-deck, from the fore perpendicular to centre of fore-mast, thirty-eight feet; thence to centre of main-mast, sixty-eight feet 3 inches; thence to centre of mizzen-mast, forty-feet five inches; thence to aft perpendicular, thirty feet.

ARMAMENT.

Four eight-inch guns, of 58 cwt.; six thirty-two pounder guns, of 32 cwt.

ESTIMATED WEIGHT AND COST.

	Weight,		*Cost.*
Hull,	575 tons,		$107,572 00
Masts and spars, (part old)	41 "		1,142 00
Rigging and blocks,	18 "		5,690 00
Sails,	6 "		3,930 00
Cables and anchors,	44 "		164 00
Tanks, water, provisions, &c.,	100 "	(tanks,)	404 00
Men, and effects,	25 "		— —
Guns, powder and balls,	34 "		1,344 00
Boats,	4 "		1,407 00
Engines, propeller, and boilers, (filled)	143 "	(unfinished,)	86,293 00
Total,	986 tons,		$207,946 00
Coal in bunkers,	184 "		
Total displacement,	1170 tons.		

Having given in the foregoing pages, the history of the various Naval Steamers that have been constructed or purchased by the Government of the United States, from eighteen hundred and thirteen, (when the *first war-steamer* was designed) to the commencement of the present year — a period of *forty* years — it only remains to add, in the next edition, the performance of the four steamers now nearly ready for sea, to make this work as complete as the author's limited time would permit. In the compilation of the work he has been greatly assisted by several of the Engineer Corps who have been connected with the steamers described, either in their construction, or while in commission.

The author returns his acknowledgments to the Engineer Corps (whose names will be found in Note N, of the Appendix), for their encouragement, and would particularly thank Chief Engineers, Wm. P. Williamson, Wm. Sewell, Jr., Henry Hunt, Daniel B. Martin, B. F. Isherwood, Jesse Gay, and George Sewell; also, Assistant Engineers, Long and Mitchell, for the statistics furnished for this work, and which could not, in all instances, be duly acknowledged in connection with the descriptions of the various steamers.

MAIL STEAMERS.

THE COLLINS LINE.

Less than three years have elapsed, since the pioneer steamer "Atlantic" made her first voyage over the wide ocean from which she derived her proud name; and yet time enough has passed, to prove the ships of this already world-renowned line, to be as unsurpassed in speed, as it is universally conceded they are unequaled in their models, and the elegance of their internal arrangements. Truly has it been said by a distinguished Senator, (Hon. W. M. Gwin) that "their success has elevated the American name and character; it has wrested from Great Britain the palm of the maritime dominion, and merits such a substantial recognition by the American Government as will indicate, that *the contest is a national one upon both sides, and not a strife between an association of American citizens and the greatest governmental power of the world.* Their enterprise cannot fail to commend itself to every American mind, as worthy the spirit of the age, and the genius and destiny of our people." He further remarks, that

"The successful and masterly policy of Great Britain, in uniting the elements of a commercial marine with those of a naval force, attracted, at an early period, the attention of our National Legislature. Some years elapsed, however, before any active measures were taken by Congress to meet this policy by competition. Meanwhile, Great Britain had intersected the waters of the world with the tracks of her swift and powerful mail steamers, and was extracting immense sums annually from American citizens in the shape of freights, postages, and passage money. The twenty thousand American vessels afloat on all the seas, with their countless millions of property, were dependent on the enterprise and courtesy of a foreign nation for the transmission of every letter that passed between them and their owners. Thus Great Britain was enabled to sustain a numerous fleet of mail steamers, (convertible into efficient war-steamers,) by contributions levied to a large extent on American commerce; because, unaided American enterprise could not enter into a successful rivalry with the self-sustaining policy and inexpensive liberality of the British Government. For several years this subject was pressed with unavailing assiduity upon the attention of Congress. At length, contracts were made which established the present lines of the United States mail steamers, running between New York, Liverpool, and other important commercial points.

"The interest with which this experiment was watched by the American people is well recollected. The establishment of the line between New York and Liverpool was regarded as the beginning of a *national contest, the issue of which was to decide for many years the question of maritime superiority.* If the United States mail steamers had failed in any important particular — in accommodation, security, or speed, as compared with the British lines — the failure would have been a source of national mortification and regret. Impressed with this view of their undertaking, the contractors determined to spare no expense that might be necessary to enable them, in all respects, to surpass their rivals.

"Without regard to the calls of their contract, they have built larger vessels than those of the Cunard line, with improved machinery; and it is officially before the country, in the last Annual Report of the Postmaster General, that these vessels exhibit "*unrivaled qualities,*" and establish the "*superiority*" of American skill and enterprise in the construction of ocean steamers. Indeed, it is admitted on all sides, that they are the finest models afloat — the swiftest, strongest, and most beautiful steamers in the world. They are thus, in fact, a school for the steam marine of the country. This school necessarily educates good machinists, engineers, firemen, mechanics, and officers of every grade, alike useful to the commercial and naval marine of the country.

"The enterprise and public spirit which induced the contractors to make this effort, and incur these large expenses, *have stripped their contract of its commercial value, and rendered it financially disastrous to all who are interested in it.* From satisfactory evidence, laid before the Committee on Naval Affairs, it appears that the entire cost of the four steamers of this line, viz.: the Atlantic, Pacific, Arctic, and Baltic, amounted to $2,944,142 71. The sworn statement of the Company, showing the actual expenses and receipts of the first twenty-eight voyages of these vessels, exhibits the actual average cost of each voyage at $65,215 64, and the actual average receipts at $48,286 85; leaving an average deficiency on each voyage, of $16,928 79, or for twenty voyages, the sum of $338,574 40.

"Under these circumstances, the contractors call upon the Federal Government for additional assistance, on the ground that they have built larger and better vessels than their contract required of them; that they have been compelled to combat a most extraordinary and unequal competition; that the cost, the interest account, the expense of running, and the premiums of insurance, have been thereby largely augmented; and that without thus exceeding the stipulations of their contract and incurring these extraordinary expenditures, they could not have accomplished the great object to which the nation looked with so much solicitude, and now contemplate with so much pride and satisfaction.

"This view of the case embraces many considerations which entitle the parties to such an increase of their compensation, as may enable them to maintain against the Government steamers of Great Britain that competition, which will continue, at least, to divide the advantages of the mail and passenger service of the Atlantic with our great commercial rival; for it is sufficiently obvious that, from the moment the British Government made its first contract with Mr. Cunard to carry the Atlantic mail, at £60,000 per annum, (a sum now largely increased,) the door was closed to mere individual enterprise, or commercial competition.

"The tonnage of the Collins steamers largely exceeds the whole amount stipulated in their contract, and is competent to perform the increased service required by the Post Office Department And it should be observed in this connection, that the sum now paid to this line constitutes no charge on the Treasury, but is overpaid by the transatlantic postages, as will be seen from the letter of the Postmaster General to the Naval Committee.

"The postage receipts accruing to the United States Government by the establishment of this line, and postal arrangement with Great Britain, up to the quarter ending 31st March, 1852, amounted to the sum of $828,675 59, of which amount $138,606 55 accrued to the Government by the postal treaty, and before the commencement of service by the Collins line, all of which, in the absence of our own steamers, and the postal treaty, and resulting from the policy of establishing these lines, would have been contributed by American citizens to the maintenance of the powerful commercial and naval marine of a foreign government. And this would have been but a small portion of the contribution; for the passage money, the freights on bullion and on expensive articles of merchandise, largely exceed the sum that is levied in the shape of sea postage. Indeed a more ingenious and successful scheme for the maintenance of a formidable steam navy, at the expense of the other nations of the world, and to the actual profit of the British exchequer, could not have been devised.

"I am aware that the objection has been urged against this line of mail steamers or the contemplated increase of pay, that it builds up a monopoly by which individuals are sustained at the expense of other members of the commercial community. But, in my opinion, the aid of Congress was invoked *to neutralize an existing foreign monopoly*, against which American enterprise could not venture to struggle, until it was encouraged and stimulated by the General Government. The aid asked for is to prevent the resumption, by Great Britain, of a monopoly now lost, and which, cost what it may, she ought never to be permitted to regain.

"But, passing over this view of the case, the present application loses all semblance of a monopoly, from *the stipulation of the contractors themselves to transfer their ships at cost, with their contracts, and all the additional facilities that may be extended to them by Congress, to any persons who may be acceptable to Government, and capable of carrying out an enterprise of such vital interest and importance to the nation.* In addition to this, there is $1,000,000 of the stock of the company, now represented by its bonds and debts, not yet taken, which will continue open to the subscription of American citizens, in the event of a favorable issue to the present application for additional compensation. In considering this important subject in all the aspects in which it has been presented, I cannot avoid the conclusion that it is the true policy and obvious duty of the Government to sustain this line of steamers by such appropriations as may be necessary. *The enterprise is one of a national character.* It enlists national feeling, pride, and interests, and must be regarded in a broad and liberal view, without reference to the narrow apprehension that too large a remuneration may accrue to individual beneficiaries. If this objection were not entirely removed by the stipulation to transfer the contract, a sense of justice would dictate that the parties who have run the hazard of this enterprise, and have achieved its remarkable results, should receive their reward."

In addition to the mail service to be performed by this line of steamers, the Government desired to have built ocean steamers of sufficient power and capacity to be converted, in case of an emergency, into war steamers. That these national objects have all been accomplished, is fully shown by the results of the experiment, supported by the concurrent testimony of some of the ablest statesmen and naval officers of the country.

Commodore Perry, in a letter of the 18th February, 1852, addressed to the Secretary of the Navy, speaking of the Collins line of steamships, says:—

"According to my calculations, the cost of the conversion of either the before-mentioned vessels, exclusive of armaments, repair of machinery, &c., would not, or certainly ought not to cost for each steamer over $20,000 and it could readily be done for this at any of our navy yards. With respect to the description and weight of their respective armaments, I am clearly of the opinion that the first class steamers already named could easily carry four ten-inch Paixhan guns on pivots—two forward and two aft—of the weight of those in the Mississippi, and ten eight-inch Paixhan guns on the sides; and this armament would not incommode the vessels, and the weight less than the ice, which is usually forty tons, and stowed away in one mass."

Commodore Perry continues, that—

"In the general operations of a maritime war, they could render good service, and especially would they be useful from their great speed as dispatch vessels, and for the transportation of troops, always capable of attack and defence, and of overhauling or escaping from an enemy.

"The Atlantic, Pacific, Baltic, and Arctic have all been built, inspected, and received by the Navy Department."

Commodore Perry adds to this letter a *note*, and says, "that an ocean steamer of 3,000 tons is of the maximum dimension for safety and efficiency, whether for *war* or commercial purposes."

At the time of the construction of these ships every attention was given to their form, strength, and models by the contractors, under the special direction of the Navy Department. To show that, we will merely refer to the communications upon the subject. They are as follows:—

E. K. Collins's letter to the Secretary of the Navy, in relation to the *side-lever engine*, with the Secretary of the Navy's approval, and his letter to the Secretary of the Navy, asking for consent to modify specifications, with the answer of the Secretary of the Navy that Commodore Skinner, of the Bureau of Construction, had approved of the alteration; also his letter to the Secretary of the Navy, asking for the appointment of a naval constructor and superintendent, with the Secretary of the Navy's answer, appointing Captain S. Skiddy naval constructor; and the Secretary of the Navy's answer to E. K. Collins, accepting the "Arctic," with the report of Commodore Perry and Commander Bell to the Secretary of the Navy, in reference to the capacity and usefulness of the "Arctic" for war purposes. To which may be added the following letter:

United States Navy Yard,
Philadelphia, April 14, 1852.

Sir:

In answer to yours of the 13th, I have to state, as chief naval constructor, the specifications for building the Collins line of steamers were submitted to me, and approved, as in accordance with the act of 3d of March, 1847.

They can be converted into war steamers to carry a battery equal to our largest steam-frigates, in a short time, and the necessary alterations to be made to receive such a battery will not exceed a cost of $20,000 each.

I am, sir, with great respect, your obedient servant,
FRANCIS GRICE.

To the Hon. Wm. M. Gwin,
United States Senate, Washington.

In reference to the converting of these steamers to Government service, in the contingency of war ensuing, there is the experience of the Mexican war, where the small merchant steamers, purchased at random, were used successfully with heavy ordnance, in the bombardment of Vera Cruz and other Mexican towns, as is shown in the preceding pages of this work; and also the instance, within the last year, where the English Government, in three days' notice, armed and equipped four of their commercial steamers for the purpose of forcing their way in a hostile expedition against heavily armed fortifications.

In alluding to this instance, the Hon. J. A. Bayard, U. S. Senator, says:

"The *fact* stands against the speculative opinions of those who are opposed to the possibility of such a use of these steamers. I presume it will not be denied, that the steamers of the Collins line are as strongly built—as well built—as speedy and as effectual for purposes of war as any commercial steamers in the British marine. If you have the fact, then, of their actual employment, and *conflicting* opinions, is it wiser to take fact and opinion combined as the basis of your determination, or to rely on conjectural objections as to the impossibility of the use of these steamers in war?

* * * * * * * * * * * * *

"I have the facts with me as regards the state of things in India, in an expedition which has lately been sent from Bombay to Rangoon. I have at least equal weight of opinion for their availability for purposes of that sort—as dispatch vessels—as vessels for the transportation of troops; for, take their speed, or their size, can you question their use in that respect? and are not such vessels adapted to purposes of war? But I go further. I cannot see why they should not be adapted to the purposes of cruisers. I will endeavor to illustrate my view in this respect.

"You have speed in a side-wheel steamer, and in vessels of this particular line—and to them alone I confine my remarks, and to all such as are equivalent to them in speed and construction—you have extraordinary speed; a speed with which, (in their present state,) on the ocean, they can overtake any vessel which they pursue, and escape from any vessel which they wish to avoid. They are capable, as they stand now, of carrying a light armament, even without the alteration of cutting down the upper deck, which would be all sufficient for the purpose of a cruiser in order to attack your enemy (if that enemy were Great Britain) in her most vital part—her commerce. They could sweep it from the face of the ocean; because no ship could escape them which was defenseless; and no ship with sufficient power to overcome, could overhaul them.

"But it may be said that, on account of the construction of these side-wheel steamers, they are unfit for cruisers, because they could not carry a sufficient supply of coal. It is not necessary that a side-wheel steamer should depend alone upon her coal. I ask you to take facts here again. Do not senators bear in their recollection the fact, that in 1851 the 'Atlantic,' leaving Liverpool in the month of December, one of the most tempestuous seasons of the year, and having crossed more than half the ocean, when eight days out broke her shaft? She was left then in the middle of the ocean with nothing but her sails to depend upon. After attempting to combat with adverse winds and reach America, she abandoned that on the 11th of January. She then returned towards England, and in eleven days crossed more than half the ocean under canvas alone, and that canvas but such as is usually carried by a ship of somewhat less than six hundred tons, whilst she was a ship of over three thousand two hundred. I ask you, Mr. President, to what are you to attribute that, but to the perfection of her model? I ask you if such a steamer, properly rigged and properly sparred, could not go upon the ocean as a cruiser as successfully as your Saranacs and Susquehannas? and with a power and speed equal to sixteen miles an hour when using steam, and the capacity which she has

To enter the contest with England, for the supremacy of ocean steam navigation, required capital, talent, energy and *faith*, of the highest order known to our countrymen; for to *fail*, would involve a loss not only of the vast sums necessary to make the effort, but, what is of far more value to every lover of his country's reputation, it would insure *national* disappointment, more deep-felt from the fact, that England had already been vanquished by our sailing ships, and gracefully yielded to us the palm of victory; since more brilliantly illuminated by the yacht "AMERICA," and the clipper-ship "WITCH OF THE WAVE."

At this time, too, as already seen, the entire postal service between Great Britain and America, and the transportation of passengers (except emigrants) and costly light freights, was under the control of the Cunard line; which involved *not only the reputation and pride of the country; but also its commercial prosperity.* Who was there, among all the wealthy and enterprising merchants or ship-builders of our metropolis of genius able to cope with the mistress of the seas, and character ample to gain the confidence and aid of cautious capitalists, that at this critical time offered to step forth, take up the challenge, repeated every month, by the arrival of an English steamer, in *less than two weeks from Liverpool*, and embark his fortune, and reputation in *starting* the enterprise.

History will record the name of "E. K. COLLINS," who, in my humble judgment, has, under Providence, done more to advance the name and interests of his country, than any American since the immortal FULTON—for the one proved the possibility of applying the steam engine to the useful navigation of our rivers and lakes; which has caused, in a great degree, the unprecedented growth of our inland and western states; the other the scarcely less important practical lesson, of narrowing the broad and boisterous Atlantic to a pleasure trip of *ten* days. To those who, from study or experience, know the vast difference there is in constructing a steamer capable of crossing the ocean, at all seasons of the year, not only with safety and wonderful regularity, but to do so in *ten days*, instead of even twelve or fourteen, this encomium will, it is believed, be deemed just and deserved. A reference to the steam-logs, given herein, will fully illustrate the labor and cost necessary to accomplish the "*quickest passages on record*" across the Atlantic.

It may be interesting to the readers of the present day, as it certainly cannot fail to be, to those of the future, to learn a few of the many difficulties that naturally presented themselves to the projector of this stupendous enterprise, for we may safely assert, that the eyes of the whole civilized world were watching the experiment in great anxiety, and England treating as an absurdity the idea that America could compete successfully with her in ocean steam navigation.

Under these circumstances, Mr. Collins determined, that if assiduity in seeking information could insure him success it should be attained; for up to that time, as before observed, our country had done nothing in constructing sea steamers that would justify him in taking any of them, either in their models, engines or boilers, for his guide with the least hope of success in distancing his competitor.

He relied upon the experience gained in his successful efforts in the establishment of the Collins line of sailing packets, between the same ports that these steamers were intended to connect—for perfecting the *models* of the vessels, and resorted to the most able engineers he could find, who had not only the proper knowledge for building marine engines and boilers, but who also had seen their operations at sea, thereby avoiding many previous errors, and succeeded in building vessels and machinery, that were acknowledged over the ocean, to be equal, *at least*, to any constructed in England.

Before giving out the contracts for the machinery, Mr. Collins obtained from Messrs. Sewell & Faron, Chief Engineers of the United States Navy, full specifications of the engines, wheels and boilers, the latter designed by Mr. Faron himself, who was afterwards appointed the chief engineer of the line, and subsequently made the original specifications (copied in Note O, of the Appendix,) for the steamers "Arctic" and "Baltic."

At that time, it was believed, from the best information that could be obtained, that the Cunard steamers carried an average boiler pressure not exceeding *ten* pounds to the square inch, and that to equal them it would only be necessary to have for the Collins' models cylinders of ninety inches diameter and nine feet stroke, with the same boiler pressure, although Mr. Sewell (it is understood) originally advocated ninety-five inch cylinders. After the contracts were given out to the "Novelty" and the "Allaire" works, of New York, Mr. Collins procured permission of the Government, to allow Mr. Faron to visit England, and examine the marine engines and boilers in use there. On his return in the "Niagara," he discovered that the safety-valves of that steamer had *thirteen one pound weights* on them, and that with every plunge of the vessel, the valve would open slightly, indicating at once the pressure of steam carried. The moment this was communicated to Mr. Collins, he addressed a note to each of the able engineers, (Faron, Sewell and Copeland) giving the *cross section* of the "Niagara," and the dimensions of her cylinder, with *thirteen* pounds of boiler pressure, together with the cross section of the "Atlantic," and the "Pacific," then building, and asked what dimensions of cylinder would be required, with the same boiler pressure, to *equal* the other vessel, and the answer of each, without concert of action, was, *ninety-five* inches diameter, and *nine* feet stroke—the size immediately substituted by Mr. Collins, against the advice of many, who thought the change unnecessary, and the expenditure uncalled for. And yet, how important does this comparatively small change become, in the sequel—for without it, even with the superior models of the ships, and the unprecedented evaporative power of the boilers, which are so important in their results, the steamers of this line could not perform the voyages in the time they *now do*, and might possibly have been beaten by the two *last* of the Cunarders, for upon examination, it will be seen that the "ASIA" has cylinders of *ninety-six inches* diameter, and the same length of stroke, with an immersed midship section of *eighty-five square feet less* than the "Atlantic," and *eighty square feet less* than the "Pacific." Estimating the nominal horse power, by rules established in England, the power of the "Asia," equals *eight hundred and sixteen*, and the "Atlantic" and "Pacific," only *eight hundred*, each. On further comparing these steamers, it will be found, that for each square foot of immersed section, the

"Atlantic"	has	$1.\frac{10}{100}$	horse	power,
"Pacific"	"	$1.\frac{12}{100}$	"	"
"Asia"	"	$1.\frac{28}{100}$	"	"

thus giving the latter an important advantage over the others.

In this view, the question naturally occurs, by what means the "Atlantic" and "Pacific" surpass the "Asia," in speed, at all seasons of the year. In my judgment, it is undoubtedly due to their unequaled models, effective boilers, and the management of their officers.

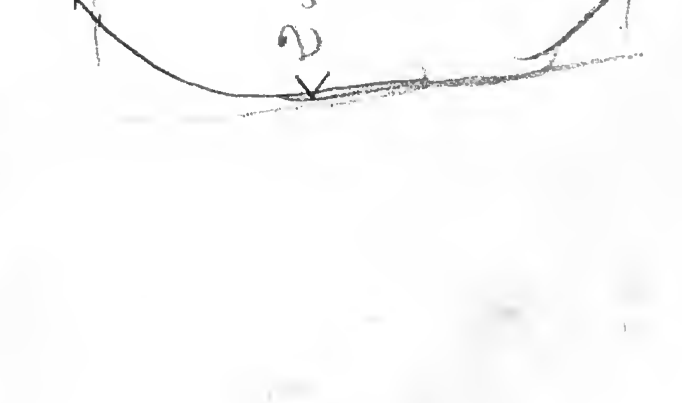
By referring to the Appendix, Note O, copies of the *original* specifications, for the hulls and the machinery of the "Arctic" and the "Baltic" will be seen, given with much minuteness of detail, and showing great care and ability in their preparation.

The other two vessels of this line ("Atlantic" and "Pacific") have the same general dimensions, with the exception that they have *two* feet less length on deck, and *five* feet less length of keel, and have *one* foot less stroke of piston, with some minor difference in the engines, boilers, and wheels, not enough, however, to warrant separate descriptions in this work.

It has been thought, therefore, advisable to confine the details to *one* of the line, and illustrate it with drawings of the vessel and the machinery, which have been prepared with much care and expense, and it is hoped they will be acceptable to the American and European engineer, and to the public generally. The vessel selected, is

THE ARCTIC.

This, the fleetest of this line, not inappropriately called the "*Clipper of the Seas*," is very correctly represented by the highly finished steel engraving, seen in the frontispiece, (engraved for this work by Ormsby, from a daguerreotype taken by Beckers & Piard,) at her moorings foot of Canal-street, New York, receiving coal from the schooner alongside, marking, by the contrast, her huge proportions.



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ENGINES OF T

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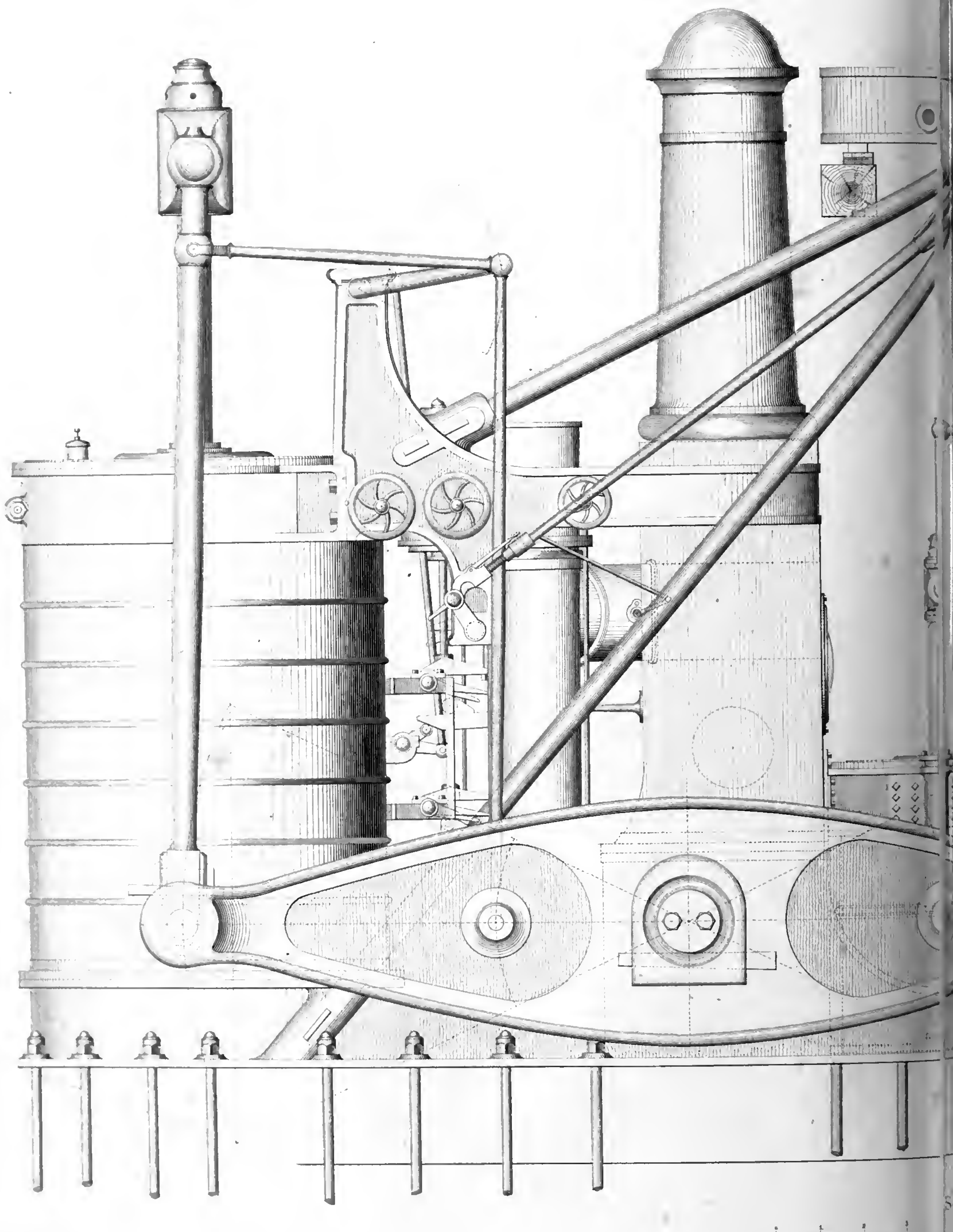

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AIL STEAMER

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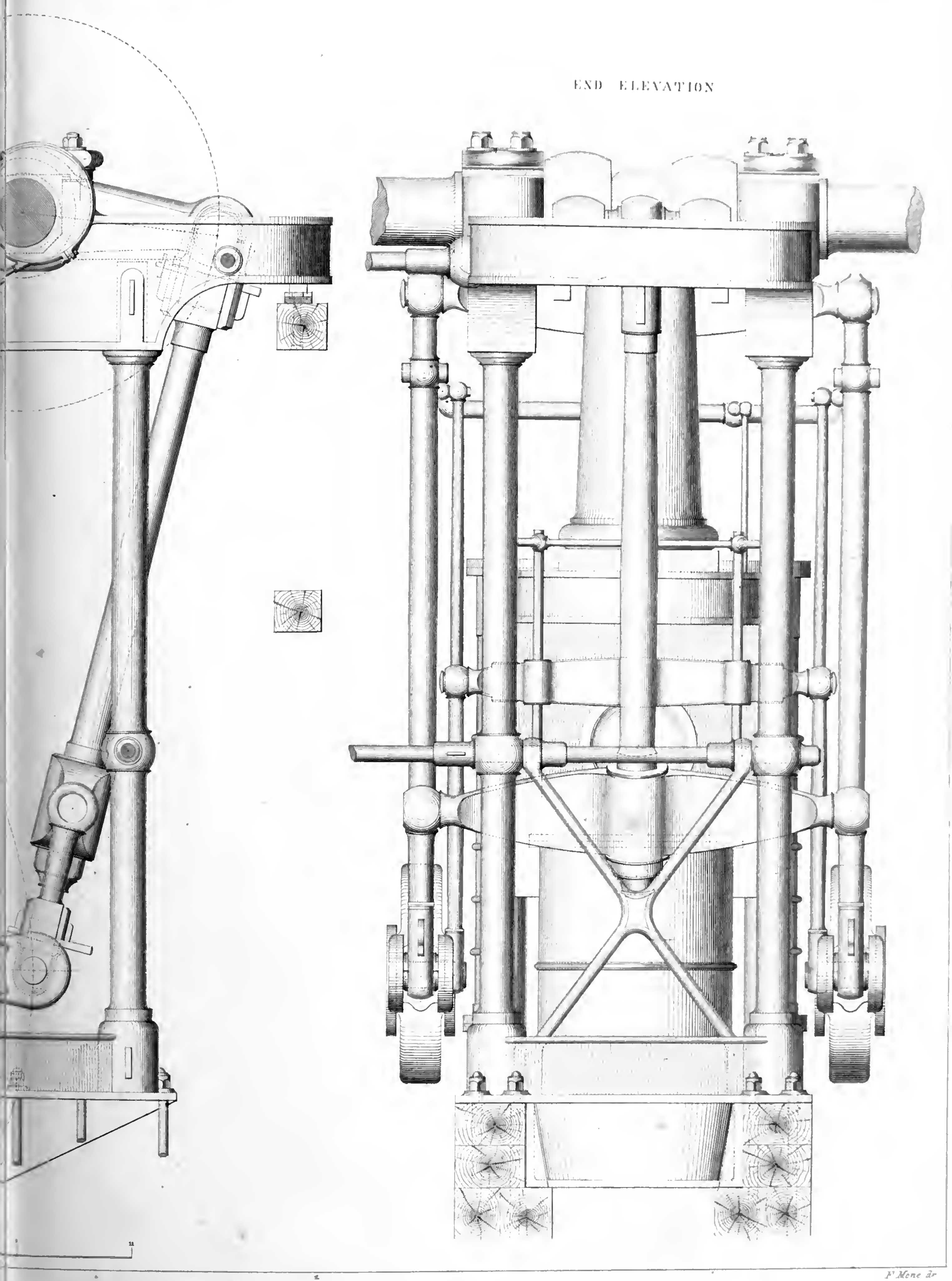
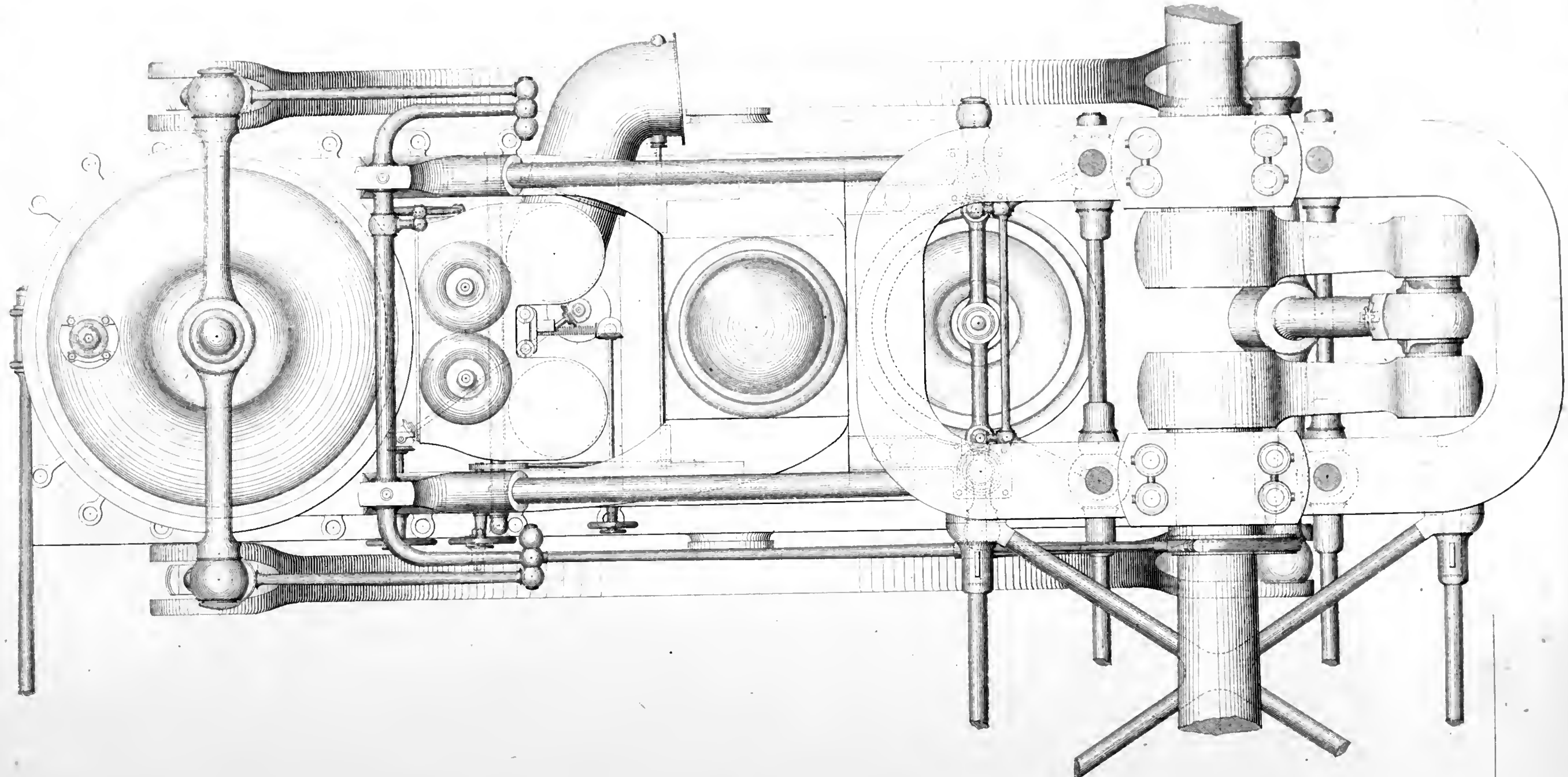


teamers U. S."

PLAN OF ONE OF ARCTIC'S ENGINES



Scale of feet

The hull of the "Arctic," was built by the experienced Naval Constructor, Wm. H. [illegible] of New York city, under the immediate superintendence of George Steers, the modeler of the yacht "AMERICA." She was launched the twenty-eighth day of January, eighteen hundred and fifty, and was placed on the line in that year. The finish of the cabins, and all the internal arrangements for heating, and ventilating, and rendering the passengers comfortable during a voyage, have never been surpassed. The tonnage of this vessel is, by the American Custom House measurement, two thousand eight hundred and fifty-six tons. The full dimensions of the hull and manner of building it, are given in Note [illegible] of the Appendix, by comparing which, with the description of the manner of constructing the [illegible] "Persia," in Appendix Note G, the reader will be able to judge of the relative strength of [illegible] of these two steamers.

ENGINES.

The engines of the "Arctic," like those of her sister vessels, are of the "side-lever" variety, with solid cast iron beams, and wrought iron columns and [illegible]. The cylinder, air pump, feed-pumps, shaft-bearing columns, &c., rest upon the bed-plate; the ordinary parallel motion is used to guide the piston-rod as in the English engines, and the motion is communicated to the cranks by the ordinary arrangement of cross-head, crosstail, side-rods and single connecting rod.

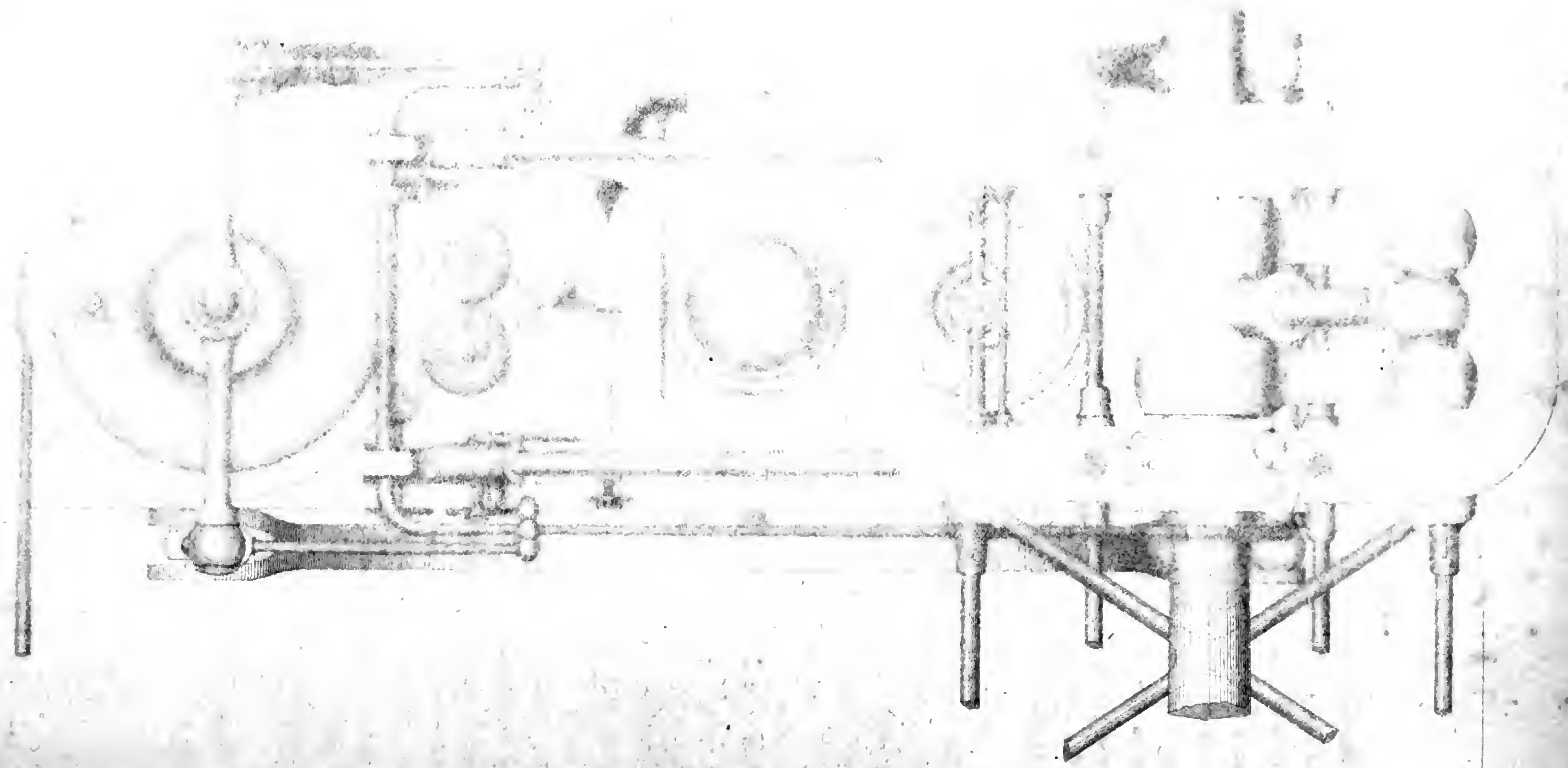
The most essential difference from the English method, is in the steam and exhaust-valves, which are of the "balance-puppet" variety, the steam-valve being also used for expansion and working in the several vessels under the following patents:— "Allen's" cut-off on the "Arctic" and "Atlantic," "Stevens'" on the "Pacific," and "Sickels'" on the "Baltic."

Plate Twenty, represents very correctly, the side and end elevation, and Plate Twenty-One, the plan of the "Arctic's" engine, the engravings having been executed from reduced drawings, for this work, by Frederick Mond, Mechanical Engineer, from the original working drawings kindly loaned him by Messrs. Stillman, Allen & Co., and made at the Novelty Works, for the "Arctic's" machinery, during the progress of its construction.

Great credit is due to the enterprising and successful proprietors of this celebrated establishment, for the superior manner in which these engines were made and erected. The skill they have displayed in the arrangement of the several parts, and the taste and judgment developed in the finish of the machinery, are obvious from an inspection of these plates, and have been justly the subject of high commendation at home and abroad.

BOILERS.

The boilers of the "Arctic" are peculiar to the Collins line, and are the result of careful research and experiment, on the part of the engineers employed for the purpose by Mr. Collins,



Scale of feet

The hull of the "Arctic," was built by the experienced Naval Constructor, Wm. H. Brown, of New York city, under the immediate superintendence of George Steers, the modeler of the yacht "AMERICA." She was launched the twenty-eighth day of January, eighteen hundred and fifty, and was placed on the line in that year. The finish of the cabins, and all the internal arrangements for heating, and ventilating, and rendering the passengers comfortable during a voyage, have never been surpassed. The tonnage of this vessel is, by the American Custom House measurement, two thousand eight hundred and fifty-six tons. The full dimensions of the hull and manner of building it, are given in Note O, of the Appendix, by comparing which, with the description of the manner of constructing the naval steamer "Powhatan," in Appendix, Note G, the reader will be able to judge of the relative strength and size of those two steamers.

ENGINES.

The engines of the "Arctic," like those of her sister vessels, are of the "side-lever" variety, with solid cast iron beams, and wrought iron columns and braces. The cylinder, air-pump, feed-pumps, shaft-bearing columns, &c., rest upon the bed-plate; the ordinary parallel motion is used to guide the piston-rod as in the English engines, and the motion is communicated to the cranks by the ordinary arrangement of cross-head, cross-tail, side-rods and single connecting rod.

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BOILERS.

The boilers of the "Arctic" are peculiar to the Collins line, and are the result of careful research and experiment, on the part of the engineers employed for the purpose by Mr. Collins, principal credit being due to the late Chief Engineer of the line, John Faron, Esq., for their highly successful results.

By reference to Plate Twenty-Three, it will be seen that they are arranged with double furnaces, large upper and lower water-spaces connected by a row of vertical tubes, around which the heated gases circulate, with a hanging bridge or plate, which checks their otherwise rapid flow into the chimney, and renders the combustion more perfect. The heating surface is principally confined to the tubes, and consequently, vertical; the height of the smoke-pipe above the grates (seventy-five feet) insures a strong natural draft, and the proportion of heating to grate surface is quite large, being 33¼ to 1. The ratio of evaporation of sea water, during her quick trip of February, eighteen hundred and fifty-two, was 8.55 pounds of water per pound of anthracite. For description in detail, of these boilers, reference is made to Appendix, Note O.

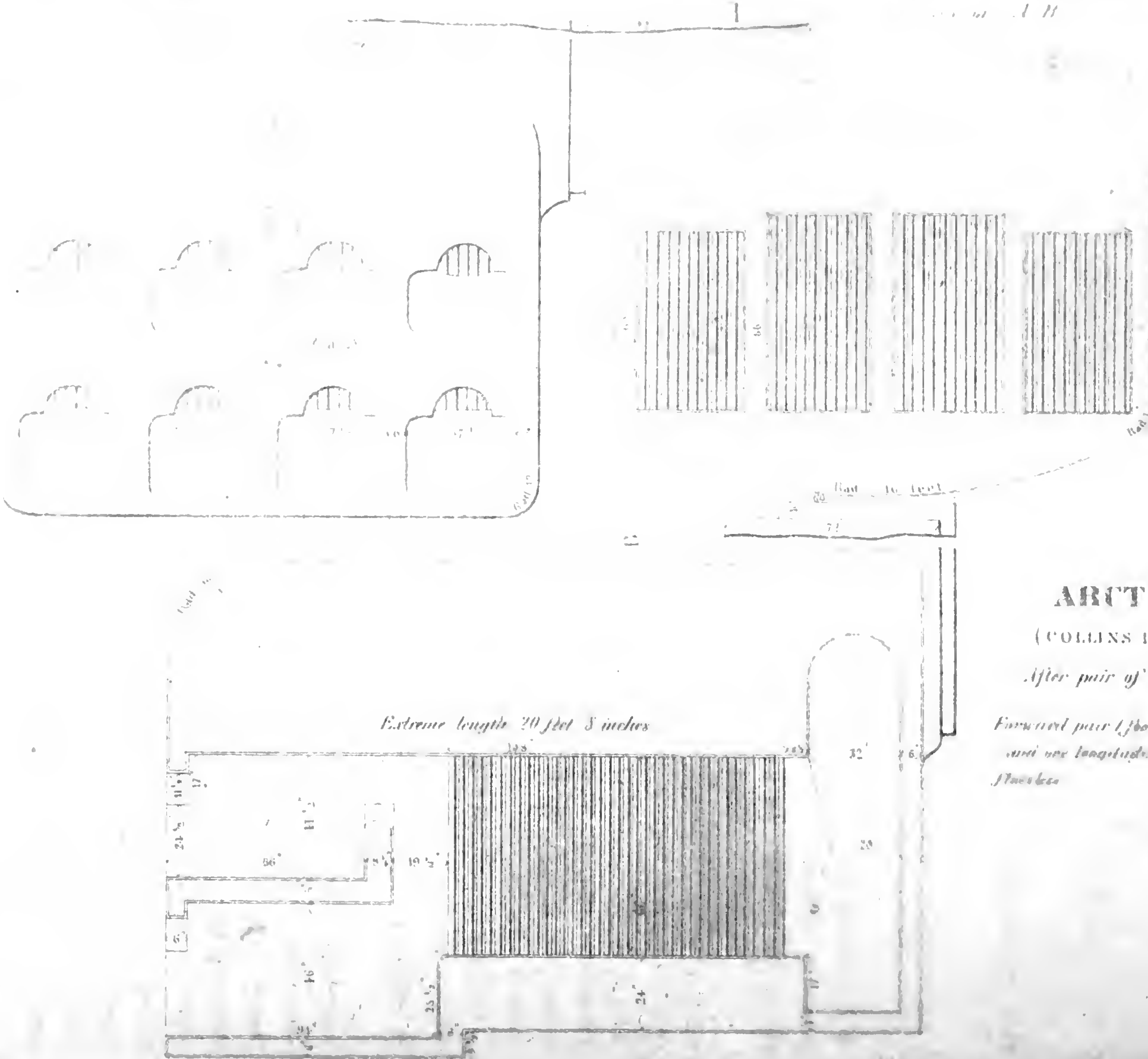
It was the original intention of Mr. Collins, under the recommendation of Mr. Faron, to use fresh water entirely in these boilers, previously condensed from sea water, and an arrangement was accordingly made with J. P. Pirsson, inventor of the "Double Vacuum Condenser," (noticed at length in the Appendix of this work,) to furnish condensers for this purpose. Orders for the tubes were sent out to England, but in consequence of their loss at sea, and the death of Mr. Faron, the vessels of the line were equipped without them. It is to be regretted, that circumstances should have prevented the introduction of this important element of additional economy and success, and the author is informed by Mr. Collins, that it is his intention in fitting out the next steamer of the line, to avail himself of the advantages involved in the evaporation of fresh water.

At first, bituminous coal was used entirely, in these boilers, but an extended and careful series of practical experiments, having established the superior qualities of anthracite in several particulars of great importance to ocean steamers, it was determined to use the former *only on the return trips*, and this has become the established practice.

PADDLE WHEELS.

The respective diameters of wheels in these steamers, from outside to outside of float, is as follows:—

Arctic,	35 feet 6 inches.
Baltic,	36 "
Atlantic,	35 "
Pacific,	35 "



ARCTIC

(COLLINS LINE)

After pair of boilers

Forward pair 1 foot less width, and one longitudinal row of flues less [illegible] ne to the late Chief Engineer of the line, John Faron, Esq., for their [illegible]

[illegible] Twenty-Three, it will be seen that they are arranged with double [illegible] water-spaces connected by a row of vertical tubes, around [illegible] a hanging bridge or plate, which checks their otherwise [illegible] the combustion more perfect. The heating surface is [illegible] consequently, vertical; the height of the smoke-pipe [illegible] a strong natural draft, and the proportion of heating [illegible] to 1. The ratio of evaporation of sea water, during [illegible] hundred and fifty-two, was 8.55 pounds of water per [illegible] detail of these boilers, reference is made to Appendix, [illegible]

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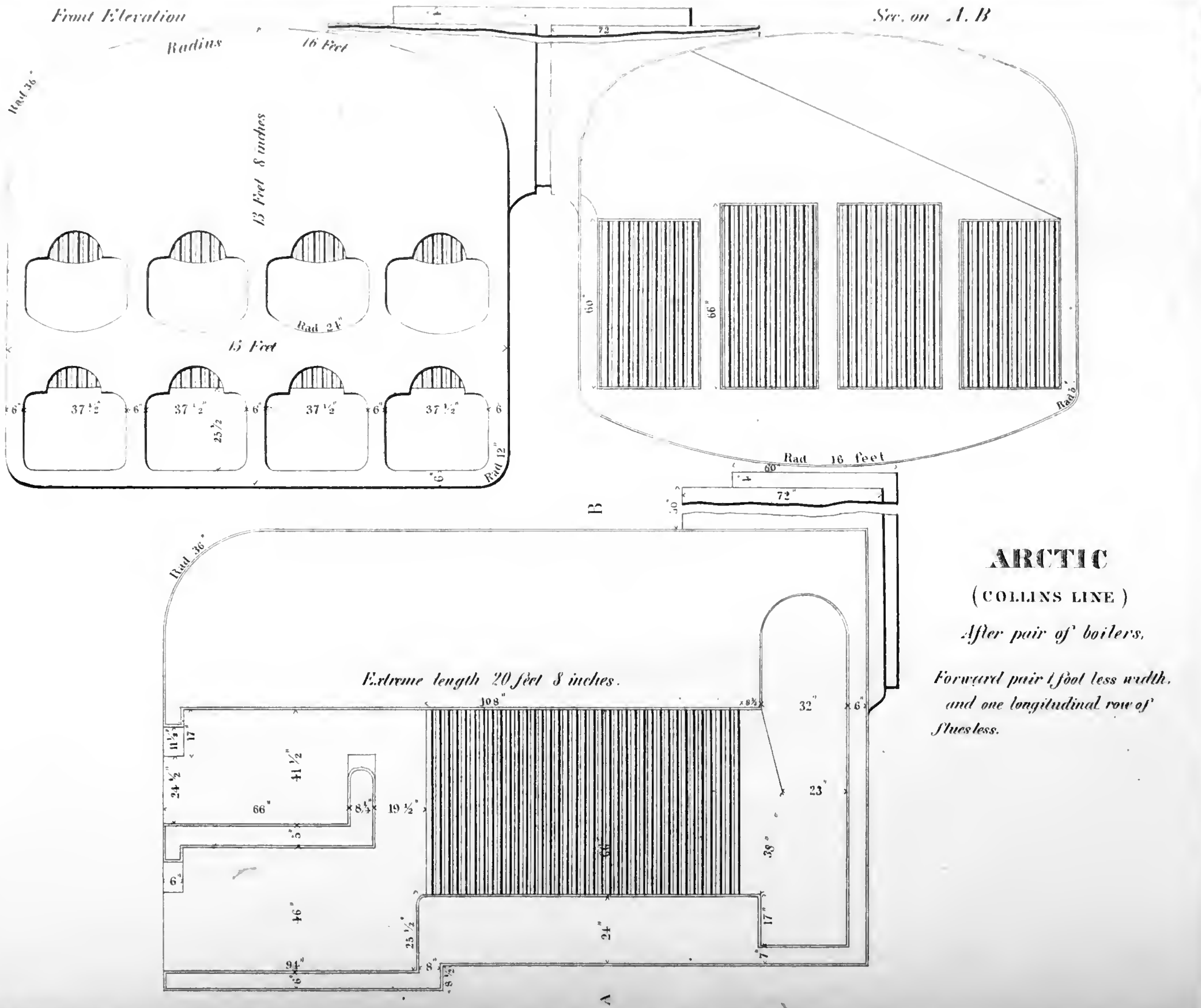
At first [illegible] used entirely, in these boilers, but an extended and careful series of practical [illegible] established the superior qualities of anthracite in several particulars of [illegible] steamers, it was determined to use the former *only on* [illegible] the established practice.

[illegible] WHEELS.

[illegible] in these steamers, from outside to outside of float, is as [illegible]

[illegible]	35 feet 6 inches.
[illegible]	36 "
[illegible]	35 "
[illegible]	35 "



ARCTIC

(COLLINS LINE)

After pair of boilers.

Forward pair 1 foot less width, and one longitudinal row of flues less.

R. H. Long, U. S. N. del.   Engraved for Stuart's "Naval & Mail Steamers U. S."   Sarony & Major Engr. N.Y.

Those of the "Arctic" and "Atlantic" have thirty-six floats, the "Baltic," thirty-two, and the "Pacific," twenty-eight.

The general dimensions are given in Appendix, Note O. Those of the "Arctic," "Atlantic," and "Baltic," were originally fitted with single floats of twenty-six inches face, which have since been reduced to twenty-one incl es. The "Arctic," owing to the large number of floats (thirty-six) in her wheels, carried a heavy sea in front of them, especially, when leaving port. To remedy this, every intermediate float was cut off eight inches from the centre row of arms, which left a space at each third float alternately, making what is called, a "step" paddle. This change made the engines work easier and much more regular in a sea way. The "Pacific" had originally thirty-five feet diameter of wheel, with twenty-eight floats, of eleven and a-half feet face, arranged as "split" paddles, each paddle being sixteen inches wide. After her fourth voyage, they were altered to single floats of twenty-six inches. This width producing a jar on the engines in a racing or following sea; on the fifth voyage they were reduced to twenty-three inches, and subsequently, further reduced to twenty-one inches, with advantage.

PROPORTIONS.

The following proportions are those of the "Arctic," and are not contained in Note O, of the Appendix.

Area of greatest transverse section, ...	772 square feet.
Launching draft, aft, ...	10 feet.
" " forward, ...	9⅓ "
Average displacement, per inch, from launching to load-line,	20⅓ tons.
Area of load-line, ...	9369.10 square feet.
Whole displacement in proportion to its circumscribing parallelopipedon, ...	.601 per cent.
Weight of hull, ...	1525 tons.
" spars and rigging, ...	34 "
Ordinary load-line, aft,.	20 feet.
" " forward, ...	19½ "
Difference of draft on entering New York, with usual passage, ...	3¼ "

Scale of displacement, taken sixty-one feet forward, and forty feet abaft the *centre* of hull.

At 19′ 8″ draft,	. . . .	22⅓ tons, per inch.
" 17′ 9″ "	. . . .	21 " " "
" 15′ 9″ "	. . . .	20½ " " "
" 13′ 9″ "	. . . .	20⅙ " " "
" 11′ 9″ "	. . . .	19⅓ " " "
" 9′ 9″ "	. . . .	19⅓ " " "

The calculations in reference to the displacement and draft of the "Arctic," and her sister vessels, were fully sustained by the test of trial. It was intended that the mean draft of the "Arctic" and "Pacific" should be the same, although there is a difference in their relative sizes. On launching the former, her forward draft was found to be nine feet four inches forward, and ten feet aft, making an average of nine feet eight inches. The launching draft of the "Pacific" was eight feet eleven inches forward, and ten feet five inches aft, making the same *average* draft.

PERFORMANCE.

The performance of the Collins line has equaled the expectations of its most sanguine friends. Since their first entry into the line, the several vessels have made a series of rapid and regular voyages, under the most trying circumstances, and in point of comfort, elegance, safety, and speed, are without equals in the world; certainly, a gratifying result for the *first* trial.

In May, eighteen hundred and fifty-one, the "Pacific" made the passage from New York to Liverpool, in nine days, twenty hours, and sixteen minutes, being the *first ever made within ten days.* In February, eighteen hundred and fifty-two, the *quickest* passage from New York to Liverpool, *up to this date*, was made by the "Arctic," being nine days, seventeen hours, and twelve minutes. The logs of both these trips have been furnished the author, by Chief Engineer, Daniel B. Martin, U. S. N., who was in charge at the time, and may be found in Appendix, Note P., together with a log of the "Atlantic's" quick trip, for which I am indebted to the Chief Engineer, J. W. Rogers, and also of the "Baltic," for which I am indebted to Mr. Robinson, her Chief Engineer.

The average performance of the "Arctic," in February, eighteen hundred and fifty-two, was as follows:—Average pressure, 16.9 pounds; average revolutions, 15.8 per minute; average consumption of anthracite, 84.3 tons; average speed, 316.4 knots per day. Maximum pressure, 17.5 pounds; revolutions, 16.7 per minute. Coal, eighty-seven tons per day; speed, three hundred and twenty knots per day.

It is proper to remark, that these vessels were specially constructed to make the transatlantic trip of ten days, maximum time, from *pilot* to *pilot;* in several cases they have made the run from *wharf* to *wharf* within this time. The detentions on account of vessels, fogs, tide, &c., after receiving the pilot on board, at Liverpool, or on this side, with the additional distance run, considerably increases the length of the passages.

The following comparison of the passages over the Atlantic, by the Collins and Cunard lines of steamers, may be interesting and valuable for future reference. It is compiled from the "New York Herald," of January 1, 1853, and embraces all the passages of the two lines, between New York and Liverpool, for 1851, and for the first *eleven* months in 1852.

	IN 1851.		IN 1852.	
	TO LIVERPOOL.	TO NEW YORK.	TO LIVERPOOL.	TO NEW YORK.
The Collins line, . . .	11*d.* 3*h.* 16*m.* . . .	11*d.* 13*h.* 12*m.*	11*d.* 1*h.* 47*m.* .	11*d.* 5*h.* 24*m.*
The Cunard line, . .	11 1 28 . .	12 5 11 . . .	11 7 38 . .	12 11 42
Difference, . . .	1*h.* 48*m.* . . .	15*h.* 59*m.*	5*h.* 51*m.* .	1*d.* 6*h.* 18*m.*

	TO LIVERPOOL.	TO NEW YORK.
The Collins line, made *shorter* passages in 1852 than in 1851, by	1*h.* 29*m.* . . .	7*h.* 48*m.*
The Cunard line, " *longer* " " " " . . .	6 10 . . .	6 27

The number of passengers conveyed, during the *eleven* months in 1852, by the two lines, was:—

	TO LIVERPOOL.	TO NEW YORK.
The Collins line, ...	2,420, ...	1,886.
The Cunard line, ...	1,783, ...	1,168.

This is a most satisfactory result for the Company, and very flattering to their captains, and speaks well for the sea-going qualities of the beautiful vessels they command.

THE LAW LINE.

This highly successful line of Mail Steamers was established by Law, Roberts & Co., under a Government contract of A. G. Sloo, made in conformity with the law of Congress, of March the third, eighteen hundred and forty-seven, for carrying the United States Mails between New York, and California, and Oregon.

This, commonly designated the Law Line, owes its origin to George Law, of New York, who has by his enterprise, intelligent policy, and business capacity, done very much in the establishment of this line, at an early day in the history of California, to hasten the introduction of civilization and comfort upon the shores of the Pacific, and to convey thousands and tens of thousands of immigrants with speed and safety to their new homes, and bring back the intelligence of their arrival, and the evidences of their golden prosperity.

There are at this time but *three* steamers of this line, that have been *inspected* and *accepted* by the Government of the United States, under the Act of March third, eighteen hundred and forty-seven, viz.: — the "Ohio," the "Georgia," and the "Illinois;" although the "Falcon" has been received temporarily, to carry the mails between Havana and New Orleans, until a steamer shall have been built in conformity to the law referred to. The three steamers first named, carry the mail, in connection with three other steamers of this line, between New York and Chagres. They also take the mails to Havana and New Orleans.

The "Ohio" was the first vessel built for this line, under the law of Congress, in eighteen hundred and forty-eight and nine. Her hull was built by Messrs. Bishop & Simonson, and her engines and boilers, by T. F. Secor & Co., New York. The hull is strongly built, and has a diagonal framing or bracing of three-inch *round* iron, (instead of *flat* iron, as introduced by Mr. Collins, in his steamers,) extending the whole length of the ship, between the keelson and the main-deck beams. The "Georgia," a sister vessel, is framed in the same manner, but is different in her model. The hull of this steamer was built by Smith & Dimon, and the engines and boilers, by the same company that made those of the "Ohio," and are of the same character and power. The general dimensions of these two mail steamers, are as follows, viz.: —

THE LAW LINE.

	Ohio.	Georgia.
Length on deck,	248 feet.	255 feet.
Breadth of beam,	45½ "	49 "
Depth of hold,	24½ "	25½ "
Tonnage,	2397 tons.	2695 tons.
Launching draft,	7 feet.	7 feet.
Average draft,	15½ "	15 "
Diameter of paddle wheels,	36 "	36 "
Number of paddles in each wheel,	32 "	32.
Length " " "	10½ "	10½ "
Depth " " "	1¼ "	1¼ "
Average dip "	6½ "	6 "

ENGINES.

The engines are of the side-lever variety, and have proved by their operations, during the past three years, that they were well constructed and proportioned by the builders. They have the (double) balanced valves; the steam-valve being worked by one eccentric, so adjusted as to cut off the steam at any part of the stroke, while the exhaust-valve, being worked by a separate eccentric, may be set to give any desired lead. Each of these steamers has two engines of the following sizes:—

Diameter of cylinder,	90 inches.
Stroke of piston,	8 feet.
Average pressure of steam,	15 pounds.
" number of revolutions,	12 "

Cutting off at one-half the stroke.

BOILERS.

The boilers in each vessel, are four in number, constructed of iron, and placed, two forward and two abaft the engines, each one being twenty-one and a-half feet long, fifteen feet wide, and fourteen feet high; with five rows of flues, and having *four* furnaces, with grates eight feet in length. The arrangement of the flues in these boilers, is different from any previously built; for after passing the bottom, similar to the ordinary drop-flue boiler, they rise and pass to the front again, where each pair of boilers unite in one chimney.

Whole amount of fire surface,	9,464 square feet.
" " grate "	426 " "

Ratio of fire surface to cubic foot of cylinder, . .	13 to 1.
" " " grate-surface, ...	$22\frac{1}{4}$ " 1.
Area of first flues of boiler	$44\frac{3}{5}$ square feet.
" second " "	39 " "
" third " "	$70\frac{2}{5}$ " "
" fourth " "	42 " "
" chimneys, ...	56 " "
Height of chimneys, above grate, ...	75 " "
Consumption of anthracite coal, per hour, (fan-blast) .	4,500 pounds.
Water evaporated by one pound of coal, (average) .	8 "
Average speed, (ordinary weather)	12 knots.

THE ILLINOIS.

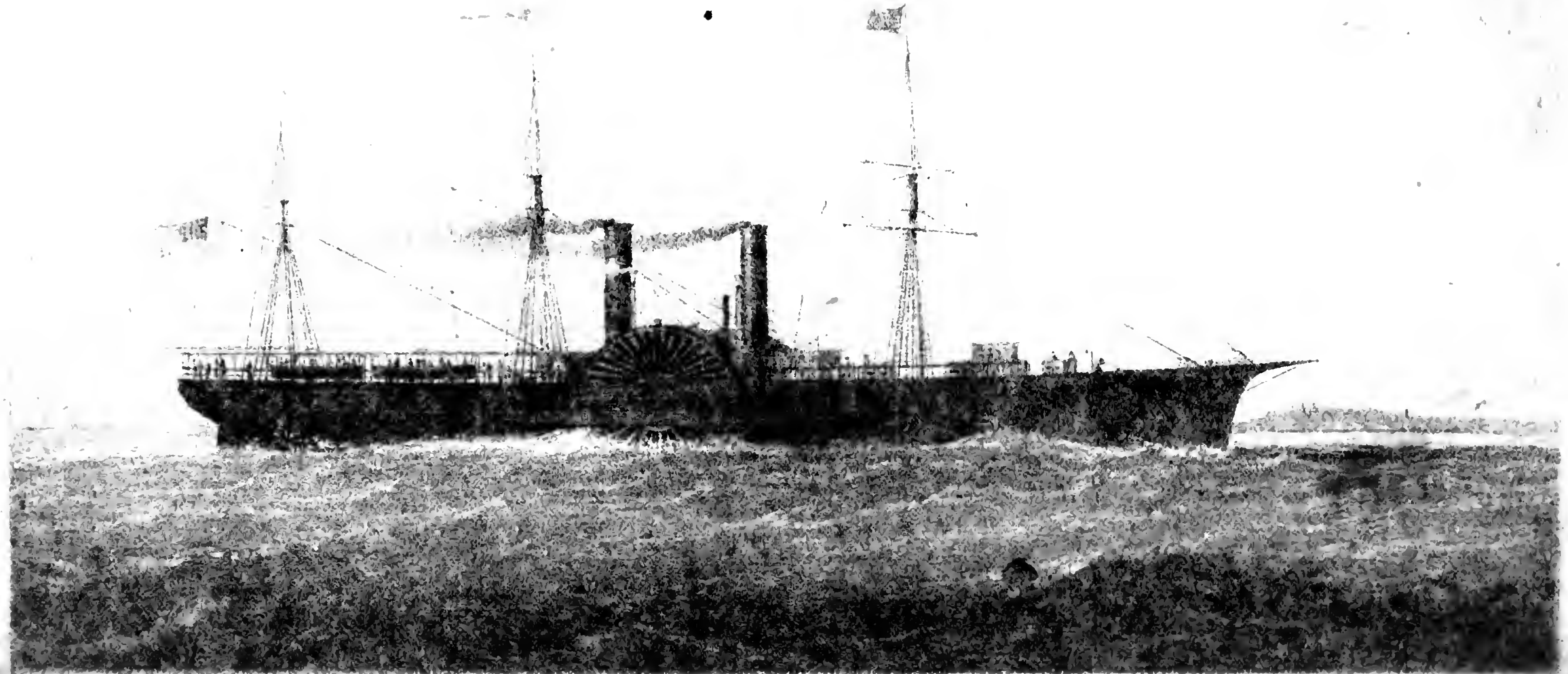
This steamer, the last and most perfect of this line, was constructed under the immediate direction of George Law, Esq. Her hull was built by Messrs. Smith & Dimon, New York, and her machinery constructed at the Allaire Works, under the immediate supervision of T. F. Secor, Esq., one of the proprietors of that establishment.

The author is indebted to the courtesy of the builders, for full and accurate information in reference to the hull of this vessel, together with the use of her model; an obligation which he the more readily acknowledges, as he has found much difficulty in procuring similar favors from other sources, in the case of other mail steamers. He is also indebted to Messrs. Secor & Co., for the loan of the working drawings of the machinery, from which the accompanying plates have been engraved. A very perfect view of this vessel is given in Plate Twenty-three, engraved by Endicott & Co., from sketches taken for this work.

HULL.

Length on deck, ...	267 feet 9 inches.
" of keel, ...	255 "
Breadth of beam, ...	40 " 3 "
Depth of hold, (to main-deck,)	22 " 6 "
" " (to spar-deck,)	31 "
Immersed midship section, (at load-line,)	1012 square feet.
Average draft, (at load-line,)	15 feet.
Immersed midship section, ...	512 square feet.
Tonnage, ...	— tons.

PLATE No. 28.



Engraved for Stuart's Naval & Mail Steamers U. S.

U. S. MAIL STEAMER, ILLINOIS.

Ratio of fire surface to cubic foot of cylinder,	13 to 1.
" " grate-surface,	22¼ " 1.
Area of [illegible] of boiler	44⅔ square feet.
[illegible]	39 " "
[illegible]	70⅔ " "
[illegible]	42 " "
chimneys,	56 " "
Height of chimneys, above grate	75 " "
Consumption of anthracite coal per hour, (fan-blast)	4,500 pounds.
Water evaporated by one pound of coal, (average)	8 "
Average speed (ordinary weather)	12 knots.

THE ILLINOIS.

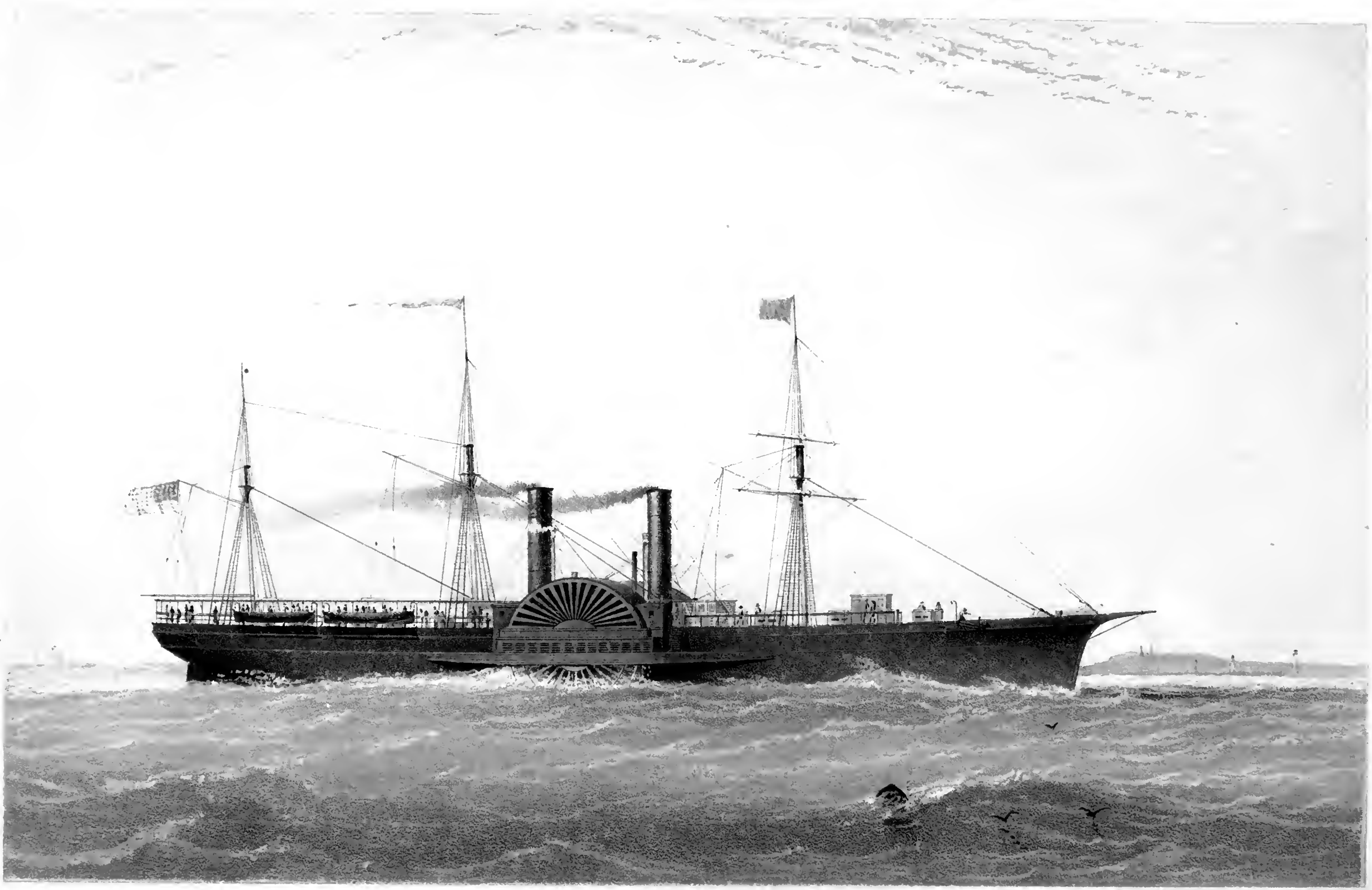
This steamer, the last and most perfect of this line, was constructed under the immediate direction of George Law, Esq. Her hull was built by Messrs. Smith & Dimon, New York, and her machinery [illegible] at the Allaire Works, under the immediate supervision of T. F. Secor, Esq., one of the proprietors of that establishment.

The author is indebted to the courtesy of the builders, for full and accurate information in relation to the hull of this vessel together with the use of her model; an obligation which he the [illegible] acknowledges, as he has found much difficulty in procuring similar favors from other sources, in the case of other mail steamers. He is also indebted to Messrs. Secor & Co. for the loan of the working drawings of the machinery, from which the accompanying plates have been engraved. A very perfect view of this vessel is given in Plate Twenty-three, engraved by [illegible] & Co., from sketches taken for this work.

HULL.

Length on deck	267 feet 9 inches.
[illegible]	255 "
Breadth of beam,	40 " 3 "
Depth of hold (to main-deck)	22 " 6 "
" (to spar-deck)	31 "
[illegible] section, (at load-line,)	1012 square feet.
[illegible]	15 feet.
[illegible]	512 square feet.
[illegible]	— tons.

PLATE Nº 28.



CHS. PARSONS DEL.

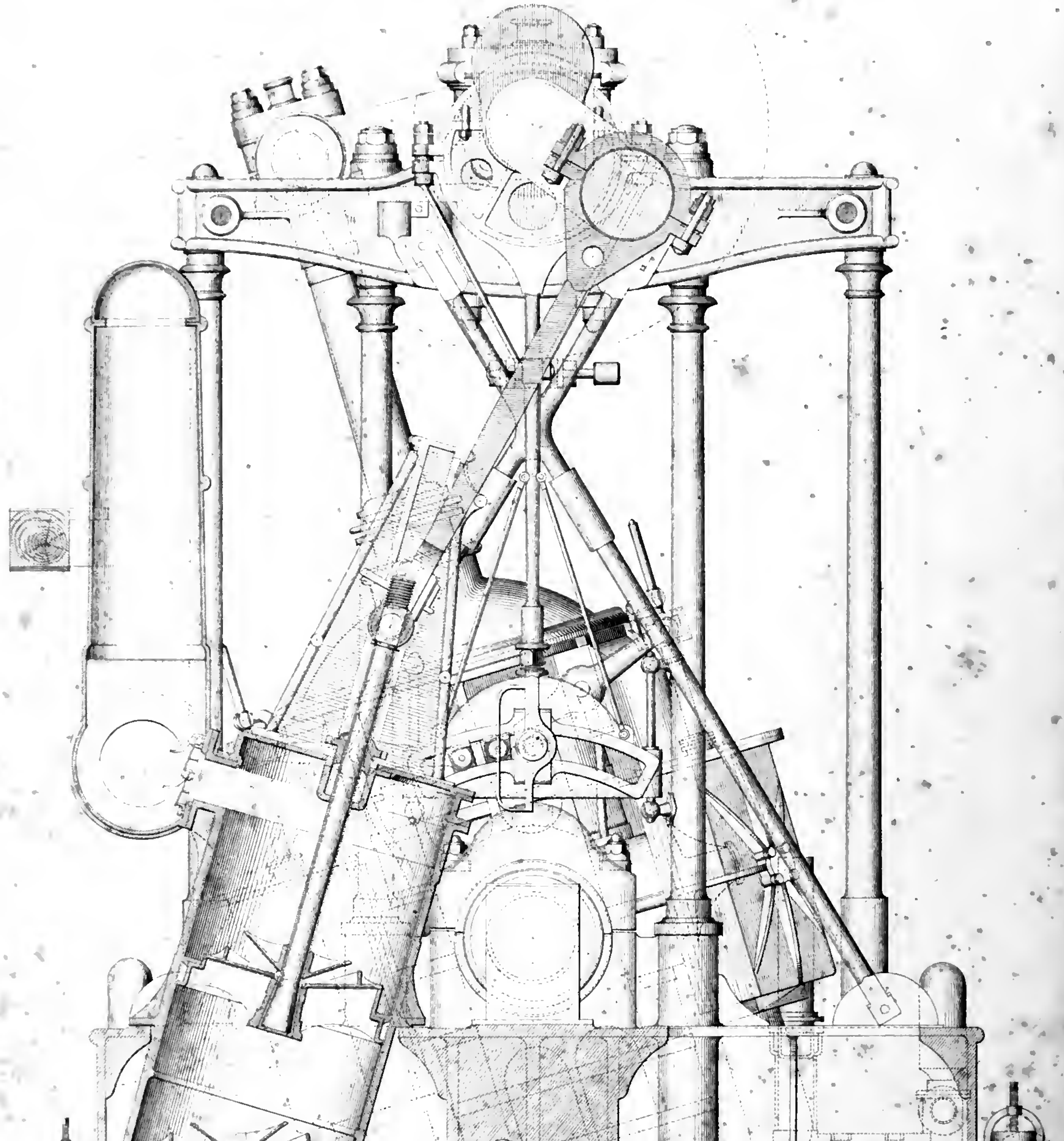
Engraved for Stuart's Naval & Mail Steamers U. S.

ENGRAVED BY ENDICOTT & Cº N. Y.

U. S. MAIL STEAMER, ILLINOIS.

ENGINES OF

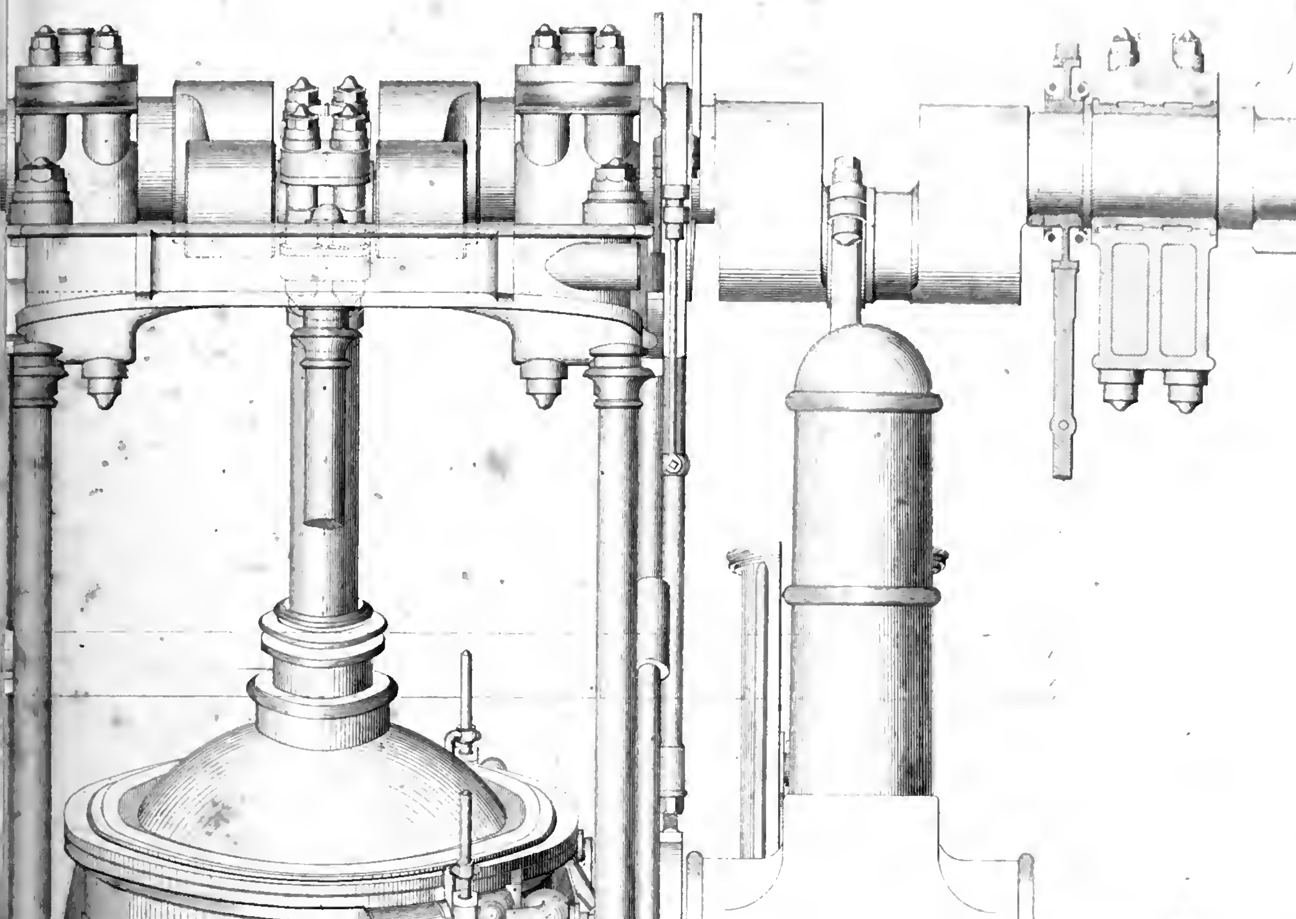
SIDE ELEVATION & SECTION *thro' air pump.*



Engraved for

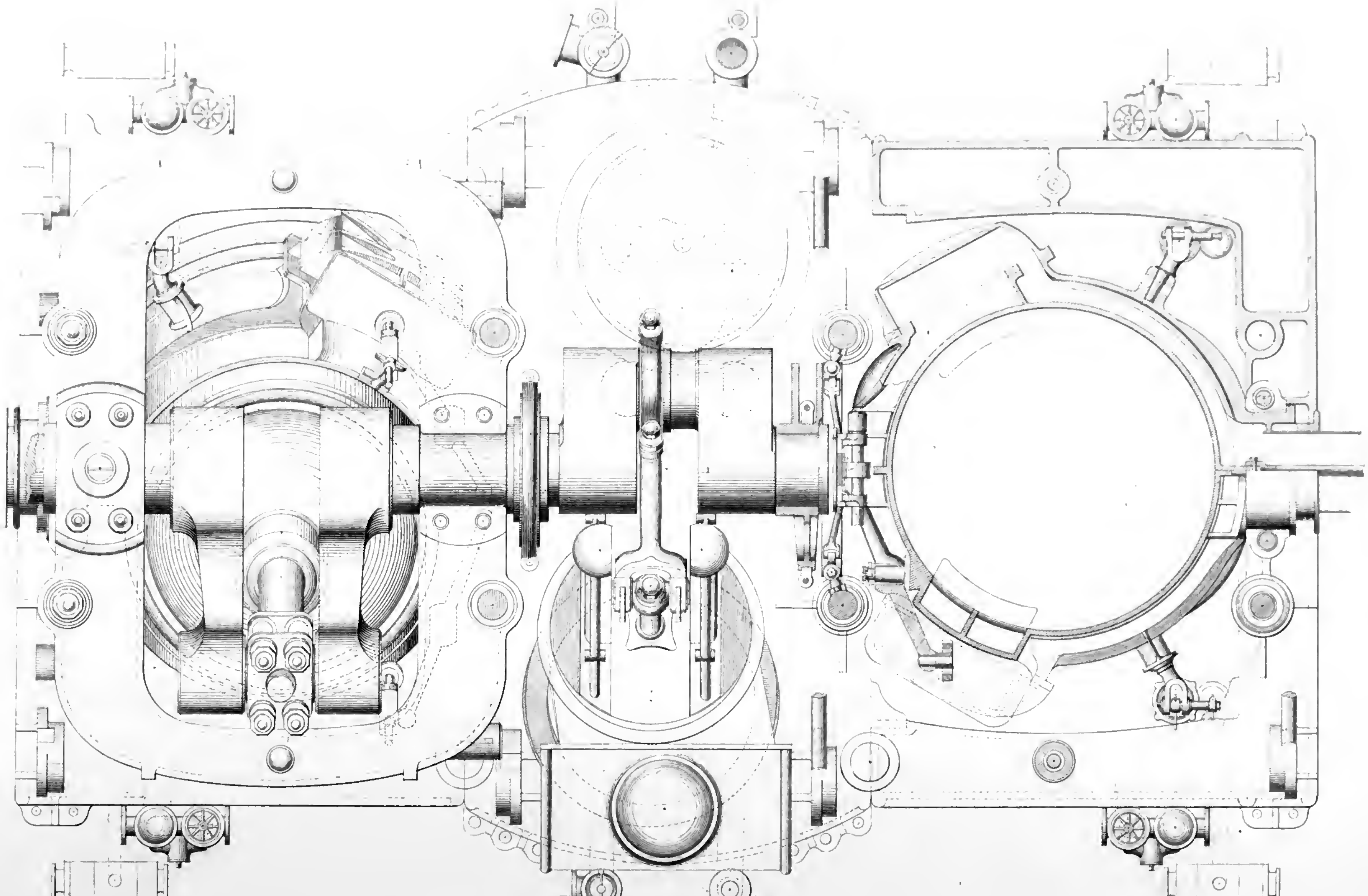
AIL STEAMER

FRONT ELEVATION



teamers U. S.

PLAN OF THE ILLINOIS' ENGINES.



Scale of Feet

0 1 2 3 6 9 12

ENGINES.

There are two oscillating engines, Plate Twenty-four, showing a side elevation with a section through the air-pump and bed-plate, and Plate Twenty-five, the plan of both engines.

Each cylinder oscillates on two trunnions resting on pillow-blocks, cast on the top of the bed-plate. The trunnions are cast on the cylinder, near the middle, and are hollow, the one admitting the steam, and the other acting as the exhaust. The steam passes through the steam-trunnion by channels to the steam-chests, one being on each side of the cylinder, cast with it. These are of the usual description, arranged for slide-valves, with cast iron covers. The slide-valve is provided with a separate brass case, fitting tight on its top on one side, and on the cover of the chest on the other side, thus preventing the fresh steam from pressing on the valve with its whole force. The inner space of the case is connected with the exhaust through a small copper pipe.

The piston-rod passes through a very long stuffing-box on the cylinder-cover. The main object of this arrangement, common to oscillating engines, is to give a firmer and steadier guide to the rod. A hemispherical cast iron piece, reaching to the top of the stuffing-box is fastened to the flanges of the cover, to prevent too rapid cooling of the top. A water-valve is also inserted in the upper cylinder cover.

The piston-rod has a strong bearing on its upper end, which receives the crank-pin, the latter being secured to it by a cover and screw-bolts.

The cranks are attached to the intermediate and main shafts. The main bearings are supported on the cast iron pillow-block frame, resting on six wrought iron columns with two pairs of diagonal braces reaching to the bed-plate, where they are keyed into sockets, provided for this purpose. The frames of both engines are connected by horizontal transversal rods keyed into sockets cast on the frames.

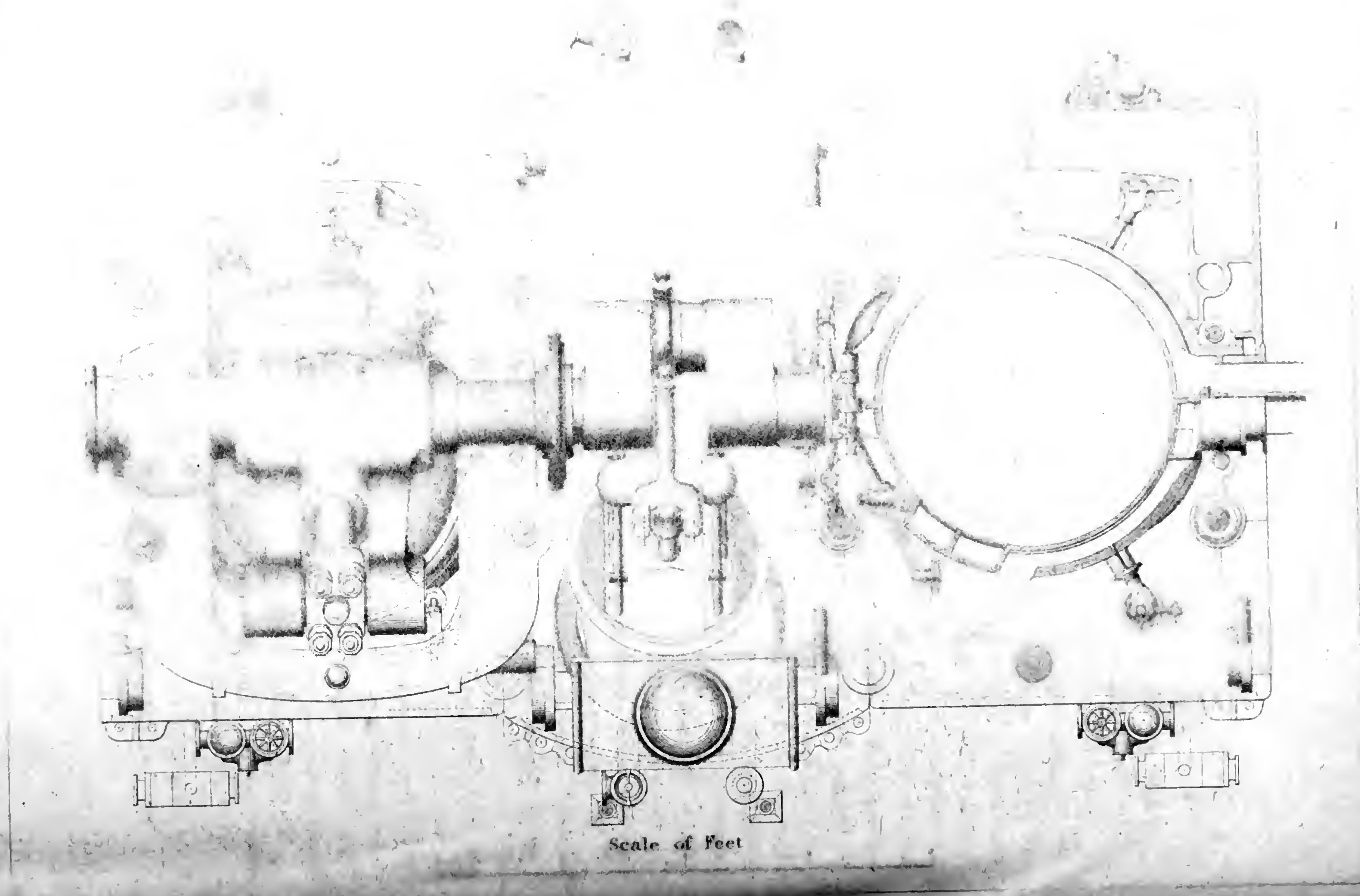
Both air-pumps are between the engines in a direction inclined to the shafts. They are worked from the intermediate shaft by a cranked arm. The air-pump connecting rods are of the common form, forked at the lower or cross-head ends. The cross-heads have guides fastened to the air-pump covers. The buckets are of brass; the air-pumps are lined with brass, and the rods are covered with the same metal.

The force and bilge-pumps are worked by rods secured in sockets, cast to the steam-cylinder between the trunnion and steam-chests.

The valve motion, eccentrics, &c., are of the common form and arrangement.

Diameter of cylinder, ...	85 inches.
Stroke of piston, ...	9 feet.

PLAN OF THE ILLINOIS



ENGINES.

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The force and bilge-pumps are worked by rods secured in sockets, cast to the steam-cylinder between the trunnion and steam-chests.

The valve motion, eccentrics, &c., are of the common form and arrangement.

Diameter of cylinder, ...	85 inches.
Stroke of piston, ...	9 feet.

Diameter of air-pump,	51 inches.
Stroke "	54 "
Diameter of force-pump,	8½ "
Stroke "	36 "
Diameter of bilge-pump,	7 "
Stroke "	36 "
Diameter of steam-pipe,	14 "
" trunnions, (outside,)	31 "
" " (inside,)	25 "
Breadth " (between brasses,)	11 "
Diameter of main shafts, (mean,)	20 "

PADDLE WHEELS.

Diameter at outside of float,	33 feet 6 inches.
Breadth of paddle wheel,	10 " 6 "
Depth of paddles,	30 "
Number "	28.

BOILERS.

There are four return, tubular, iron boilers, with two smoke-pipes.

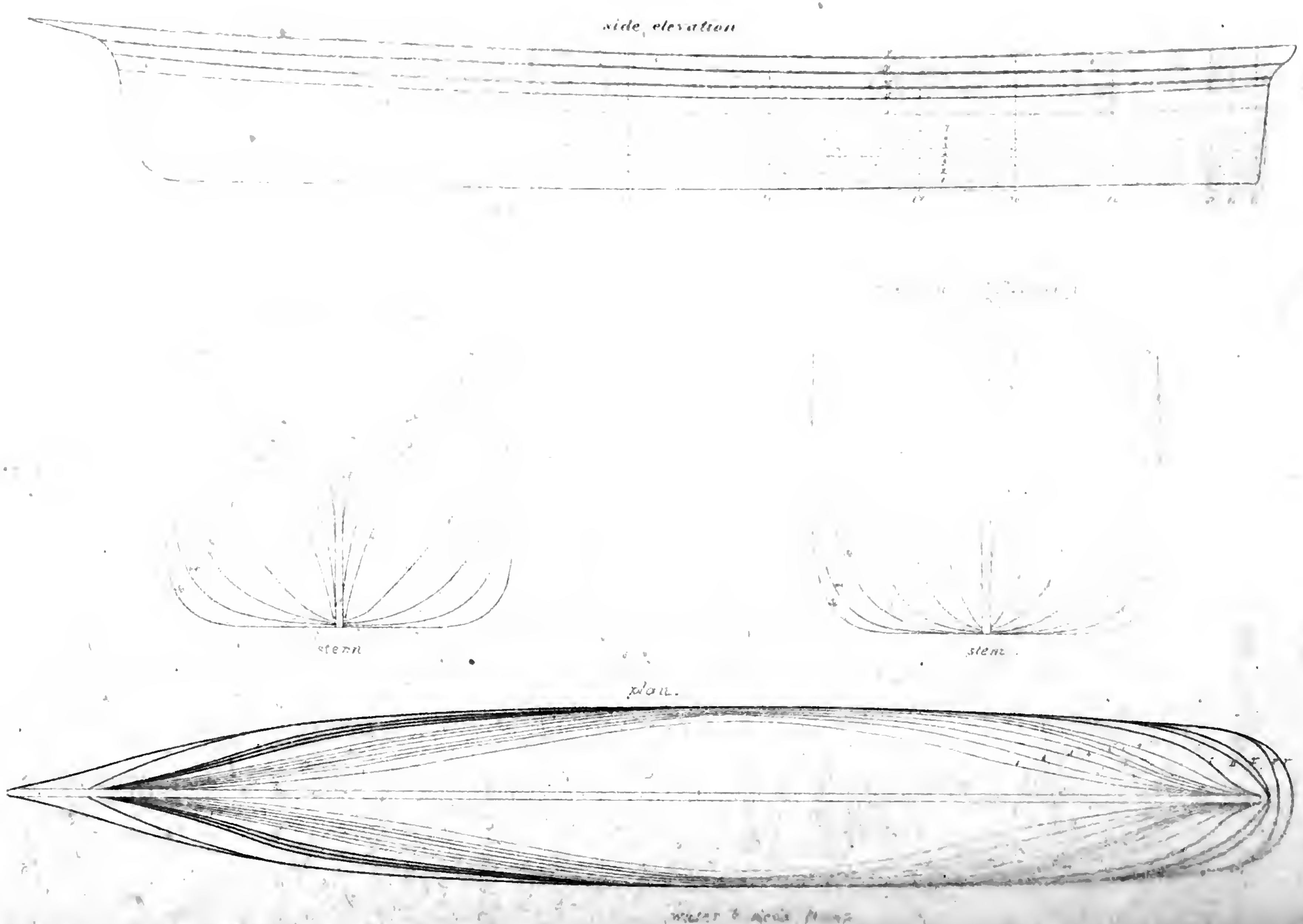
Area of furnace surface,	2,000 square feet.
" tubular "	9,120 " "
" grate "	1,469.56 " "
" one smoke-pipe,	30.679 " "
Diameter of one smoke-pipe,	6 feet 3 inches.
Height above grates,	51 " 6 "
Length of boilers, (at bottom,)	12 "
" " (at top,)	13 " 6 "
Height " (exclusive of steam-dome,)	13 "
Length of grate-bars,	7 "

PERFORMANCE.

The maximum performance of this vessel, as taken from a log of her trip from New York to Chagres and back, via Havana, in May, eighteen hundred and fifty-two, given in Appendix, Note R, for which the author is indebted to the courtesy of her Chief Engineer, E. S. Birdsall,

Plate No. 26.

U. S. MAIL STEAMER ILLINOIS



[illegible]	51 inches.
[illegible]	54 "
[illegible]	8½ "
[illegible]	36 "
[illegible]	7 "
[illegible]	36 "
[illegible]	14 "
[illegible]	31 "
[illegible]	25 "
[illegible] brasses,)	11 "
[illegible]	20 "

[illegible]

Diameter [illegible] . .	33 feet 6 inches.
Breadth of paddle [illegible]	10 " 6 "
Depth of paddles . . .	30 "
Number [illegible] . .	28.

BOILERS.

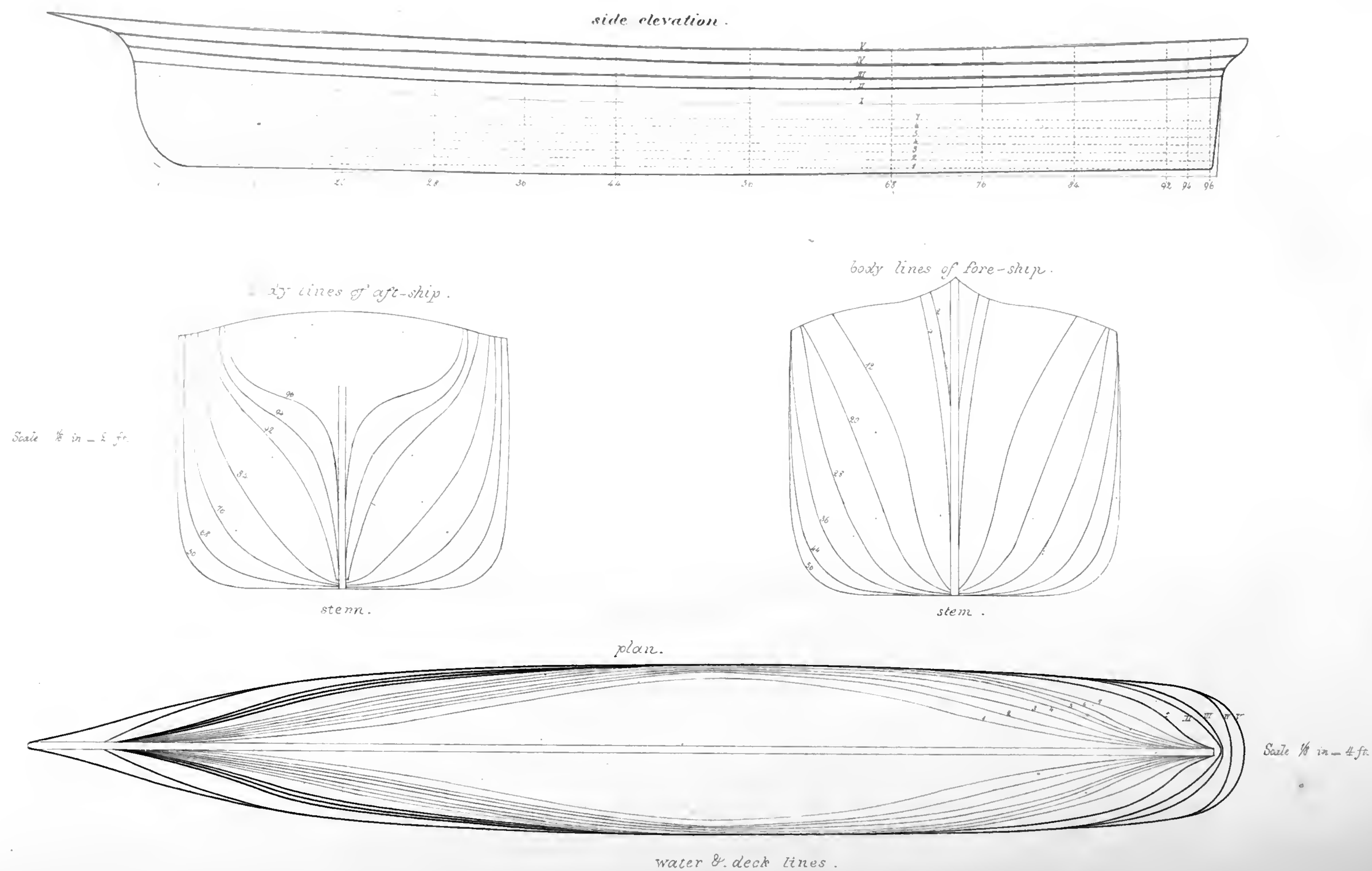
[illegible] tubular, [illegible] smoke-pipes.

Area of furnace surface, . . .	2,000 square feet.
" [illegible] " . . .	9,120 " "
" grate " . . .	1,469.56 " "
" [illegible] smoke-pipe, . . .	30.679 " "
[illegible] smoke-pipe, . . .	6 feet 3 inches.
Height [illegible] grates, . . .	51 " 6 "
Length [illegible] (at bottom,) . . .	12 "
" " (at top,) . . .	13 " 6 "
Height [illegible] (exclusive of steam-[illegible],) . . .	13 "
Length of grate-bars, . . .	7 "

PERFORMANCE.

The maximum performance of this vessel, as taken [illegible] her trip from New York [illegible] and back, via Havana, in May, eighteen [illegible] fifty-two, given in Appendix, [illegible] which the author is indebted to the [illegible] Chief Engineer, E. S. Birdsall,

U. S. MAIL STEAMER ILLINOIS



Edw. Deicke engr.

F. M. ... dr.

Engraved for Stuart's "Naval & Mail Steamers U. S."

is as follows:—Average pressure of steam, seventeen pounds; average revolutions, eleven; average consumption of coal, sixty tons per day; average speed, eleven miles per hour; maximum speed, thirteen and one-half miles per hour. Running time from Havana to New York, ninety-four and a-half hours, from dock to dock; distance run, one thousand and thirty-two miles; greatest run, per day, (in Gulf Stream,) three hundred and thirty-seven miles.

On another occasion, this vessel ran from Chagres to New York, (estimated distance, one thousand nine hundred and eighty miles,) in six days and sixteen hours, being an average of nearly twelve and a-half miles per hour, the whole voyage.

THE FALCON.

This steamer is mostly employed in carrying the mail between Havana and New Orleans, in connection with the other vessels of this line. Her hull was built by William H. Brown, and her machinery by Hogg & Delamater, of New York, of the following dimensions:—

Length on deck, 206 feet; breadth of beam, 30½ feet, and depth of hold, 21 feet. Tonnage, 875 tons. Average draft of water, 12 feet. She has two inclined engines, with cylinders of 60 inches diameter, and 5 feet stroke of piston. Paddle wheels of thirty-two feet diameter, 7¾ feet face, and 1¼ foot breadth of paddle, with twenty-four paddles in each wheel, having an average dip of 5 feet.

Two iron flue boilers, placed side by side, having 2,500 square feet of heating surface, with 100 square feet of grate-surface. The top of chimney is 65 feet above the grates. Average consumption of bituminous coal, 24 tons per day. Amount of water evaporated by 1 pound of coal, 5½ pounds. Average revolutions, 15 per minute, with boiler pressure of 14 pounds, cutting off at half stroke. Average speed, 9 knots.

THE BREMEN LINE.

THE first American ocean steamers, after the "Savannah," were the "WASHINGTON," and the "HERMANN," constructed in eighteen hundred and forty-seven, to form a monthly communication between New York and Bremen.

The hulls of these sister ships, were built by Westervelt & Mackay, and the machinery by Stillman, Allen & Co., New York. They have the following general dimensions and proportions, viz:—

THE WASHINGTON.

HULL.

Length on main-deck,	230 feet.
" " spar-deck,	236 "
Breadth of beam,	39 "
Depth of hold,	31 "
Average draft of water,	19½ "
Tonnage, (Custom House measurement),	1700 tons.

ENGINES AND WHEELS.

Two side-lever engines.

Diameter of cylinders,	6 feet.
Length of stroke,	10 "
Diameter of paddle-wheels,	34⅔ "
Length of paddles,	7½ "
Depth " " (originally),	3⅓ "
" " " (in 1852),	2⅔ "
Number " " in each wheel,	28.
Average slip of paddles,	6⅓ feet.
" number of revolutions,	11.
" pressure of steam,	14 pounds.
" cut-off,	⅓ stroke.

BOILERS.

There have been two sets of flue-boilers put in this steamer, (the last being Miller's patent,) of the following proportions, viz:—

Two iron boilers, side by side.

	First.	*Second.*
Whole amount of fire-surface,	5,760 sq. feet.	6,798 sq. feet.
" " " grate-surface,	182 " "	292 " "
Ratio of fire-surface to cubic foot of cylinder,	$10\frac{1}{5}$ to 1.	12 to 1.
" " " to grate-surface,	32 to 1.	$23\frac{1}{2}$ to 1.
Area of first flues,	36 sq. feet.	22 sq. feet.
" " second "	$21\frac{1}{10}$ " "	$12\frac{1}{2}$ " "
" " third "		$22\frac{1}{2}$ " "
" " chimney,	$33\frac{1}{5}$ " "	$33\frac{1}{5}$ " "
Height of " above grate,	75 feet.	75 feet.
Consumption of bituminous coal per hour,	3,930 pounds.	3,360 pounds.
Water evaporated by 1 pound of coal,	$4\frac{78}{100}$ "	$5\frac{33}{100}$ "
Coal per hour to a square foot of grate,	$23\frac{1}{4}$ "	$10\frac{1}{2}$ "
Average speed per hour,	———	11 knots.

THE HERMANN.

HULL.

Length on spar-deck,	241 feet.
" " main-deck,	235 "
Depth of hold,	31 "
Breadth of beam,	40 "
Average draft of water,	$19\frac{1}{2}$ "
Tonnage, (Custom House measurement,)	1800 "

ENGINES AND WHEELS.

Two side-lever engines.

Diameter of cylinders,	6 feet.
Length of stroke,	10 "
Diameter of paddle-wheels,	36 "

Length of paddles,	8 feet.
Original paddle, (double buckets of 18 inches,)	3 "
Reduced in 1851, to a single bucket of	$2\frac{1}{6}$ "
And in 1852, reduced to one of	2 "
Average depth of wheels,	$7\frac{1}{2}$ "
Number of paddles in each wheel,	28.
Average number of revolutions with original buckets,	11.
" " " " new "	12.

BOILERS.

Two sets of boilers have been placed in the "Hermann" since her construction. The first (built by Stillman, Allen & Co.,) were of the common "single return-flue" variety, two in number, side by side, used with a fan-blast, being thirty-six feet long, with twelve feet nine inches shell.

In eighteen hundred and fifty-one, these boilers were cut in two, the internal arrangement of furnaces and flues removed, and new furnaces and tubes substituted. The number of furnaces was doubled, and the fire-surface greatly increased; a uniform pressure of steam was maintained with less consumption of coal, without the aid of a fan-blast. The four tubular boilers were placed "fore and aft" forward of the engines, with two fire-rooms. They were fourteen feet long, twelve feet nine inches in diameter, with circular fronts, each front having three furnaces seven feet long, the arches extending the whole length of the boiler to the back connections. The returns were composed of iron tubes, three inches internal diameter. These alterations were made under the direction and from the designs of Erastus W. Smith, Esq., by Mott & Ayres, New York.

Proportions of Boilers.	*First Set.*	*Second Set.*
Whole amount of fire-surface,	5,760 square feet.	8,350 square feet.
" " tube "	" "	5,680 " "
" " grate-surface,	182 " "	270 " "
Ratio of fire-surface to cubic foot of cylinder,	$10\frac{1}{5}$ to 1.	$14\frac{4}{5}$ to 1.
" " grate-surface,	32 " 1.	$30\frac{2}{5}$ " 1.
Area of first flues,	36 square feet.	
" second "	$21\frac{1}{5}$ " "	
" tubes,		39 square feet.
" chimneys,	$33\frac{1}{3}$ " "	$47\frac{1}{2}$ " "
Height " above grates,	75 feet.	75 feet.

Consumption of bituminous coal, per hour,	3,920 pounds.	3,546 pounds.
Average pressure of steam, ...	12 "	12 "
Cutting off at	$\frac{1}{3}$.	$3\frac{1}{2}$ feet.
Water evaporated by 1 pound of coal, .	$4.\frac{78}{100}$ pounds.	$5\frac{1}{2}$ pounds.
Coal, per hour, to a square foot of grate,	$21\frac{1}{2}$ "	13 "

ALTERATIONS.

The author is indebted to Erastus W. Smith, Esq., Chief Engineer of the Ocean Steam Navigation Co., since July, eighteen hundred and forty-eight, (and also Chief Engineer of the Collins line in eighteen hundred and fifty,) for memorandums of the alterations made on these vessels, after their construction.

The original boilers of the "Washington" were of the common "single return-flue variety," thirty-six feet long, twelve feet nine inches in diameter, with grates eight feet long by fourteen feet wide. With these boilers, the consumption of bituminous and anthracite coal, per hour, was an average of three thousand nine hundred pounds, and it was necessary to use blowers in order to maintain a sufficient supply of steam.

The interior of these boilers were re-constructed on the plan of "Miller's patent," so that each boiler afforded nine furnaces, and each furnace one direct and two return flues, the length of boiler being shortened two feet. The fire and grate-surface was greatly increased, and the number of furnaces multiplied three-fold, (from six to eighteen); the blowers were removed. The consumption of coal was thus reduced to thirty-five tons per day, but the natural draft being insufficient, the bridge-walls of eight furnaces were removed so as to permit the flame to pass through without return, while in the remaining ten furnaces, it passed through and returned twice. This change made the desired improvement in draft, increasing the consumption of fuel to three thousand three hundred and sixty pounds per hour, still exhibiting, however, an important saving over the original boilers. The large number of furnaces produced great uniformity in the pressure of steam, while the natural draft saved much troublesome and extensive repairs otherwise involved in the use of blowers.

In eighteen hundred and fifty-two, the direct and double return-flues of each of the four lower furnaces were removed, and one direct circular-flue substituted. This change was made principally to facilitate the cleaning and repairs of the boilers.

The original diameter of paddle wheels was thirty-seven feet eight inches, which was reduced after her first voyage, in consequence of excessive dip, to thirty-four feet eight inches. The face of the paddles was seven feet six inches, with divided paddles, each twenty inches wide, making three feet four inches total width. Single paddles of the same width were substituted, giving less slip and a perceptible advantage in speed. Subsequently, this width was reduced to two feet eight inches.

The original foot-valves were heavy composition single disc-valves in the bottom of the air-pump. These occasionally worked with great noise, and the valve-guards required frequent repairs. In eighteen hundred and forty-nine, these metal valves were removed, and India-rubber valves, with gratings substituted, with a decided advantage, the noise being prevented, a better vacuum maintained, without requiring material repairs.

In eighteen hundred and fifty, in consequence of the advantages realized in the foot-valves, the metal air-pump bucket and delivery-valves were removed, and India-rubber valves, with grating substituted, which have been in operation, with occasional removal, for three years, giving complete satisfaction.

The original paddles of the "Hermann's" wheels were three feet wide, being double, each single one eighteen inches wide, placed on opposite edges of the arms. In eighteen hundred and forty-nine, they were altered to single paddles, twenty-six inches wide, and subsequently farther reduced to a width of twenty-four inches.

In eighteen hundred and forty-nine, the metal foot-valves were removed, and India rubber substituted.

PERFORMANCE.

For the performance of these vessels, reference is made to Appendix, Note T. The average passages from January first, to December first, eighteen hundred and fifty-two, were, from New York to Cowes, fourteen days, seven hours, and seventeen minutes, and from Cowes to New York, thirteen days, fourteen hours, and fifty-three minutes each.

THE HAVRE LINE.

The "Franklin," constructed in eighteen hundred and forty-eight, and the "Humboldt," in eighteen hundred and fifty, originally intended to be added to the Bremen line, were placed, by Messrs. Fox & Livingston, to run between New York and Havre. These vessels were built by the same firms as those of the Bremen line, and have the following dimensions, viz:

THE FRANKLIN.

HULL.

Length on deck,	263 feet.
Breadth of beam,	41 " 10 inches.
Depth of hold,	26 "
Average draft of water,	18 "
Tonnage,	2400 tons.

ENGINES AND WHEELS.

Two side-lever engines.

Diameter of cylinders,	7 feet 9 inches.
Length of stroke,	8 "
Diameter of paddle-wheels,	32 " 2 inches.
Length of "	11 " 6 "
Depth " "	1 " 8 "
Average dip of paddles,	6 " 6 inches.
Number of " in each wheel,	28.

BOILERS.

Four iron flue-boilers, back to back.

Whole amount of fire-surface,	8,528 square feet.
" " " grate "	300 " "
Ratio of fire-surface to cubic foot of cylinder,	$11\frac{1}{2}$ to 1.

Ratio of fire-surface to grate-surface,	$28\frac{2}{5}$ to 1.
Area of first flues,	57 sq. feet.
" " second "	46 " "
" " third "	$43\frac{1}{2}$ " "
" " chimney,	50 " "
Height of " above grate,	63 feet.
Consumption of bituminous coal per hour,	6,150 pounds.
Coal per hour to a square foot of grate,	$20\frac{1}{2}$ "
Water evaporated by 1 pound of coal,	5 "
Average pressure of steam,	15 "
" number of revolutions,	13.
" cut-off,	3 feet.

THE HUMBOLDT.

HULL.

Length on deck,	292 feet.
Breadth of beam,	40 "
" " " across paddles,	72 "
Depth of hold,	27 "
Average draft of water,	$19\frac{1}{2}$ "
Tonnage,	2850 tons.

ENGINES AND WHEELS.

Two side-lever engines.

Diameter of cylinders,	95 inches.
Length of stroke,	9 feet.
Diameter of paddle-wheels,	35 "
Length of paddles,	12 "
Breadth of "	2 "
Average dip wheel,	$8\frac{1}{4}$ "
Number of paddles in each wheel,	36.

The engines of the Humboldt being the latest, as well as of the largest class of side-lever engines, embody many valuable improvements, in their arrangement, proportions, finish, and stability, and are highly creditable to the establishment, (Novelty Works,) at which they were designed and constructed.

The bed-plate is a massive casting, common to both engines; the system of supports and bracing is very complete and firm; the valve motion is simple and effective, and the various working parts conveniently arranged. For a full description of this engine, reference is made to a work now in course of publication, on American marine engines, by Frederick Mone, Mechanical Engineer, New York.

BOILERS.

Four iron flue-boilers, back to back, with double furnaces to each.

Length,	27 feet.
Height,	11 "
Breadth,	14 "
Diameter of chimney,	9 "
Whole amount of fire-surface,	11,332 square feet.
" " " grate "	608 " "
Ratio of fire-surface to cubic foot of cylinder,	$12\frac{4}{5}$ to 1.
" " " " " grate surface,	$18\frac{3}{5}$ to 1.
Area of first, second, and third flues, each,	56 sq. feet.
" " chimney,	$56\frac{1}{2}$ " "
Height of " above grate,	65 feet.
Consumption of bituminous coal per hour,	6,500 pounds.
Coal per hour to a square foot of grate,	$10\frac{1}{2}$ "
Water evaporated by 1 pound of coal,	7 "
Average pressure of steam,	15 "
" number of revolutions,	14.
" cut-off,	4 feet.

PERFORMANCE.

The performance and time of voyages of these vessels are given in Appendix, Note T. Their average passages across the Atlantic, from January first to December first, eighteen hundred and fifty-two, were, from New York to Cowes, twelve days, seventeen hours, nine minutes; and from Cowes to New York, twelve days, twenty-two hours, each.

THE ASPINWALL LINE.

This line, originally established by Messrs. Howland and Aspinwall, of New York, between New York and California, has for the past two years, by an arrangement with the Law line, performed mail service exclusively, between Panama, California, and Oregon, under Government contract.

The steamers of this line, that it is understood are included in the mail service in the contract with the Post-master General, are the "Golden Gate," the "Tennessee," the "Columbia," the "Panama," the "California," the "Oregon," and the new vessel, "John L. Stephens," (named in honor of the late celebrated American traveler,) now on her outward voyage to join the line at Panama.

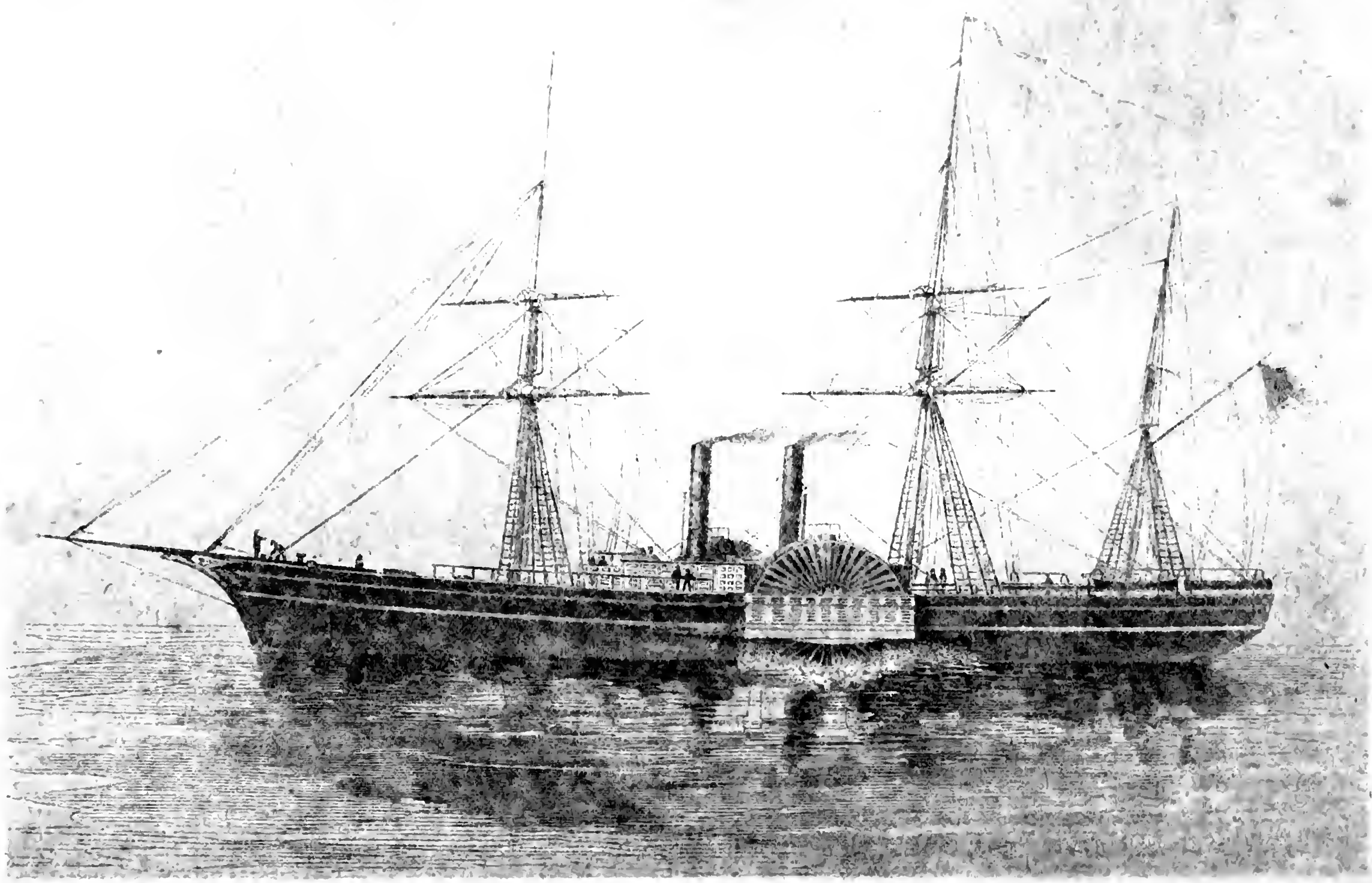
The "Golden Gate" was completed in eighteen hundred and fifty-one, and made a very successful trial trip to Annapolis, Md., where she was visited by the President of the United States, several members of the Cabinet, and many distinguished members of Congress, and other citizens, who all united in their praise and admiration of this fine steamer, so appropriately called the "Golden Gate."

The success of this vessel, being the fleetest in the Pacific, and the novel arrangement of her engines, has induced the author to illustrate them very fully by engravings and descriptions, and to give a view of her as she appears under steam, as seen in Plate Twenty-seven, engraved by Major, for this work.

The hull was built by Wm. H. Webb, and the engines by Messrs. Stillman, Allen & Co., of the Novelty Works. The principal dimensions are as follows:—

HULL.

Length on deck,	265 feet.
Breadth of beam,	40 "
Depth of hold,	22 "
Tonnage,	2,030 tons.



U. S. STEAMER GOLDEN GATE

THE ASPINWALL LINE.

This line, originally established by Messrs. Howland and Aspinwall, of New York, between New York and California, has for the past two years, by an arrangement with the Law line, performed mail service exclusively, between Panama, California, and Oregon, under Government contract.

The steamers of this line that it is understood are included in the mail service in the contract with the Post-master General are the "Golden Gate," the "Tennessee," the "Columbia," the "Panama," the "California," the "Oregon," and the new vessel, "John L. Stephens," (named in honor of the late celebrated American traveler,) now on her outward voyage to join the line at Panama.

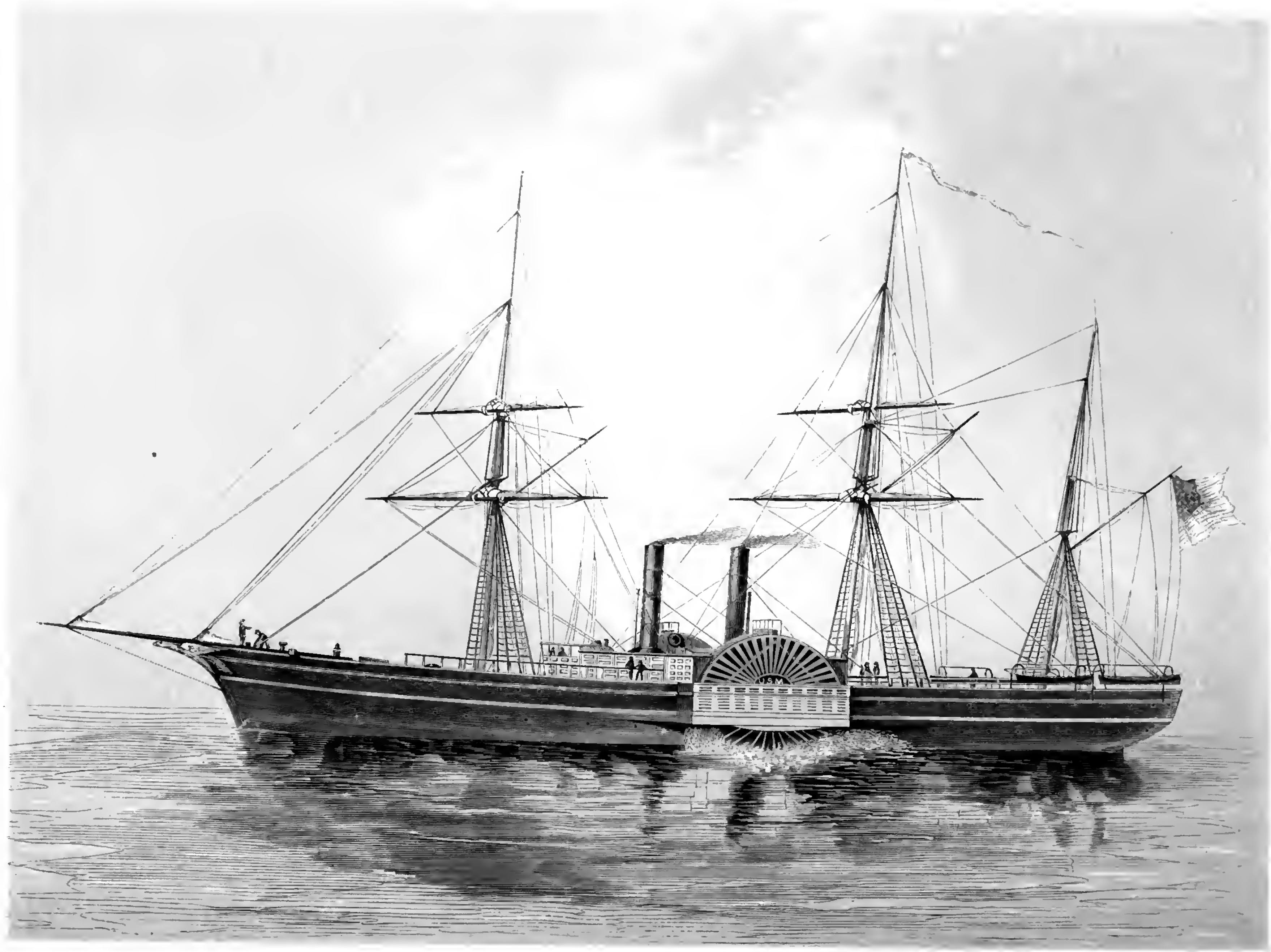
The "Golden Gate" was completed in eighteen hundred and fifty-one, and made a very successful trial trip to Annapolis, Md., where she was visited by the President of the United States, several members of the Cabinet and many distinguished members of Congress, and other citizens, who all united in their praise and admiration of this fine steamer, so appropriately called the "Golden Gate."

[illegible] vessel, being the fastest in the Pacific, and the novel arrangement of [illegible] induced the author to illustrate them very fully by engravings and descriptions, [illegible] as she appears under steam, as seen in Plate Twenty-seven, engraved [illegible]

[illegible] Wm. H. Webb, and the engines by Messrs. Stillman, Allen & Co., [illegible] the principal dimensions are as follows:—

HULL.

Length on deck	265 feet.
Breadth of beam	40 "
Depth of hold	22 "
Tonnage	2,030 tons.



Engraved by R. Major, N. Y.

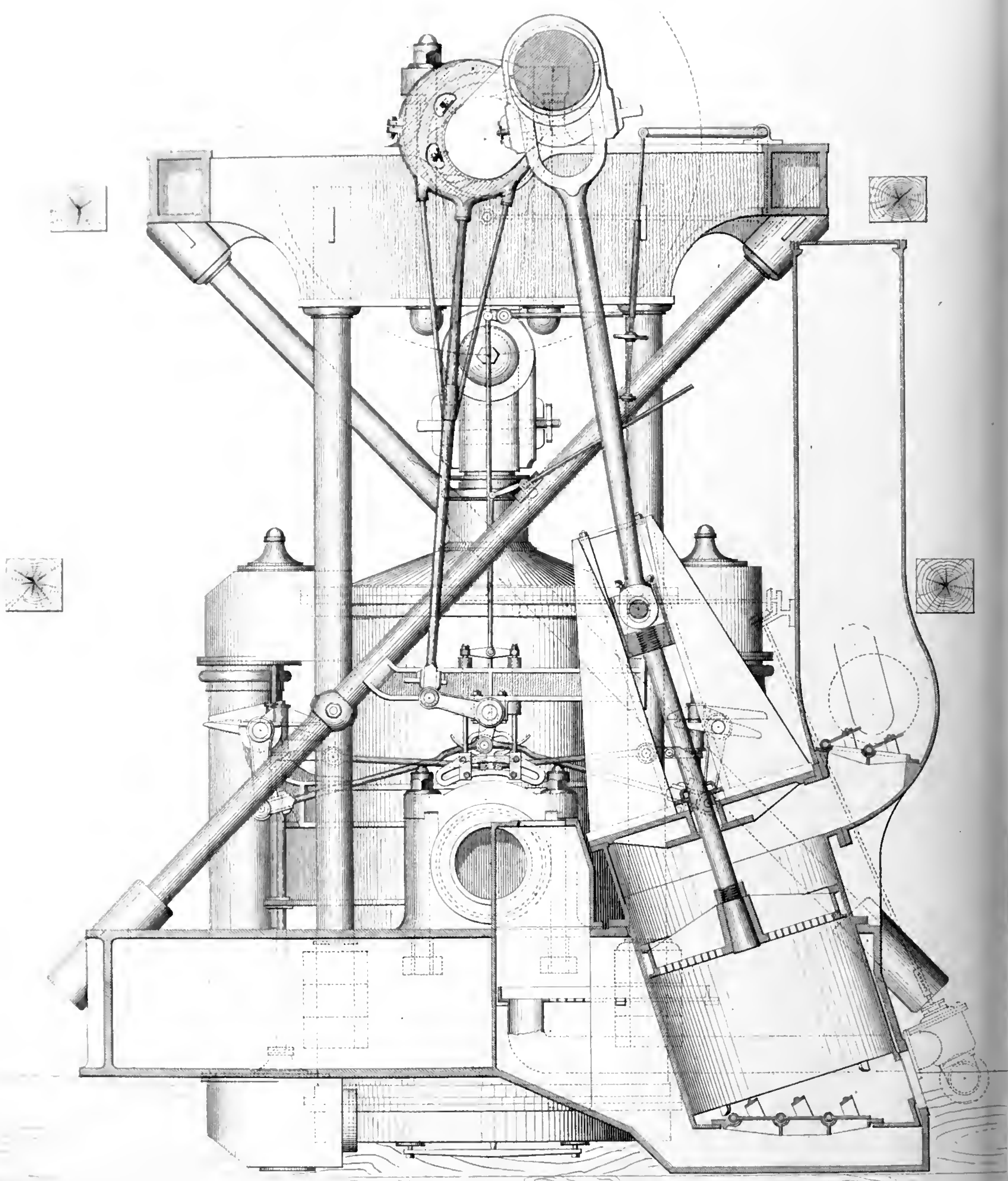
U. S. STEAMER GOLDEN GATE.

Engraved for "Stuart's Naval and Mail Steamers of U. S."

ENGINES OF T

G

SIDE ELEVATION & SECTION *thro' air pump*



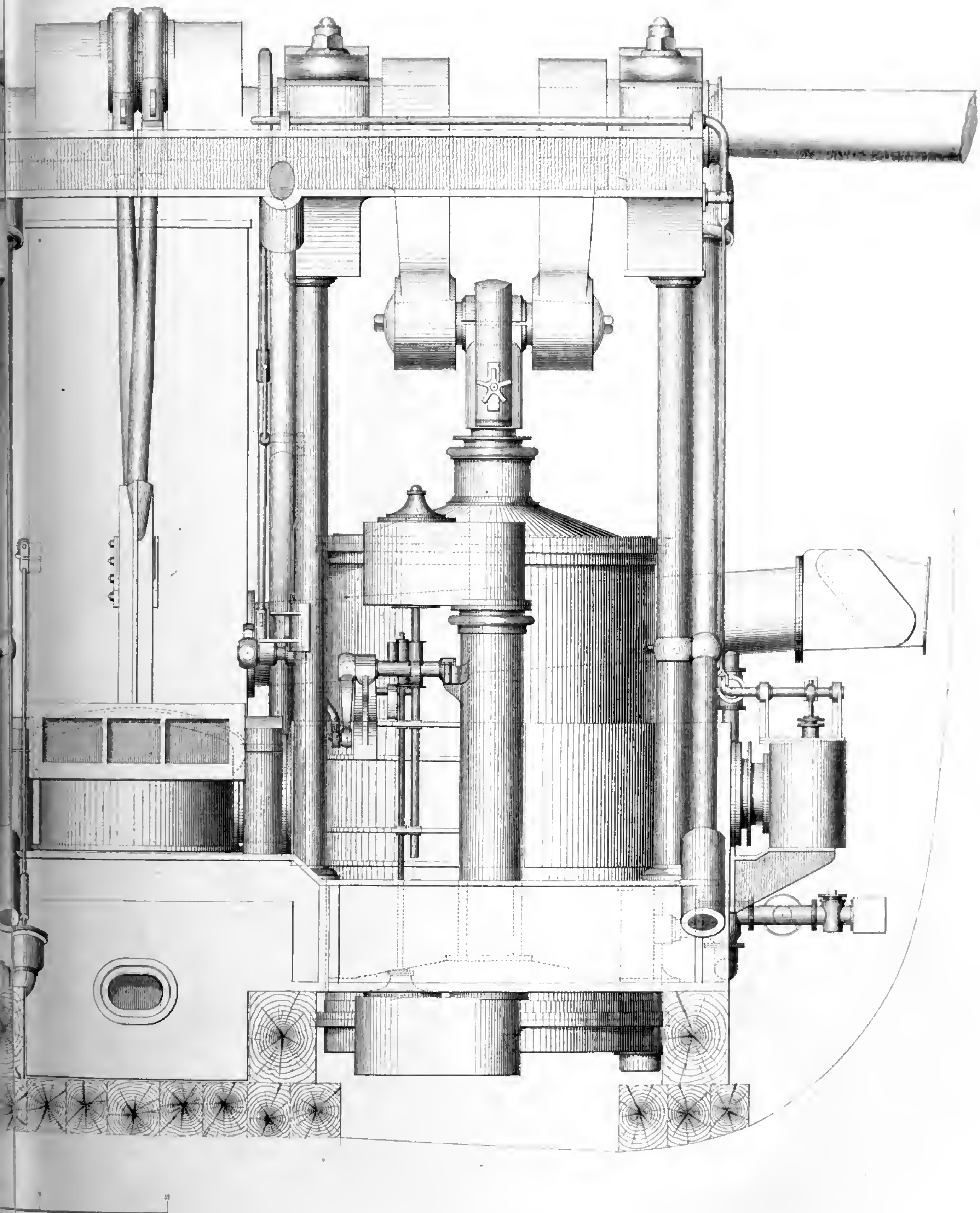
F. ... sc.

Engraved for

[M]AIL STEAMER

[PL]ATE

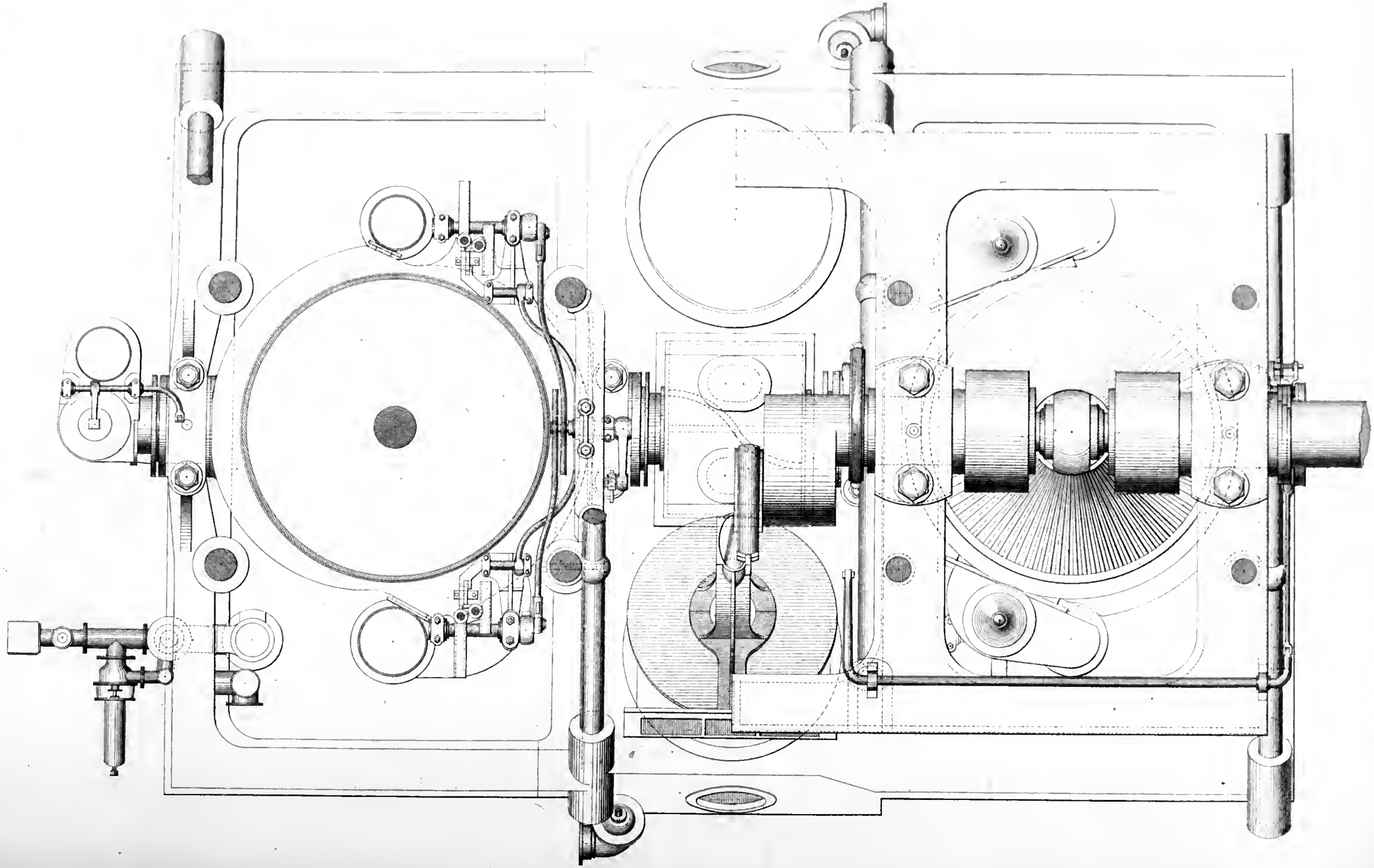
FRONT ELEVATION



F. Mone dr

[Na]val Steamers U. S."

PLAN OF THE GOLDEN GATE'S ENGINES



Scale of feet

Edw Decke engr.

P. Mens dr

Engraved for Stuarts "Naval & Mail Steamers U. S."

THE ASPIN...

ENGI...

There are two oscillating engines shown ... and front elevation, with a section through the ...

The bed-plate is cast in three parts, one part ... air-pumps. The two main pillow-blocks of each engine ... in the centre of the engines forming one rigid structure ... supported upon two wrought iron columns with one pair of diagonal ...

The most important feature of these engines ... oscillating engine, of the American "balance-valve" ... ment, the motion being simply and effectively ... air-pump valves are also of improved construction ... hinges, combining smoothness of motion with durability.

Diameter of cylinders, . . .

Length of stroke, ...

Average number of revolutions, . .

" pressure, ...

" cut-off, ...

BOILERS.

There are four iron tubular boilers, (with tubes ...) two aft and two forward of the engines, with ... the fronts of the boilers.

Whole amount of fire-surface, . .

" " tube " .

" " grate " .

Calorimeter of tubes, ...

" chimneys, above grate, ...

Height of " . . .

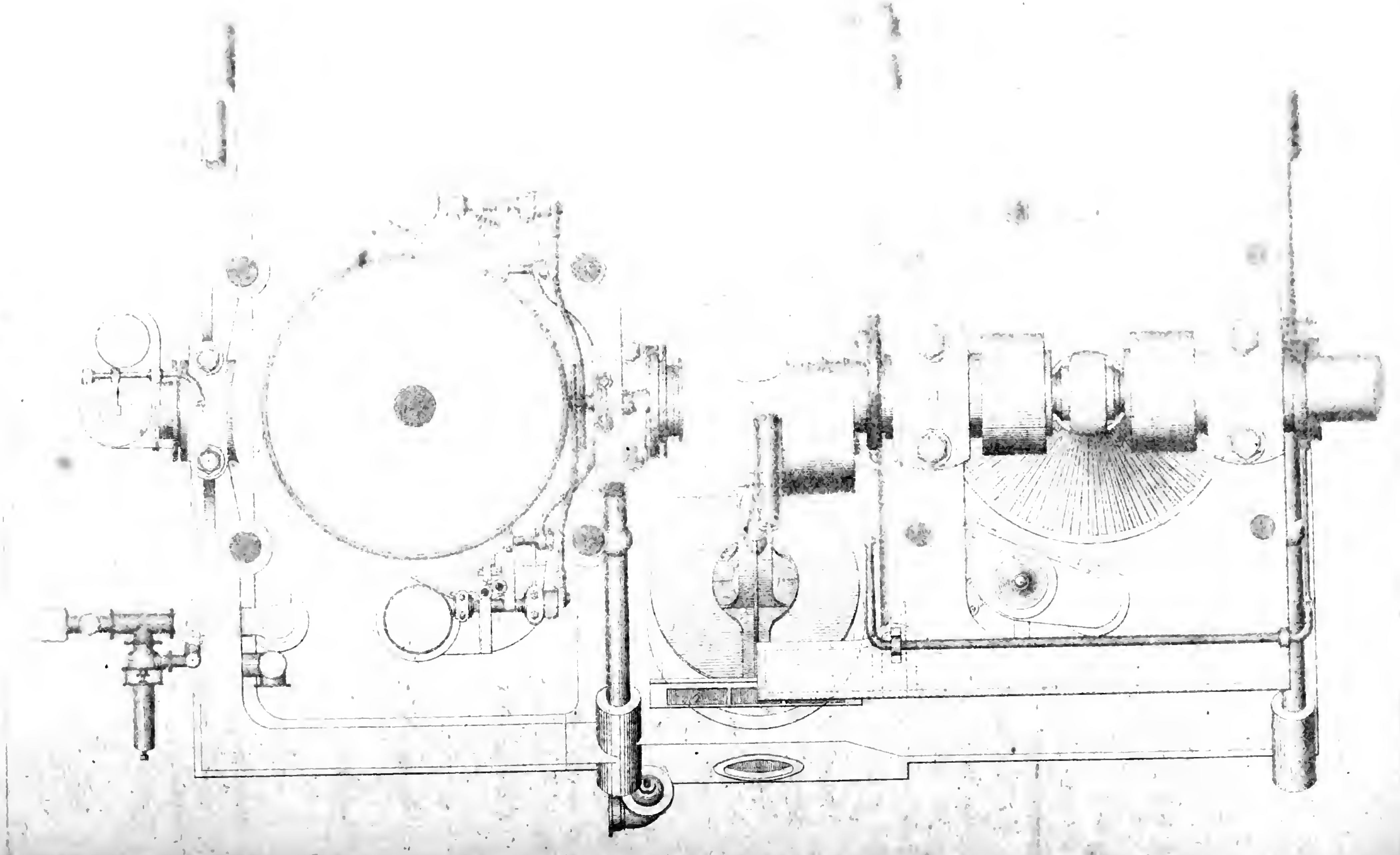
PADDLE WHEEL...

Diameter, ...

Length of paddles, ...

Depth " . . . .

Number " (in each wheel,) . .



Scale of feet

Engraved for Stuarts' Naval & Mail Steamers U. S.

ENGINES.

There are two oscillating engines shown in Plates Twenty-eight and Twenty-nine, in side and front elevation, with a section through the air-pump, and a plan view.

The bed-plate is cast in three parts, one part forming both condensers, and receiving both air-pumps. The two main pillow-blocks of each engine are cast together with projections, united in the centre of the engines forming one rigid structure of the four pillow-blocks, each being supported upon two wrought iron columns with one pair of diagonal braces to the bed-plate.

The most important feature of these engines is the introduction, for the first time, in an oscillating engine, of the American "balance-valve" in place of the ordinary slide-valve arrangement, the motion being simply and effectively arranged, with "Allen's" adjustable cut-off. The air-pump valves are also of improved construction, being made of India-rubber, with metallic hinges, combining smoothness of motion with durability.

Diameter of cylinders, ...	85 inches.
Length of stroke, ...	9 feet.
Average number of revolutions, ...	15¼.
" pressure, ...	12 pounds.
" cut-off, ...	3 feet.

BOILERS.

There are four iron tubular boilers, (with tubes of three inches internal diameter,) placed two aft and two forward of the engines, with two smoke-pipes, having the fire-rooms between the fronts of the boilers.

Whole amount of fire-surface, ...	12,052 square feet.
" " tube "	8,396 " "
" " grate "	367 " "
Calorimeter of tubes, ...	61¾ " "
" chimneys, above grate, ...	57 " "
Height of "	60 feet.

PADDLE WHEELS.

Diameter, ...	31 feet.
Length of paddles, ...	12 "
Depth "	2 "
Number " (in each wheel,)	30.

PERFORMANCE.

It will be seen by reference to the steam log of this ship, given in Note S, of the Appendix, that she made the passage, in the months of January and February of last year, from San Francisco to Panama, in twelve days and two hours running time, and returned to San Francisco, in thirteen days, having most of the way a strong breeze ahead. On the first voyage, the maximum performance for one day, was two hundred and ninety knots, or about twelve and a-half knots per hour, using seventy tons of coal in twenty-four hours, or about five thousand eight hundred and thirty pounds per hour, of which thirty-eight per cent. was thrown out as ashes, the coal being a poor quality of bituminous. Maximum revolutions, fourteen and three-quarters per minute; vacuum, twenty-five inches; draft of water, thirteen feet six inches, dip of wheel, five feet. On the return trip, her maximum speed was eleven and a-half knots per hour; revolutions, fourteen and one-third, per minute; draft of water, thirteen feet, and dip of wheel, four and a-half feet; consumption of coal, sixty tons per day, with twenty-seven per cent. of ashes. The average speed of this steamer is about eleven knots per hour.

JOHN L. STEPHENS.

This steamer was built by Messrs. Smith & Dimon, New York, the engines being constructed by Messrs. Stillman, Allen & Co. She was completed so as to make a trial trip on the seventh day of December, eighteen hundred and fifty-two, and is now on her way to the Pacific. Her principal dimensions are as follows:—

HULL.

Length on deck,	280 feet.
" of keel,	270 "
Breadth of beam,	40 "
Depth of hold,	26 "
Average draft,	12 "
Deep load,	15 "
Tonnage,	2,450 tons.

ENGINES.

There is one oscillating engine, supported on wooden framing. The valves, like those of the "Golden Gate," are of the "balance-puppet" variety; the cut-off being "Allen's" patent arrangement.

THE ASPINWALL LINE.

Diameter of cylinder,	85 inches.
Stroke of piston,	9 feet.
Thickness of cylinder,	$1\frac{3}{8}$ to $1\frac{3}{4}$ inch.
Diameter of trunnions, internal,	19 inches.
" " outside,	28 "
" piston-rod,	9 "
" air-pump,	44 "
Stroke "	63 "
Diameter of shaft-journals,	18 "

PADDLE WHEELS.

Diameter,	32 feet.
Breadth,	10 "
" of paddles,	20 "
Number " (double,)	16.
" arms,	16.

BOILERS.

There are two "drop return-flue" iron boilers, placed fore and aft the engine.

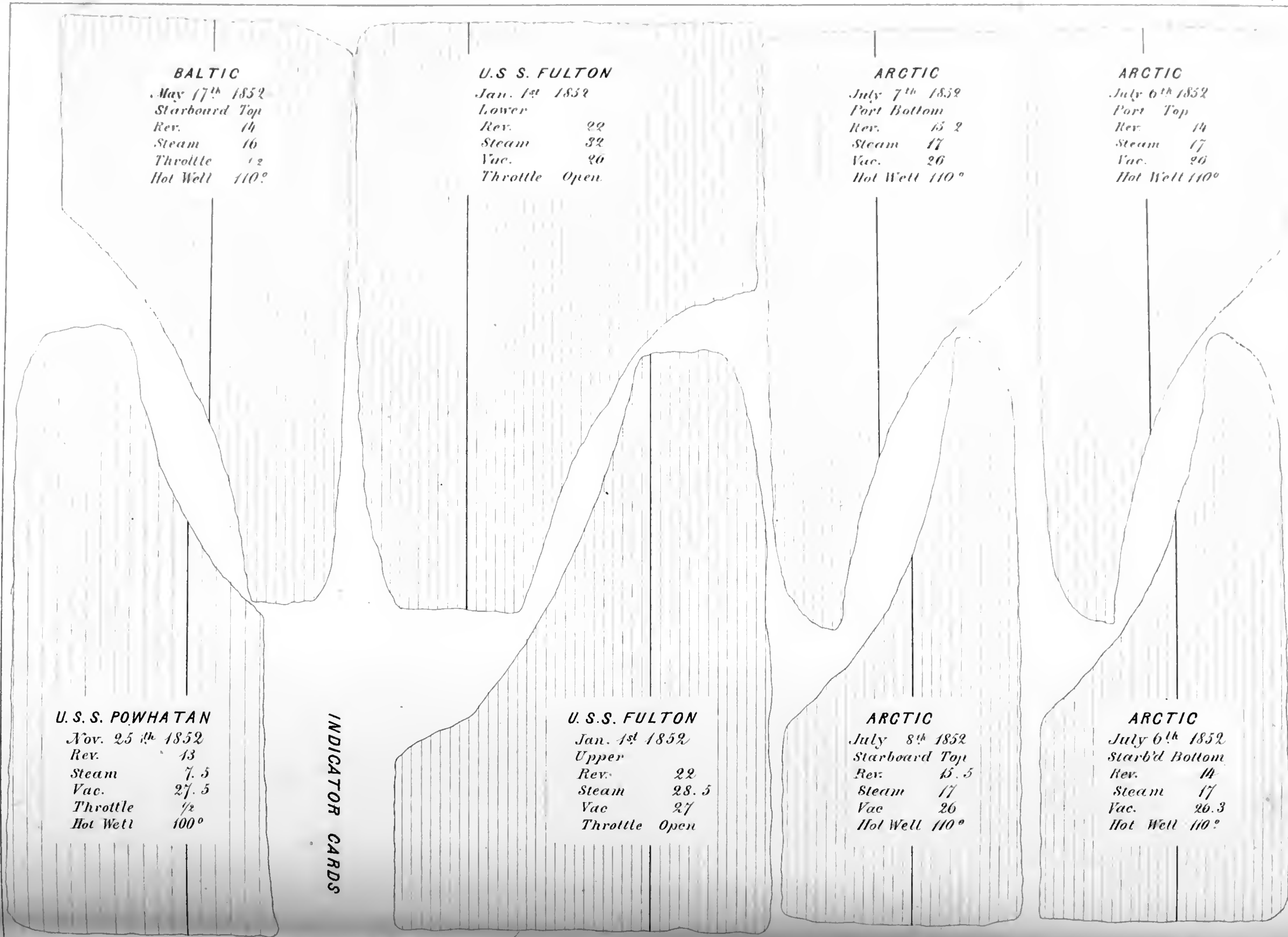
Length,	23 feet.
Diameter of shell,	14 "
Thickness "	$\frac{3}{8}$ inch.
Number of furnaces, (in each)	3.
Length of grate-bars,	7 feet.
Heating-surface,	6,109 square feet.
Grate "	168 " "
Number of 13-inch flues,	54.
Diameter of smoke-pipes, (two,)	5 feet.
Height above grates,	55 "

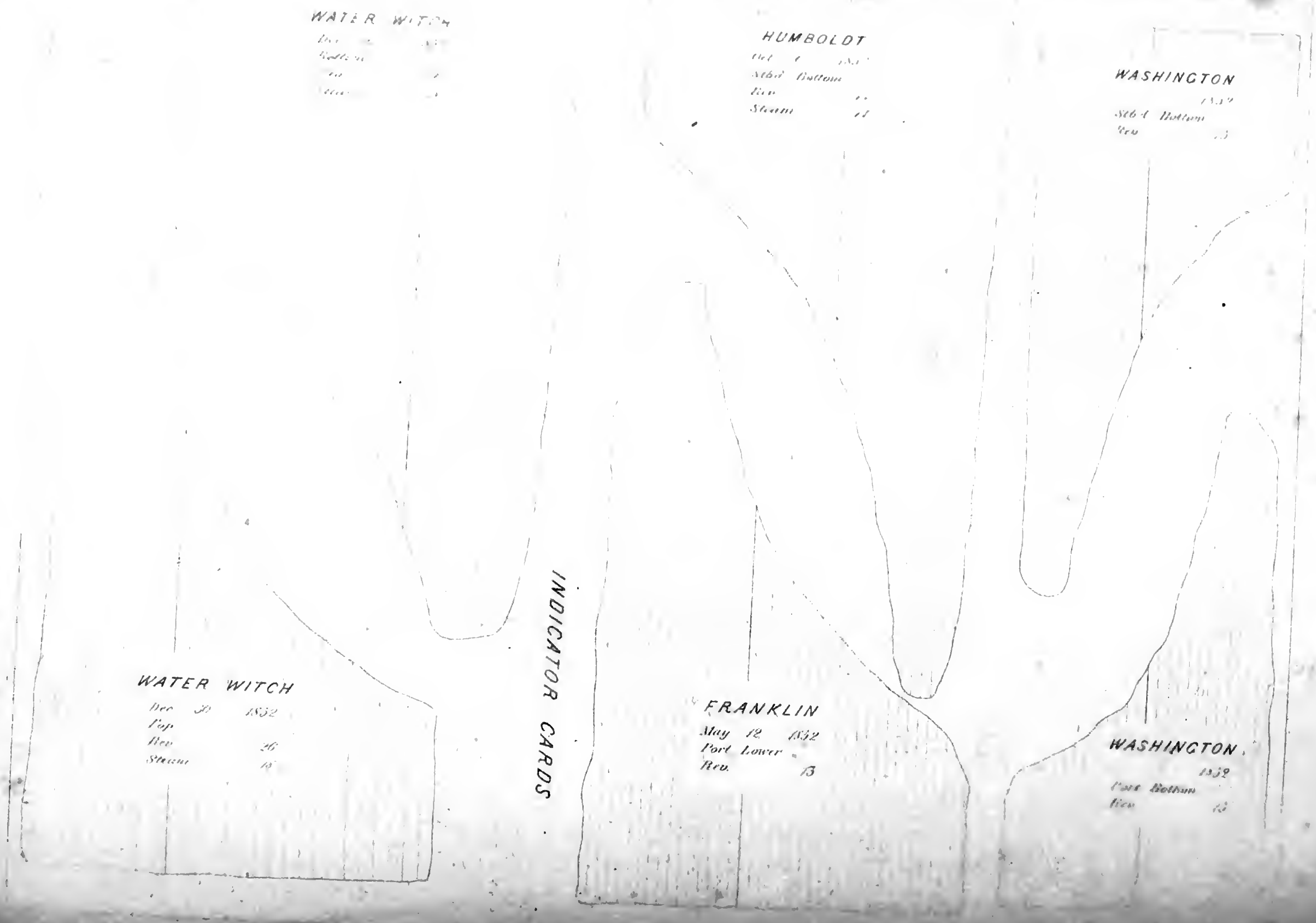
The boilers are supplied with fresh water by "Pirsson's" patent double vacuum condenser, (described in another part of this work,) this being the largest condenser of the kind yet constructed, and calculated to condense eighteen thousand cubic feet of steam at 202° F., per minute, maintaining a vacuum of twenty-seven and a-half inches, and delivering the fresh water feed at 104° F.

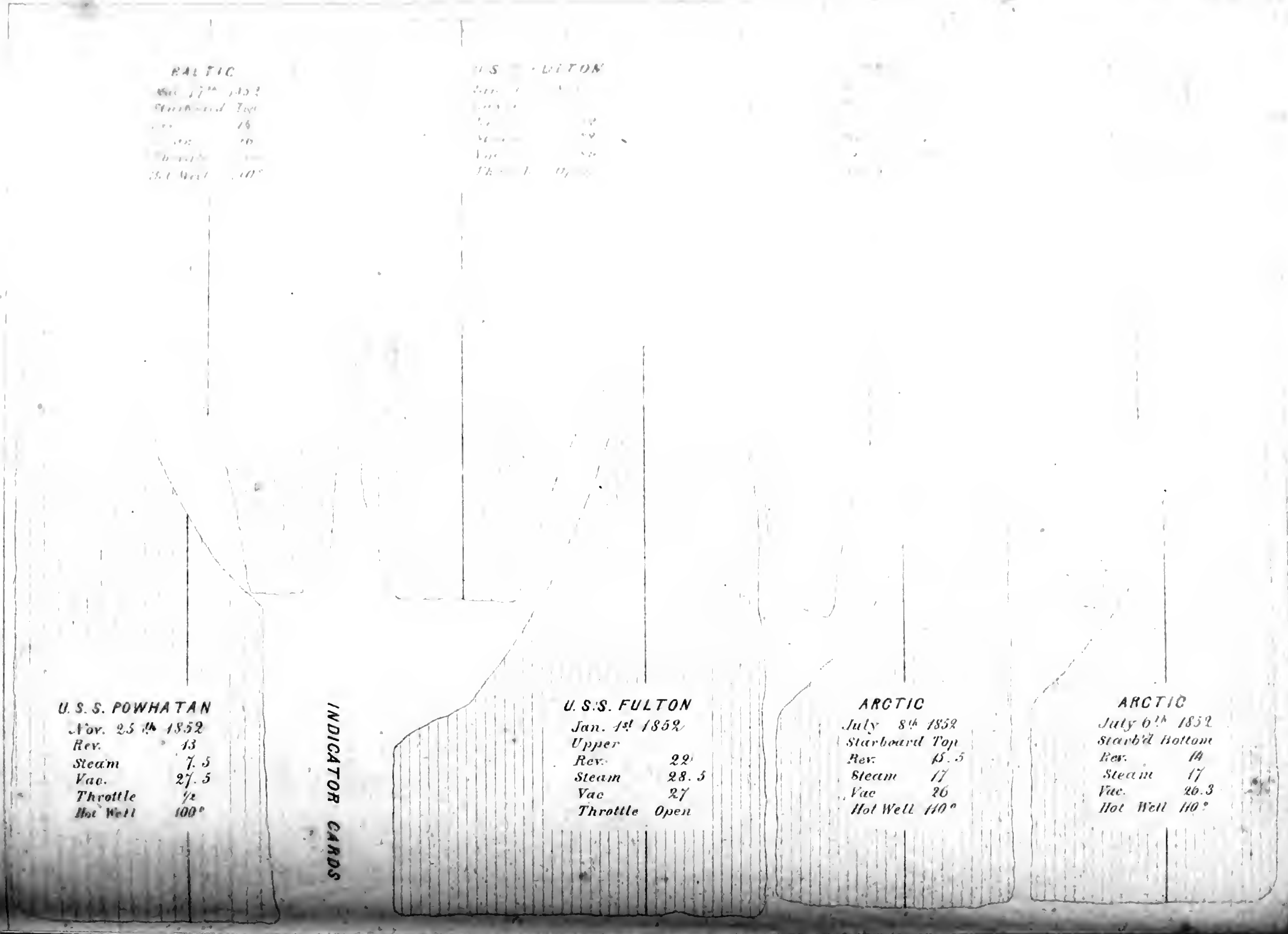
On the trial trip the maximum capability of the condenser was not tested. Her pressure of steam varied from two to twenty pounds, averaging from twelve to fifteen. The cut-off was varied from one-third to one-half, and two-thirds the stroke. The vacuum obtained was steadily twenty-six and a-half inches, and the feed-water returned to the boilers at 129° F. The proportion of condensing-surface to that of heating-surface is as one to three, the quantity of condensing water required being the same as in the ordinary engine.

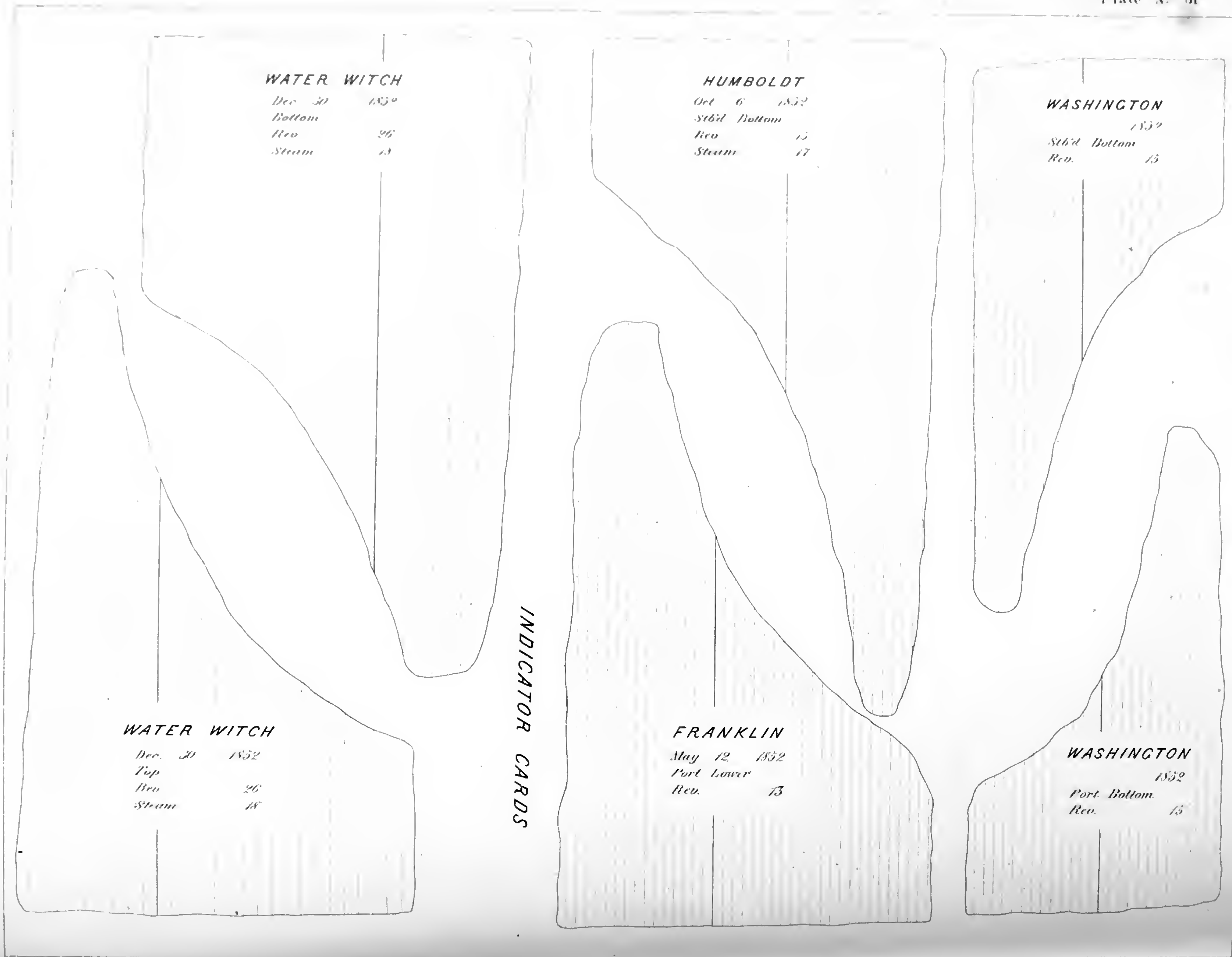
The remaining vessels of this line having been for some time employed in the Pacific, and not possessing any peculiar style of engine or arrangement, their general dimensions have been compiled in the tabular form herewith given, which combines such information as is deemed of interest, and all that could be obtained in time for this edition.

	COLUMBIA.	TENNESSEE.	PANAMA.	CALIFORNIA.	OREGON.
Length on deck,	220 feet.	212 feet.	200 feet.	200 feet.	200 feet.
" keel,	219 "				
Breadth of beam,	29 "	35 "	32 "	33 "	34 "
Depth of hold,	13 "	22 "	21 "	20 "	20 "
Average draft,	6 "	12 "			
Deep load draft,	8½ "	13 "			
Tonnage,			1087 tons.	1050 tons.	1100 tons.
Kind of engines,	Side lever.	Side lever.	Side lever.	Side lever.	Side lever.
Diameter of cylinders,	57 inches.	75 inches.	70 inches.	70 inches.	70 inches.
Stroke of piston,	5 feet.	8 feet.	8 feet.	8 feet.	8 feet.
Diameter of paddle wheels,	22 "	$31\frac{11}{12}$ "	26 "	26 "	26 "
Breadth of " "	8½ "	8 "	8 ft. 6 inches.	9 "	9 "
" paddles,	20 inches.	30 inches.	30 "	30 inches.	30 inches.
Number "	24 "		22 "	24 "	24 "
" arms,	12 "	24 "	22 "	24 "	24 "
" boilers,	2	2	2	2	2
Kind "	Return flue,	Return flue.	Return flue,	Return flue.	Return flue.
Fire-surface,	2600 sq. feet.	3178 sq. feet.	3656 sq. feet.		
Grate "	103 "	126 "	120 "		
Height of smoke-pipe, above grates,		54 feet.	64 feet.		
Diameter of " "	54 inches.	60 inches.	66 inches.		


BALTIC
May 17th 1852
Starboard Top
Rev. 14
Steam 16
Throttle 1/2
Hot Well 110°
U.S. S. FULTON
Jan. 1st 1852
Lower
Rev. 22
Steam 32
Vac. 26
Throttle Open
ARCTIC
July 7th 1852
Port Bottom
Rev. 15.2
Steam 17
Vac. 26
Hot Well 110°
ARCTIC
July 6th 1852
Port Top
Rev. 14
Steam 17
Vac. 26
Hot Well 110°
U.S.S. POWHATAN
Nov. 25th 1852
Rev. 13
Steam 7.5
Vac. 27.5
Throttle 1/2
Hot Well 100°
INDICATOR CARDS
U.S.S. FULTON
Jan. 1st 1852
Upper
Rev. 22
Steam 28.5
Vac 27
Throttle Open
ARCTIC
July 8th 1852
Starboard Top
Rev. 15.5
Steam 17
Vac 26
Hot Well 110°
ARCTIC
July 6th 1852
Starb'd Bottom
Rev. 14
Steam 17
Vac. 26.3
Hot Well 110°


WATER WITCH
HUMBOLDT
Std. Bottom
Rev.
Steam
WASHINGTON
Std. Bottom
Rev.
INDICATOR CARDS
WATER WITCH
Dec. 30 1852
Top
Rev. 26
Steam 15
FRANKLIN
May 12 1852
Port Lower
Rev. 13
WASHINGTON
1852
Port Bottom
Rev. 13


U. S. S. POWHATAN
Nov. 25 th 1852
Rev. 13
Steam 7.5
Vac. 27.5
Throttle ½
Hot Well 100°
INDICATOR CARDS
U. S. S. FULTON
Jan. 1st 1852
Upper
Rev. 22
Steam 28.5
Vac 27
Throttle Open
ARCTIC
July 8th 1852
Starboard Top
Rev. 15.5
Steam 17
Vac 26
Hot Well 110°
ARCTIC
July 6th 1852
Starb'd Bottom
Rev. 14
Steam 17
Vac. 26.3
Hot Well 110°


WATER WITCH
Dec 30 1852
Bottom
Rev 26
Steam 13
HUMBOLDT
Oct 6 1852
Stb'd Bottom
Rev 13
Steam 17
WASHINGTON
1852
Stb'd Bottom
Rev. 15
INDICATOR CARDS
WATER WITCH
Dec. 30 1852
Top
Rev 26
Steam 18
FRANKLIN
May 12 1852
Port Lower
Rev. 13
WASHINGTON
1852
Port Bottom
Rev. 15

CONCLUSION.

The reader of the foregoing history will have noticed, that of the thirty-one steamers, of all classes, which have been constructed or purchased by the Navy Department, since the formation of our Government, there are now but fourteen remaining in the service, including one used for a receiving ship.

Of this small number, there are but two of the first class, the "Susquehanna" and the "Powhatan;" five of the second class, the "Mississippi," "Saranac," "San Jacinto," "Princeton," and "Alleghany;" three of the third class, the "Fulton," "Massachusetts," and "Michigan;" and of the fourth class, the "Water Witch," "John Hancock," and "Vixen;" all but three of the entire number having been either completed, rebuilt, or thoroughly repaired, since the commencement of eighteen hundred and fifty.

Comparing this force with that of other nations, we find it less than that of Spain, Holland, Prussia, or Russia; about one-eighth that of France, and one-twelfth that of England: and yet we are, commercially, the second maritime power of the world, with a coast extending for thousands of miles on two oceans; and bear such relation to foreign nations, on this account, as have for a number of years past involved the constant possibility, and oftentimes, the serious probability, of hostile collision.

In view of our liability to attack, on our coast and our commerce, and the vast interests which demand protection and surveillance, even in times of peace, we have in this fact, a remarkable instance of the reliance which is placed by our Government on the latent and undeveloped sources of power in our country: a policy which is certainly open to serious question, vast as these resources undoubtedly are.

With the regrets, however, which must be felt in consequence of the meagreness in number of our naval steamers, there is much satisfaction in knowing, that though insignificant in this respect, in every other quality they are types of wonderful progress and capability, and, for their class, are, in many essential particulars, superior to those of any other nation. It is stated in the second edition of Murray's "Marine Engine," recently issued in England, that the "Terrible," "Sidon," and "Odin," are "probably the *fastest* war steamers, properly so called, in the Royal Navy." Of these, the "Terrible," with two hundred and twenty-six feet length, forty-two feet beam, twenty-seven feet hold, and seventeen and a-half feet load-draft, and with two engines of eight feet stroke, and seventy-two inches diameter of cylinder, each, attained a speed of ten knots per hour, on trial, with sea-stores and guns on board: the "Sidon," with two hundred and ten and three-quarter feet length, thirty-six and a-half feet beam, and twenty-seven feet hold, and with two engines of six and one-third feet stroke, and eighty-six and a-half inches diameter, has a speed, on trial, of ten knots, while the speed of the "Odin" is superior to either, being eleven and one-quarter knots, also on trial; the average sea-speed of the three being not to exceed nine knots.

A reference to the detailed performance of our war steamers, as given in this work, will show, very conclusively, that in point of speed, they excel the best steamers of a navy which has spent millions in experiments, and exerted the most strenuous efforts to attain perfection, while it is also true, that in economy, efficiency, beauty of construction, and convenience of arrangement, for purposes of war, their superiority is not less decisive.

Notwithstanding the opinions which some of our citizens may entertain to the contrary, there is no doubt, that in the present steam marine of the United States exists the nucleus of the finest naval force which the world has yet to see. What it needs, and what it only needs, is encouragement and development. It will stand the test of severe, impartial criticism, as it is: it will surprise the most sanguine, as it can be, and will be, with proper care, and untrammeled progress.

What is true of our naval steamers, is also true with regard to our mail steamers. While they have in numbers a corresponding ratio with those of England, they have, in all their important qualities of architectural and mechanical construction, a similar superiority; a fact which is a source of national pride and gratification, as well as an honor to the private enterprise and skill developed in their construction. It is also worthy of remark, that, like the naval steamers, they are by no means superior copies of English hulls and engines, but in most instances, possess features essentially original.

Of their number, but seven have been inspected and *accepted* by our Government as convertible into war steamers, according to the law of Congress, as will appear from the following letter from the Secretary of the Navy, of December ninth, eighteen hundred and fifty-two, to Chief Engineer William Sewell, U. S. N., recently appointed Inspector of the Mail Steamers, under the act of Congress of August last:—

Sir:

In reply to your letter of yesterday's date, requesting to be informed of the names of the ocean steamers constructed under contract with the United States, you are informed that the steamships accepted under the contract authorized by the act of March third, eighteen hundred and forty-seven, requiring that the steamships to be employed in the transportation of the United States Mail, "shall be so constructed as to render them convertible, at the least possible cost, into war steamers of the first class," are those of the New York and Liverpool line, viz:—The "Arctic," "Baltic," "Pacific," and "Atlantic," and those of the New York and New Orleans and Chagres line, viz:—The "Ohio," "Georgia," and "Illinois."

I am, very respectfully, your obedient servant,

(Signed) JOHN P. KENNEDY.

The remainder of the number noticed in this work, are conveying the mails under contracts with the Post-office Department, which stipulate that the Government have the right to take them for war purposes, at their valuation, whenever it shall be deemed expedient to do so. In addition to these, there are also, a large fleet of first class mail and other steamers on the Atlantic and Pacific coasts, not included in the contracts referred to.

In conclusion, the author would add, that he has endeavored to furnish as concise a history of our naval steam marine, as the materials within his reach, and his official duties, would allow; and trusts that the past triumphs of national enterprise and skill recorded in this volume, will gratify his countrymen, and encourage them to further exertions, for the future.

APPENDIX.

APPENDIX.

NOTE A.

STEAM FRIGATE.

Report of HENRY RUTGERS, SAMUEL L. MITCHEL, *and* THOMAS MORRIS, *the Commissioners superintending the construction of a steam vessel of war, to the Secretary of the Navy.*

NEW YORK, *December 28th*, 1815.

SIR:

The war which was terminated by the treaty of Ghent, afforded, during its short continuance, a glorious display of the valor of the United States by land and by sea—it made them much better known to foreign nations, and, what is of much greater importance, it contributed to make them better acquainted with themselves—it excited new enterprises—it educed latent talents—it stimulated to exertions unknown to our people before.

A long extent of coast was exposed to an enemy, powerful above every other on the ocean. His commanders threatened to lay waste our country with fire and sword, and, actually, in various instances, carried their menaces into execution. It became necessary, for our defense, to resist, by every practicable method, such a formidable foe.

It was conceived, by a most ingenious and enterprising citizen, that the power of Steam could be employed to propel a floating battery, carrying heavy guns, to the destruction of any hostile force that should hover on the shores, or enter the ports of our Atlantic frontier. The perfect and admirable success of his project for moving boats containing travelers and baggage by the same elastic agent, opened the way to its employment for carrying warriors and the apparatus for fighting.

The plan was submitted to the consideration of the executive of an enlightened government. Congress, influenced by the most liberal and patriotic spirit, appropriated money for the experiment, and the Navy Department, then conducted by the honorable William Jones, appointed commissioners to superintend the construction of a convenient vessel under the direction of ROBERT FULTON, the inventor, as engineer, and Messrs. Adam and Noah Brown, as naval constructors. The enterprise, from its commencement, and during a considerable part of its preparatory operations, was aided by the zealous co-operation of Major General Dearborn, then holding his head-quarters at the city of New York, as the officer commanding the third military district. The loss of his valuable counsel in conducting a work which he had maturely considered, and which he strongly recommended, was the consequence of his removal to another section of the Union, where his professional talents were specially required.

The keels of this steam-frigate were laid on the twentieth day of June, eighteen hundred and fourteen. The strictest blockade the enemy could enforce interrupted the coasting trade, and greatly enhanced the price of timber. The vigilance with which he guarded our coast against intercourse with foreign nations, rendered difficult the importation of copper and iron. The same impediment attended the supplies of coal heretofore brought to New York from Richmond and Liverpool. Lead, in like manner, was procured under additional disadvantages. These attempts of the enemy to frustrate the design, were vain and impotent. All the obstacles were surmounted. Scarcity of the necessary woods and metals were overcome by strenuous exertions; and all the blockading squadron could achieve, was not a disappointment in the undertaking, but merely an increase of the expense.

So, in respect to tradesmen and laborers, there was an extraordinary difficulty. Shipwrights had repaired to the lakes, for repelling the enemy, in such numbers, that, comparatively speaking, few were left on the seaboard. A large portion of the men who had been engaged in daily work, had enlisted as soldiers, and had marched under the banners of the nation to the defense of its rights—yet amidst the scarcity of hands, a sufficient number were procured for the purpose which the Commissioners had in charge. An increase of wages was the chief impediment, and this they were enabled practically to overcome.

By the exemplary combination of diligence and skill, on the part of the Engineer and Constructors, the business was so accelerated, that the vessel was launched on the twenty-ninth day of October, amidst the plaudits of an unusual number of citizens.

Measures were immediately taken to complete her equipment; the boiler, the engine, and the machinery were put on board with all possible expedition. Their weight and size far surpassed any thing that had been witnessed before among us.

The stores of artillery in New York not furnishing the number and kind of cannon which she was destined to carry, it became necessary to transport guns from Philadelphia. A prize, taken from the enemy, put some fit and excellent pieces at the disposal of the Navy Department. To avoid the danger of capture by the enemy's cruisers, these were carted over the miry roads of New Jersey. Twenty heavy cannon were thus conveyed by the strength of horses. Carriages of the most approved model were constructed, and every thing done to bring her into prompt action, as an efficient instrument of war.

About this time, an officer, pre-eminent for bravery and discipline, was commissioned by the government to her command. Prior to this event, it had been intended by the Commissioners to finish her conformably to the plan originally submitted to the Executive. She is a structure resting upon two boats and keels, separated from end to end by a canal fifteen feet wide, and sixty-six long. One boat contained the caldrons of copper to prepare her steam. The vast cylinder of iron, with its piston, levers, and wheels, occupied a part of its fellow; the great water-wheel revolved in the space between them; the main or gun-deck supported her armament, and was protected by a bulwark four feet ten inches thick, of solid timber. This was pierced by thirty port-holes, to enable as many thirty-two pounders to fire red hot balls; her upper or spar deck was plain, and she was to be propelled by her enginery alone.

It was the opinion of Captain Porter and Mr. Fulton, that the upper deck ought to be surrounded with a bulwark and stanchions—that two stout masts should be erected to support latteen sails—that there should be bowsprits for jibs, and that she should be rigged in a corresponding style. Under authorities so great, and with the expectation of being able to raise the blockade of New London, by destroying, taking, or routing the enemy's ships, all these additions were adopted and incorporated with the vessel.

It must here be observed, that during the exhaustion of the treasury, and the temporary depression of public credit, the Commissioners were exceedingly embarrassed—their payments were made in treasury notes, which they were positively instructed to negotiate at par. On several occasions even these were so long withheld, that the persons who had advanced materials and labor were importunate for payment, and silently discontented. To a certain extent, the Commissioners pledged their private credit. Notwithstanding all this, the men, at one time, actually broke off. The work was retarded, and her completion unavoidably deferred, to the great disappointment of the Commissioners, until winter rendered it impossible for her to act.

Under all this pressure, they, nevertheless, persevered in the important object confided to them. But their exertions were further retarded by the premature and unexpected death of the Engineer. The world was deprived of his invaluable labors before he had completed this favorite undertaking. They will not inquire, wherefore, in the dispensations of Divine Providence, he was not permitted to realize his grand conception. *His discoveries, however, survive for the benefit of mankind,* and will extend to unborn generations.

At length all matters were ready for a trial of the machinery to urge such a bulky vessel through the water. This essay was made on the first day of June, eighteen hundred and fifteen. She proved herself capable of opposing the wind, and of stemming the tide, of crossing currents, and of being steered among vessels riding at anchor, though the weather was boisterous and the water rough. Her performance demonstrated that the project was successful—no doubt remained that a floating battery, composed of heavy artillery, could be moved by steam. The Commissioners returned from the exercise of the day, satisfied that the vessel would answer the intended purpose, and consoled themselves that their care had been bestowed upon a worthy object.

But it was discovered, that various alterations were necessary. Guided by the light of experience, they caused some errors to be corrected, and some defects to be supplied. She was prepared for a second voyage with all practicable speed.

On the fourth of July she was again put in action. She performed a trip to the ocean, eastward of Sandy Hook, and back again, a distance of fifty-three miles, in eight hours and twenty minutes. A part of this time she had the tide against her, and had no assistance whatever from sails. Of the gentlemen who formed the company invited to witness the experiment, not one entertained a doubt of her fitness for the intended purpose.

Additional expedients were, notwithstanding, necessary to be sought for quickening and directing her motion. These were devised and executed with all possible care.

Suitable arrangements having been made, a third trial of her powers was attempted on the eleventh day of September, with the weight of twenty-six of her long and ponderous guns, and a considerable quantity of ammunition and stores on board; her draft of water was short of eleven feet. She changed her course by inverting the motion of the wheel, without the necessity of putting about. She fired salutes as she passed the forts, and she overcame the resistance of the wind and tide in her progress down the bay. She performed beautiful manœuvres around the United States' Frigate JAVA, then at anchor near the light-house. She moved with remarkable celerity, and she was perfectly obedient to her double helm. It was observed that the explosion of powder produced very little concussion. The machinery was not affected by it in the smallest degree. Her progress, during the firing, was steady and uninterrupted. On the most accurate calculations, derived from heaving the log, her average velocity was five and a-half miles per hour. Notwithstanding the resistance of currents, she was found to make headway at the rate of two miles an hour against the ebb of the East River, running three and a-half knots. The day's exercise was satisfactory to the respectable company who attended, beyond their utmost expectations. It was universally agreed that we now possessed a new auxiliary against every maratime invader. The City of New York, exposed as it is, was considered as having the means of rendering itself invulnerable. The Delaware, Chesapeake, Long Island Sound, and every other bay and harbor in the nation, may be protected by the same tremendous power.

Among the inconveniences observable during the experiment, was the heat endured by the men who attended the fires. To enable a correct judgment to be formed on this point, one of the Commissioners (Dr. Mitchel) descended and examined, by a thermometer, the temperature of the hold, between the two boilers. The quicksilver, exposed to the radiant heat of the burning fuel, rose to one hundred and sixteen degrees of Fahrenheit's scale. Though exposed thus to its intensity, he experienced no indisposition afterwards. The analogy of potteries, forges, glass-houses, kitchens, and other places, where laborers are habitually exposed to high heats, is familiar to persons of business and of reflection. In all such occupations, the men, by proper relays, perform their services perfectly well.

The Government, however, will understand that the hold of the present vessel could be rendered cooler by other apertures for the admission of air, and that on building another steam frigate, the comfort of the firemen might be provided for, as in the ordinary steamboats.

The Commissioners congratulate the Government and the nation on the event of this noble project. Honorable alike to its author and its patrons, it constitutes an era in warfare and the arts. The arrival of peace, indeed, has disappointed the expectations of conducting her to battle. That last and conclusive act of showing her superiority in combat, has not been in the power of the Commissioners to make.

If a continuance of tranquillity should be our lot, and this steam vessel of war be not required for the public defense, the nation may rejoice that the fact we have ascertained is of incalculably greater value than the expenditure—and that if the present structure should perish, we have the information never to perish, how, on a future emergency, others may be built. The requisite variations will be dictated by circumstances.

Owing to the cessation of hostilities, it has been deemed inexpedient to finish and equip her as for immediate and active employ. In a few weeks every thing that is incomplete could receive the proper adjustment.

After so much has been done, and with such encouraging results, it becomes the Commissioners to recommend that the steam frigate be officered and manned for discipline and practice. A discreet commander, with a selected crew, could acquire experience in the mode of navigating this peculiar vessel. The supplies of fuel, the tending of the fire, the replenishing of the expended water, the management of the mechanism, the heating of shot, the exercise of the guns, and various matters, can only become familiar by use. It is highly important that a portion of seamen and marines should be versed in the order and economy of the steam frigate. They will augment, diffuse, and perpetuate knowledge. When, in process of time, another war shall call for more structures of this kind, men, regularly trained to her tactics, may be dispatched to the several stations where they may be wanted. If, on any such disposition, the Government should desire a good and faithful agent, the Commissioners recommend Captain Obed Smith to notice, as a person who has ably performed the duties of inspector from the beginning to the end of the concern.

Annexed to the report, you will find, Sir, several statements explanatory of the subject. A separate report of our colleague, the honorable Oliver Wolcott, whose removal from New York precluded him from attending to the latter part of the business, with his accustomed zeal and fidelity, is herewith presented. A drawing of her form and appearance, by Mr. Morgan, as being like to give satisfaction to the department, is also subjoined, as are likewise an inventory of her furniture and effects, and an account of the timber and metals consolidated in her fabric.

It is hoped these communications will evince the pains taken by the Commissioners, to execute the honorable and responsible trust reposed in them by the Government.

SAMUEL L. MITCHEL.
THOMAS MORRIS.
HENRY RUTGERS.

NOTE B.

The United States Naval Steamer "Union."

ABSTRACT OF LOG.

TIME.	Number of Hours.	Pounds of Steam in boiler per square inch above Atmosphere.	Revolutions of the Wheels per minute.	Speed of vessel in knots of 6082⅔ feet per hour.	REMARKS.
Dec. 12, 1844.	16	87	24	5	Draft of vessel, 13 feet, with 184 tons of Cumberland bituminous coal. All sail set, wind abeam, sea ordinary.
" 13 "	24	75	25	5	Sail and wind, as before, but wind fresher.
" 14 "	8	65	24	6	Wind abaft the beam, all sail set.
	4	70	25	8	Fresh wind aft, all sail set.
	4	71	26	9	
	4	75	26	8	Wind abaft the beam, all sail set.
	4	71	22	7½	
" 15 "	4	70	23	7	Wind abaft the beam, all sail set.
	8	—	—	—	Endeavoring to assist vessel, &c.
	12	75	22	3	Wind variable, making and taking in sail.
" 16 "	4	70	21	4	All sail set.
	4	75	23	3	Sail shortened by taking in gaff-topsails.
	4	75	22	3	Ditto, and fresh breezes.
	12	71	22	4	All sail set, moderate breezes; took in all sail [at end of day.
" 17 "	4	75	20	3	Set courses, jib and flying-jib, light breezes.
	4	75	20	3	Took in all sail at end of watch; moderate weather.
	16	75	20	3	Heavy sea.
" 18 & part 19	—	—	—	—	Lying-to.
" 19,	4	70	20	2½	Courses set, rough sea, but pleasant weather.
	8	70	20	3½	" " sea going down.
	4	Not noted.	Not noted.	Not noted.	" " ordinary sea.
" 20 "	4	71	20	5½	Moderate breezes, making and taking in sail.
	8	71	20	5½	" " " " "
	12	79	22	4	" " sail set.
" 21 "	4	78	22	4	" " " " stopped steaming.
" 22,23,24,25,	—	—	—	—	Lying-to.
" 26,	24	75	23	3	Moderate breezes; stopped steaming, at the end of the 26th, and started steaming at 12 o'clock, on the 27th.
" 27 "	4	80	24	3	Moderate breezes; no sail, smooth sea.
	12	75	23	3	" " sail part of the time.

Note C.

U. S. Navy Yard, Washington,
July 5th, 1850.

Sir:

In compliance with your order of the 25th ult., we convened at this place on the 1st inst., and having discharged the duties you assigned to us, in a survey of the U. S. steamer "Alleghany," we have to

REPORT.

1st.—"As to her fitness for service, and her efficiency as a cruising vessel."

In the opinion of this Board, the "Alleghany" is unfit for service, and inefficient as a cruising vessel, and for the following reasons:—

1st.—She is unsafe from the deficiency of materials in the construction of her hull, and in the arrangement of her wheel cases, in consequence of the proximity of the intermediate shafts of her engines to them, which involves the probability of their being ruptured in the event of the engine becoming detached from its propeller-shaft.

2d.—"An examination of the log-book of her late cruise, advises us that when under steam alone, and also when under steam and all sails combined, she has attained speeds ranging from 3.25 to 10 knots per hour, and at a consumption of fuel of from nineteen to thirty tons per day; also, that an average of these speeds is less than six knots per hour, and at the extravagant expenditure of fuel, of twenty-three tons of coal per day.

3d.—"Whether her model, engines, and mode of propulsion, are such as to combine speed and security."

Her model and engines are not such as to combine security, and for the reasons already given, added to which, her model is such as to afford little stability with uneasiness of motion, which, with the deficiency of material, is shown by many of the frames being broken, and by the necessity that has occurred, of adding braces to her sides and decks; and in re-fitting her for service it would be necessary to add additional frames and braces.

Her mode of propulsion is impracticable of speed, within the occupancy of space, and with the expenditure of fuel that can be allotted to it in a marine steamer. In illustration of this, a comparison of the effects of coal expended in this vessel and in the "Mississippi," shows that it requires about seven pounds of it in the former to produce the same useful result, as one pound does in the latter vessel, and when the "Saranac" is compared, the effect of one pound of coal in her is equal to ten pounds in the "Alleghany."

4TH.—"The length of time for which she can carry fuel."

Her coal-bunkers will contain about one hundred and ninety-five tons of coal, which, at her average consumption of twenty-three tons per day, is equal to a supply of eight and one-half days.

6TH.—"It is particularly desirable, that the Board should examine carefully and report fully as to her engines, with authority to suggest alterations, should any in their opinion be necessary, to render the "Alleghany" an efficient war-steamer, and also, the cost of alterations, should they be deemed necessary."

6TH.—Having examined the engines, boilers, &c., to the extent that was practicable, we find that extensive repairs are necessary, that the nature and quantity of the material with which she is built, (iron,) that her model and construction we consider such as to render her unfit for a war-steamer, and that her engines being designed for the peculiar requirements to which they are applied, that as a whole, they cannot be adapted to any other instrument of propulsion; but many parts can be incorporated with the construction of new engines, so as to be economically and effectively applied to side-wheels, to which method of propulsion it is recommended this vessel be converted; also, that her spars, rig, and sails, be reduced to those of a three-masted schooner, with a square fore-topsail.

The cost of which alterations, aside from any estimate of unapplied parts of engine, old boilers, stores, rigging, &c., will be as follows:—

Two engines of direct action, with cylinders upon an inclined plane, with wrought iron wheels, and with two wrought iron vertical, tubular boilers, . .	$40,000 00
Repairs and additions to hull, guard-beams, keelsons, spars, rigging, boats, furniture, &c., ...	13,000 00
Hauling out and launching hull, ...	2,000 00
	$55,000 00.

The time required to effect these alterations would be nine months.

"The economy of retaining her for service."

Entertaining the views already expressed, we are convinced that it would be improper to retain her for service, under her existing method of propulsion, but when altered as proposed, she would be rendered an effective and economical vessel, for other than purposes of war; and the expenditure of fuel would be reduced to sixteen tons of coal, per day.

5TH.—"The probable cost of fitting her for sea without alterations."

5TH.—The probable cost is estimated as follows:—

Hauling out and launching hull, ...	$2,000 00
Taking out, repairing, and replacing boilers, ...	10,500 00
Repairing, and refitting engines, wheels, &c., ...	8,000 00
" " " hull, spars, rigging, &c., including additional frames and braces, ...	14,500 00
	$35,000 00.

The time required to effect these repairs and alterations, would be five months.

Very respectfully, your obedient servants,

JOHN B. MONTGOMERY, *Com. U. S. N.*
JOHN LENTHALL.
CHAS. H. HASWELL, *Eng.-in-Chief, U. S. N.*
WM. P. WILLIAMSON, *Chief-Eng., U. S. N.*
WM. M. ELLIS, *Chief-Eng., W. N. Y.*

COM. CHAS. W. SKINNER,
Chief Bureau of Con., Eqp., &c., Washington, D. C.

Note D.

U. S. Steamer Mississippi,
At Sea, *Nov. 8th*, 1851.

Sir:

After long experience on board of this ship, a careful observation of the defects, with a wish to render her more efficient, I take the liberty to make the following observations, and suggest improvements, which, if adopted, will render the "Mississippi" more useful, efficient, and safe.

The objects to be obtained in a war-steamer are, First, Weight of battery. Second, Speed by steam, with an economical expenditure of coals. Third, To combine her steam and sails, so that one shall not be transported at the expense of the other. A ship of war, without guns, would be perfectly defenceless; a war-steamer, with encumbrance on her steam power, is equally so. The sails of the "Mississippi" are auxiliary to her steam; with her sails unaided by the engines, she is helpless; on the other hand, her engines are sufficient to handle her without the assistance of sails. The conclusion is, therefore, that the less the engines are encumbered with the spars and sails, which are useless, the better for efficiency and safety. Again, if a ship is overburdened with sails, spars, steam engines, boilers, beside any useless weight, it deducts the same number of pounds from her battery, or immerses her to a dangerous depth in the water, obstructs her speed, and occasions a useless expenditure of coal, for which a small compensation is obtained.

The spars and sails of the "Mississippi" are too large; if they were reduced to the proper size, her speed would be augmented more than one knot per hour, allowing her to draw the same water. The engines not only have her vast hull to propel, but the great surface of spars, which are a great obstruction to the speed. It is supposed, the larger the sails the more assistance they are capable of rendering. This is a mistaken idea, as experience abundantly has shown; a proper area of sails is unquestionably advantageous, but this area must not exceed a limit at which they would be an obstruction to speed by steam. When the winds are fair, a six knot breeze is required before the sails are of any use in propelling the ship conjointly with steam power; if the winds are strong, a large spread of canvas is dangerous. In a storm, only a sufficient quantity is necessary to steady the ship, and this will of course be fore and aft sails. With light fair winds, the power of the engines will bring light airs ahead; thus, a steamer will most of the time have light airs ahead, or occasionally aft, but not in sufficient force to make her sails effective; hence, it is clear, that her great spars are an encumbrance to her speed, under most of these circumstances; the mainsail cannot be carried—the main-topsail has seldom been used—steering-sails have been useless—fore-topsail useful—top-gallantsails seldom—fore-topmast stay-sail, and jib, useful. The useful sails are fore and main-trysails, fore-topmast stay-sail, and jib, and occasionally, the spanker, with effect. With moderate, or fresh breezes ahead, the top-gallant masts are necessarily sent down; in strong head winds, lower yards and top-masts are also sent down. In fine weather, all these spars are again sent up to improve the appearance of the ship. All this has to be done at the expense of labor of the crew, while the very spars which are so often sent up and down, are seldom of any use in propelling the ship. The ship may be propelled by the aid of her sails, but in a very awkward manner; the first difficulty, the crew is far too small to handle her immense sails with sufficient promptitude; in the second place, the mainmast is so far abaft the centre of motion, that all the sails upon it, (except with a wind directly aft) are of but little or no use; the foremast is also too far forward. All these difficulties it is impossible to obviate; with sails alone she is a clumsy ship, hardly capable of handling herself; she never can be an auxiliary steamer with her masts in their present position, the most important of which cannot be moved (the main). But these are not all the difficulties: the great lengths of spars produce another difficulty of equal damage to her efficiency, which must exist with her great spars, viz.: spare sails, spars, and rigging must be put into the ship to the amount of many tons; this weight only adds to her immersion, and reduces her speed; or, in other words, it requires a portion of her steam power to transport this useless weight, which does nothing to add to efficiency, speed, or safety. As I before remarked, all the unnecessary weight put into a war-steamer, deducts the same from her general efficiency and safety. On two occasions, she has been fitted for a cruise with all the spare material on board, which rendered her dangerously deep and almost unfit for sea, and I believe a very small proportion of these sails and spare spars have ever been used, for the purpose for which they were put on board.

To remedy the difficulties I have enumerated, I suggest that the spars, including lower masts, be reduced to a proper dimension, which would not exceed in weight more than one-half the present ones; this would be a reduction of many tons, beside the reduction of weight of spare spars, sails, and rigging, the saving to convert to more useful purposes room which it now occupies, and with this reduction, the sails, rigging, &c., would be useful, where now it is so unwieldy as not to be used at all. Again, if this reduction was made, the sails and spars would be proportioned to her crews, and could then be worked with ease, where now they cannot.

Besides the reduction of spars, she requires a reduction in the weight of her anchors, (she now carries four, which weigh 63 cwt. each; she only requires two, or if four, of much less weight than the present,) this would also reduce the weight of chain. At no time during this cruise, has she required more than two anchors; late in the cruise a much smaller one was substituted for one of the above weight; this has been found sufficient, and much less labor to work it.

I am of the opinion, that a steamer is more secure with two anchors (and not extremely heavy ones) than a sailing ship is with four. The engines themselves are a greater security than two anchors; hence, a steamer does not require so great weight of anchor.

If the foregoing suggestions were followed out, the "Mississippi" could then carry two or four more guns, and draw less water than she now does; her speed would be augmented with the same expenditure of coal. She would have more room to berth her crew, which she much needs; her expenses would be reduced, and she would be more formidable; but if her present spars are retained, all of these qualities, which are so important in a war-steamer, will be lost.

In submitting these views, which I have gathered from experience, on board of the "Mississippi," I have felt some delicacy, knowing that I have ventured opinions which do not accord with theory. What I have submitted, is based upon practical observations alone, for the correctness and verity of which, I appeal to every experienced officer who has sailed in her any length of time. I have also had opportunity of seeing many foreign war-steamers, particularly those of England and France; the difference between them and the "Mississippi," is, they carry less spars and more guns. I have not seen a war-steamer, of any nation, carrying so heavy spars as the "Mississippi," but I have frequently met with those of much less tonnage and power, carrying a much greater weight of battery.

I am very respectfully,

Your obedient servant,

JESSE GAY, *Chief Engineer.*

Capt. John C. Long,

Com. U. S. Steamer "Mississippi."

Note E.

BEARING THE BROAD PENNANT OF COMMODORE M. C. PERRY.

Steam Log *of the U. S. Steamer Mississippi, Capt. William J. McCluney, Commanding.*

At Sea, *on Sunday, the 24th day of October,* 1852.

HOUR. A. M.	SPEED. K.	SPEED. F.	COURSE.	WIND. Direction.	WIND. Force.	Revolutions of Engine.	Pressure of steam.	Vacuum. S.	Vacuum. L.	Throttle.	Cut-off.	Pounds of Coal used.	Saturation of boilers used. 1	2	3	4	TEMP. Engine room.
1	9	4	South.	North'd.	4	9	12	27	27	8	27¼	2400	1¼	1⅛	1⅛	1¼	70
2	9	2	"	"	5	9 5	12	27	27	8	"	2400	1⅛	1⅛	1⅛	1¼	70
3	9	4	"	"	5	10·3	12	27	27	8	"	2400	1⅜	1⅛	1¼	1¼	82
4	9	6	"	"	5		12	27	27	8	"	2400	1⅛	1⅛	1⅛	1⅜	80
5	10		"	"	4	9·1	12	27	27	8	"	2400	1⅛	1¼		1⅛	73
6	9	4	"	"	4	9 1	12	27	27	8	"	2400	1⅜	1⅛	1¼	1⅛	74
7	9		S. S. W.	"	4	9	12	27	27	8	"	2400	1⅜	1¼	1¼	1⅜	74
8	9	4	"	N. N. W.	4	9	12	27	27	8	"	2400	1⅜	1¼	1⅛	1⅛	75
9	4 4	4 4	" S. W. by S.	" "	4	8·8	12	27	27	8	"	2400	1⅜	1¼	1¼	1⅛	71
10	9		"	"	4	9	12	27	27	8	"	2400	1⅛	1⅛	1⅜	1⅛	72
11	9		"	N. W.	4	9·3	12	27	27	8	"	2400	1⅛	1⅜	1¼	1⅛	72
12	0		"	"	4	9·2	12	27	27	8	"	2400	1⅛	1⅜	1¼	1⅜	75

	Pounds of Coal.	Feet of Wood.	Galls. of Oil.	Pounds of Wiping Stuff.	Pounds of Tallow.	Counter.		Lat.	Long.
Expended this day	49,500	"	3	4	17	Commenced at	345,540	Revolutions made	11,881
Remaining . .	1,092,914	408	509	894	488	Ended at	357 420	Knots run.	199

HOUR. P. M.	SPEED. K.	SPEED. F.	COURSE.	WIND. Direction.	WIND. Force.	Revolutions of Engine.	Pressure of steam.	Vacuum. S.	Vacuum. L.	Throttle.	Cut-off.	Pounds of Coal used.	Saturation of boilers used. 1	2	3	4	TEMP. Engine room.
1	6 3	6	S. W. by S. S. W.	N. W.	4	9·3	12	27	27	8	27¼	2400	1⅛	1⅛	1¼	1⅛	76
2	9	6	"	"	3	9·5	12	27	27	8	"	2400	1⅜	1⅛	1¼	1⅛	76
3	9		"	"	3	0·5	12	27	27	8	"	2400	1⅜	1⅜	1¼	1⅜	76
4	9		"	"	3	9	12	27	27	8	"	2400	1⅛	1⅜	1¼	1⅜	86
5	9		"	West'd.	2	9	12	27	27	8	"	2400	1⅜	1⅜	1¼	1⅛	86
6	9		"	"	2	9·1	12	27	27	8	"	2400	1⅜	1⅜	1	1⅜	82
7	7		"	N. W.	4	9·5	5	27	27	8	"	1740	1⅜	1⅜	1⅛	1⅜	88
8	6		"	"	4	9·3	6	27	27	8	"	2160	1⅜	1⅜	Shut	off.	88
9	1 5		" W. by S.	" N'd and W'd.	2	5·6	8	27	27	0	"	840	1⅛	1⅛	"	"	88
10	4	4	"	"	2	5	7	27	27	0	"	600	1⅛	1⅜	"	"	86
11	4		"	"	2	4	6	27	27	0	"	600	1⅛	1⅜	"	"	86
12	4		"	"	2	4·3	6	27	27	0	"	360	1⅛	1⅜	"	"	84

At Sea, *on Monday, the 25th day of October,* 1852.

HOUR. A. M.	SPEED. K.	SPEED. F.	COURSE.	WIND. Direction.	WIND. Force.	Revolutions of Engine.	Pressure of steam.	Vacuum. S.	Vacuum. L.	Throttle.	Cut-off.	Pounds of Coal used.	Saturation of boilers used. 1	2	3	4	TEMP. Engine Room.
1	4		W. by S.	West'd.	3	4·6	6	27	27	0	27¼	660	1⅜	1⅛	Shut	off.	79
2	3	4	"	"	3	4·5	4	27	27	0	"	720	1⅜	1⅛	"	"	76
3	4		"	"	3	4·1	4	27	27	0	"	660	1⅜	1⅛	"	"	76
4	4		"	"	3	4	5	27	27	0	"	660	1⅜	1¼	"	"	74
5	4		"	"	3	3·3	3	27	27	0	"	840	1⅜	1¼	"	"	75
6	4		"	"	3	4·1	4	27	27	0	"	600	1⅜	1¼	"	"	76
7	5		"	"	3	5·1	6	27	27	0	"	2040	1⅜	1¼	"	"	79
8	3 3		W. N. W. ½ W. W. N. W.	" "	3	7·3	8	27	27	3	"	2040	1⅜	1¼	"	"	82
9	5		"	"	3	7·3	10	27	27	3	"	2400	1¼	1¼	"	"	75
10	4 3		N. W. N. N. W.	" "	2	8·5	11	27	27	3	"	2400	1⅛	1⅛	1	1⅛	76
11						9	11	27	27	3	"	2400	1⅛	1¼	1¼	1¼	75
12						9·2	12	27	27	3	"	2400	1⅛	1¼	1⅛	1⅛	76

	Pounds of Coal.	Feet of Wood.	Galls. of Oil.	Pounds of Wiping Stuff.	Pounds of Tallow.	Counter.		Lat.	Long.
Expended this day	41,640	"	5	3	4	Commenced at	357,420	Revolutions made	9910
Remaining . .	1,051,274	408	504	891	484	Ended at	367,330	Knots run.	41·4

HOUR. P. M.	SPEED. K.	SPEED. F.	COURSE.	WIND. Direction.	WIND. Force.	Revolutions of Engine.	Pressure of steam.	Vacuum. S.	Vacuum. L.	Throttle.	Cut-off.	Pounds of Coal used.	Saturation of boilers used. 1	2	3	4	TEMP. Engine Room.
1						9	10	27	27	8	27¼	2400	1⅛	1⅛	1¼	1¼	78
2						9	10	27	27	8	"	2400	1¼	1⅜	1¼	1¼	77
3						9·1	11	27	27	8	"	2400	1¼	1¼	1	1⅛	77
4						9·6	12	27	27	8	"	2400	1⅜	1¼	1¼	1¼	74
5						9·1	12	27	27	8	"	2400	1⅛	1⅛	1¼	1¼	80
6						9·4	12	27	27	8	"	2400	1⅜	1¼	1⅜	1¼	81
7						9·3	12	27	27	8	"	2400	1⅛	1¼	1¼	1¼	82
8						9 6	9	27	27	8	"	2400	1⅛	1¼	1⅜	1¼	80
9			Standing	up the		8 8	6	27	27	6	"	2400	1⅛	1⅛	1¼	1⅛	80
10			Chesapeake	Bay.		5	6	27	27	0	"	600	1⅛	1⅛	1¼	1⅛	80
11						4	5	27	27	0	"	840	1⅜	1⅛	Shut	off.	82
12						4	5	27	27	0	"	780	1⅛	1¼	"	"	82

NOTE F.

Steam Log of the U. S. Steamer "Saranac," being her maximum performance.

DATE.	Number of hours.	Speed per hour.	Direction of wind.	Course of vessel.	Cut-off.	Revolutions per minute.	Av. steam in boilers.	Coal per hour.	REMARKS.
May 19, 1850,	16	11·375	S. E.	South.	3·5	14·808	12·85	2787·5	Fore and aft sails set a short time; gentle breeze.
April 4, 1851.	24	9·4	N. N. W.	N.N.W.½W	5.	15·2	11·9	4250	Light air; no sail set.
July 4, 1851,	24	9·366	West.	N. N. E.	5·	14·1	13·75	3066·6	Light wind and smooth sea.
Oct. 8, 1851,	24	8·53	N. & E.	N. & W.	4·5	13·35	12·58	3090·8	Fresh breeze and moderate sea.

The mean performance of the "SARANAC," under steam and sail for *forty days*, in 1850 and '51, was as follows:

Speed per hour	8·14 knots.
Revolutions of wheels per minute	12¼
Steam pressure in the boilers	11⅛ lbs.
Cut-off at from commencement of stroke	4 feet.
Consumption of bituminous coal per hour	2,446 pounds.

Performance of U. S. Steamer "San Jacinto," between New York and Norfolk.

DATE.	Number of hours.	Revolutions.	Pressure.	Vacuum.	Throttle.	Cut-off.	Speed.	Coal per hour.	REMARKS.
Jan. 1, 1852,		25¼	10 lbs.	24 inches	¾ open	½	8 knots.		In New York Harbor.
" "	4	22¼	"	24¾ "	"	"	7 "		Off Sandy Hook; light head wind.
" "	4	23	"	25 "	⅝ open	"	8½ "		
Jan. 3, "	12	22⅚	"	24 "	¾ "	"	3·52 "		Heavy head wind and sea.
" 6, "		19	5	24 "	½ "		4½ "		Heavy sea; fore and main top-sails.
		Synopsis of Log between Norfolk and Cadiz.							
March, "		25·06	11·8	24 "	⅚ open	½	7·58 kts.	2177 lbs.	Knots taken at 6140 feet.

Note G.

General directions for building War-Steamers of the First Class, "Powhattan" *and* "Susquehanna."

Keel.—To be of white oak, sided, 1 foot 6 inches; to be laid straight without any curve; to be made of two depths, viz.:—the upper or internal keel, and the lower keel may be in one depth, if the timber will work.

The upper keel in depth, 1 foot 2 inches.

The lower keel in depth, 1 foot.

The rabbet to be cut on the upper keel; the lower edge of the rabbet being four inches above the lower edge of the upper keel. The number of pieces in the upper keel not to exceed six, and in the lower keel not to exceed seven.

Scarphs to be in length, 10 feet; to be plain without jogs, and four coags in two rows let in. Coags, in width, 3½ inches; in thickness, 2½ inches; in length 16 inches.

The lips of scarphs to be fastened with two copper bolts, ¾ inch in diameter; to be riveted on; in length, three times the thickness of the nib.

The scarphs will be further fastened with four copper bolts in each, in diameter, 1 inch; to be driven in the spaces between the floor-timbers and riveted.

Between the upper and lower keel, the joint to be fair, and two rows of coags to be let in; coags, 18 inches long, 4 inches wide, 3 inches thick, and 30 inches asunder.

The upper and lower keels to be fastened together, with copper bolts, about 5 feet asunder, ⅞ inch in diameter.

The upper keel to be bolted athwart ships, near the lower edge, about five feet asunder, and the lower keel in the same manner, about seven and one-half feet asunder, with copper bolts, in diameter, ⅞ inch.

False keel, in thickness, 2 inches; fastened to main keel with copper bolts, 12 inches in length; ⅝ inch in diameter.

Whole depth of keel and false keel, clear of rabbet, 1 foot 6 inches.

Dead-wood, forward and aft, of live oak, sided, 1 foot 6 inches.

The stern-post knee, of live oak; to be fayed on the keel and to the fore side of the stern-post. Over this knee the dead-wood is to be built, keeping the shortest pieces below; and they will be coaged to each other, and to the keel.

Stern-post knee bolts, of copper, in diameter, $1\frac{3}{8}$ inch; in number four; of which two will be driven through the lower end of the stern-post, and two through the after end of the keel. Care must be taken that these bolts do not interfere with those of the dead-wood.

Dead-wood: the seven main bolts of the after dead-wood, that is, the four last in the keel, and the three first in the lower end of the stern-post, to be in diameter, $1\frac{3}{4}$ inch.

The remaining bolts in the post, and the four next in the keel, will be in diameter, $1\frac{1}{2}$ inch.

From which to the after square frame, they will be driven two feet asunder; in diameter, $1\frac{1}{4}$ inch.

When the dead-wood is not more than seven inches deep, the bolts will be in diameter, $\frac{3}{4}$ inch, gradually increasing in size as the depth becomes greater; but they will not, in any case, between the aftermost and foremost square frame, be of greater diameter than 1 inch.

These bolts for drawing the dead-wood to the keel, will be in length about twice and one-third the depth of the piece through which they are first driven, but when this is within four inches of the lower side of lower keel, let the bolts go through and riveted, as all others.

The forward dead-wood bolts, before the forward square frame, to be about 20 inches asunder, and in diamter $1\frac{1}{4}$ inch.

The dead-wood knee fayed on and coaged to the dead-wood; bolts of copper, about 20 inches asunder, and in diameter, $1\frac{3}{8}$ inch.

The bolts in the arm to go through and riveted; those in the body to be in length twice and one-half the depth of the piece through which they are driven.

Stern-post of live oak, sided at rabbet, 1 foot 6 inches.

Moulded at height of cross-seam, clear of rabbet, 1 foot 3 inches.

Moulded at heel, clear of rabbet, 2 feet 4 inches; to keep its full siding on the aft side down to the cross-seam, from which it will taper at heel, on aft side, to $10\frac{1}{2}$ inches.

The rabbet to be cut near the middle of the main piece of stern-post, or in that part most free from defects. The aft side of the rabbet, at the height of the cross-seam, to be kept 11 inches abaft the front of the post, and at the keel from 12 to 16 inches, as the piece will work best.

The deficiency of the main post to be made up by a false or after post, coaged to the main post; each piece having one or two tenons in the keel, according to the size.

Main transom: sided and moulded, 1 foot 8 inches; cross-seam below top of transom, to be 9 inches, fastened to stern-post, with three bolts, in diameter, $1\frac{1}{4}$ inch. The remaining transoms to side, 1 foot, fastened with two bolts in each, in diameter, $1\frac{1}{4}$ inch.

Stem, of live oak, sided, 1 foot 6 inches. Scarphs hooked about two inches, and fastened with bolts, in diameter, $1\frac{1}{4}$ inch; the nibs secured with bolts, in diameter, $\frac{3}{4}$ inch; the rabbet of the stem, if the size and quality of the timber will admit, is not to be cut close to the aft side, but to be so situated that the aft side of the stem may be at, or near the bearding line.

Apron of live oak, sided, 1 foot 6 inches; moulded at head, at the after corner on a square from the plank, 9 inches; fastened to the stem with bolts of copper and iron, about two feet asunder, in diameter, $1\frac{1}{4}$ inches.

TIMBER AND ROOM.—Floor timbers, side, from 1 foot to 1 foot 2 inches; first futtocks, side, from 10 to 12 inches; second futtocks, third futtocks, fourth futtocks, top timbers, and stanchions, for a length amidships of 100 feet, side, 11 inches; for the next 40 feet, forward and aft, the same timbers will side, 10 inches; for the next 35 feet, forward and aft, the same timbers will side, 9 inches.

Moulding of floor-timbers in the throat, 1 foot 6 inches; moulding size at floor-head, 1 foot; moulding at the port-sill, or planks two feet above upper deck, $7\frac{1}{2}$ inches. The intermediate sizes to be ascertained; a curved diminishing line; these are the moulding sizes; the timbers are to hold on the square when ready for planking inside and outside.

The heels of cant timbers to have two inches left on the inside, to let that much into the dead-wood, with a jog of 12 inches from their heels, and to be secured by *two* copper bolts in each pair, in diameter, $1\frac{1}{8}$ inch.

Frame bolts in each scarph, asunder about 2 feet 6 inches; those below the third futtock-head, in diameter, $1\frac{1}{8}$ inch; those in the floor-timbers to be of copper; those above the third futtock-head, in diameter, 1 inch.

Keelson: made of live oak plank, in thickness 7 inches; to be *five* plank in height, the plank composing the keelson to be butted together and not scarphed. The lower plank to be coaged to the first futtocks, the whole to be coaged together with two rows of seasoned live oak coags, 10 inches long, 3 inches square, and 15 inches asunder. Bolts for drawing plank to each other, and for the bolts of copper, in diameter, $\frac{3}{4}$ inch. There will be driven through the keelson and each floor timber, *two* copper bolts, in diameter, $1\frac{1}{4}$ inch.

Those through the stemson and keelson, to be of the same size, and all to be riveted outside before false keel and gripe are put on. After the bolts are driven and the corners of the keelson chamfered, there will be a capping of three inch live oak plank to fill the width between the chamfers nailed to the top of the keelsons, into which the heels of the berth-deck stanchions may mortice.

Knight-heads and hawse pieces of live oak, sided, 1 foot 2 inches; bolted into the apron and into each other, with bolts of iron, in diameter, $1\frac{1}{8}$ inch; asunder, about 2 feet 6 inches.

The spaces between the frames to a level line, fore and aft, as high as half way between the first and second futtock-heads, amidships, will be filled in solid and caulked; the upper ends to be cut off level.

Before the clamps and inside plank are put on, the frames will be secured by diagonal braces of iron, in breadth, 4 inches, and in thickness, $\frac{3}{4}$ inch, over which the plank will be fitted, and in each timber there will be a bolt through the plate $1\frac{1}{8}$ inch in diameter, to be riveted before the outside plank is put on. The upper end of these plates to be 5 feet asunder, under the upper strake of gun-deck clamps, the lower end being under the strakes at first futtock-heads. The upper bolts to be $1\frac{1}{4}$ inch in diameter, and go through the clamp and outside plank. The alternate bolts above the copper fastenings to go through the out plank; the holes to be drilled, and centre sunk amidships; the heads of two braces will come on the same frame, the heels reaching forward in the fore body, and aft in the after body, at an angle of 45 degrees.

Hawse holes in clear of leads and pipes, 1 foot 4 inches.

Running plank of bottom, of white oak, in thickness, 5 inches.

Wales of white oak, in thickness, 6 inches; in width, about 8 inches. They will gradually and fairly diminish in thickness till they fall in with the bottom plank and strake under the plank sheer, which is in thickness, 5 inches. The five strakes of wales below the plank sheer, three opposite the gun-deck clamps, three at the third futtock-heads, and two at the second futtock heads, to be $1\frac{1}{4}$ inches thicker, and jogged that much over the frames. The plank will be put on with fair edges, without hooks or jogs.

Garboard strakes, in thickness next the keel, 10 inches; in width, 12 to 15 inches. To allow for thickness, the timbers will be taken off on a level with the top of the dead-wood, or upper keel, which will be made up in the thickness of the plank next the garboard, falling gradually and fairly in with the bottom plank. These strakes will be fastened edgeways through the keel and each other, with copper bolts 5 feet asunder, and in diameter, 1 inch; and into the timber as the other plank, with bolts, in diameter, 1 inch. All the fastenings that come through will be of copper, to a line 19 feet above the lower edge of the rabbet of the keel, and from that line upwards, iron will be used. The plank will be square, fastened from the keel to the plank sheer, that is, there will be *two* through bolts in each strake, in each frame, (except where a knee-bolt will answer the purpose) and two short fastenings.

The short fastenings, in diameter, $\frac{3}{4}$ inch; the through fastenings, which below will be riveted, in diameter, $\frac{7}{8}$ inch. In each bolt there will be one through bolt, and one fastening, except the hood ends, where both will go through, if practicable. The length of the short fastenings to be twice and one-third the thickness of the plank through which they are driven, taking care that the bolts shall not go through the timber.

Engine, or bilge keelsons, of white oak, sided, 1 foot $5\frac{1}{2}$ inches; made or fastened as the main or centre keelson.

Inside strakes at first and second futtock-heads, in number at each butt, *three*, of white oak, in thickness, 6 inches; fastened with bolts, in diameter, $\frac{3}{4}$ inch.

Berth-deck clamps, of white oak; number of strakes on each side, *six*; in thickness, 6 inches. The three upper strakes to jog over the timbers, $1\frac{1}{4}$ inches, the plank being that much thicker, and will be in thickness, $7\frac{1}{4}$ inches; fastened with bolts, in diameter, $\frac{7}{8}$ inch. To be fair seams without hooks or jogs, and to be bolted edgeways about 5 feet asunder, with iron bolts, in diameter, $\frac{15}{16}$ inch.

Berth-deck beams, of yellow pine, sided, 1 foot; moulded, 1 foot 2 inches; and have a spring of 6 inches in 45 feet, the ends not to be snaped.

Berth-deck knees: to each end of each beam, there will be one ledge and one lap and hanging knee, each sided, 8 inches; fastened with bolts, in diameter, $1\frac{1}{8}$ inch.

Carlings, or fore and aft pieces: of yellow pine, square, 7 inches; in three ranges, that is, one in the middle of the deck, and the others midway, between the middle range and the side of the ship.

Ledges: of yellow pine, sided, 5 inches; moulded, 6 inches.

Berth-deck plank: of yellow pine, in thickness, $3\frac{1}{2}$ inches; in width, about $8\frac{1}{2}$ inches; fastened to the beams with iron spikes, (plugged) in length, 7 inches. Spikes in the ledges, in length, 6 inches.

The beams and ledges of this and other decks, to have two spikes in each strake.

Water ways: of yellow pine; deck edge, in thickness, $6\frac{1}{2}$ inches, of which 1 inch will jog over the beams; next the water-ways will be two strakes of yellow pine, in thickness, $6\frac{1}{2}$ inches, which will likewise jog over the beams and ledges, 1 inch. The inner edge of these strakes to be chamfered to the thickness of the deck plank; these strakes to be bolted through the water-way and side of the ship, with *one* bolt in each frame, in diameter, 1 inch.

The edge of the water-way will be chimed in 2 inches, the wood taken off thence in a straight line across to the thickness of the sperketting, which is 6 inches. The thick strakes and deck edge of water-way fastened with bolts, 11 inches long; in diameter, $\frac{5}{8}$ inch.

Sperketting: of white oak, in diameter, 6 inches; the sperketting and side edge of water-way fastened with bolts, in diameter, $\frac{7}{8}$ inches.

Coamings and head-ledges of yellow pine, in width, for the coaming, 1 foot $2\frac{1}{2}$ inches; in thickness, $6\frac{1}{2}$ inches; chined on $1\frac{1}{2}$ inches to show, 5 inches; height above the deck, 4 inches; fastened with bolts in diameter, $\frac{7}{8}$ inch.

Coamings for scuttles, same height above deck, and sided 1 inch less; bolts in diameter, $\frac{3}{4}$ inch.

Abreast the crank hatchway, the half beams will side, 10 inches.

Beams moulded at side of ship the same as whole beams, and continue that size, 1 foot; from thence they will taper to the coamings of the hatchway, to 7 inches; kneed to coamings with lodge knees, sided, 5 inches, and to the side with lodge and lap knees, sided, 7 inches.

The lower edges of beams, ledges, and carlings, to be rounded.

Stanchions under berth-deck beams; of white oak, square, 9 inches; chamfered 1 inch on each corner to within 9 inches of the head and heel, and let into caps under the beam.

Breast hooks of live oak, and all fayed to the timber, sided, 1 foot. The throat bolt, and the next on each side, in diameter, $1\frac{3}{8}$ inch; the remaining bolts, $1\frac{1}{4}$ inch.

The hooks aft, the same size and secured in the same manner.

Gun and deck clamps: of white oak; in thickness, 6 inches. The two upper and two lower strakes to be $1\frac{1}{4}$ inches thicker, and jog that much over the timbers. The whole to have fair edges and bolted edgeways with bolts, in diameter, 1 inch; about 5 feet asunder, and clear of the air-ports; fastening, in diameter, $\frac{7}{8}$ inch.

The air-ports to be between the second and third strake, there being no air-list, the clamps will reach the sperketting.

Gun-deck beams, of yellow pine, sided, 1 foot $1\frac{1}{2}$ inches; moulded, 1 foot 3 inches; to spring 6 inches in 45 feet.

Gun-deck knees: to each end of each beam there will be 1 lodge knee, 1 dagger knee, and 1 hanging knee.

Lodge and dagger knees, sided, 8 inches; hanging knees, sided, 9 inches.

Bodies of hanging knees to reach the lower deck water-way; arms in length, 5 feet.

Knee bolts, in diameter, $1\frac{1}{4}$ inch.

Deck, or stern hook knees, sided, 9 inches; bolts, in diameter, $1\frac{1}{4}$ inch.

Knees to be white oak or live oak.

Stanchions on berth-deck, of white oak; in diameter, 8 inches.

Carlings: of yellow pine; same number of tiers as berth-deck; square, 8 inches.

Ledges: of yellow pine; one between every two beams, except in the range of the hatches, where they will be average distance asunder, 2 feet; sided, $5\frac{1}{2}$ inches; moulded, 7 inches.

Coamings and head ledges of hatches, in height, above the deck, 10 inches; to be 1 inch thicker than those on the deck below, and fastened with bolts, in diameter, 1 inch.

Gun-deck plank: of yellow pine, in thickness, when planed, $4\frac{1}{2}$ inches; width not to exceed 8 inches; fastened with iron spikes, and plugged; spikes in beams, in length, 9 inches; spikes in ledges, in length, 8 inches. To have 2 strakes, next the water-way, in width, 9 inches each, jogged over the beams and ledges, $1\frac{1}{2}$ inch; in thickness, 6 inches.

Water-ways: of yellow pine; side edge, in thickness, 5 inches; deck edge, in thickness, 6 inches; of which $1\frac{1}{2}$ inch jogs on the beams; the deck edge will be chined in 2 inches; the wood taken off thence in a straight line to the thickness of the sperketting, 5 inches.

The thick strakes will be bolted edgeways, through the water-ways and side of ship, with 1 bolt in each frame, if practicable, in diameter, $1\frac{1}{16}$ inch.

Side edge of water-way fastened with bolts, in diameter, $\frac{3}{4}$ inch.

Sperketting: of white oak; in thickness, 5 inches. The midships part, when practicable, will be $1\frac{1}{4}$ inch thicker, and jog that much over the timber, where the thickness will be $6\frac{1}{4}$ inches; fastened with bolts, in diameter, $\frac{7}{8}$ inch, as in the outside plank.

Plank sheer: of white oak; in thickness, 6 inches; every other timber to come through; scarphed edgeways, and bolted into water-ways, through the sperketting and into the outside plank, with bolts, in diameter, $\frac{3}{4}$ inch.

Height of top of plank sheer, above deck, 2 feet.

Partners of fore and main-masts, of live oak; in breadth, 1 foot 3 inches; in thickness, 9 inches; framed to admit wedges of 3 inches.

Kneed, as will also those on the berth-deck, with lodge and sap knees, sided, 6 inches; fastened with bolts, in diameter, $\frac{7}{8}$ inch. Those of the mizzen-mast, of live oak, in breadth, 1 foot; in thickness, 8 inches; knees, sided, 5 inches; bolts, in diameter, $\frac{3}{4}$ inch.

Guard beams: of yellow pine, sided, 1 foot 8 inches; moulded, 2 feet 2 inches. To be made in two thicknesses, the pieces coaged together and secured with screw bolts.

Kneed with hanging knees at each end, that is, two inside, sided, 8 inches.

The lodge knees, as the other beams, all to be fastened with screw bolts, sided, 8 inches.

Cable bitts: of live oak; square at head, 1 foot 6 inches; bolts, in diameter, $1\frac{1}{4}$ inch.

Bowsprit bitts: of live oak; square at head 1 foot 2 inches; bolts, in diameter, $1\frac{1}{8}$ inch.

Cat-heads: of white or live oak, sided, 1 foot 3 inches; moulded, 1 foot 5 inches; bolts, in diameter, $1\frac{1}{8}$ inch.

Rudder-head: in diameter, 2 feet; fore and aft, at heel, 5 feet; diameter of bolts, $1\frac{1}{4}$ inch.

Pintles: in number, 4; in diameter, $4\frac{1}{2}$ inches; width of straps, $4\frac{1}{2}$ inches.

Stern timbers, on each side of rudder, of live oak, and kept asunder to clear rudder-head, sided, 10 inches. In the range of the wheel-houses, where the timbers run up, they will mould at the head, $4\frac{3}{4}$ inches.

The plank, inside and out, to be of yellow pine; in thickness, 3 inches; fastened with spikes, in length, $5\frac{1}{2}$ inches.

Between the thick strakes and the clamps in the hold, there will be trusses of timber in a contrary direction to the iron braces, about 6 inches square.

All the through bolts of iron, above the water line, will have nuts and screws, with washers.

Orlop deck plank: of yellow pine; in thickness, $2\frac{1}{2}$ inches.

Orlop deck beams: sided, 1 foot; moulded, 9 inches.

Orlop deck lodge knees: sided, 6 inches; bolts, $\frac{7}{8}$ inch.

Beams over the wheel beams; sided, 16 inches; moulded, 8 inches.

Height in the clear under the beam, 7 feet; under the gun-deck beam to top of berth-deck plank, 6 feet 9 inches; to top of berth-deck beam to orlop plank, 5 feet 2 inches.

Water tight bulk-heads, in number, two; one at the forward fire-room, and the other at the after end of engine room.

Note II.—TABLES OF THE PERFORMANCE OF THE U. S. STEAMSHIP SUSQUEHANNA.

Performance under Sail alone, the paddle wheels being turned by steam only as fast as was necessary to prevent them from impeding the Vessel's speed.

Date. 1851.	Number of consecutive hours.	Speed of the vessel per hour, in knots of 6082⅔ feet.	Course of the vessel.	Wind. Direction.	Wind. Kind.	Sail.	Sea.	Draft of vessel. Forward.	Draft of vessel. Aft.	Draft of vessel. Mean.	Immersion of lower edge of paddle.	Engines. Steam pressure per sq. in. in lbs. above atmos.	Engines. Double strokes of piston per minute.	Engines. Steam cut off at from commencement of stroke.	Engines. Back pressure in condenser per gauge.	Engines. Proportion of throttle open.	Boilers. Number of furnaces of the boilers in operation.	Boilers. Pounds of coal consumed per hour.	Boilers. Kind of Coal.	Speed of the vessel in feet per hour.	Speed of the centre of pressure of the paddles in feet per hour.	Slip of the centre of pressure of the paddles per centum.
								ft. in.	ft. in.		ft. in.	lbs.			lbs.							
Nov. 23 to 27.	108	7·732	—	From abeam to aft.	Gentle breeze.	All sail set	Smooth.	18 0	18 4½		5 8	7·7	8·520	¼	2	0·14	6 for 12 hs. and 4 for 96 hours.	1674	Mixed patent fuel and Newcastle.	47031·18	45169·63	
Nov. 30 to Dec. 2.	56	7·259	N. N. W.	N. E. abeam.	Light breeze.	"	Smooth.	16 7	18 5		4 6	5·3	8·349	"	2	0·15	4	1762	Do. do. do.	45836·01	44154·16	
Oct. 4 to 7.	84	8,865	E. S. E.	S. W. abeam.	Moderate gale.	"	Heavy aft.	18 7	18 9		6 4	7·0	8·636	"	2	0·16	6	2054	Cumberland bituminous.	53922·81	47411.64	
Oct. 10 to 15.	124	8·500	S. E.	N. and W. or aft.	Moderate breeze.	"	Moderate.	16 3	18 6		4 4	7·2	9·078	"	2	0·16	4 for 72 hs. and 6 for 52 hours.	1629	Do. do. do.	51702·66	55838·22	
Sept. 2 to 6.	84	8·000	E. S. E.	W. S. W. on quarter.	Moderate breeze.	"	Moderate.	18 1	19 2		6 4	7·0	8·220	"	2	0·13	6 for 60 hs. and 4 for 24 hours.	1900	Newcastle bituminous.	48661·33	45127·80	
Sept. 12 and 13.	36	9·417	N. N. E.	E. or on quarter.	Fresh top-gal'nt bre.	"	Smooth.	16 7	18 10		4 8	7·6	10·155	"	2	0·16	6 for 24 hs. and 5 for 12 hours.	1962	Do. do. do.	57280·47	55750·98	
Means,		8·234		From aft to abeam.	Moderate breeze.	All sail set	Ordinary.	17 4	18 8		5 4	7·1	8·73	¼	2	0·15	5	1797	Bituminous.	50084·68	47927·70	
Performance under Steam assisted by Sail.																						
June 6 and 7.	16	8·000	S. W.	E. or on quarter.	Moderate breeze.	All sail set	Smooth.	19 2	19 5	19 3½	6 3½	7·2	9·950	·5	2	·11	7 for 8 hs. and 6 for 8 hours.	2775	Cumberland bituminous.			12·77
July 21 to 25.	104	9·190	S. W. by S.	S. E. or abeam.	Moderate breeze.	Sail to top-sails	Smooth.	17 11	18 2	18 0½	5 0½	7·6	11·430	·5	2	·25	8 for 60 hs, 9 for 32 hs. and 7 for 12 hours.	3317	Do. do. do.			10·78
June 9 to 16.	180	8·000	E. by S.	S. W. or on quarter.	Gentle breeze.	All sail set	Smooth.	18 4	19 1	18 7½	5 7½	8·3	10·935	·5	2	·32	12 for 98 hs. 10 for 24 hs. and 8 for 60 hours.	3433	Do. do. do.			18·94
Means,		8·413		From quarter to abeam.	Gentle to moder. br.	All sail set	Smooth.	18 3	18 9½	18 6	5 8	8·0	11·054	·5	2	·28	0·43	3358	Cumberland bituminous.			
Performance under Steam unassisted by Sail.																						
June 8 and 9.	20	6·625	E. S. E.	S. S. E. or on bow.	Moderate breeze.	None.	Moderate.	19 11	20 2	20 0½	7 0½	10·6	87·900	¼	2	·75	12	4084	Cumberland bituminous.			21·22
June 17 to 24.	189	7·335	E. S. E.	E. or on bow.	Moderate breeze.	None.	Smooth.	16 9	17 11	17 4	4 4	7·7	10·480	"	2	·30	8 for 24 hours, 9 for 93 hs. and 10 for 72 hs.	3565	Do. do. do.			22·45
July 5.	19	7·895	S. W.	S. W. or ahead.	Moderate breeze.	None.	Smooth.	19 3	19 6	19 4½	6 4½	9·3	11·230	"	2	·50	10	4270	Do. do. do.			22·10
July 16 to 18.	48	7·200	S. by W.	S. by W. or ahead.	Gentle breeze.	None.	Moderate.	17 9	18 6	18 1½	5 1½	10·4	10·730	"	2	·70	12	4288	Do. do. do.			19·46
July 18 to 20.	60	8·390	S. W. by S.	S. E. or abeam.	Moderate breeze.	Fore & Aft	Moderate.	17 5	18 2	17 9½	4 0½	8·3	11·500	"	2	·31	9 for 34 hours, 10 for 10 h. and 6 for 16 hours.	3808	Do. do. do.			19·18
July 24 to 26.	32	8·220	S. W. by W.	Variable.	Light airs.	None.	Smooth.	16 8	17 6	17 1	4 1	6·7	11·250	"	2	·25	10 for 12 h. and 9 for 20 hours.	3340	Do. do. do.			19·05
September 1 and 2.	34	6·574	E. S. E.	On bow.	Gentle breeze.	None.	Mod'tly heavy.	19 3	19 6	19 4½	6 4½	10·0	8·840	"	2	·625	8	3968	Duffryn, (Welsh.)			17·60
September 7 to 11.	112	7·634	E.	N. E. by E. or on bow.	Moderate breeze.	None.	Moderate.	17 11	18 8	18 3½	5 3½	8·5	10·326	"	2	·35	6 for 32 hs. and 8 for 80 hours.	3183	Do. do. do.			18·19
Sept. 11 and 12.	20	7·712	N. E.	E. or on bow.	Moderate breeze.	Fore & Aft	Smooth.	17 9	18 7	18 2	5 2	9·0	10·766	"	2	·25	8 for 16 hs. and 6 for 4 hours.	3245	Do. do. do.			20·63
Sept. 27 to Oct. 3.	140	7·874	S. E.	E. or on bow.	Gentle breeze.	None.	Smooth.	19 3	19 5	19 4	6 4	10·1	10·650	"	2	·43	10	3432	Do. do. do.			18·08
Oct. 8 and 9.	36	8·240	S. E.	S. or on bow.	Moderate breeze.	Fore & Aft	Moderate.	18 3	18 5	18 4	5 4	9·0	11·320	"	2	·37	10 for 24 h. and 6 for 12 hours.	3067	Do. do. do.			19·35
Oct. 30 and 31.	48	7·230	S. E.	S. or on bow.	Moderate breeze.	None.	Moderate.	19 10	19 10	19 10	6 10	10·0	9·700	"	2	·625	8	3956	Newcastle bitumin's.			17·42
Dec. 8 to 14.	136	7·037	E. by N.	E. N. E. or ahead.	Gentle breeze.	None.	Smooth.	17 11	18 8	18 3½	5 3½	7·8	9·605	"	2	·20	6	2279	Liverpool "			18·83
Dec. 21 to 23.	72	6·042	N. N. E.	On bow.	Moderate breeze.	Fore & Aft	Smooth.	10 0	17 10	17 2	4 2	8·0	8·507	"	2	·20	6	2120	Do. do. do.			21·31
Means,		7·433		On bow.	Gentle to moderate.	None.*	Ordinary.			18 3½	5 3½	8.6	10·259	¼	2	·375	8·444	3279	Semi bituminous.			19·73

* The fore and aft sail producing no perceptible effect.

Note I.

Abstract of Steam Log U. S. Steamer "Powhatan," from New York to Havana.

DAY	DATE.	Average steam.	Average revolutions.	Revolutions made.	Time. H. M.	Coal, pounds.	Knots. D. R.	Lat. at M.	Long. at M.	REMARKS.
Saturday,	Oct. 16, 1852.	13·8	13·5		12 20	56,199	Pilot.			Started from off Battery, N. Y., at 10 20 A.M.; smooth sea; wind abeam; fore and aft sails set; draft of ship, 19 ft. 7 in. & 19 ft. 8 in.; immersion of bucket, 6′ 6″.
Sunday,	" 17,	12·7	12·5	17·353	23 22	116,680	224	37° 15′ N.	75° 03′ W.	Light wind on quarter; sea smooth; fore and aft sail set.
Monday,	" 18,	11·6	11·4	16·040	22 41	103,715	216·5	34° 15′	74° 15′	Moderate head wind; smooth sea.
Tuesday,	" 19,	11·1	12·1	17·423	24	99,300	196	31° 45′	76° 16′ 30″	Light head wind; smooth sea; coal inferior Cumberland.
Wednesday,	" 20,	12·4	12·6	18·185	24	102,010	239	28° 56′	78° 18′	Moderate breeze on quarter; smooth sea; fore and aft sails set.
Thursday,	" 21,	10·3	13.	18·801	24	106,750	247	26° 22′	79° 45′	" " " easy rolling; sails set to top-gallant-sail.
Friday,	" 22,	9·3	13·5	18·843	23 11	102,985	226	24° 01′	80° 52′ 30″	Wind, sea and sails as preceding day; stopped off Moro Castle, Havana, at 11 11 P.M.
From Havana to Vera Cruz.										
Thursday,	Oct. 28,	10·3	12·4	11·359	15 15	59,625	139	25° 16′ N.	82° 47′ W.	Started at 8 40 A.M.; wind astern; mod. sea; sails to top-gal'ts; draft 17 ft. 10 in. forward, 18 ft. 4 in. aft; imm. of W. W. buck. 62″.
Friday,	" 29,	8·3	11·3	15·772	23 15	76,675	221	22° 40′ 15″	86° 45′ 15″	Mod. wind and sea abeam; ship rolling; fore and aft sails.
Saturday,	" 30,	8·4	10·6	14·372	22 32	74,775	176	22° 05′ 20″	89° 36′ 30″	Short, rough sea, and wind fresh abeam; no sails.
Sunday,	" 31,	12·2	12·9	18·280	23 35	86,055	188	21° 44′ 30″	92° 56′ 15″	Mod. wind and sea on quarter; fore and aft sails and top-sails.
Monday,	Nov. 1,	11·4	13·1	10·109	12 50	48,158	233	19° 19′ 15″		Fresh wind abeam; fore and aft sails; anchored off Sacrificios at 1 09 P.M.
From Vera Cruz to Pensacola, Fa.										
Tuesday,	Nov. 2,	10·	13·2	13·529	17 05	64,690	Pilot.	19° 49′ 30″	95° 49′ 15″	Started at 6 10 A.M.; light wind abeam; sea smooth; fore and aft sails; draft 17 ft for'd, 17 ft. 9 in. aft; imm. of W. W. buck. 53″.
Wednesday,	" 3,	19·1	11·6	16·748	24	68,650	214	22° 41′ 15″	93° 20′ 30″	Moderate wind abeam; smooth sea; fore and aft sails; 4 fires banked.
Thursday,	" 4,	9·	11·5	16·408	24	67,275	202	25° 51′	91° 18′ 45″	Fresh wind and rough sea abeam; fore and aft sails and top-sails; 4 fires banked.
Friday,	" 5,	10·	12·5	17·152	23 22	66,300	240	28° 47′ 15″	89° 18′ 15″	As preceding day.
Saturday,	" 6,	7·5	11·8	7·608		21,975	Pilot.			Starting and stopping irregularly during the night; at 10 A.M. anchored at Navy Yard, Pensacola; draft forward, 16 ft. 7 in., aft, 17 ft. 5 in.; immersion of buckets 49″.

When not otherwise noted, the throttle valve is one-half open, and the cut-off operating at half stroke.

Note J.

Office of U. S. Steamer "Fulton,"
New York Navy Yard, *January* 3, 1852.

Sir:—Agreeably to your instructions, I have the honor to report the enclosed Register of Performance of the U. S. Steamer "Fulton," on her trial trip of the 1st instant, under your command: Engineer-in-Chief Charles B. Stuart, and Chief Engineer Henry Hunt, being in charge. The distances are taken from the Coast Survey Chart, and the tabular statements having been compared with the observations of the Engineer-in-Chief, are found to be correct. The distances given by the Pilot exceed those of the Chart six miles.

Very respectfully yours, &c.,

Samuel McElroy,

Assist. Engineer U. S. S. "Fulton."

Capt. W. D. Salter, *Commandant.*

Register of the Performance on Trial Trip of U. S. Steamer "Fulton," Jan. 1st, 1852.

TIME.	Distance run from	Rate.		Miles per hour.	Pressure.	Vacuum.	Cut-off	Throttle.	Revolutions per minute.	REMARKS.
		Miles.	Minutes.		lbs.	in.				
H. M. 10 37 A. M.	Navy Yard.									Started, running 2 miles up E. River; wind on starboard bow 1¾ kts; tide ¼ kt ahead; "San Jacinto" started.
11 3	6¼ miles.	6¼	26	14·95	25	23	½	open	21	Off Castle William; "San Jacinto" estimated distant 3 miles.
11 19	11½ "	4¾	16	17·81	25	25	⅜	"	23½	Passed "San Jacinto" off Quarantine; no wind; ¾ kt tide in favor; blowers used.
11 29½	13¼ "	2¼	10¼	14·00	25	25	½	"	21	Off Fort Hamilton; tide slack.
12 12	22¼ "	8¾	42½	12·52	25	27¼	½	½ open	19	Passed Buoy South-West Spit.
12 21	24¾ "	2½	9	14·16	30	27½	⅜	close	20	Passed Sandy Hook Light.
1 P. M.					25	26¼	½	open	20	(At 12 37, "San Jacinto" passed Buoy S. W. Spit; time, 18½ miles in 2 hours.)
1 23	34½ "	10¼	62	9·79	20	26½	½	close	17	Stopped engine 2 miles beyond Light Ship; under canvas; turned in 5 minutes.
1 49	Return.									Started engine 2 miles beyond Light Ship; sails furled; distance sailed, 2 miles.
1 57	2 miles.	2	8	15·00	25	26¼	½	open	21	Passed Light Ship; wind (2 kts) ahead to Fort Hamilton.
3 22	18¾ "	16¾	83	12·13	30	24½	½	"	22	Passed Fort Hamilton from Swash Channel; slack water; 2 kt breeze ahead.
3 54	25¼ "	6¼	26	15·00	25	24	½	"	22	Passed Castle William; 1½ kt wind ahead; slack water.
4 8										Stopped and backed for "Worcester" 4 min. at Jersey City Ferry.
4 16					30	26	½	⅜ open	21	Passed 23d-street, Hudson River.
4 20	30 "	4¾	22	12·95	30	26	½	"	21	At 34th-street, helm a-starboard.
4 23										Ship about; time 3 min.; 1½ knot breeze in favor.
4 44	37 "	7	21	20	30	26	⅜	open	23	Stopped engine at Navy Yard; blowers used.

Anthracite Coal on board, ...	220 tons.
Mean draft of water, ...	10 feet.
Immersed midship section, ...	298 sq. feet.
Dip of paddles, ...	3 ft. 8 inches.
Horse Power of engine developed, ...	890
Evaporation of water per lb. of coal (return trip),	8·77 lbs.
Indicator Cards were taken hourly.	

Running time under steam, ...	5 hours 22 min.
Distance run under steam, ...	71½ miles.
Average time per hour, ...	13·34 "
Average consumption of Coal per hour, . .	2280 pounds.
Average No. of revolutions per min. (per counter)	21
Sea-water was used in the boilers.	

Note K.

Report of the Secretary of the Navy, communicating, in compliance with a resolution of the Senate, a Report of the Engineer-in-Chief of the Navy, on the Comparative Value of Anthracite and Bituminous Coals.

May 24, 1852—Ordered to lie on the table.

May 27, 1852—Referred to the Committee on Naval Affairs, and ordered to be printed.

Navy Department, *May* 21, 1852.

Sir:

I have the honor to submit the enclosed report of the Engineer-in-Chief of the Navy, on the comparative value of anthracite and bituminous coals, called for by a resolution of the Senate, passed on the 17th instant.

I have the honor to be, sir, with high respect, your obedient servant,

C. M. CONRAD, *Acting Secretary of the Navy.*

Hon. William R. King,
President of the Senate.

Office of Engineer-in-Chief, U. S. N.,
February 24, 1852.

Sir:

In compliance with your instructions, made in conformity to the orders of the Navy Department in June last, to test the comparative value of anthracite and bituminous coals for the purpose of generating steam, I have the honor to report:

That on the completion of the pumping-engine of the dry dock of the New York Navy Yard, I caused experiments to be made with bituminous (Cumberland) and anthracite (white ash) coals; and also on the completion of the United States steamer "Fulton," in January last, I made a series of experiments with the same varieties of coals; the condensed results of all which are herein given. In addition, I would also state, that the United States steamer "Fulton" has been on constant duty several days since the experiments were made, burning constantly *white ash anthracite.*

From a letter from her chief engineer, H. Hunt, Esq., detailing her performance for the first four days, I extract the following:—"The engine worked as well as any I ever saw, but the boilers exceeded my calculations; with clean fires very *easily* keeping forty pounds, cutting off at half stroke *without blowers.* I will here predict that she (the "Fulton") will do *more* service at *less expense*, than any steamer Government will have in five years. Whilst she was out on the first four days I was in her, we were frequently shut off or cutting off to run slow, and turning around, running from one vessel to another, so no calculations could be made of her speed or slip of wheel. The furnace doors were *open full half the time, to keep steam down*, so much more fuel was used than necessary, but the nature of our service was such, that it could not be avoided."

In consequence of the ill health of the chief engineer, he was not able to return in her second trip; the results of her consumption of coal on that occasion, are therefore extracted from a letter written by the assistant engineer, S. McElroy, showing the following:—"Running time with white ash anthracite, January 25 to 28, seventy-one hours. Total coal used, 69,480 pounds; average, $992\frac{6}{10}$ pounds per hour. The above extracts are made, not because they are the most favorable which occur in the log, but as they show the action of the engine and boilers for *several consecutive hours.* Nothing can be smoother than the motion of the engine under ordinary running circumstances; and in relation to the generative power of the boilers, it is more difficult to keep steam *down* than up.

"It is unnecessary to use the blowers for ordinary work, as the natural draft proves abundantly sufficient for twenty to twenty-five pounds of steam, with sixteen to eighteen turns; although they are undoubtedly of great value in cases of emergency, and necessary to the prompt and proper management of the fire-room, with anthracite coal. The 'Fulton' will have no difficulty whatever in making twelve knots in ordinary sea weather, as long as the bunkers hold out."

A more extended series of experiments would undoubtedly be more favorable to the anthracite, owing to the fact that small quantities were put in the furnaces and almost entirely consumed while the engine was working; it being well known that a small body of bituminous coal will burn longer than the same amount of anthracite spread *thinly* over the grates.

The cost of the two kinds of coals used in the experiments were as follows, at the New York Navy Yard:—Anthracite, $3 90 per ton; bituminous, $5 65 per ton.

I have made no comparison of the relative costs of the two kinds of coal, as it may vary according to different localities and periods of delivery, and cannot therefore be considered a fixed element; but have confined the results entirely to their generating powers, deduced from the following experiments:—

1.—*Experiments with bituminous coal, made with the boilers of the United States steamer "Fulton," at the New York Navy Yard, January,* 1852.

The temperature of the water in the boilers being at 38° F., and the temperature of the boiler-room 18°, the fires were lighted at ten hours thirty minutes, A. M.

At eleven hours forty minutes, A. M., the temperature of the water was 212° F., and steam began to be generated at the atmospheric pressure. Time raising steam, seventy minutes. The temperature of the boiler-room had now increased from 18° to 32° F. At eleven hours fifty-four minutes A. M., the steam pressure in the boilers was thirty pounds per square inch above the atmosphere. Time of obtaining thirty pounds of steam, one hour and twenty-four minutes, from a temperature of 32° F. Up to this time there had been fed into the furnaces, one thousand pounds of dry pine wood, equal to five hundred pounds of coal, and two thousand eight hundred and twenty six pounds of (Cumberland) bituminous coal. Total, three thousand three hundred and twenty-six pounds.

The engine was now set in operation to work off all the steam, which the above amount of coal would generate, no more being fed to the furnaces. In fifty-three minutes the steam pressure was reduced from forty pounds to five pounds, and the number of double strokes of piston made from forty-one to seven, when the engine was stopped. During the time the engine was in operation, the steam was cut off at half stroke.

The engine consisted of one cylinder, fifty inches diameter, and ten feet four inches stroke. The space between cut-off valve and piston, including clearance, to be filled with steam per stroke, is 3.094 cubic feet. The calculation of the amount of water evaporated is made from the quantities of steam measured out by the cylinder, divided by the relative bulks of steam of the experimental pressures and the water from which it is generated.

The initial pressure of the steam in the cylinder is taken at one pound *less* than in the boilers. The space displacement of piston filled with steam, per stroke, is 70.448 cubic feet, to which must be added the above 3.094 cubic feet, making a total of 73.542 cubic feet.

Time.	Mean pressure above atmosphere, per square inch, in cylinder.	Number of double strokes of piston made.	Cubic feet of water evaporated.
MINUTES.	POUNDS.		
6	$32\frac{1}{2}$	41	10.326
5	25	34	7.311
5	$22\frac{1}{2}$	32	6.483
5	$19\frac{1}{4}$	$31\frac{1}{2}$	5.879
5	$16\frac{1}{2}$	31	5.352
5	14	30	4.796
5	$11\frac{1}{4}$	26	3.797
5	9	23	3.075
5	$7\frac{1}{4}$	21	2.631
5	$5\frac{1}{2}$	12	1.393
2	$4\frac{1}{4}$	7	0.868
			51.911

Taking the weight of a cubic foot of sea water at 64.3 pounds, the total weight evaporated is (51.911 × 64.3) = 3337.877 pounds. The boilers of the Fulton contained 82.000 pounds of water at the initial temperature of 32° F., which was raised to 212° F., and 3337.877 pounds of it evaporated by three thousand three hundred and twenty-six pounds of coal.

Now it requires five times and a-half as much caloric to evaporate a given bulk of water from a temperature 212° F. as to raise it to that temperature from 32° F. The quantity of fuel, therefore, expended in raising the water from the initial temperature to that of 212° F., compared to that expended in evaporating the 3337.877 pounds from that temperature, will be as $(82.000 \times 180°) = 14{,}760{,}000$ to $(3337.877 \times 990°) = 3{,}304{,}498.23$, or as 4.4666 to 1.000; consequently $\frac{3326}{4.4666} = 744.6$ pounds of coal were consumed in evaporating 3337.877 pounds of sea water, or 4.483 pounds of water per pound of coal. It was intended to have made, on the following day, an experiment, under precisely the same circumstances as above, with anthracite; but it was found impossible from the presence of *ice* to work the engine, the experiment was therefore only made so far as regards the time of getting up steam, with the following results, viz.:—

The fires were lighted with the same *quantity* and *kind* of wood, and the same *quantity* of coal that had been used the day previous. At seven hours and twenty minutes, A. M., the temperature of the water in the boiler being 38° F., and that of the boiler room, 32° F., with the natural draft, the temperature of the water at eight hours and five minutes, was 212° (steam,) and the boiler room, 43° F. Time to generate steam, forty-five minutes. At eight hours and twenty minutes, the steam pressure in the boiler was thirty pounds of steam, per square inch. Time of obtaining thirty pounds of steam from water at 38° F. was *one* hour.

With the bituminous coal, it will be seen, that it required seventy minutes to obtain steam from water at the temperature of 32° F., while it only required forty-five minutes with the anthracite; being a difference of time in this respect of about thirty-six per cent. of the bituminous time.

The data for a comparison of the evaporative values of the coals, were obtained by another experiment, as follows:—

Experiments with White Ash Anthracite made with the boilers of the United States Steamer "Fulton," in New York Bay, January 1, 1852.

This experiment was made with the steamer under way, while steaming with steady pressure of steam and revolutions of the wheel, as follows:—

Steam pressure (*initial*) in cylinder, per square inch above the atmosphere, twenty-five pounds; double strokes of piston, per minute, twenty-one and one-third; cutting off at from commencement of stroke, three-eighths; consumption of coal, per hour, eighteen hundred pounds.

From the above data, there were filled, per stroke, 52.837 cubic feet of the space displacement of the piston, to which add 3.094 cubic feet of space comprised between cut-off valve and piston, making a total of 55.931 cubic feet of steam of twenty-five pounds pressure, which would be per minute $55.931 \times 42\frac{2}{3} = 2386.39$ cubic feet, and per hour 143,183.40 cubic feet. Dividing this last number by the relative bulks of steam of the pressure generated, and the water from which it was generated, we obtain $\frac{143183.40}{684} = 209.332$ cubic feet of sea water, which at 64.3 pounds per cubic foot, amounts to 13,460.047 pounds, evaporated by 1800 pounds of coal, or 7.478 pounds of sea water per pound of coal.

3. *Experiment with White Ash Anthracite coal made with the boilers of the pumping engine at the United States Dry Dock, New York Navy Yard.*

A comparative experiment was made with the boilers of the pumping engine at the New York Navy Yard, in October, 1851, on the relative advantages of anthracite and bituminous coals; all the conditions were as nearly alike as practicable. With the anthracite coal, a combustion of nine hundred and eighty pounds per hour, evaporated a sufficient quantity of water to supply the engine with steam of twelve pounds pressure above the atmosphere, per square inch, for four hundred and twenty-five double strokes of piston, per hour, the steam pressures being alike in both cases; the economical values of the coals will be represented by the number of double strokes of piston made, divided by the quantity of fuel per given unit of time; or will be, anthracite $\frac{425}{980} = 0.4337$: bituminous $\frac{294}{1100} = 0.2673$, or the anthracite is better than the bituminous, in the proportion of $\frac{0.4337}{0.2673} = 1.623$ to 1.000.

It is proper to remark that these boilers were expressly designed for burning *bituminous* coal.

COMPARISON.

The coals used in these experiments were the kinds furnished by the agents of the Government for the use of the United States Navy Yard and Steamers, and were taken indiscriminately from the piles in the yard without assorting.

The bituminous was from the "Cumberland" mines. The anthracite was the kind known as "White Ash Schuylkill."

From the preceding data, it appears that in regard to the rapidity of "getting up" steam, the anthracite exceeds the bituminous thirty-six per cent.

That in economical evaporation per unit of fuel, the anthracite exceeds the bituminous in the proportion of 7.478 to 4.483 or 66.8 per cent.

It will also be perceived, that the result of the third experiment on the boilers of the pumping engine, at the New York Dry Dock, which experiment was made and calculated entirely different from the first and second experiments, gave an economical superiority to the anthracite over the bituminous of 62.3 per cent.; a remarkably close approximation to the result obtained by the experiments on the "Fulton's" boilers, (66.8 per cent.) particularly, when it is stated that the boilers and grates of the pumping engine were made with a view to burning bituminous coal, which has been used since their completion; while those of the "Fulton" were constructed for the use of anthracite. The general characters of the boilers were similar, both having return drop-flues.

Thus it will be seen, from the experiments, that, without allowing for the difference of weight of coal that can be stowed in the same bulk, the engine using anthracite, could steam about two-thirds longer than with bituminous.

These are important considerations in favor of anthracite coal for the uses of the Navy; without taking into account the additional amount of anthracite more than bituminous that can be placed on board a vessel in the same bunkers, or the advantages of being free from *smoke*, which in a *war*-steamer, may at times be of the utmost importance in concealing the movements of the vessel, and also the almost, if not altogether, entire freedom from spontaneous combustion.

The results of the experiments made last Spring, on the United States steamer "Vixen," were so favorable, that I recommended to the Bureau of Construction, &c., the use of anthracite for all Naval steamers at that time having, or to be thereafter fitted with *iron* boilers; particularly the steamers "Fulton," "Prince ton," and "Alleghany," the boilers for all of which were designed with a special view to the use of *anthracite*, and with the approval of that Bureau.

The "Fulton's" bunkers are now filled with anthracite, and the consumptions referred to in the Engineer's Report on that steamer show, during the short time she has been at sea, that the anticipated *economy* has been fully realized.

In view of the results contained in this report, I would respectfully recommend to the Bureau of Yards and Docks, the use of anthracite in the several Navy Yards, and especially for the engine of the Dry Dock at the New York Navy Yard.

In conclusion, I desire the approval of the Bureau to make such investigations as my duties will permit, with regard to the *experience* of the durability of *copper* boilers, when used with bituminous or anthracite coal; which can be done without any specific expenditure.

The inquiry may prove highly important to the Navy Department, as the use of anthracite under copper boilers has been heretofore generally considered as more injurious than bituminous coal, and is, consequently, not used by Government in vessels having copper boilers.

Respectfully submitted, by your obedient servant,

CHARLES B. STUART,

Engineer-in-Chief, U. S. Navy.

Com. Joseph Smith,

Chief of Bureau of Yards and Docks.

APPENDIX.

Letter of the Engineer-in-Chief of the Navy, in relation to Coals, addressed to the Chairman of the Committee on Naval Affairs.

OFFICE OF ENGINEER-IN-CHIEF, U. S. N.,
May 27th, 1852.

SIR:

The Senate, by resolution, having called for my reports to the Navy Department, giving the results of several experiments to test the relative value of anthracite and bituminous coals for generating steam, and referred the same to the Committee on Naval Affairs, I have thought that the results obtained from additional tests and experiments, made in this country and England, would be of service to the committee, and trust that the importance of the subject, both to the interests of the Government and of individuals, will be considered a sufficient apology, if any be needed, for the liberty I have taken in addressing you this communication.

It should be remembered that what is required to be known on this subject, is neither the absolute nor relative evaporation by coals under conditions that never occur in practice, (as too many experiments are conducted,) but the facts to be determined are, the results which can be obtained from them under the ordinary circumstances in which they are used in marine boilers.

With this view I have prepared the following tabular statement, showing the actual evaporation of water effected by bituminous and anthracite coals in the boilers of several Naval steamers, and in those of some transatlantic and river steamers plying to and from New York the past few years.

This table, therefore, from being prepared with care from the steam logs of the different vessels (those of the Navy being on file in this office) is of great value; more so, undoubtedly, than if the results had been obtained from a series of special experiments made under circumstances not normal to the practice, which results, therefore, must be extensively modified before they could be received for practical guides.

The table includes all the cases I have been able to obtain at this time, where the data were unexceptionable; it extends, in most instances, over a course of several years steaming, and the average evaporation thus obtained, although not equal sometimes to the maximum of special experiments, is, in my judgment, more entitled to confidence than any single experiment made with greater critical accuracy, but on too small a scale for trustworthy results.

Of the latter character, I should rank those of W. R. Johnson, Esq., made under the direction of the Navy Department, 1843, in the report of which he states, that "on each sample of coal were made from one to six trials, according to the quantity furnished. The coal consumed in one trial never exceeded 1567 pounds—this being the greatest quantity which the apparatus could receive in the period allotted to each experiment, including the time required for cleaning out the residue, making the necessary adjustments and preparing for a new trial. The total weight of coal consumed in the trials of evaporative power has been nearly sixty-two and a-half tons; and the weight used, on an average, nine hundred pounds per trial"—being less, it will be seen, than half a ton per trial, or not three tons for the greatest number of trials made with any one kind of coal, not equal to a two hours' consumption of an ordinary sea-steamer.

These experiments were not only very limited in their extent, but were made with a boiler entirely different in its construction from those in Naval and sea-steamers, and not at all adapted for that service, and cannot therefore be compared in value to the following practical tests, deduced from the consumptions of hundreds of tons of coals on each steamer named, and in actual service.

Table of Practical Tests of different varieties of Coal.

Name of vessel.	Trade.	Sea-water evaporated from temperature of condenser (100° F.) by 1 lb. of bituminous coal.	Sea-water evaporated from temperature of condenser (100° F.) by 1 lb. of anthracite coal.	REMARKS.
		POUNDS.	POUNDS.	
Michigan,	United States Navy,	*5.000		Fresh water.
Mississippi,	" " "	†4.780		Sea water.
Spitfire,	" " "	†4.870		Sea water.
Engineer,	" " "	‡4.531		Sea water.
Alleghany,	" " "	†5.600		Sea water.
Iris,	" " "	†5.180		Sea water and old flue boilers.
Princeton,	" " "	†6.666		Sea water and new boilers.
Princeton,	" " "	§5.372		Sea water and new boilers.
Princeton,	" " "		7.554	Sea water and new boilers.
Princeton,	" " "		6.639	Sea water and old boilers.
McLane,	United States Treasury,		7.030	Sea water.
Bibb,	" " "		6.030	Sea water.
United States,	Transatlantic Packet,		7.480	Sea water.
Hermann,	" "	†4.487		Sea water and old boilers.
Baltic,	" "		8.555	Sea water.
City of Pittsburg,	" "	†4.930		Sea water.
New World,	Hudson River,		8.022	Sea water.
Commodore,	Long Island Sound,		7.262	Sea water.
Roanoke,	New York and Norfolk,		6.554	Sea water.
		10)51.416	9)65.116	
	Averages, . .	5.142	7.235	

* Pittsburg coal. † Cumberland coal. ‡ Virginia coal. § Scotch coal.

From the averages of the above table, it will be seen that the economical evaporation by the anthracite exceeded that by the bituminous in the proportion of 7.235 to 5.142, or about forty-one per centum of the latter.

In the experiments made on coals by Playfair and De la Beche, by order of the British government, in 1848, I find eleven varieties of Welsh coals having a constitution almost identical with the nine specimens of various Pennsylvania anthracite, experimented on by Johnson, viz.:—

	Welsh anthracite.	Pennsylvania anthracite.
Fixed carbon, ...	87.54	88.54
Sulphur, ...	0.79	0.05
Other volatile matter, ...	5.50	5.17
Earthy matter, &c., ...	6.48	6.51
	100.31	100.27

The average evaporation of water by the Welsh anthracite, and by the Pennsylvania anthracite, was as follows:—

Fresh water evaporated from the temperature of 212° F., by one pound of coal.

By Welsh anthracite, ... 9.263 pounds.

By Pennsylvania anthracite, ... 9.590 "

Thus far there is a very close agreement between the results obtained by the different experimenters from substantially the same coal—that coal being anthracite.

In the experiments of Playfair and De la Beche, above cited, I find three varieties of Welsh bituminous, three varieties of Scotch bituminous, and one variety of English bituminous, having a constitution almost identical with the five specimens of Maryland (Cumberland) bituminous coal experimented on by Johnson.

	Welsh, Scotch, and English bituminous.	Maryland, (Cumberland,) bituminous.
Fixed carbon, ...	75.00	75.05
Sulphur, ...	1.47	——
Other volatile matter, ...	14.55	15.45
Earthy matters, &c., ...	8.97	9.49
	99.99	99.99

The average evaporation by the Welsh, Scotch and English bituminous and by the Cumberland bituminous, was as follows, viz.:—

Fresh water evaporated from a temperature of 212° F., by one pound of coal.

By Welsh, Scotch and English bituminous, ... 8.02 pounds.

By Maryland (Cumberland) bituminous, ... 9.93 "

Here is a great discrepancy between the results obtained by the two experimenters on substantially the same coals; Johnson making the Cumberland bituminous better than the British bituminous in the proportion of no less than twenty-four and a-half per centum of the latter. Had a similar difference been found in the case of anthracite between the results of the two experiments, it might have been accounted for by a difference of boiler or method of conducting the experiments.

From an investigation of the two kinds of boilers employed, I am of opinion that though in their proportions separately different, yet in the aggregate they were equivalent; an opinion justified also by the equality of results obtained with anthracite.

The results, then, of Johnson's experiments are that Cumberland bituminous exceeds the Pennsylvania anthracite in economical evaporation, four per centum of the latter; while the results from the English experiments, on substantially the same coals, make the economical evaporation of the anthracite to exceed that of the bituminous over twenty-four per centum of the latter.

I would here beg leave to remark that there were several important facts attending the experiments of Professor Johnson, which, rightly understood, would greatly modify his results; and which facts it is absolutely necessary to consider in order to arrive at correct practical information. One of the most important of these is the rapidity of combustion, which is ordinarily measured by the number of pounds of coal consumed per hour per square foot of grate surface, the average quantity of which in marine boilers may safely be taken at fifteen pounds.

In Johnson's experiments, however, the consumption of Cumberland bituminous coal was at the rate of only $7\frac{11}{100}$ pounds, and of anthracite $6\frac{43}{100}$ pounds; an average of less than half the practical rate of consumption.

It is obvious, therefore, that the rapidity of combustion being an important element in determining the evaporative efficiency of different coals, that in any experiments made to ascertain this efficiency for marine boilers, the rapidity of combustion should be about the average of what occurs in actual practice at sea.

Again: the importance of the rate of combustion in effecting the results to be obtained from anthracite or bituminous coals, are well signalized in the following extract from a paper by Chief Engineer Isherwood, United States Navy, published in "Appleton's Mechanic's Magazine," etc., for October, 1851, page 621, viz:

"In the combustion of bituminous coal, *time* is the important element, and a slow rate of combustion with low velocity of draft is necessary for obtaining high evaporative results, and for the following reasons, viz: The bituminous portion of the coal is volatalized and separated from the fixed carbon part at a lower temperature than is required for its ignition, that is, than is required for its chemical union with oxygen. In this gaseous state, occupying the furnaces and flues of the boiler, it can only be ignited by being mixed with atmospheric air at a sufficiently high temperature; the element of time is, therefore, doubly important; *first*, to allow the gases to become intimately mixed with the atmospheric air; *second*, to allow them to acquire the necessary high temperature. If now, by means of a powerful draft, the gases, having only the low temperature due to their volatilization, be driven so quickly through the flues and out of the chimney of the boiler as not to allow them time enough to acquire the proper temperature for combustion, and to have the proper mixing with the atmospheric air, a great loss of effect must inevitably follow.

"For the economical combustion, then, of bituminous coal in generating steam, there should be a slow rate of burning, or a small amount consumed per unit of time per unit of surface."

"In the combustion of anthracite coal, however, the above general observations do *not* apply. Considering the principal portions of the anthracite to be fixed carbon, there will of course be no volatilization of bitumen at a lower temperature than what is required for the ignition of the fixed carbon; the coal will consequently remain unchanged until the temperature is sufficiently high for its combustion, that is, for the combustion of its fixed carbon; a forced draft cannot, therefore, carry off the fuel before it is ignited, and in this view velocity of draft is comparatively unimportant. Again, combustion with the anthracite is effected solely by the contact of the air with their solid surfaces; there is therefore no mixing to be done, and consequently no time required to do it in. Here, then, under two important conditions, great velocity of draft, which is highly detrimental to the economical combustion of bituminous, is unimportant in the combustion of anthracite coal."

Taking the above views to be correct, which it is believed they are, it will be perceived that the very *slow* rate of combustion used with the bituminous coal in Johnson's experiments, (a rate utterly out of question with marine boilers) was in the *highest degree favorable for the development of the full heating power of the bituminous coal;* now as this rate of combustion is impracticable in marine engines, a very great correction for inferior results to be obtained by the faster rate of combustion must be made, in order to obtain their *practical value.* With the anthracite, the very slow rate of combustion used was positively a *disadvantage,* as it could not keep the *whole* mass sufficiently high to enable the fixed carbon to take up the oxygen of the air as fast as the latter entered; consequently it exerted, in a considerable degree, a *cooling* power.

Further, it is generally acknowledged that the quantity of *carbon* in coals is at least an index, if not a full measure of their practical heating power. This idea is entertained by Johnson himself, and is announced in his work on coals, published in 1850, pages 118, 123 and 124, viz:

"The British experimenters continued their analysis of the coals till every sample had been submitted to both proximate and ultimate determination. In the American experiments time was not allowed before the report was demanded, for extending the ultimate analyses to more than one-eighth part of the samples. From such trials as were made, the deductions which appeared to be authorized by a careful comparison between the constituents of the coals and their *evaporative efficiency* was, *that the latter depended upon the total amount of carbon in the coal.* If hydrogen had been, as many European chemists had contended, the more efficient element, weight for weight, then all highly bituminous coals ought to have presented a greater heating power than those of lower bituminousness."

"Both the American and British experiments concur in proving the *reverse of this to be the fact.*"

"This development finally *sets aside the old calculations about the relative heating powers of carbon and of the hydrogen in coals.* By the principle of that calculation, any coal having a high degree of bituminousness ought, in consequence of the large proportion of hydrogen in its bitumen, to possess a much higher heating power than any coal of lower bituminousness. *The reverse of this is true. The higher the bituminousness, or, in other words, the greater the proportion of volatile matter a coal contains, the less is its available heating power.* The fact has been pointed out in former publications of the writer, that when solid hydrogen (that being its state in coals) is converted by the effect of heat into gaseous hydrogen, it requires for this change a large amount of heat, as experimentally proved in the manufacture of illuminating gas. The hydrogen thus brought to the gaseous state, assumes the same bulk at a given temperature, say 212°, as it will retain at the same temperature when converted into vapor of water under the atmospheric pressure; and consequently, unless we can suppose the capacity for heat of gaseous hydrogen, bulk for bulk, to be greater than that of the vapor of water, we can conceive no reason why it should give out more heat in combining with oxygen than it had taken up in being converted into gas. The British Commissioners refer to this view of the subject, but do not clearly express an opinion of its validity.

"Fortunately their silence is of less importance, as their own experiments furnish abundant proofs of the correctness of the principle. In order more clearly to exhibit the independence of *hydrogen efficiency* in computing heating powers of analyses, we have placed in the above table the per centage of hydrogen found in each sample of coals. From this column the averages are deduced, and a glance will show, that so far as any law or relation is perceptible, the *coals of highest heating powers are those which have the lowest per centage of hydrogen.*" The table above referred to, condensed from Johnson, stands as follows, viz:

	Hydrogen.	Carbon.	Steam by experiment.	Steam by calculation.
	PER CENT.	PER CENT.	POUNDS.	POUNDS.
Four coals, average, . .	4.13	74.15	7.78	8.03
Do. do. . . .	4.30	76.63	8.35	8.37
Do. do. . . .	4.57	79.67	8.65	8.60
Do. do. . . .	4.88	81.06	8.89	8.75
Do. do. . . .	4.17	85.68	9.17	9.25
Do. do. . . .	4.55	88.12	9.50	9.51
Do. do. . . .	4.47	88.99	9.75	9.75

"Thus the four coals having a heating power of 7.78, have excess of hydrogen 4.13; the four having heating powers of 9.17, have of oxygen in excess 4.17. It will also be noted that an intermediate class of coals having a heating power of 8.65, has a higher per centage of hydrogen than either of the above, viz: 4.57. This is as we might expect to find it, if the *hydrogen be truly without efficiency in the practical use of coal. Indeed, the hydrogen appears from the practical tests thus far adduced, no more to merit the consideration as an element of evaporative efficiency in coal, than an equal weight of silicia, alumina, oxide of iron, or other inert substance found in its earthy residuum or ash.*"

It appears to be difficult to reconcile the foregoing and well-established facts, with the numbers given by Professor Johnson as the results of his experiments on anthracite and Cumberland (bituminous) coals, the former containing $88\frac{54}{100}$ per centum of carbon, and the latter only $75\frac{05}{100}$ per centum, while he makes the latter *four per centum* better than the former, while it should have been as above demonstrated, the reverse, in the proportion of $88\frac{54}{100}$ to $75\frac{05}{100}$, or eighteen per centum.

The results of the British improvements on substantially the same coals, viz: containing relatively

$87\frac{54}{100}$ and 75 per centum of carbon, gave for the former a greater efficiency of twenty-four and a-half per centum, making a difference in the results of over twenty-eight per centum.

A large number of experiments and practical tests might be cited to further prove the greater efficiency of anthracite over bituminous coals, in proportion very nearly as the element of carbon was found; but they would swell this paper, now already too extended. I have therefore confined the comparison to a few experiments of admitted correctness, to illustrate the facts, and in conclusion would add, that I agree fully with the views expressed in Professor Johnson's report, "that for the purpose of steam navigation, therefore, the rank most important to be considered (in different coals) is in the order of their evaporative power under given bulks. This is obviously true, since, if other things be equal, the length of a voyage must depend on the amount of evaporative power effected by the fuel which can be stowed in the bunkers of a steamer, always of limited capacity. With this scale of value, however, must be combined the relative freedom from clinker, and the maximum rapidity of action; while the rapidity of ignition is of inferior importance, but may deserve some consideration where short voyages, frequent stoppages, and prompt commencement of action are demanded"—all of which qualities I think have been from practical results found to be more fully combined in the white ash anthracite of Pennsylvania than any other known coal. I therefore fully concur in the opinion of Professor Johnson, expressed in his work on coals, published in 1850, page 160.

"In conclusion I may observe, that while these analyses demonstrate the high density and compactness of this coal (anthracite) fitting it for the purposes of steam navigation, for which these qualities, combined with great heating power, are of primary importance, they also show, that for the various arts and for domestic consumption, its properties are calculated to sustain the high character of the central coal-field of Pennsylvania, for the concentrated and durable heat which it furnishes, and the absence of those ingredients which might interfere with its useful application."

I have the honor to be, sir, with great respect, your obedient servant,

CHARLES B. STUART,

Engineer-in-Chief, U. S. N.

Note L.

Dear Sir:

In accordance with the request you did me the honor to make, for a description of my condensing system, for publication in your forthcoming work on the Naval and Mail Steamers of the United States, I have prepared the following, which I hope will prove acceptable.

The proposition for supplying the boilers of marine engines with fresh water, is one which has occupied the attention of engineers, more or less, since the time of Watt himself, and it may seem a little strange that up to the time I was first attracted to the subject, every attempt, however auspicious at the commencement, had proved a failure, so that as far as I can learn at the present day, throughout the world, sea-water is still the only element used for generating steam in ocean steamers, except in the case of those ships supplied with my apparatus.

The immense quantity of water which is required to be evaporated, in order to supply steam for a large marine engine, renders the conveyance of it in the vessel out of the question. The first idea, then, which presents itself, is to preserve that which was originally put in the boilers previous to starting, by contriving some means of saving the water resulting from the condensation of the steam, and, by returning it through the feed-pumps back again to the boiler, to maintain a constant circulation of fresh water through the machine.

The *theoretical* apparatus for effecting this result immediately suggests itself, for it is only necessary to discharge the steam into an air-tight chamber, kept at a low temperature by cold water on the outside, and drawing out the water resulting from the condensation, by a pump, restore it to the boiler. This produces all that the injection-condenser does, with the additional advantage of saving the fresh water.

The practical difficulties and dangers attending surface condensation, have been so great as to override its advantages, and until the discovery made by myself of a means for getting rid of all force and pressure, and of the destructive effects of expansion and contraction, there appeared to be no possibility of reviving the system.

The preservation of life and property in ocean steamers is of such importance, that it is not surprising that proposals for any change in the system of working the engines should be entertained with great caution. Hence the first requirement of any apparatus for furnishing fresh water is, that it must not change the mode of working, nor increase the liability to derangement of the engine.

Second, in case of disarrangement, it must involve no other change than the partial or entire loss of the fresh water, thus allowing the engine to go on in the ordinary way with the common condenser. These elements were all wanting in the old propositions for surface condensation, for those all change the mode of working the engine, so that a derangement, however slight, of any part (and sooner or later some such must occur) would at once disable the engine.

I have deemed the foregoing introduction necessary, in order to show the distinctive features between my system and the former ones.

The condenser for the United States steam-ship "Alleghany," which you desire me to use in illustration of this description, is not in all respects of the most agreeable shape and proportions, the nature of the engines and space allowed me being such as to require some modification in the shape and position of the parts; the principle involved, however, is not at all changed. In Plate 17, Fig. 1, is a longitudinal elevation of the condenser and evaporator, partly in section. Fig. 2, is a top view of the same, and Fig. 3, is an elevation of the exhaust end. A, exhibits a case of cast iron, sufficiently strong to resist the pressure of the atmosphere; it must, when ready for operation, be perfectly air and water tight. (*a*) is a nozzle to join the exhaust-pipe of the engine. (*b*) leads to and connects with the channel of the large air-pump. (*c*) is an injection-pipe. This, it will be perceived, extends along in the inside and immediately over a perforated plate (*d*) for distributing the water upon the surface condenser in the form of a shower. B, is the surface condenser. This consists of a cluster of small tubes, inserted in perforated plates, and covered by caps (*e*, *f*,). In the cap (*f*), a hole is cut joining the exhaust nozzle (*a*), through which the steam passes into the pipes. In the bottom of (*e*) is a discharge-hole, leading to a channel which connects with a small air-pump, (*g*). At (*e*′) is shown a hole cut in the cap (*e*). At (*f*′) is a screen, being a sheet of metal perforated with fine holes, the object of which is to distribute the steam in equal quantities to all the tubes. The operation of this part of the apparatus is as follows:

The engine is started and the injection let on through (*c*) as in the ordinary manner. The great air-pump connecting with the channel (*b*) and also the small air-pump (*g*) now operate, the large one removing the salt injection-water, and producing a vacuum in A, while the small one (*g*) draws off the condensed steam through the channel (*i*) and produces a vacuum *within* the surface condenser. Now it is evident that if there were only a *single* vacuum, so to term it, that is, a vacuum within the surface condenser, B, then that would be required to sustain the pressure of the atmosphere. But by reason of the large air-pump exhausting also the air from the case A, the pressure is taken off the surface condenser, and that therefore is not required to sustain any, but the case A sustains it, as in a common condenser. This at once transfers all liability to accident from that cause, from the *surface* condenser to the injection condenser, and reduces the whole risk to the permanency of the latter vessel, or to the least that is possible, in the present mode of working the steam engine. Hence it follows, 1st. That all risk of derangement by a rupture of the surface from pressure is reduced to the *minimum*. And 2d, that if a fracture should at any time occur, it involves only the loss of a part or the whole of the *fresh* water, according as the break is more or less extensive.

Here, then, is the solution of the whole question. But, to make assurance doubly sure, I cut the aperture (*e*′) (an operation which would be *fatal* to any surface condenser on the *old* principle). This is to insure, under every circumstance, an absolute equality between the vacuum within A, and that within B, so that, should any steam remain uncondensed, by reason of insufficient surface or condensing-water, it would flow through this aperture, (*e'*) and be condensed by direct contact with the jet. It is thus within the ability of the engineer to work the engine in either way he pleases, at a moment's notice, and without even stopping the machine, since by withdrawing the valve (*o*) and unhooking the pump (*g*) from the working-beam, he at once restores the engine to its common form. The next feature is the provision for expansion. The surface condenser is entirely detached from the case A; the nozzle joining the exhaust (*a*) is merely a slip-joint, and thus the whole mass of tubes may expand and contract together, without risk of rupture to any of the joints. In case of small leaks, it is evident that the vacuum will not be impaired, because there is nothing present to enter.

Consequent upon the absence of pressure is the ability to reduce the weight of metal employed in the surface condenser, and therefore the thinnest that is capable of being worked, is sufficiently strong.

Neither is it necessary to form the surface condenser of tubes; sheets of metal subdividing the steam and water into thin strata, will work efficiently, as will many other forms which I have contemplated. I prefer tubes, however, for the reason that the handling and working of these is known to all machinists, and besides I am not aware that any decided advantage would be gained, either in work, weight, or space occupied, by the employment of any other arrangement.

There remains to be described another vessel to be used in connection with the condenser. This is seen at C. The only use of this apparatus is to make up for deficiencies caused by leaks in the boilers, engines, and conducting pipes.

It is understood that the original supply of fresh water put into the boiler before starting, is that which is to be continually used. If there were no leaking joints, this would last *ad infinitum;* but to replace the amount lost I employ the evaporator C. This is a case of metal, of proper dimensions, within which is a series of tubes, D, communicating at (*m*) with a steam-chamber. (*n*) is a pipe connecting C with the exhaust-pipe (*a*). (*o'*) is a pipe to feed salt water to C. (*p*) a pipe connecting C with the channel (*b*) leading to the large air-pump. (*r*) is a pipe leading to the boiler. (*s*) a pipe discharging into the exhaust opening (*a*). The operation is as follows:—As soon as a vacuum is formed in the condenser, there will be a like vacuum in the case C, by reason of the connection through (*a*). Open now the cock in the pipe (*o'*), and let salt water flow in to the proper height, as ascertained by the glass water-guage (*t*). Steam is then let in through (*r*), and entering the tubes D, soon brings the sea water to a state of ebullition. The vapor is drawn off through (*n*) into the condenser, and is there condensed along with the steam from the engine, going with it to the feed-pumps, and thence to the boiler. Thus, whatever amount is evaporated in C is added to the supply, until the loss is made up. The pipe (*p*) is for removing a portion of the concentrated water, or is equivalent to a "blow-off" pipe in an ordinary boiler. (*s*) is a pipe to draw off the water from (*m*), arising from the condensation of steam within the pipes D; being fresh, it is thus saved. As soon as the boiler is filled up by this means, the salt water is all drawn off by (*p*), and a stream allowed to flow through for a few minutes to wash all out; then shut every thing off until the apparatus is again wanted for use.

It is very important that commanders and engineers should have an understanding with each other relative to stopping at sea, in all steamers supplied with my condenser. For, if the engineer is ordered suddenly to stop the engine, for any purpose, as to take soundings, &c., while there is a full head of steam on, it involves the necessity of raising the safety-valves, and thus a large amount of fresh water is *wasted in the air.* In all cases, fifteen or twenty minutes' previous notice should be given, in order that the steam may be run down, and the fires diminished.

I have the honor to be, your obedient servant,

J. P. PIRSSON.

Dimensions of the Alleghany's Condenser.

Outside shell or case:

Extreme length,	$72\frac{3}{4}$ inches.
" height,	$62\frac{1}{2}$ "
" width,	$39\frac{1}{2}$ "

Surface condenser:

Number of square feet in tubes,	1000 feet.
Length of "	4 "
Number of "	1000.
Diameter of outside,	1 inch.
Weight of tubes,	20 oz. to sq. foot.

This is calculated to maintain a vacuum of $26\frac{1}{2}$ inches, and to have the feed-water delivered at 130° F.

Evaporator—Outside shell or case:

Extreme height,	71 inches.
" length,	38 "
" width,	$27\frac{1}{2}$ "

Copper tubes:

Length,	4 feet.
Diameter,	$1\frac{1}{2}$ inches.
Number of square feet,	200

Note M.

Schedule of Contract Prices for Materials and Work on several U. S. Naval Steamers.

	Powhatan.	Susquehanna.	San Jacinto.	Fulton.
	$ cts.	$ cts.	$ cts.	$ cts.
FINISHED IRON CASTINGS, per pound:—				
For the steam cylinders, accurately bored and their end-flanges faced,	10	10	11	
" " air-pumps, rough-bored, and all their flanges faced,	10	10	11	11
" all castings made in loam moulds,	5½	5½	6	6
" " " " dry sand "	4½	4½	5	5
" the two sets of grate bars cast in green sand and close flasks,	3	3½	3½	3½
" all castings made in green sand moulds,	3¼	3¼	4½	4½
FINISHED WROUGHT IRON, per pound:—				
For the water-wheel and centre-shaft cranks, when bored, rough-planed, turned, and cold-hammered,	30	30	20	24
" " cylinder and air-pump cross-heads when bored and turned,	25	25	25	25
" " water-wheels complete and in their places, (the buckets being furnished by the United States)	13	13		18
" " shafts, rough turned, except journals and eccentric seats,	15½	16	15	14
" all other parts of wrought iron,	16		20	15
" the frames of three-eighths and one-half inch iron plates, butted and double-riveted, and well braced with socket-bolts,		15		
" finished wrought steel, per pound,	32½	32½	35	35
" " " copper, "	35½	35	38	38
" " " composition, per pound,				
" all castings for engines, (including lining)	30	35	35	35
" " " " boilers,	26	30	30	30
" the screw-propeller,			50	
BOILERS:—				
For building, and putting up on board, (the copper for the first *three* furnished by Government)	8½	8½	10	12½
" the smoke-pipe, braces, bands, casing, &c.,	14	14	16	16
" all other work, including tools, &c.	12½	12½	16	18
TURNING AND BORING, per square inch:—				
For wrought iron, cast iron, and steel,	2¼	2¾	2½	2½
" composition and copper,	2	2	2½	2½
PLANING, per square inch:—				
For wrought and cast iron, composition and copper,	2	2	3	3
" steel,	2½	2½	3	3
PATTERN-MAKING, per day:—				
For pattern-makers, including tools, &c.,	2 25	2 25	2 50	2 67½
" lumber, per foot, of 144 cubic inches,	4½		5	5
" mahogany, " " " "	18	18	16	16
Fitters, per day,	2 25	2 25	2 50	2 87½
" " " erecting engines on board,			2 75	3 16
Laborers, "	1 25	1 25	1 50	1 72½
COAL-BUNKERS, per pound:—				
Of puddled plate iron, with bolts, braces, and doors, fitted and in their places,	12¼	12½	13	13
Copper pipes, per pound,	45	45	46	46

APPENDIX.

In fixing the prices for the work on the "Fulton," the Bureau made such additions to those of the "San Jacinto," as the relative value of labor seemed to require, and for the prices of the "Alleghany" an addition of from ten to fifteen per cent. was made on those of the "Fulton," as the difference in cost, in the opinion of the Bureau, between New York and Norfolk. The author has advised against the system of letting work by the pound and day, preferring proposals for the entire work at a given sum, on the ground of economy and efficiency, which plan was adopted in the case of the "John Hancock," (the second) the benefits of which will appear by reference to the cost of the machinery of that steamer.

Note N.

ENGINEER CORPS OF THE UNITED STATES NAVY.

Charles B. Stuart, Engineer-in-Chief.

CHIEF ENGINEERS.

Wm. P. Williamson, . .	Alleghany.
Wm. Sewell, ...	Inspector of such mail steamers as are convertible into war steamers.
Wm. W. W. Wood, . .	Saranac.
Henry Hunt, ...	Fulton.
Daniel B. Martin, . .	John Hancock.
Joshua Follansbee, .	Waiting orders.
B. F. Isherwood, . . .	Office of Engineer-in-Chief.
Jesse Gay, ...	Mississippi.
Samuel Archbold, . . .	Susquehanna.
George Sewell, . . .	Powhatan.
William E. Everett, .	San Jacinto.
William H. Shock, . .	Princeton.
James W. King, . . .	Michigan.

FIRST ASSISTANT ENGINEERS.

Naylor C. Davis, . . .	Active, (Revenue steamer.)
Michael Quinn, . . .	Saranac.
George F. Hebard, . .	Susquehanna.
William K. Hall, . .	Powhatan.
John P. Whipple, . . .	Powhatan.
Elbridge Lawton, . .	Argus.
Henry Mason, ...	Saranac.
James G. Young, .	San Jacinto.
John Alexander, . . .	Engineer.
Jesse Rutherford, . .	Princeton.
Robert Danby, ...	Mississippi.
Wm. Holland, . . .	Mississippi.
B. F. Garvin, ...	San Jacinto.
E. A. Whipple, . . .	Massachusetts.
Theodore Zeller, . . .	Massachusetts.
Thomas Kilpatrick, .	Princeton,
Henry H. Stewart, . .	Susquehanna.
C. W. Geddes, . . .	Engineer-in-Chief's office.

SECOND ASSISTANT ENGINEERS.

J. W. Parks, ...	Michigan.
N. P. Patterson, . .	Alleghany.
Robert H. Long, . . .	Office of the Engineer-in-Chief.
Alvan C. Stimers, . .	Walker, (Revenue steamer.)
Thomas A. Stephens, .	On his way home from Cal.
John Faron, ...	Powhatan.
F. C. Dade, ...	Corwin, (Revenue steamer.)
George T. W. Logan, .	Mississippi.
E. S. DeLuce, ...	Fulton.
Harman Newell, . .	Saranac.
Mont. Fletcher, . . .	Alleghany.
George Gideon, . . .	Powhatan.
Edward Fithian, . . .	Susquehanna.
Wm. C. Wheeler, . .	San Jacinto,
David B. Macomb, . . .	Hancock.
Eli Crosby, ...	Susquehanna.

SECOND ASSISTANT ENGINEERS.—*Continued.*

Andrew Lawton, . . .	Saranac.
Wm. H. King, . . .	Powhatan.
R. C. Potts, ...	Water Witch.
J. C. E. Lawrence, . .	Susquehanna.
John M. Mauny, . . .	Massachusetts.
James M. Adams, . .	Hetzel, (Revenue steamer.)
Simon B. Knox, . . .	Duty, Baltimore.
Amos Broadnix, . . .	Leave, (sick.)
Jackson R. Hatcher, .	Leave, (sick.)
James M. Hobbey, . .	San Jacinto.
Wm. A. R. Latimer, . .	Active, (Revenue steamer.)
Daniel T. Mapes, . .	Vixen.
James H. Warner, . .	Princeton.
Wash. H. Nones, . .	Walker.
Wm. H. Rutherford, .	Mississippi.
Geo. W. Alexander, .	Mississippi.
Theo. A. Jackson, . .	Saranac.
Wm. J. Lambdin, . .	Water Witch.

THIRD ASSISTANT ENGINEERS.

T. A. Shock, ...	Susquehanna.
Chas. A. Loring, . .	Princeton.
Wm. H. Stamnn, . . .	Powhatan.
H. S. Barker, . . .	Water Witch.
Samuel H. Houston, . .	Engineer-in-Chief's office.
Columbus W. Lee, . .	San Jacinto.
Geo. F. Barton, . . .	Waiting orders.
Oscar Davids, . . .	Saranac.
Alex. Henderson, . . .	Susquehanna.
T. B. C. Stump, . . .	Water Witch.
C. H. Manson, ...	San Jacinto.
C. T. Parbe, ...	Waiting orders.
Virginius Freeman, . .	San Jacinto.
George E. DeLuce, .	John Hancock.
Stephen D. Hibbert, .	Susquehanna.
P. H. Taylor, . . .	Vixen.
George R. Johnson, . .	East India Squadron.
Mortimer Kellog, . .	East India Squadron.
J. C. Hall, ...	Corwin.
John C. Mitchell, . .	John Hancock.
Wm. Gorton, ...	Waiting orders.
Henry Fauth, . . .	Powhatan.
Edward D. Robie, . .	Mississippi.
Hiram Hains, ...	Corwin, (Revenue steamer.)
H. C. Jewell, ...	Active, " "
Wm. R. Brooks, . . .	Michigan.
Samuel O. Shorey, . .	Fulton.
Levy Arnold, . . .	Powhatan.
Lloyd A. Williams, . .	John Hancock.
Henry W. Spooner, .	Michigan.
George E. Shock, . .	Walker, (Revenue steamer.)
John D. Mercer, . .	Mississippi.
J. M. Freeman, . . .	Michigan.
Cleavland Lindsley, .	Walker, (Revenue steamer.)

Note O.

Copy of Specification for the Building of the U. S. Mail Steamships "Baltic" *and* "Arctic."

HULLS.

Dimensions and description, to wit:—

Length of keel, two hundred and seventy-seven (277) feet.

Length on main-deck, two hundred and eighty-two (282) feet.

Depth under the main-deck, twenty-four (24) feet.

Depth under the spar-deck, thirty-two (32) feet.

Breadth of beam, forty-five (45) feet, moulded, and to have a rounded stern, three (3) masts, with suitable spars, a lower-deck, main-deck, spar-deck, and orlop-deck, the latter to extend from engine-room, forward and aft.

Frame to be of white oak and chestnut, except the top, which is to be of live oak, locust and cedar; stanchions and timber-heads, to be of locust, keel to be of white oak, and sided 17 to 20 inches; main-keelson, of white oak and sided 16 to 17 inches, and to be two in depth, of 16 inches each, and coaged; side-keelsons, extending the whole length of the ship, of yellow pine, except the upper-keelson sunder the engines, to be of white oak; keelsons under the engines to be twenty-two (22) inches in width and forty-two (42) inches deep, under the boilers, 22 inches wide and 27 inches deep.

The frame to side from 10 to 12 inches, viz:—floors, 12 inches, and moulded 20 to 21 inches.

Lower futtocks, 12 inches, and all the other timbers to side 10 inches, and frames to be placed from 30 to 36 inches apart from centre to centre, except the floors, which are to be filled in solid to the turn of the bilge, from stem to stern.

Outside plank to the main-deck to be yellow pine, 5 to 7 inches thick, from 6 to 8 inches wide, except the streaks next to the keel, which are to be of white oak, 15 inches wide, and 9 inches thick. and to be bolted edgewise every 3 feet, with 1 inch copper bolts, through the keel, and 2 bolts of the same size through each timber, and to be clenched on rings on the inside; yellow pine plank to extend 3 feet above main-deck.

Bilge streaks, ceiling, clamps, and lower-deck water-ways, to be of yellow pine; fire bilge streaks to be 12 inches square, and bolted together edgewise every *four* feet; clamps to lower-deck to be 8 inches; upper-deck, 7 inches, and all the ceiling under the main deck, 7 inches.

Deck beams to lower and main-decks to be of yellow pine, sided from 12 to 14 inches, and moulded 10 inches at the ends, and 13 inches in the middle; spar-deck beams to be of white and yellow pine, moulded 6½ inches, and 8 inches in the middle, and to have a lap-lodge and hanging-knee to each beam; orlop-deck beams to be of white and yellow pine, of suitable size.

Deck plank to be of white pine, lower-deck, 3½ inches; main-deck, 4 inches; spar-deck and orlop-deck, 3 inches.

All the coamings on the spar-deck to be of mahogany, and bulwarks on that deck, to be 3½ feet high.

Lodging, boson, and hanging-knees to be white oak and hackmetack; knees not to be less than 7 inches; clamps and ceiling for the spar-deck to be of yellow or white pine, from 3 to 5 inches thick, as the Company's superintendent may deem best.

Fastenings.—Scarfs of keel to be fastened with 1 inch copper bolts, dead-woods, from 1¼ to 1¾ inches; stern-frame, stern-apron, and lower-keelson, to be 1¼ inch copper bolts, and through the upper-keelson, 1½ inch, except where iron is used.

Keel and keelson to be bolted as follows:—Lower keelson to have 1⅜ inch iron bolts, passing through a coag in each frame; 1¼ inch copper bolts in each filling-in timber, and 1½ inch copper bolts through the upper-keelson, in each frame; bolts on the under side of the keel, to have rings clenched on them; side-keelsons to be fastened with 1½ inch iron; the bilge-streaks to be bolted to the frames, and together, between each frame, with 1 inch iron bolts.

The frame to be well coaged, and screw-bolted; the keelsons to be all coaged; the main, lower and spar-deck clamps, to be coaged, and to be bolted up and down, every 4 feet; the clamps and ceiling of the spar-deck to be bolted edgewise, with bolts from 6 to 7 feet long, 4 feet apart, for 75 feet each way from centre of the ship; the outside of the ship to be square, fastened to 3 feet above main-deck, as follows:—From the keel, to 20 feet water-line, two ⅞ inch copper bolts, and 2 locust tree-nails, in each frame; and 2 locust tree-nails in each filling-in timber; all the bolts clenched on rings on the inside, and tree-nails wedged; the fastenings above the 20 feet water-line, to be ½ inch iron bolts, clenched, and half tree-nails, wedged; seven streaks of the wales to be coaged; filling-in timbers, to be bolted, each way, to frames; throat-bolts of the knees of the lower and main-decks, to be 1¼ inch iron; and for the spar and orlop-decks, 1⅛ inch iron.

Apron, main and lower-deck breast-hooks and inner stern-posts, to be of live oak; to have diagonal iron braces, both ways, and each four feet apart, from centre to centre, the first set to be let into the frames, the other, to have the ceiling and clamps let on to it; the iron for the same to be furnished by the parties of the second part, and to be put in, and fastened, by the parties of the first part.

To do the out-board joiners' work, block making, and plumbing, attached to the hull, and give the vessel three coats of paint outside, from light-water mark, as far as the carpenter work extends.

Bulwarks to be of white pine, 3 inches thick; to build wheel-houses, and guards, the main-beams for guards, of yellow pine, 22 inches square, for a wheel of thirty-five (35) feet diameter, and 12 feet face. All the iron fastenings to be galvanized.

The whole to be of good materials, and work to be done in the best manner.

APPENDIX.

ENGINES.

Bed-plates: of cast iron, made in loam, with cylinder bottom, condenser and channel all in one piece; the condenser to have a capacity of not less than 160 cubic feet; sockets for columns, 24 inches deep, and to be accurately bored; ribs on the upper and lower sides of plate, to run the whole length of the same; thickness of metal, the plate to be $2\frac{1}{2}$ inches, the upper ribs, $2\frac{1}{4}$ inches, the least height, 20 inches; cross-ribs, at columns, $2\frac{1}{4}$ inches thick, the lower-ribs, $2\frac{1}{4}$ inches; the sides of condensers, three inches thick, with hubs for main centre cast on, and strongly ribbed; twenty coags, 3 inches in diameter, to be cast on lower side of plate.

Engine frames: columns, of wrought iron, 11 inches diameter, four to each engine, the ends to be turned to fit the sockets in bed-plates, and plumber-blocks, and keyed to the same.

Braces: of wrought iron, two to each engine, from plumber-blocks to cylinders, each $6\frac{3}{4}$ inches diameter; two to each engine, from plumber-blocks to cylinder bottom, each 5 inches diameter; diagonal bracing between columns, transverse the ship, to be 4 inches diameter; one diagonal brace between plumber-blocks, of centre shaft, $4\frac{1}{2}$ inches diameter; direct slugs, between columns, and also between plumber-blocks, $3\frac{1}{2}$ inches diameter.

Plumber-blocks for water-wheel shafts, of cast iron, with sockets for the columns, and braces, all accurately bored to receive the same; to be fitted with brass boxes, for the water-wheel shafts; four cap-bolts to each block, $4\frac{1}{2}$ inches diameter.

Cylinders, of hard cast iron, to be accurately bored, 95 inches diameter, and for a stroke of 10 feet; least thickness of metal, $1\frac{5}{8}$ inch; four belts, 5 inches wide, thickness at belts, $2\frac{1}{4}$ inches, and flanges, $2\frac{1}{4}$ inches thick, and to be faced the whole width of flanges; the steam-openings $9\frac{1}{2}$ by 48 inches.

Covers for cylinders, of cast iron, with double shell, and ten ribs the whole depth; the least thickness of metal, $1\frac{1}{4}$ inches, with stuffing-box and gland for piston, rod-bushed with brass, and to be packed with hemp and straw; thickness of flange, $2\frac{1}{4}$ inches, and to be fitted with a manhole and plate.

Pistons for cylinders, of brass, with double shell, and eight ribs the whole depth, and 1 inch thick; thickness of metal at bottom, top, and periphery, not less mean of $1\frac{3}{8}$ inch; depth at centre, 21 inches, at periphery, 9 inches, and to have two wrought iron bands, $2\frac{1}{2}$ inches square, shrunk on, to be filled with spring-packing, and cast iron rings.

Piston rods, of wrought iron, $9\frac{3}{4}$ inches diameter, to be secured to cross-heads by a key, and screw-nut on the ends of rods.

Cross-heads for cylinders, of wrought iron; diameter of journals, $8\frac{3}{4}$ inches, by 10 inches long; web at centre, $26\frac{1}{2}$ by $6\frac{3}{4}$ inches; depth at eye, 29 inches, by 20 in diameter.

Cross-tails for connecting-rods, to be the same as cross-heads for cylinders.

Cylinder side-rods, of wrought iron; diameter of lower necks, 7 inches; the upper necks, $7\frac{1}{2}$ inches, and to be fitted with brass boxes, for journals, $8\frac{3}{4}$ inches diameter, by 10 long.

Parallel motion, of wrought iron; all the journals to be fitted with brass boxes.

Lever-beams, of cast iron, to be 23 feet from centre to centre; at main centre, to be 66 by $3\frac{1}{2}$ inches, with T edge, 10 inches broad, or its equivalent; and to be fitted with brass boxes, for main centre.

Main-centres for lever-beams, of wrought iron; diameter of journals, 15 by 20 inches long.

Connecting-rods, of wrought iron; diameter at necks, $9\frac{1}{2}$ inches, to be fitted with brass boxes for crank-pins; to be secured to cross-tails by a key and screw-nut.

Cranks for centre and water-wheel shafts, of wrought iron, from centre to centre, 5 feet; thickness of metal around shaft, 8 inches; depth of hub, 20 inches; thickness of metal around pin, $5\frac{1}{2}$ inches; depth of eye, 16 inches.

Crank-pins, of wrought iron; diameter of journal, $12\frac{1}{2}$ by 20 inches long.

Water-wheel shafts, of wrought iron; inboard journal, $20\frac{1}{2}$ inches diameter, by 24 long, swelled to $22\frac{1}{2}$ inches diameter; outboard journal, $14\frac{1}{2}$ inches diameter, by 18 long; to be twined between the journals; the collars, 25 inches diameter; centre-shaft, of wrought iron; diameter of journals, $20\frac{1}{2}$ inches by 24 long, the diameter between journals, 21 inches; the diameter of collars, 25 inches.

Water-wheels: centres of cast iron, the diameter to be 7 feet, the least thickness of metal, $1\frac{1}{2}$ inch; three for each wheel; eighteen sockets for arms; hubs, 16 inches deep, and well ribbed, and to have two wrought iron bands shrunk on.

Arms, of wrought iron, 18 in each row, for a diameter of wheel of $35\frac{1}{2}$ feet, and to be at the centres, $7\frac{1}{2}$ by $1\frac{1}{2}$ inch; at buckets, 5 by $1\frac{1}{8}$ inch; the ends of the arms to have a curved form, of such length as to form a complete circle when put together, and to have 13 inches lugs for inner bucket-rims, and 10 inches lugs for inner rims; the segment on rims to be 5 by $\frac{3}{4}$ of an inch; the short arms for buckets, 18 in number, 5 by $1\frac{1}{8}$ inch. To be three rows of arms in each wheel.

Rims, of wrought iron, three to each row of arms, viz: outer, 5 by 1 inch; second, $4\frac{1}{2}$ by 1 inch; inner, 4 by $\frac{3}{4}$ of an inch. All the holes in arms and rims, to be accurately drilled.

Buckets, of cast iron, 12 feet by 32 inches, 36 to each wheel.

Diagonal braces, 36 to each wheel, $1\frac{3}{8}$ inch diameter.

Air-pumps, of cast iron, bore 58 inches, and for a stroke of $4\frac{1}{2}$ feet; thickness of metal, $1\frac{5}{8}$ inch; three bands, 4 inches wide; thickness at bands, $1\frac{3}{4}$ inch. To be lined with brass, $\frac{3}{8}$ of an inch thick; the flanges, 2 inches thick.

Cover for air-pumps, of cast iron; least thickness of metal, $1\frac{3}{8}$ inch, and well ribbed; the flange, $1\frac{3}{4}$ inch thick; the stuffing-box and gland to be bushed with brass.

Buckets for air-pumps, of brass; depth at centre, 13 inches; at periphery, $7\frac{1}{2}$ inches.

Foot-valves and seats, of brass; four openings and valves to each engine, the area to be not less than 1000 square inches.

Delivery-valves and seats, to be the same as foot-valves and seats.

Rods for air-pump buckets, of brass, 6 inches diameter, or 5 inches diameter of wrought iron, and covered with cast brass.

Cross-head for air-pump, of wrought iron, with sockets for guide-rods and feed-pumps; the web at centre, 16 by $4\frac{1}{2}$ inches; the diameter of journal, $4\frac{1}{2}$ by 6 inches long.

Links for air-pumps, of wrought iron, $3\frac{3}{4}$ inches diameter, at necks, and fitted with brass boxes for journals.

Reservoirs, of cast iron, to extend 7 feet above load-line; the least thickness of metal, $1\frac{1}{4}$ inch, and to have thermometers attached.

Out-board delivery-valve chests, of cast iron; least thickness of metal, $1\frac{1}{4}$ inch; diameter, 24 inches; valves and seats, of brass.

Out-board delivery-pipes, of copper; 24 inches diameter: thickness of metal, $\frac{1}{4}$ inch, and to be connected with the reservoirs by a slip-joint.

Steam-chests, of cast iron; least thickness of metal, $1\frac{1}{8}$ inch; faces and flanges, $1\frac{3}{8}$ inch; to be fitted with double valves; the valves and seats, of brass; steam valve-seats, each pair, to have an area of 450 square inches; the exhaust-valve seats, an area of 530 square inches in the clear; valve-stems, of cast steel; side-pipes, of cast iron, 24 inches diameter, and to be fitted with slip-joints.

Rock-shafts, of wrought iron.

Eccentric-wheels, of cast iron, to have counter balances, and to be fitted with stops, so as to work the engines either ahead or back.

Straps for eccentric-wheels, of wrought iron.

Throttle-valves, of brass, 24 inches diameter, with cast steel stems.

Injection-valves, of brass, three for each condenser, two of $6\frac{1}{2}$ inches diameter, and one of $8\frac{1}{2}$ inches, to be fitted with handles in the engine-room, the pipes to be of copper, $\frac{3}{16}$ inch thick.

Bottom-valves, of brass; two for each engine, and two for the boilers, with areas to suit their attached pipes.

Feed-pumps, of cast iron, one for each engine; the flanges, valves, seats and glands, to be of brass, with copper air-vessels, the plungers $9\frac{1}{2}$ inches diameter, and for a stroke of $4\frac{1}{2}$ feet.

Feed-pipes, of copper, $4\frac{1}{4}$ inches diameter, and $\frac{1}{8}$ inch thick, with hose-cocks attached.

Bilge-pumps, of cast iron; the plungers, seats, valves, and glands of brass, two to each engine, 11 inches diameter, and 18 inches stroke, or their equivalent; the pipes to be so arranged as to discharge into the reservoir. Two fire-pumps, with pipes leading to spar-deck, and air-vessels attached.

Out-board pillow-blocks, for water-wheel shafts, of cast iron, fitted with brass boxes for shaft-journal.

Spring-bearings for water-wheel shafts, to be placed on the gunnel of the ship.

Water-valves for cylinders, of brass, to connect with upper and lower ends of cylinders, and to be closed by elliptic springs.

Water-cocks, of brass, two for steam-pipes, four for steam-chests, and two for cylinders.

Blow through valves, to connect with channel-plates, 6 inches diameter; valves and seats of brass.

Oil-cups, of brass, one for each journal.

Oil-cocks, of brass, one for each cylinder, and one for each feed-pump.

Holding-down bolts, of wrought iron, to be tinned and galvanized; forty bolts, 3 inches diameter, for each bed-plate, or their equivalent; each bolt to have a wrought iron plate under the head, $2\frac{1}{2}$ inches thick, and 10 inches square; the plates to be let 1 and $1\frac{1}{2}$ inch into the underside of floor-timbers.

Vacuum-guages, one for each engine.

Steam-guages, one for each engine, and one for each boiler.

Oil-pipes, of copper, two for out-board pillow-blocks.

Drip-pans and pipes, of copper, two for each shaft pillow-block, and two for each journal of main-centres of lever beams.

Anti-attrition metal: all boxes for journals, and working surfaces, to be fitted with "Babbett's" metal, as may be required.

Joints: all bearing surfaces, either in flanges or strips, to be smooth-faced, metal to metal, and where required, to be set with red lead. All joints of copper pipes to be made with copper bolts, that are below the top of keelsons.

Felting and casing: the cylinders and steam-pipes to be covered with hair felt, 2 inches thick, one thickness of canvas, and also of white pine. All to be well secured and hooped.

Painting: all rough work to receive one coat of red lead in oil, and one coat of colored paint; the water-wheels one coat of red lead in oil, when finished in the shop, and one coat when on board.

Floors for engine and fire-rooms, platforms of cast iron, to be at a convenient height for working engines, and of a neat pattern. Floor-plates, of cast iron, to cover the entire space between engine and fire-room bulkheads.

Stair-ways and ladders for engine and fire-rooms, of cast and wrought iron, with hand-rail, of brass, to engine stair-ways. Hand-rails above and below, on each side of engine, the in-board hand-rail above and below, to be of brass, and well secured and finished.

Finished work: in addition to the boring, turning, planing, and fitting of such parts as are necessary for the proper operation of the machinery, the following parts are to be finished, viz:—

Covers and glands for air-pumps and cylinders; bonnets for steam-chests; cross-heads for cylinders, connecting-rods, air-pumps; side-links for cylinders, connecting-rods, air-pumps; connecting-rods; cranks for water-wheel and centre-shafts; columns and braces for engine-frames; bonnets for feed and blow-valves; rock-shafts, lifters, toes, and arms, and all the valve motion and starting geer; side pipes to steam-chests.

All straps, gibs, and keys, and all bolts and nuts for finished work. All other heads and nuts of bolts to be roughed to the required dimensions.

Blowing engines and blower. Two engines, each 12 inches diameter, and 12 inches stroke, and to be so arranged as to work hand-pumps for supplying the boilers with water, with all the necessary steam and exhaust-pipes and valves, the blowers to be of approved construction.

Steam-pipes, of copper, one for each engine, 24 inches diameter, and $\frac{1}{4}$ of an inch thick.

Shut-off steam valves: chests of cast iron; valves and seats of brass, one to each boiler, the diameter $17\frac{1}{2}$ inches, and to be arranged in connection with boilers and steam-pipes, that any one boiler can be shut off from the others.

Water blow-off valves: chests of cast iron; valves and seats of brass, two to each boiler; pipes of copper, $\frac{1}{4}$ of an inch thick, the pipes to form annulars around the feed-pipes.

Feed-stop valves: chests of cast iron; valves and seats of brass; diameter, $4\frac{1}{2}$ inches, and fitted with the necessary mounting.

Hand feed-pumps: of brass, two in number, 7 inches diameter, and for a stroke of 9 inches; fitted with the necessary mounting, copper pipes, copper air-vessels, hose-cocks, &c.; the pipes and cocks so arranged that the pumps may be used for pumping the water out as well as into the boilers.

Drip-pans and pipes: of copper, one for each set of guage-cocks, one for each safety-valve, and one for each slip-joint in steam-pipes.

Indicators: one for each engine, with all the necessary fixtures, each piston to have an area of not less than $\frac{1}{2}$ a square inch.

Metre: one of brass, and to be of the best construction.

Clock: one of the best construction for engine frame.

Tanks: of plate iron, to hold 250 gallons of oil, and 500 pounds of tallow; and two tallow-kettles, of copper.

REMARKS.—All articles, except tools and outfits, that may be necessary for the proper operation of the machinery, that are not here specified, are to be furnished by the contractor, of such materials, dimensions, and workmanship, as will best secure the required efficiency and durability. All the materials and workmanship to be of the very best quality.

All the work to be placed on board, and secured in the very best manner.

Tools, such as may be selected, to the value of five hundred dollars.

Buckets, for water-wheel.

BOILERS.

Four tubular boilers: of iron, to be made from plates and rivets of the best quality, and to be placed on board and secured; length of boiler, 22 feet, 14 feet 3 inches high; two of them to be 14 feet wide, and two 15 feet, and to have steam-chimneys 4 feet high.

Tubes: to be "Proper's" lapwelded, 2 inches diameter outside, $\frac{1}{10}$ of an inch thick; the whole number of tubes in the four boilers to be 5,624; of that number, 2,812 to be 5 feet long, and 2,812 to be $5\frac{1}{2}$ feet long; the ends of tubes to be secured in tube-plates by "Proper's" tube-expander.

Shell: that is to say, the whole exterior, to be of sheets $\frac{3}{8}$ of an inch thick, and to be double-riveted.

Furnaces: to be formed by four sheets, $\frac{5}{16}$ inch, and so placed that no seam of rivets shall be in the fire; the lower sheet, or ash-pit, to be $\frac{3}{8}$ inch thick.

Water-legs: to be made from sheets $\frac{5}{16}$ inch thick, and each sheet of such dimensions, that one of them will form one side of a tube-box.

Tube-plates: each tube-head to be from one sheet of iron, and to be $\frac{1}{2}$ inch thick.

Back-connections, and inner shell of steam-chimney, to be $\frac{5}{16}$ inch thick.

Screw brace-bolts, $\frac{7}{8}$ inch diameter, and not to exceed 10 inches apart.

Braces for sides and heads, to be formed with crow-feet, to be $1\frac{1}{4}$ inch diameter, and not to exceed 12 inches apart.

Braces for top and bottom, to be formed with crow-feet, and to be $1\frac{1}{2}$ inch diameter, not to exceed 12 inches apart.

Manhole-plates: each boiler to have two manhole-plates and rings; one to steam-room, and one to enter space below tubes.

Hand-holes: each boiler to have seven hand-hole plates, with the necessary mounting.

Ash-stoppers: each boiler to have four ash-stoppers, fitted with ketches, &c.

Furnace-doors: each boiler to have eight doors, of cast-iron, to be securely hung, with all the necessary mounting, and to be double-lined.

Ash-pit doors: each boiler to have eight ash-pit doors, of wrought iron, $\frac{1}{8}$ inch thick, with all the necessary mounting.

Grate-bars: to have a surface of 600 square feet; one set of bars and bearers, of cast iron.

Turnbuckles: six to each boiler, $1\frac{1}{2}$ inch diameter, and well secured for holding down boilers.

Bedding: all the boilers to be bedded in oil-cement, and well secured together.

Felting: to be covered with hair felt, 2 inches thick, with one thickness of canvas, and one of sheet lead.

Painting: internal and external surfaces, to receive two coats of red lead in oil.

Dampers: of sheet iron, with the necessary chains.

Caulking: all the seams to be caulked, inside and out, where possible.

Safety-valves: chests, of cast iron; valves, $10\frac{1}{2}$ inches diameter; valves and seats, of brass, one for each boiler, with the necessary mountings, chains, &c.; all the pipes leading to one or two general escape-pipes, of copper, equal to 20 inches diameter, $\frac{1}{8}$ inch thick, and extending 33 feet above deck.

Smoke-pipe: from steam-chimneys to 8 feet above the spar-deck, to be a water-jacket sheet of water, 2 inches; thickness of metal, 7 pounds per square foot; the external surface to be covered with hair felt, 2 inches thick; one thickness of canvas, and one of sheet lead. The smoke-pipe to be 9 feet diameter, and to extend 45 feet above the spar-deck, of plates running from Nos. 8 to 12, wire-guage, with two brace bands, and twelve 1 inch iron braces.

Water connecting-cocks: one to each boiler, of brass, $4\frac{1}{2}$ inches diameter.

Hydrometer cocks: of brass, one to each boiler.

Guage cocks: of brass, four to each boiler, and one of Worthington's percussion guages.

Proving: to be proved with a water pressure of 30 pounds per square inch, before being put on board, and to the same pressure by steam, when on board.

Remarks.—All the materials and workmanship to be of the best quality.

All the sheets to be of pattern iron, that is to say, they shall be of such dimensions as are best suited for their respective places.

The drawings and plans of the boilers, by which to execute the work, will be furnished by Edward K. Collins.

General considerations of contract: The engines, boilers, and all their necessary appendages, to be placed on board, and secured in the best manner. And the whole to be complete, ready for trial-trip, on or before the 15th day of May, 1850.

The plans and drawings, also the materials and workmanship, are to be subject to the examination and approval of Edward K. Collins.

Payments of eight per cent., to be made as follows, viz:—

1st.—When the cylinders, pistons, covers, and air-pumps are cast.

2d.—When the bed-plates and main pillow-blocks are cast.

3d.—When the water-wheels are fitted in the shop.

4th.—When the centre and water-wheel shafts are turned.

5th.—When the cranks and cross-heads are finished.

6th.—When the columns for engine-frames are turned.

7th.—When the bottoms of boilers are riveted.

8th.—When the boilers are ready to receive the tubes.

9th.—When the boilers are placed on board.

10th.—When the bed-plates, cylinders, steam-chests, and air-pumps, are placed on board.

11th.—When the water-wheels are on board, finished.

The remaining twelve per cent., to be paid when the engines have made a successful trial-trip.

(Signed) E. K. COLLINS, *Agent.*

NEW YORK, APRIL 18, 1849.

We acknowledge the foregoing to be a correct copy of the specification referred to in the contract made the fifteenth day of May, 1849, by and between the Trustees of the New York and Liverpool Line United States Mail Steamship Company, and Stillman, Allen & Co., of the Novelty Works, New York.

(Signed) STILLMAN, ALLEN & CO.

For the Allaire Works,
B. B. McILVAIN, *Treasurer.*

Note P.

Abstract of the U. S. M. Steamer "Pacific." Steam Log for 7th passage from New York to Liverpool,

BEING THE *FIRST* TEN DAYS' PASSAGE OVER THE ATLANTIC.

1851. DAY.	DATE.	Average steam.	Average revolutions.	Revolutions made.	Time.	Coal, (tons.)	Knots.	Lat.	Long.	REMARKS.
Sunday,	May 11,	16·4	13·5	19,012	23 20	62	300			Wind light; sea smooth.
Monday,	" 12,	17·4	14·3	20,285	23 29	67	312	42° 53′	61° 22′	
Tuesday,	" 13,	17·6	14·5	21,180	23 33	73	302	45° 02′	55° 00′	
Wednesday,	" 14,	17.	15·2	21,480	23 31	74	305	46° 30′	48° 00′	
Thursday,	" 15,	16·	14·52	20,568	23 32	74	293	47° 38′	41° 25′	Strong breeze on quarter; heavy sea; ship rolling.
Friday,	" 16,	15·	14·38	20,372	23 31	78	299	48° 32′	34° 40′	
Saturday,	" 17,	16·6	15·6	22,0[illegible]2	23 33	75	306	49° 28′	27° 29′	
Sunday,	" 18,	15·7	16·35	22,810	23 15	76	320	51° 12′	18° 50′	
Monday,	" 19,	15·	15·75	22,048	23 20	79	314	51° 31′	10° 32′	
Tuesday,	" 20,	16·3	17·3	24,480	24	80	327	Channel.		

Arrived at the Rock 1′ 14″, making the passage 10d. 1h. 4m.; deducting 4′ 48″ for difference of time, 9 days, 20 hours, 16 minutes.

Abstract of U. S. Mail Steamer "Arctic." Steam Log for 8th passage from New York to Liverpool.

SHORTEST PASSAGE UP TO JANUARY, 1853.

1852. DAY.	DATE.	Average steam.	Average revolutions	Revolutions made.	Time.	Coal.	Knots.	Lat.	Long.	REMARKS.
Sunday,	Feb. 8,	17·	14·5	20,550	23 45	80	298	40° 46′	67° 55′	Wind mod. and fair; sea mod.; sail set.
Monday,	" 9,	16·7	14·3	20,167	23 30	75	308	42° 22′	61° 34′	" on the quarter; " "
Tuesday,	" 10,	17·5	15·3	21,704	23 24	77	314	45° 15′	55° 25′	" light & variable; " " at times.
Wednesday,	" 11,	17·5	15·8	22,419	23 30	82	315	46° 25′	48° 18′	" " " " "
Thursday,	" 12,	17·	15·7	22,254	23 30	84	320	49° 28′	41° 43′	" " quarter; " "
Friday,	" 13,	16·1	15·3	21,497	23 31	84	305	50° 52′	34° 08′	" strong; " heavy; sail set; ship rolling.
Saturday,	" 14,	17·	16·4	23,104	23 25	87	310	51° 02′	26° 04′	" " " " " " heavy.
Sunday,	" 15,	17·	16·7	23,440	23 23	85	305	51° 00′	17° 36′	" " " " " " "
Monday,	" 16,	16·7	16·5	23,237	23 20	86	309	51° 22′	9° 37	" " " " " " "
Tuesday,	" 17,	16·5	17·5	22,594	21 10	80	295	Channel.		" light; smooth.

Arrived at the Rock, Liverpool, at 10 A.M., making the passage from New York [dock] to Liverpool, 9d. 17h. 12m. mean time, or 9d. 22h. apparent time, deducting 4h. 48m. for difference of longitude.

Note P.—*Concluded.*

Log of U. S. Mail Steamer "Atlantic," from New York to Liverpool, 14th voyage.

1852. DAY.	DATE.	Average steam.	Average revolutions.	Total revolutions.	Time.	Coal. tons. lbs.	Knots.	Lat.	Long.	REMARKS.
Saturday,	July 24,	18·	13·	18,424	23 42	66 80	254	40° 55′	68° 25′	Left wharf at 12h. 6m. P.M.; mod. breeze, calm sea, fine weather.
Sunday,	" 25,	19·	13·6	19,164	23 34	69 24	280	42° 25′	62° 19′	Mod. breeze, calm sea, fine weather.
Monday,	" 26,	19·7	14·2	20,116	23 35	71 88	290	45°	55° 56′	Latter part mod. wind from S. E. "
Tuesday,	" 27,	19·	14.3	20,147	23 29	76 56	304	45° 32′	49° 09′	Light S. W.; all sail set. "
Wednesday,	" 28,	19·	14·5	20,412	23 25	78 72	300	46° 57′	42° 10′	Calm; no wind.
Thursday,	" 29,	19·2	15·2	21,372	23 25	83 16	305	48°	34° 52′	"
Friday,	" 30,	19·	15·5	21,626	23 21	80 96	315	49° 03′	27° 10′	Light head wind; sea smooth.
Saturday,	" 31,	19·6	16·1	22,539	23 20	79 20	320	49° 55′	19° 11′	" wind and variable; no sails set.
Sunday,	Aug. 1,	18·6	16·3	22,884	23 22	80 10	310	50° 50′	11° 12′	Latter part of day light S. W. wind; sail set but not filling.
Monday,	" 2,	18·7	16·5	23,205	23 25	79 84	300			Cloudy wea.; all sail set; after midn. head [wind.
Tuesday,	" 3,	20·	18·	6,172		20 60	65			Thick weather going up channel; off Rock Light at 5 30 P.M.

From Sandy Hook—Time, 10 days 15 minutes. J. W. ROGERS, *Chief Engineer.*

Abstract from Log of U. S. Mail Steamer "Baltic," from Liverpool to New York.

August 7, 1852,	200	miles run.
" 8, "	312	"
" 9, "	315	"
" 10, "	322	"
" 11, "	334	"
" 12, "	322	"
" 13, "	336	"
" 14, "	318	"
" 15, "	320	"
" 16, "	275	"
Total distance run,	3054	miles.

Time—9 days 13 hours.

Note Q.

Passages of British and American Steamers.

The following result of the passage of the ocean steamships between New York and Liverpool, from July to January, 1851, was prepared by the Courier and Enquirer, which may be found valuable as a matter of reference hereafter, showing the relative speed of the steamers of the two lines, and the time of their trips, for six months in 1851.

FOURTEEN TRIPS OF THE COLLINS LINE FROM LIVERPOOL.

	DAYS.	HOURS.	MINUTES.
Total time occupied, ...	158	21	15
Average time per trip, ...	11	8	00
Quickest trip since August, by the Baltic, . . .	9	13	00
Longest " " " " " Atlantic, . . .	13	17	30

THIRTEEN TRIPS OF THE CUNARD LINE FROM LIVERPOOL.

	DAYS.	HOURS.	MINUTES.
Total time occupied, ...	161	4	15
Average time per trip, ...	12	9	00
Quickest trip since July, by the Africa, ...	10	6	00
Longest " " " " " Europa, . . .	16	20	00

THIRTEEN TRIPS OF THE COLLINS LINE TO LIVERPOOL.

	DAYS.	HOURS.	MINUTES.
Total time occupied, ...	142	10	45
Average time per trip, ...	10	23	00
Quickest trip since July, by the Baltic, ...	10	4	45
Longest " " " " " "	12	9	00

FOURTEEN TRIPS OF THE CUNARD LINE TO LIVERPOOL.

	DAYS.	HOURS.	MINUTES.
Total time occupied, ...	160	18	44
Average time per trip, ...	11	11	00
Quickest trip since July, by the Africa, ...	10	9	20
Longest " " " " " Europa, ...	14	3	00

The passages of the Collins line, for the year 1851, *averaged* 10 days 21 hours and 10 minutes, from New York to Liverpool, and the *return* voyages, to New York, averaged, for the year, 11 days 17 hours and 30 minutes.

The Cunard steamers performed twenty-three voyages, in 1851, from New York to Liverpool, at an average speed of 11 days 4 hours and 13 minutes per trip, and their return trips to New York, averaged, for the same year, 12 days 15 hours and 7 minutes per trip.

Abstract of the passages over the Atlantic of the Collins and the Cunard steamers; as compiled by J. H. C. Campbell, Esq., for Hunt's Merchants' Magazine, for September, 1852, for the *first six months* in that year:

THIRTEEN TRIPS OF THE COLLINS LINE TO LIVERPOOL.

	DAYS.	HOURS.	MINUTES.
Total time occupied, ...	143	17	50
Average time per trip, ...	11	1	00
Quickest trip, since January, by the Arctic, in February,	9	13	30
Longest " " " " " Baltic, in March,	12	21	00

THIRTEEN TRIPS OF THE CUNARD LINE TO LIVERPOOL.

	DAYS.	HOURS.	MINUTES.
Total time occupied, ...	145	13	30
Average time per trip, ...	11	5	00
Quickest trip, since January, by the Asia, in May, .	10	5	00
Longest " " " " " " in March,	12	21	30

THIRTEEN TRIPS OF THE COLLINS LINE FROM LIVERPOOL.

	DAYS.	HOURS.	MINUTES.
Total time occupied, ...	154	20	15
Average time per trip, ...	11	22	00
Quickest trip, since January, by the Atlantic, in June,	10	3	00
Longest " " " " " Pacific, in January,	15	4	30

THIRTEEN TRIPS OF THE CUNARD LINE FROM LIVERPOOL.

	DAYS.	HOURS.	MINUTES.
Total time occupied, ...	170	15	45
Average time per trip, ...	13	3	3
Quickest trip, since January, by the Asia, in May, .	10	19	00
Longest " " " " " Niagara, in January,	20	19	00

QUICKEST TRIPS EVER PERFORMED, TO JULY, 1852.

	DAYS.	HOURS.	MINUTES.
By Collins line, outward, by Arctic, in February, 1852, .	9	18	30
" " " return, " Baltic, in August, 1851, .	9	13	40
" Cunard " outward, " Asia, in May, 1851, . .	10	2	00
" " " return, " Africa, in August, 1851, .	10	6	00

NOTE R.

Steam Log United States Mail Steamer "Illinois," from New York to Aspinwall,

VIA THE EAST SIDE OF CUBA.

DATE.	Average pressure.	Revolutions. Average per min.	Revolutions. Made.	Time.	Coal.	Miles from M. to M.	Lat.	Long.	REMARKS.
	LBS.			HOURS.	TONS.				
April 26, 1852	10	10	1.200	2	13				At 2 P.M. left the dock; at 4 40, owing to dense fog, anchored off Quarantine.
" 27, "	14	$12\frac{3}{4}$	10.710	14	55				At 5 45 A.M. got under way; fine weather from N.W.; at 7 25 discharged pilot; Highland light bearing S.W. by S.; the Light Ship S.E. by E.; at 10 A.M. Barnegat light in sight bearing W.
" 28, "	16	11	15.840	24	62		35° 17′ N	74° 2′ N.	At 9 15 A.M., entered the G. Stream, its northern limit being very distinct; at M., 312 miles from S. Hook; southerly winds from 1 to 3, weather b. c.; sea short and broken.
" 29, "	17	$10\frac{3}{4}$	15.480	24	61	258	31°	74° 4′	Southerly winds 1 to 3; sky b. and b. c.; sea smooth.
" 30, "	17	$10\frac{3}{4}$	15.480	24	63	270	26° 31′	73° 46′	Same weather and sea.
May 1, "	17	$10\frac{1}{2}$	14.820	24	60	242	22° 29′	73° 43′	At 6 45 A.M., made land ahead on starboard bow; at 9 30 A.M., Atwood Island bore north; at 11 40 the south end of the Planas bore E. dist. about 4 miles; passed the Hog Stye and made Cuba; E. winds 4, b. c.; made sail.
" 2, "	17	$10\frac{1}{2}$	14.820	24	62	258	18° 22′	75°	Furled sails; at 5 30 A.M. made Cape Dame Maria; at 11 45 passed within 80 yards the S.E. part of Navarra Island; Jamaica in sight; wind E.; force variable.
" 3, "	17	$10\frac{3}{4}$	15.480	24	61	270	14° 28′	77° 16′	S. easterly winds 2 to 4; sky b. and b. c.; smooth sea; all sail set.
" 4, "	17	$10\frac{3}{4}$	10.320	$16\frac{2}{3}$	45	282	10° 19′	79° 29′	At 1 30 P.M. made high land over Porto Bello bearing about S.; at 4 45 P.M. slowed engines in harbor of Aspinwall; at 5 40 P.M. secured ship to wharf.
From Aspinwall to New York via the west end of Cuba and Havana.									
" 8, "	20	11	9.246	14	48				At 11 A.M. went to sea; northerly winds 3 to 4; sky b. c.
" 9, "	20	11	15.840	24	64	272	13° 44′	81° 7′	At 10 P.M. Old Providence Island bore W.; N.E. winds 2 to 4; b. c. and p. c.; same head sea.
" 10, "	18	11	15.840	24	59	270	17° 54′	82° 46′	N.E. winds 2 to 3; b. and b. c.; smooth sea.
" 11, "	18	11	15.840	24	63	280	21° 59′	85°	At 8 A.M. made Cuba on starboard bow; at 11 5, Cape St. Antonio bore E.N.E.; winds variable: b. and b. c.
" 12, "	12	6	2.160	6	8	180			At 2 A.M. made Moro Light, and slowed engines; at sunrise entered Havana; at 6 A.M. hauled in to coal wharf.
" 13, "	15	$10\frac{3}{4}$	10.340	16	50	65	23° 42′	81° 21′	At 6 45 A.M. started; passed Moro at 7 15; at 7 30, Carysfort Light (fixed) in sight, bearing at 8 P.M. N.W. distant about 12 miles; wind N.E. 3 to 4; b. c.
" 14, "	18	$11\frac{1}{2}$	16.120	24	60	337	28° 48′	79° 24′	First part winds N. and E. 1, b. c.; remainder S. and E. 2, b. c.; smooth sea.
" 15, "	18	11	15.840	24	63	320	33° 20′	76° 24′	Made sail; winds variable; in evening threatening appearance; lightning b. c. l.; a moderate, following sea.
" 16, "	18	11	7.260	11	30	270	37° 29′	74° 8′	First part winds N. and E. 3; sky b. c.; second part ends with S. winds 2, b. c.; at 6 30 P.M. the fog lifted; at 9 P.M. sounded in 25 fathoms on brown sand; kept lead going every half hour; at 11 P.M. Barnegat Light bore W.
" 17, "	15		7.350	$19\frac{1}{2}$	45				At 2 A.M. off the Highlands; received pilot; slowed engines until daylight; at 4 20 passed Sandy Hook, and at 7 30 made fast to dock at New York.

ELI L. BIRDSALL, *Chief Engineer.*

Note S.

Steam Log of the U. S. Mail Steamer "Golden Gate," from San Francisco to Panama and back, January and February, 1852.

[FROM THE JOURNAL OF THE FRANKLIN INSTITUTE.]

From San Francisco to Panama.

DATE.	Hours of Steaming.	Steam.	Vacuum.	Cut-off.	Throttle.	Revolutions.			Distance.		Coal used.				Per cent of ashes.	Draft of water.	Dip of wheels.	Saturation in boilers.	REMARKS.
						Per day.	Per hour.	Per knot.	Per day.	Per hour.	Per day.	Per hour.	Per knot.	Total.					
1852.		lbs.	in.	ft. in.	in.									tons					
Jan. 21	2	10	25	4 6	2½	1532	766	76½	20	10	9200	4600	460		23	15 5	6 10	1¾	Light winds and calms.
" 22	24	10½	25	4 6	2½	18416	768	74¾	246	10¼	105672	4403	430	52¼	23			1¾	
" 23	24	10¾	25	4 6	2½	19023	792	76	250	10½	111112	4630	444	55⅝	26			1¾	Fine weather, light breeze, smooth sea.
" 24	24	11	25	4 6	2½	19503	812	74¾	261	10¾	115282	4803	442	58⅝	28			1¾	Light winds and calm all these days. Stopped at Acapulco 16 hours.
" 25	24	11	25	4 6	2½	20234	844	73⅛	277	11½	126948	5290	458	63⅛	36			1¾	
" 26	24	9	25	4 6	2½	20260	844	70½	287	12	137952	5831	480	69⅞	38			1¾	
" 27	24	9	25	4 6	2½	20006	875	69	290	12½	117368	4890	405	58¾	28			1¾	
" 28	20	10½	25	4 6	2½	17672	883	71	249	12½	90576	4528	364	45¾	23	13 0	4 6	1¾	
" 29	12	10	25	4 6	2	9065	824	59¾	252	12⅝	75344	4432	495	37⅞	16	13 7	5 0	1¾	
" 30	24	12	25	4 6	2½	20575	857	79½	259	10¾	103850	4328	401	56⅞	20			1¾	
" 31	24	11⅛	25	4 6	2½	21065	878	89⅝	235	10	114704	4779	488	57⅛	20			1¾	
Feb. 1	24	11	25	4 6	2½	20995	873	81⅛	259	10¾	120632	5026	465	60⅛	20			1¾	Strong breeze from eastward.
" 2	24	10⅛	25	4 6	2½	21460	894	77	280	11⅝	120088	5004	429	60	20			1¾	Rain squalls and calms.
" 3	16	10½	25	4 6	2	13184	824	70⅛	188	11¾	74664	4666	397	37⅛	21	12 3	3 8	1¾	Strong breeze and tide against us.
From Panama to San Francisco.																			
" 12	8	12	25	4 6	2½	6280	785	89¾	70	8¾	54536	6817	779	27¼	19	15 11	7 4	1¾	Light wind, sail set running down bay, 90 m.
" 13	24	11½	25	4 6	2½	18215	759	85½	213	8⅞	130532	5438	614	65¼	19			1¾	Light head winds.
" 14	24	11⅝	25	4 6	2½	18830	784	79⅛	238	10	122944	5122	516	61½	20			1¾	
" 15	24	11⅝	25	4 6	2½	19020	792	79¾	274	11½	116280	4845	425	58⅛	19			1¾	Strong breeze and rough head sea.
" 16	24	11	25	4 6	2	18725	780	74⅛	252	10½	128754	5364	511	64⅝	21			1¾	
" 17	24	10½	25	4 6	2¼	19130	797	77¾	246	10¼	123646	5151	503	61¾	22			1¾	Moderate breezes and head sea.
" 18	13½	11¾	25	4 6	2	11367	844	74⅛	153	11¼	61855	4418	404	31⅞	22			1¾	Fine weather and calms; stopped at Acapulco 25½ hours.
" 19	9	10⅛	25	4 6	2¼	6391	710	66⅝	96	10⅝	50874	5653	530	25⅝	21			1¾	
" 20	24	11	25	4 6	2½	19680	820	77½	254	10½	120640	5026	475	60¼	20			1¾	Fine weather and calms.
" 21	24	11½	25	4 6	2½	20385	849	80¼	254	10½	123666	5152	487	61¾	20			1¾	
" 22	24	11¾	25	4 6	2½	20555	856	79⅝	258	10¾	127424	5309	494	63¾	20			1¾	Strong breeze and head sea.
" 23	24	11½	25	4 6	2¼	20670	861	80⅛	258	10¾	115092	4795	444	57½	20			1¾	Light head winds and fine weather.
" 24	24	10⅝	25	4 6	2	20687	862	78⅛	264	11	113729	4738	431	56¾	20			1¾	
" 25	24	11	25	4 6	1¾	21238	885	80½	264	11	112342	4680	425	56¼	21			1¾	Strong breeze and head sea.
" 26	17½	10	25	4 6	1½	15384	880	80⅛	192	11	78257	4475	408	39¼	21	12 00	3 6	1¾	

Note T.

Statement of the Number of Days' Passages of the Havre and Bremen Lines of Steamers, in and out of New York, in 1851.

PASSAGES OF THE HAVRE LINE OUT OF NEW YORK, IN 1851.

MONTH.	NAME.	DAYS.	HOURS.
February,	Franklin,	12	10
April,	"	13	11
May,	Humboldt,	12	16
"	Franklin,	11	6
June,	Humboldt,	12	10
July,	Franklin,	12	4
August,	Humboldt,	12	8
September,	Franklin,	11	23
October,	Humboldt,	12	16
November,	Franklin,	12	20
December,	Humboldt,	13	9

Average passage, 12 days and 10 hours.

PASSAGES OF THE HAVRE LINE INTO NEW YORK, IN 1851.

MONTH.	NAME.	DAYS.	HOURS.
January,	Franklin,	14	6
March,	"	14	—
May,	"	11	14
June,	Humboldt,	12	12
July,	Franklin,	11	5
August,	Humboldt,	12	18
September,	Franklin,	11	12
October,	Humboldt,	14	1
November,	Franklin,	10	15
December,	Humboldt,	14	15

Average passage, 12 days and 16 hours.

PASSAGES OF THE BREMEN LINE OUT OF NEW YORK, IN 1851.

MONTH.	NAME.	DAYS.	HOURS.
February,	Washington,	16	00
March,	Hermann,	15	00
April,	Washington,	13	12
May,	Hermann,	14	12
June,	Washington,	12	12
July,	Hermann,	13	11
August,	Washington,	12	18
September,	Hermann,	15	00
October,	Washington,	14	00
November,	Hermann,	17	00

Average passage, 14 days 9 hours.

PASSAGES OF THE BREMEN LINE INTO NEW YORK, IN 1851.

MONTH.	NAME.	DAYS.	HOURS.
January,	Washington,	17	00
April,	"	15	00
May,	Hermann,	13	18
June,	Washington,	11	22
July,	Hermann,	13	12
"	Washington,	14	5
August,	Hermann,	16	00
September,	Washington,	12	20
October,	Hermann,	14	21
November,	Washington,	13	14
December,	Hermann,	19	12

Average passage, 13 days and 20 hours.

APPENDIX.

Passages of the Bremen and Havre Lines over the Atlantic, in 1852.

(FROM THE NEW YORK HERALD.)

THE BREMEN LINE.

EASTERN PASSAGES.

	DAYS.	HOURS.	MIN.
Washington, in January,	13	00	00
" " March,	22	00	00
Hermann, " April,	13	01	00
Washington, " May,	13	18	00
Hermann, " June,	12	2	00
Washington, " July,	13	12	00
Hermann, " August,	12	21	00
Washington, " September,	14	7	00
Hermann, " October,	13	11	00
Washington, " November,	15	00	00

Number of passengers, . . 618.

WESTERN PASSAGES.

	DAYS.	HOURS.	MIN.
Washington, in March,	15	02	00
" " April,	15	08	00
Hermann, " May,	11	17	30
Washington, " June,	14	16	30
Hermann, " "	11	15	00
Washington, " August,	14	00	00
Hermann, " September,	13	9	30
Washington, " October,	13	17	00
Hermann, " November,	13	00	30

Number of passengers, . . 1,205.

THE HAVRE LINE.

EASTERN PASSAGES.

	DAYS.	HOURS.	MIN.
Franklin, in January,	10	13	00
" " March,	13	00	00
Humboldt, " April,	15	19	30
Franklin, " May,	11	12	00
Humboldt, " June,	11	06	45
Franklin, " July,	10	23	00
Humboldt, " "	12	00	00
Franklin, " August,	11	22	30
Humboldt, " September,	12	00	00
Franklin, " October,	16	00	00
Humboldt, " November,	14	20	00

Number of passengers, . . 1,082.

WESTERN PASSAGES.

	DAYS.	HOURS.	MIN.
Humboldt, in January,	21	17	00*
Franklin, " February,	12	12	30
" " April,	11	11	00
Humboldt, " May,	13	06	00
Franklin, " June,	12	04	30
Humboldt, " July,	11	09	30
Franklin, " August,	11	20	00
Humboldt, " September,	11	11	30
Franklin, " "	10	08	00
Humboldt, " October,	13	00	00

Number of passengers, . . 1,046.

* Put into Halifax to repair.

Note U.

NAMES OF THE BUILDERS OF THE U. S. MAIL STEAMERS.

Names of Steamers.	of Hull.	of Machinery.	Joiners' Work.	Brass Work.	Painting.	Spars.
Washington,	Westervelt & Mackay,	Stillman, Allen & Co., [Novelty Works.	Youngs & Cutter,	Edgar M. Brown,	Bogardus & Ramsay,	Abraham Deoike,
Hermann,	do. do.	do.	do. do.	do.	do. do.	do.
Humboldt,	do. do.	do. do.	do. do.	do.	do. do.	do.
Franklin,	do. do.	do. do.	do. do.	do.	do. do.	do.
Columbia,	J. E. Westervelt & Co.	do. do.	do. do.	E. Hidden,	do. do.	do.
Golden Gate,	Wm. H. Webb,	do. do.	Alex. Hawkes,	do.	Prince & Moon,	
Panama,	do.	Allaire Works,	Robert Latou,			
California,	do.	Stillman, Allen & Co.,	do.			
Oregon,	Smith & Dimon,	do. do.	E. Mills,		Prince & Moon,	H. & D. J. Taff,
Tennessee,	Wm. H. Webb,	do. do.	Robert Latou,			
J. L. Stephens,	Smith & Dimon,	do. do.	A. Mills,	A. Mills,	Prince & Moon,	H. & D. J. Taff,
Arctic,	Wm. H. Brown,	do. do.	Robert Latou,		Stephen Squires,	Wm. Dorian,
Atlantic,	do.	do. do.	do.		do.	
Pacific,	Brown & Bell,	Allaire Works,	Youngs & Cutter,		G. D. & I. G. Lugar,	
Baltic,	do. do.	do.	do. do.	Dodd & Hinken,	do.	
Illinois,	Smith & Dimon.	do.	A. Mills,		Prince & Moon,	H. & D. J. Taff,
Georgia,	do. do.	T. F. Secor & Co.	C. M. Simonson,	E. Hidden,	Stephen Squires,	do.
Ohio,	Bishop & Simonson,	do. do.	do.	do.	do.	
Falcon,	Wm. H. Brown,	H. R. Dunham & Co.,	do.		do.	

OFFICERS OF THE U. S. MAIL STEAMERS.

Names of Steamers.	Captain.	First Officer.	Chief Engineer.	First Assistants.	Second Assistants.	Third Assistants.
Arctic,	James C. Luce,	Robert J. Gourlie,	J. B. Kiersted,	Isaac Darling, Daniel Murphy,	John Degrow, Jos. Thorne,	Samuel Havens, Walter Scott.
Atlantic,	James West,	Wm. H. Townsend,	J. W. Rogers,	Charles Bernard, Jno. F. Robinson,	G. R. Vanderbilt, R. A. Walbrer,	John Bulson, E. Berryman.
Pacific,	Ezra Nye,	P. M. Bogart,	Jno. C. Thompson,	Beverley Parkis, Alex. Cunningham,	W. C. Russell, Thos. Jeffries,	Rand'h Thompson, Mark Parsons.
Baltic,	J. I. Comstock,	G. V. Fox,	Robert Robinson,	Samuel Matthews, John L Anderson,	Jesse Bunce, David B. Rice,	Edwd Marsland, Chas. Rodgers.
Illinois,	H. J. Hartstein, U.S.N.	J. P. Griffin, U. S. N.	Eli. S. Birdsall,	Wm. H. Scott,	Thos. Purdy,	J. Fuller.
Georgia,	D. D. Porter, U. S. N.	J. D. Bullock, U. S. N.	Wm. B. Skidmore,	C. O. Skidmore,	E. T. Lockwood,	Nelson Winans.
Ohio,	J. F. Schenck, U. S. N.	Leon. Paulding, U.S.N.	Wm. Scott,	John C. Clark,	Wm. Fox,	Edward Price.
Falcon,	H. Rodgers, U. S. N.	C. P. Jones, U. S. N.	Martin A. Scott,	Jas. McBeam,	David Anderson,	Jas. Welch.
Washington,	Elisha M. Fitch,	P. W. King,	Jno. K. Matthews,	V. R. Terry, Jno. H. Rogers,	Chas. G. Fleet, Chas. D. Kiersted,	W. E. Brinkerhoff. H. C. Maxwell.
Hermann,	E. Higgins, U. S. N.	R. Venas,	Jno. Gallagher,	Albert Pemble,	P. Esler, Wm. Timpson,	
Humboldt,	David Lines,	Wm. Wymack,	Jno. H. Mars,	Philip L. Mars,	Oliver Baird,	Thomas J. Falls.
Franklin,	J. A. Wotton,	A. V. Crooker,	L. S. Bartholomew,	Nicholas Slater, Jefferson Young,	H. E. Rhodes, Francis Blank,	Wm. H. Idleck. Marcus Woodhull.
J. L. Stephens,	R. H. Pierson,	— Bailey,	Charles French,	A. H. Roam.		

Note S.

Steam Log of the U. S. Mail Steamer "Golden Gate," from San Francisco to Panama and back, January and February, 1852.

[FROM THE JOURNAL OF THE FRANKLIN INSTITUTE.]

From San Francisco to Panama.

DATE.	Hours of Steaming.	Steam.	Vacuum.	Cut-off.	Throttle.	Revolutions. Per day.	Revolutions. Per hour.	Revolutions. Per knot.	Distance. Per day.	Distance. Per hour.	Coal used. Per day.	Coal used. Per hour.	Coal used. Per knot.	Coal used. Total.	Per cent of ashes.	Draft of water.	Dip of wheels.	Saturation in boilers.	REMARKS.
1852.		lbs.	in.	ft. in.	in.									tons					
Jan. 21	2	10	25	4 6	2½	1532	766	76½	20	10	9200	4600	460		23	15 5	6 10	1¾	Light winds and calms.
" 22	24	10½	25	4 6	2½	18416	768	74¾	246	10¼	105672	4403	430	52¼	23			1¾	
" 23	24	10¾	25	4 6	2½	19023	792	76	250	10½	111112	4630	444	55⅝	26			1¾	Fine weather, light breeze, smooth sea.
" 24	24	11	25	4 6	2½	19503	812	74¾	261	10¾	115282	4803	442	58⅝	28			1¾	Light winds and calm all these days. Stopped at Acapulco 16 hours.
" 25	24	11	25	4 6	2½	20234	844	73⅛	277	11½	126948	5290	458	63⅛	36			1¾	
" 26	24	9	25	4 6	2½	20260	844	70½	287	12	137952	5831	480	69⅞	38			1¾	
" 27	24	9	25	4 6	2½	20006	875	69	290	12½	117368	4890	405	58¾	28			1¾	
" 28	20	10½	25	4 6	2½	17672	883	71	249	12½	90576	4528	364	45¾	23	13 0	4 6	1¾	
" 29	12	10	25	4 6	2	9065	824	59¾	252	12⅝	75344	4432	495	37⅜	16	13 7	5 0	1¾	
" 30	24	12	25	4 6	2½	20575	857	79½	259	10¾	103850	4328	401	56⅞	20			1¾	
" 31	24	11⅛	25	4 6	2½	21065	878	89⅜	235	10	114704	4779	488	57⅛	20			1¾	
Feb. 1	24	11	25	4 6	2½	20995	873	81⅛	259	10¾	120632	5026	465	60⅛	20			1¾	Strong breeze from eastward.
" 2	24	10⅛	25	4 6	2½	21460	894	77	280	11⅔	120088	5004	429	60	20			1¾	Rain squalls and calms.
" 3	16	10½	25	4 6	2	13184	824	70⅛	188	11¾	74664	4666	397	37⅛	21	12 8	3 8	1¾	Strong breeze and tide against us.
						From Panama to San Francisco.													
" 12	8	12	25	4 6	2½	6280	785	89¾	70	8¾	54536	6817	779	27¼	19	15 11	7 4	1¾	Light wind, sail set running down bay, 90 m.
" 13	24	11½	25	4 6	2½	18215	759	85½	213	8⅞	130532	5438	614	65¼	19			1¾	Light head winds.
" 14	24	11⅜	25	4 6	2½	18830	784	79⅛	238	10	122944	5122	516	61½	20			1¾	
" 15	24	11⅜	25	4 6	2½	19020	792	79¾	274	11½	116280	4845	425	58⅛	19			1¾	Strong breeze and rough head sea.
" 16	24	11	25	4 6	2	18725	780	74⅛	252	10½	128754	5364	511	64⅜	21			1¾	
" 17	24	10½	25	4 6	2¼	19130	797	77¾	246	10¼	123646	5151	503	61¾	22			1¾	Moderate breezes and head sea.
" 18	13½	11⅜	25	4 6	2	11367	844	74⅛	153	11¼	61855	4418	404	31⅞	22			1¾	Fine weather and calms; stopped at Acapulco 25¼ hours.
" 19	9	10⅛	25	4 6	2¼	6391	710	66⅔	96	10⅜	50874	5653	530	25⅝	21			1¾	
" 20	24	11	25	4 6	2½	19680	820	77½	254	10½	120640	5026	475	60¼	20			1¾	Fine weather and calms.
" 21	24	11½	25	4 6	2½	20385	849	80¼	254	10½	123666	5152	487	61¾	20			1¾	
" 22	24	11¾	25	4 6	2½	20555	856	79⅜	258	10¾	127424	5309	494	63¾	20			1¾	Strong breeze and head sea.
" 23	24	11½	25	4 6	2¼	20670	861	80⅛	258	10¾	115092	4795	444	57½	20			1¾	Light head winds and fine weather.
" 24	24	10⅜	25	4 6	2	20687	862	78⅛	264	11	113729	4738	431	56¾	20			1¾	
" 25	24	11	25	4 6	1¾	21238	885	80½	264	11	112342	4680	425	56¼	21			1¾	Strong breeze and head sea.
" 26	17½	10	25	4 6	1½	15384	880	80⅛	192	11	78257	4475	408	39¼	21	12 00	3 6	1¾	

Note T.

Statement of the Number of Days' Passages of the Havre and Bremen Lines of Steamers, in and out of New York, in 1851.

PASSAGES OF THE HAVRE LINE OUT OF NEW YORK, IN 1851.

MONTH.	NAME.	DAYS.	HOURS.
February,	Franklin,	12	10
April,	"	13	11
May,	Humboldt,	12	16
"	Franklin,	11	6
June,	Humboldt,	12	10
July,	Franklin,	12	4
August,	Humboldt,	12	8
September,	Franklin,	11	23
October,	Humboldt,	12	16
November,	Franklin,	12	20
December,	Humboldt,	13	9

Average passage, 12 days and 10 hours.

PASSAGES OF THE HAVRE LINE INTO NEW YORK, IN 1851.

MONTH.	NAME.	DAYS.	HOURS.
January,	Franklin,	14	6
March,	"	14	—
May,	"	11	14
June,	Humboldt,	12	12
July,	Franklin,	11	5
August,	Humboldt,	12	18
September,	Franklin,	11	12
October,	Humboldt,	14	1
November,	Franklin,	10	15
December,	Humboldt,	14	15

Average passage, 12 days and 16 hours.

PASSAGES OF THE BREMEN LINE OUT OF NEW YORK, IN 1851.

MONTH.	NAME.	DAYS.	HOURS.
February,	Washington,	16	00
March,	Hermann,	15	00
April,	Washington,	13	12
May,	Hermann,	14	12
June,	Washington,	12	12
July,	Hermann,	13	11
August,	Washington,	12	18
September,	Hermann,	15	00
October,	Washington,	14	00
November,	Hermann,	17	00

Average passage, 14 days 9 hours.

PASSAGES OF THE BREMEN LINE INTO NEW YORK, IN 1851.

MONTH.	NAME.	DAYS.	HOURS.
January,	Washington,	17	00
April,	"	15	00
May,	Hermann,	13	18
June,	Washington,	11	22
July,	Hermann,	13	12
"	Washington,	14	5
August,	Hermann,	16	00
September,	Washington,	12	20
October,	Hermann,	14	21
November,	Washington,	13	14
December,	Hermann,	19	12

Average passage, 13 days and 20 hours.

APPENDIX.

Passages of the Bremen and Havre Lines over the Atlantic, in 1852.

(FROM THE NEW YORK HERALD.)

THE BREMEN LINE.

EASTERN PASSAGES.

	DAYS.	HOURS.	MIN.
Washington, in January,	13	00	00
" " March,	22	00	00
Hermann, " April,	13	01	00
Washington, " May,	13	18	00
Hermann, " June,	12	2	00
Washington, " July,	13	12	00
Hermann, " August,	12	21	00
Washington, " September,	14	7	00
Hermann, " October,	13	11	00
Washington, " November,	15	00	00

Number of passengers, . . 618.

WESTERN PASSAGES.

	DAYS.	HOURS.	MIN.
Washington, in March,	15	02	00
" " April,	15	08	00
Hermann, " May,	11	17	30
Washington, " June,	14	16	30
Hermann, " "	11	15	00
Washington, " August,	14	00	00
Hermann, " September,	13	9	30
Washington, " October,	13	17	00
Hermann, " November,	13	00	30

Number of passengers, . . 1,205.

THE HAVRE LINE.

EASTERN PASSAGES.

	DAYS.	HOURS.	MIN.
Franklin, in January,	10	13	00
" " March,	13	00	00
Humboldt, " April,	15	19	30
Franklin, " May,	11	12	00
Humboldt, " June,	11	06	45
Franklin, " July,	10	23	00
Humboldt, " "	12	00	00
Franklin, " August,	11	22	30
Humboldt, " September,	12	00	00
Franklin, " October,	16	00	00
Humboldt, " November,	14	20	00

Number of passengers, . . 1,082.

WESTERN PASSAGES.

	DAYS.	HOURS.	MIN.
Humboldt, in January,	21	17	00*
Franklin, " February,	12	12	30
" " April,	11	11	00
Humboldt, " May,	13	06	00
Franklin, " June,	12	04	30
Humboldt, " July,	11	09	30
Franklin, " August,	11	20	00
Humboldt, " September,	11	11	30
Franklin, " "	10	08	00
Humboldt, " October,	13	00	00

Number of passengers, . . 1,046.

* Put into Halifax to repair.

Note U.

NAMES OF THE BUILDERS OF THE U. S. MAIL STEAMERS.

Names of Steamers.	of Hull.	of Machinery.	Joiners' Work.	Brass Work.	Painting.	Spars.
Washington,	Westervelt & Mackay,	Stillman, Allen & Co., [Novelty Works.]	Youngs & Cutter,	Edgar M. Brown,	Bogardus & Ramsay,	Abraham Denike,
Hermann,	do. do.	do.	do. do.	do.	do. do.	do.
Humboldt,	do. do.	do. do.	do. do.	do.	do. do.	do.
Franklin,	do. do.	do. do.	do. do.	do.	do. do.	do.
Columbia,	J. E. Westervelt & Co.	do. do.	do. do.	E. Hidden,	do. do.	do.
Golden Gate,	Wm. H. Webb,	do. do.	Alex. Hawkes,	do.	Prince & Moon,	
Panama,	do.	Allaire Works,	Robert Laton,			
California,	do.	Stillman, Allen & Co.,	do.			
Oregon,	Smith & Dimon,	do. do.	E. Mills,		Prince & Moon,	H. & D. J. Taff,
Tennessee,	Wm. H. Webb,	do. do.	Robert Laton,			
J. L. Stephens,	Smith & Dimon,	do. do.	A. Mills,	A. Mills,	Prince & Moon,	H. & D. J. Taff,
Arctic,	Wm. H. Brown,	do. do.	Robert Laton,		Stephen Squires,	Wm. Dorian,
Atlantic,	do.	do. do.	do.		do.	
Pacific,	Brown & Bell,	Allaire Works,	Youngs & Cutter,		G. D. & I. G. Lugar,	
Baltic,	do. do.	do.	do. do.	Dodd & Hinken,	do.	
Illinois,	Smith & Dimon.	do.	A. Mills,		Prince & Moon,	H. & D. J. Taff,
Georgia,	do. do.	T. F. Secor & Co.	C. M. Simonson,	E. Hidden,	Stephen Squires,	do.
Ohio,	Bishop & Simonson,	do. do.	do.	do.	do.	
Falcon,	Wm. H. Brown,	H. R. Dunham & Co.,	do.		do.	

OFFICERS OF THE U. S. MAIL STEAMERS.

Names of Steamers.	Captain.	First Officer.	Chief Engineer.	First Assistants.	Second Assistants.	Third Assistants.
Arctic,	James C. Luce,	Robert J. Gourlie,	J. B. Kiersted,	Isaac Darling, Daniel Murphy,	John Degrow, Jos. Thorne,	Samuel Havens, Walter Scott.
Atlantic,	James West,	Wm. H. Townsend,	J. W. Rogers,	Charles Bernard, Jno. F. Robinson,	G. R. Vanderbilt, R. A. Walbrer,	John Bulson, E. Berryman.
Pacific,	Ezra Nye,	P. M. Bogart,	Jno. C. Thompson,	Beverley Parkis, Alex. Cunningham,	W. C. Russell, Thos. Jeffries,	Rand'h Thompson, Mark Parsons.
Baltic,	J. I. Comstock,	G. V. Fox,	Robert Robinson,	Samuel Matthews, John L Anderson,	Jesse Bunce, David B. Rice,	Edwd Marsland, Chas. Rodgers.
Illinois,	H. J. Hartstein, U.S.N.	J. P. Griffin, U. S. N.	Eli. S. Birdsall,	Wm. H. Scott,	Thos. Purdy,	J. Fuller.
Georgia,	D. D. Porter, U. S. N.	J. D. Bullock, U. S. N.	Wm. B. Skidmore,	C. O. Skidmore,	E. T. Lockwood,	Nelson Winans.
Ohio,	J. F. Schenck, U. S. N.	Leon. Paulding, U.S.N.	Wm. Scott,	John C. Clark,	Wm. Fox,	Edward Price.
Falcon,	H. Rodgers, U. S. N.	C. P. Jones, U. S. N.	Martin A. Scott,	Jas. McBeam,	David Anderson,	Jas. Welch.
Washington,	Elisha M. Fitch,	P. W. King,	Jno. K. Matthews,	V. R. Terry, Jno. H. Rogers,	Chas. G. Fleet, Chas. D. Kiersted,	W. E. Brinkerhoff. H. C. Maxwell.
Hermann,	E. Higgins, U. S. N.	R. Venas,	Jno. Gallagher,	Albert Pemble,	P. Esler, Wm. Timpson,	
Humboldt,	David Lines,	Wm. Wymack,	Jno. H. Mars,	Philip L. Mars,	Oliver Baird,	Thomas J. Falls.
Franklin,	J. A. Wotton,	A. V. Crooker,	L. S. Bartholomew,	Nicholas Slater, Jefferson Young,	H. E. Rhodes, Francis Blank,	Wm. H. Idleck. Marcus Woodhull.
J. L. Stephens,	R. H. Pierson,	— Bailey,	Charles French,	A. H. Roam.		

The following letter was originally written for "Appleton's Magazine," but some portions of it having been objected to by the Publishers of that Journal, the author takes this opportunity of bringing it before the members of his Profession.

MESSRS. D. APPLETON & CO.,

Publishers, &c., New York.

GENTLEMEN:

My attention has been called to an article in the December number of your Magazine, purporting to be a "*review*" of the "Naval Dry Docks of the United States."

I should let it pass unnoticed, were it not that the character of a third party was unjustly assailed, and the possibility that the position you occupy as publishers, might give the statements so freely made, regardless of truth, a credit and importance they could not otherwise obtain.

I shall, therefore, answer as briefly as possible the erroneous and ungenerous allusions made by the individual that wrote the article in question, respecting the correctness of the History of the New York Dry Dock, in which Mr. Dixon's connection with that work is mentioned, and properly credited; and ask that it may be inserted in the February number of your paper.

The writer, on page 287, in alluding to Mr. Dixon's opinions and statements relative to the Iron Turning Gates of the Dry Dock, indulges the following remarks, viz:

"In the matter of the iron turning gate (p. 33), he says: 'The details have in many respects been constructed essentially different from the original plan designed in 1849,' and then adds, 'they have been constructed in the following manner,' copying the descriptions which follow (and without acknowledgment) from the Report made to the Bureau in 1849, by his *predecessor*, who planned the gate. The method of opening these gates was, it is true, arranged by Mr. S.; but how? In the Appendix will be found five pages of correspondence between Mr. S. and the Contractor for the gate, on the subject of the proper mode of opening them. In this correspondence reference is had to the opinion and statements of a Mr. Dixon, with whom Mr. S. had also corresponded on the subject—called elsewhere, Horatio Dixon, Esq., (those who have met the gentleman will at once perceive the appropriateness of the designation); it seems that the opinion of the contractor for the gates and this Mr. Dixon, who was the inspector of the gates, was favorable to the suggestions of Mr. S., the engineer of the gates, for the time being (which by the way was a remarkable coincidence), and if their opinion was entitled to weight on any subject connected with the gate, it was rather in the cost of a given quantity and shape of iron, in which they had dealt all their lives, than in a matter of which they could have known nothing by experience as engineers; and yet it will be seen in this correspondence, that they differed in opinion as to the amount *saved* to the government, no less than $3,000! and this in estimating the cost of work amounting to $9,600. Their opinions on this matter were clearly entitled to great consideration. But supposing that the saving to the government had been double, or even treble that amount, what would have been the gain? A method of opening the gates, which by the failure of a cog, or the jamming of a pebble might, under certain circumstances, be the means of ruining a ship, and on the other hand, a gain of $10,000.

* * * * * * * * * * * * * * *

"Mr. Stuart, in a manner highly becoming to himself, as well as to the position he occupies, endeavors to show, in this connection, by the testimony of this Esquire Dixon, that his predecessor had been guilty of a petty larceny, in taking from the Government yard, certain condemned plans of his own designing. To those acquainted with the respective parties, the attempt will prove a very happy one.

"These turning-gates were the first entirely *wrought*-iron gates ever constructed, and the merit of their *design and construction* is due Mr. McAlpine. Who, we may ask, upon reading the account of them in Mr. Stuart's work, would imagine it?

* * * * * * * * * * * * * * *

"Floating gate or Caisson, p. 38. The usual proportion of the description of this will be found in the Dictionary; but Mr. Stuart, as usual, gives no credit to the design of his predecessor, or, if he has done so, it has escaped our observation. They were built in entire accordance with the plans of Mr. McAlpine, and we believe are the first vessels of the kind ever constructed of iron. The description of the engine and pumps (p. 45) next demands our attention. It is not easy to fix precisely upon the individual

Mr. Dixon is decidedly ingenious, and though unable to explain his ideas in words, will project them on paper, and execute them in a very satisfactory manner.

I learn (from him) that you desire a foreman, and I have no doubt but you will—if you employ him—be as well pleased as I have been.

Respct'y yr. obt. serv't,

(*Signed*) WM. J. McALPINE, *Engineer.*

Messrs. Merrick & Towne, Philad'a.

It will be evident from the foregoing *official* statements of Mr. McAlpine, together with his letter to Mr. Dixon, that, as before remarked, he could *not* have been the author of the article in "Byrne's Dictionary," credited to him by the writer of the article in your Magazine; as he must have been perfectly aware of the condition of the work when he left it, and the incorrectness of the statements in reference to the *completion* of the important structures therein named. It is a mistaken friendship for this gentleman, which induces the writer to claim for him what he could not have claimed for himself, and *did not do.*

Having thus shown the injustice done to Mr. Dixon, and the correctness of the statements in relation to him in my work, I may be permitted to make a further addition to this notice, already too extended, upon matters personal to myself.

When I commenced this History, it was with a desire to show to our own countrymen, and to others in foreign lands, in a permanent form, some of the triumphs of American Engineering; my object was a national one, and the first quotation made in this "*review,*" shows that this purpose has been attained. It was also my intention to exercise great care in giving to my several predecessors on the New York Dock, the credit due to them for their important share in that great structure, and especially to the one whom I immediately succeeded. If a foreign editor, hastily reading the work, imbibes the impression that I planned the dock, the gates, engine, etc., and built them *all*, certainly I should not be held responsible for the error, because my work ***distinctly states, and this in its most prominent portions,*** the names of the several superintending engineers, the dates of their charge, and their various skillful operations, and gives a correct detail synopsis of the actual work done, and the amount of money expended under each. What I state in reference to the work done under my own charge, as well as that of my predecessors, is a matter of official record, and cannot be disproved.

To refute the statement on the subject of "authorship," that the language of the History is taken from a "Dictionary of Machines," edited by Mr. Byrne, it is only necessary to refer to the preface of the volume, where it is remarked that "care has been taken to refer constantly to the official records of the Navy Department, and the reports of the engineers in charge of the several docks, during their construction, for valuable and reliable information;" and it will be seen not only that these reports have been used, but that particular credit is given to their respective authors. Wherever, therefore, the language of my History is found to correspond with that of "Byrne's Dictionary," it is because both (together with an article in the Tribune of July 6th, 1849) are taken from the same source, the difference consisting in the fact that what I claim to have copied, Byrne publishes as original. The impropriety of statements further made in that work, I have already shown, as far as is important at this time.

The charge that my description of the "Balance" and "Sectional" Dry Docks was published in "Weale's Quarterly Papers," over "three years ago," is totally untrue, for the docks therein described have all been *designed, put under contract, and built,* since that account of the New York *City* Docks was published, in 1845, in Weale's Papers. The basins and railways, and the hydraulic cylinders, described in my work, and which are among the most prominent features of the naval docks, were not known at the time of Weale's publication, nor for several years thereafter, and occupy a large space in the second part of my volume.

With regard to the time and manner of my appointment to the charge of the New York Dry Dock, the writer is, as usual, singularly in error, in stating that Mr. McAlpine was removed, and myself appointed, by President Fillmore. I was placed in charge of the work the 1st of October, 1849, *nine* months before the lamented death of General Taylor. If the writer of the article is the individual whose name appears, fortunately, for the last time, on the cover of your Journal, it is strange that he should have so soon forgotten this, when it was understood, at the time, that he was himself a candidate for the office (notwithstanding his mistaken zeal, at this moment, for the honor of the then incumbent), and subsequently made personal application to myself for the place of Mr. Morse, for whom he also seems to be interested at present. How much light this fact throws on the character of the article and the writer, others will judge.

CHARLES B. STUART.

New York, January 17th, 1853.

LETTERS.

Letter from his Excellency the President of the United States.

Washington City, *May* 11, 1852.

My dear Sir,—

Your favor of the 8th, together with a copy of your work on the Naval Dry Docks of the United States, came to hand yesterday, for which I beg you to accept my sincerest thanks. The work is much larger, more comprehensive and beautiful, than I anticipated. I have as yet only found time to glance at it, but I am gratified to see that the public press speaks of it in high commendation; and the typography, plates, and binding, are certainly deserving of all praise. This is truly a national work, and I shall be pleased to see Congress patronize it in the way you suggest.

I am your obedient servant,

MILLARD FILLMORE.

Hon. C. B. Stuart, *Engineer-in-Chief.*

From Hon. William A. Graham, Secretary of the Navy.

Navy Department, Washington, *May* 10, 1852.

Sir,—

I hasten to express my acknowledgments and thanks for the very elegant copy of your work on the "Naval Dry Docks of the United States." From the examination I have been able to give to it, it impresses me as altogether worthy of the navy and the country.

With great respect, your obedient servant,

WILLIAM A. GRAHAM.

Gen. Charles B. Stuart, *Engineer-in-Chief, U. S. Navy.*

From Commodore Charles Stewart, Senior Officer of U. S. Navy.

Hill of Health, near Bordentown, N. J., *June* 6, 1852.

Dear Sir,—

I received a letter from Mr. C. B. Norton a few days since, which enabled me to find at the dépôt of the Camden and Amboy Railroad Company the work you have compiled on the "Naval Dry Docks of the United States," a copy of which you have done me the honor to transmit for my acceptance. For this distinguished attention of the Engineer-in-Chief of the U. S. Navy, permit me to return you my sincere thanks, united to the hope that the demand for this splendid exhibit of the genius, science, and mechanical talent displayed throughout the work, will command the attention of all maritime nations, as well as all persons interested in the efficiency of naval preparations, for the promotion of naval success and national glory; through a sufficient exhibit whereof, commercial nations can only secure and enjoy peace, with its valuable effects—national security and prosperity.

The elaborate and masterly manner in which the drawings have been executed, and the descriptions have been given, as well as the interesting details which it contains,—all of which are so well sustained throughout the work, by a faithful execution in its letter-press and steel engravings,—will, in all future time, render it, no doubt, a valuable book of reference to whomsoever may be engaged or interested in similar scientific and mechanical undertakings.

With grateful thanks for your kindness, I beg to unite the distinguished respect and regard of

Your obedient servant,

CHARLES STEWART.

Gen. Charles B. Stuart, *Engineer-in-Chief, U. S. Navy.*

From the Chief Naval Constructor of the U. S. Navy.

Washington, *June 5*, 1852.

Sir,—

I have had the pleasure of receiving your letter, together with your work on the "Naval Dry Docks," which exceeds in beauty and execution any thing of the kind I have seen.

In the examination of it I have been much gratified, and, judging from the subject of the Floating Docks, upon which I have had an opportunity of acquiring some information, the work must be of very great value to engineers.

The scientific information, the minute detail, and the clearness of the explanations given in relation to those structures, are fully equal to, and such as their importance demanded.

With the highest respect, sir, your obedient servant,

JOHN LENTHALL.

To Gen. Charles B. Stuart, *Engineer-in-Chief, U. S. Navy.*

From Commodore Joseph Smith, Chief of the Bureau of Yards and Docks.

Bureau of Yards and Docks, *May* 14, 1852.

My dear Sir,—

I thank you for the elegant volume of your work on the "Naval Dry Docks of the United States," received with your friendly note of yesterday's date.

The book speaks for the author and the executors of the design, as well as for the parties connected with the construction of the Docks therein described, and needs no commendation from me.

These important structures were wholly confided to the engineers in charge to direct, and to the mechanics employed to execute, and to them the credit belongs; they show with what fidelity their several duties have been discharged.

The skill and industry you have displayed in preparing this useful book on Dry Docks will, I trust, meet with a favorable response from a discriminating public; and you have my best wishes that your future labors may be crowned with success.

I am, very respectfully, your obedient and humble servant,

JOSEPH SMITH.

Gen. Charles B. Stuart, *Engineer-in-Chief, U. S. Navy.*

From Commodore W. B. Shubrick, Chief of the Bureau of Construction, Equipment, and Repair.

Washington, 18*th May*, 1852.

Dear Sir,—

Accept my thanks for the copy of your very beautiful book on the "Naval Dry Docks of the United States." The subject is treated in the book in a manner suitable to its importance, and the book is got up in a style worthy of the subject; the first is creditable to the literature, and the last to the mechanic arts, of the country.

I am, very respectfully, yours, &c.,

W. B. SHUBRICK.

Gen. Charles B. Stuart, *Engineer-in-Chief, U. S. Navy.*

LETTERS.

From Commodore M. C. Perry, appointed to command the U. S. Squadron, on the East India station.

New York, *May* 12, 1852.

My dear Sir,—

I seize the earliest moment to thank you for the beautiful edition of your magnificent work, "The Naval Dry Docks of the United States."

Since the completion of the permanent Docks at three of our Navy Yards, works unsurpassed, if indeed equalled, in any other part of the world, and in their construction reflecting the highest credit upon their projectors and superintending engineers, a volume such as you have given to the world will be found particularly useful and instructive; and I shall cherish your gift, not only as a flattering evidence of your friendly consideration, but as a most valuable acquisition to my library.

With great respect, I am, dear sir,

Your obliged and most obedient servant,

M. C. PERRY.

Gen. Charles B. Stuart, *Engineer-in-Chief, U. S. Navy, Washington, D. C.*

From Hon. Robert F. Stockton, United States Senator.

Washington, *June* 9, 1852.

Dear Sir,—

I am under obligations to you, for a copy of your magnificent volume of the "Naval Dry Docks of the United States." While it does great credit to our country, as a specimen of the progress of the arts among us, it is, at the same time, instructive as to national and scientific works, intimately connected with the interests of commerce and naval defence. I think, sir, that the country is much indebted to you for this complete and admirable work. It cannot fail to be of great use to the nautical enterprise and commercial interests of our great and growing republic. Your obedient servant,

R. F. STOCKTON.

Gen. Charles B. Stuart.

From Hon. Wm. M. Gwin, Chairman of Naval Committee, United States Senate.

Senate Chamber, Washington City, *June* 10, 1852.

Dear Sir,—

I give you my thanks for your truly beautiful and instructive illustrations of the National Dry Docks of the United States, and I sincerely hope that your meritorious enterprise may be amply rewarded. I remember no national work so elaborately and exquisitely executed in its engravings and letter-press; and if your succeeding numbers at all equal the present, you will, doubtless, have cause to feel a pride in having projected such an elegant contribution to the arts and science of your country.

I am, with high regard, &c.,

Your friend, and obedient servant,

WILLIAM M. GWIN.

To Gen. Charles B. Stuart, *Engineer-in-Chief, U. S. Navy.*

From Thomas Ewbank, Esq., Commissioner of the U. S. Patent Office.

U. S. Patent Office, Washington, *May* 27, 1852.

My dear Sir,—

I have to acknowledge the receipt from you of the most splendid book that ever came as a present into my hands, "The Naval Dry Docks of the United States." In presenting this work to the public in the highest style of art, you have set an example which it is to be hoped will be followed by both authors and publisners. Gorgeous dresses are often expended on treatises of ordinary, and even ephemeral value; while such as relate to those arts to which society is indebted for its chiefest acquisitions, have been pretty generally clothed in rags. Your volume will be hailed as a monument of professional patriotism and of elevated national pride.

After superintending the progress of the most elaborate structure illustrated in the volume—the Dry Dock in the New York Navy Yard—until its successful completion, it must be to you a source of high gratification to be able to present this lucid and appropriate account of it to the world.

Your style appears to me easy, clear, and concise; this is every thing in descriptions of machinery; and I congratulate you on the issue of a work that constitutes you an authority on the great subject of which you treat.

The idea of a series of such volumes is a bold one. How far success would be commanded, my experience does not enable me to say. No one will deny that you would deserve it; and no one, I am sure, will more fervently rejoice at every addition to your fame and fortune than

Your sincere friend,
THOMAS EWBANK.

GEN. C. B. STUART, *U. S. Engineer-in-Chief.*

From General J. G. Totten, Chief Engineer, U. S. Army.

ENGINEER DEPARTMENT, WASHINGTON, *May* 14, 1852.

SIR,—

I had the honor to receive yesterday your letter of the 13th inst., accompanied by a very beautiful copy of your great work on the "Naval Dry Docks of the United States."

The book is published in a style worthy of the great national constructions which it describes; and I shall give my first leisure to a careful perusal, assured by a hasty glance at the contents that I shall derive much important instruction.

Very respectfully, your obedient servant,
JOSEPH G. TOTTEN.

GEN. CHARLES B. STUART, *Engineer-in-Chief, U. S. Navy, Washington.*

From his Excellency the Governor of the State of New York.

ALBANY, *May* 15, 1852.

DEAR SIR,—

I would gratefully acknowledge your kindness in sending me a copy of your valuable work on the "Naval Dry Docks of the United States." I have examined it with much interest and satisfaction. There was need of such a volume, to convey a correct knowledge of our progress in the class of improvements to which your attention has been directed, for some years past. You are entitled to high credit for undertaking to supply this *desideratum*, and I must congratulate you on the admirable success with which you have performed the task. I have seen no American publication better calculated to gratify a just national pride. The public appreciation of the work cannot fail to bring you an ample and substantial reward.

I remain, with great regard, yours truly,
WASHINGTON HUNT.

GEN. CHARLES B. STUART, *Engineer-in-Chief, U. S. Navy.*

LETTERS.

From Charles Ellet, Jr., Civil Engineer, and Chief Engineer of the Schuylkill, Niagara, and Wheeling Suspension Bridges.

PHILADELPHIA, *May* 20, 1852.

DEAR SIR,—

Though I have not yet been able to read thoroughly your work on the "Naval Dry Docks of the United States," I wish to express to you my great admiration of the book, which I regard as one of the most valuable, as well as most beautiful, ornaments of my professional library.

In my opinion, you are entitled to the thanks of the profession, and of all others who take pride in the great achievements of the country, for this excellent contribution to the descriptive history of our public works.

The plan which you have formed for continuing your laborious enterprise, and exhibiting in the most appropriate style the progress of the country in the production of sea-going steamers, in railroads, river navigation, and in other of the mechanical pursuits of society, appears to me to be admirably calculated to elevate the profession we follow, and to make and spread a durable record of the monuments which we have erected, and which we hope still to erect. The plan deserves, and I trust will receive, the hearty co-operation and support of every liberal and enlightened engineer.

I trust that you will receive adequate encouragement for what you have already done, and as well as that which you propose still to accomplish, and remain,

Respectfully and truly yours,

CHARLES ELLET, JR.

GEN. CHARLES B. STUART, *Engineer-in-Chief, U. S. Navy.*

From the Chief Engineer of Merrick & Sons' Iron Works, Philadelphia.

PHILADELPHIA, *May* 10, 1852.

MY DEAR SIR,—

I have to acknowledge the receipt of a copy of your work on Dry Docks, from the hands of Mr. Norton, and regret that I was absent from the establishment at the time he visited it. I have very carefully perused the work, and aside from the getting up in its mechanical department, (engravings, etc.,) which is very superior, I must say that I have never perused any work on engineering, in any of its various departments, that has given more pleasure. As this may appear a strong expression, I will give my reason for making it. Nearly all the works that have been published, give you engravings that are not sufficiently accurate to work from; in fact, they are *pictures* and not drawings, while your engravings are accurate in scale and authentic records of what they represent. The description of the various Docks and their details is very complete, and, to my mind, very clear. I shall do all I can to extend their sale, and hope that the sale will justify the trouble and expense. Yours truly,

B. H. BARTOL.

GEN. CHARLES B. STUART, *Engineer-in-Chief, U. S. Navy.*

From H. R. Dunham & Co., Engineers, Archimedes Works, New York.

NEW YORK, *May* 25, 1852.

DEAR SIR,—

It is with pleasure and satisfaction we have read your excellent work on Dry Docks, from which we have derived much valuable and interesting information. We regard it as a standard work, clear, minute, and correct in its description of the subject, enabling the engineer to proceed with safety in the construction of similar works. The drawings we regard as the finest in any work of the kind produced in the country, and are especially valuable, because they are exact from the different Docks as complete and finished. It is seldom a work of the expensive character you have furnished in the copy sent us, is remunerative to the author; in this case, however, we trust the importance of the subject, and the able manner it is set forth, may prove otherwise, so soon as its value is known to the public. With considerations of respect,

We remain yours,

H. R. DUNHAM & CO.,

Engineers, Archimedes Works.

GEN. CHARLES B. STUART, *Engineer-in-Chief, U. S. Navy.*

LETTERS.

From the Editors of the American Journal of Science.

NEW HAVEN, *June 5*, 1852.

DEAR SIR,—

I have great pleasure, on behalf of the editors of the "American Journal of Science," in acknowledging your magnificent work on the "Naval Dry Docks of the U. S."

It is to us both a matter of surprise and gratification that you have been able to bring out this truly valuable volume in a style so worthy the present advanced state of science and art; a style, however, in which very few scientific works have ever been published in the United States. We hope that this enterprise may meet with such decided encouragement from the public, that you may be induced to record the history of our Naval Steam Marine in the same style. Accept our thanks for your polite attention. The July number of the American Journal will contain a public acknowledgment, but we have much pleasure in also making this communication to you personally.

Accept, dear sir, the assurances with which I am, very truly,

Your obedient servant,

B. SILLIMAN, JR.

TO GEN. CHARLES B. STUART, *Engineer-in-Chief, U. S. Navy.*

From Wm. Sewell, Esq., Chief Engineer, U. S. Navy.

PORTSMOUTH, VA., *June* 10, 1852.

DEAR SIR,—

I have received per your agent my copy of your work on the "Naval Dry Docks of the United States." I have examined it, and am very much pleased. You have spared neither expense nor labor in the engraving, printing, or binding. I have seen nothing superior to it; but the principal value to the practical engineer is in its contents, which are of the most valuable and important kind, and particularly in the illustrations of the Docks of American invention.

Being taken from structures of the largest size in successful operation, it furnishes to the engineer or builder accurate plans, drawn to a scale in sufficient detail to enable him to construct others like them, and must be of the greatest value to those engaged in public works, and should, in my opinion, be considered of a national character. Respectfully yours,

WILLIAM SEWELL.

GEN. CHARLES B. STUART, *Engineer-in-Chief, U. S. Navy.*

From Commodore Charles Morris, Chief of Bureau of Ordnance, &c.

WASHINGTON D. C., *May* 18, 1852.

SIR,—

I have to return you my thanks for the very beautiful copy of your work illustrating the "Naval Dry Docks of the United States," which you have been so kind as to send me.

I have no doubt that this work will be highly useful to future engineers who may be charged with the construction of similar works, and will meet with the approval of those who are competent to appreciate its merits.

I am, very respectfully, your obedient servant,

C. MORRIS.

CHARLES B. STUART, *Engineer-in-Chief, U. S. Navy, Washington.*

LETTERS.

From Hon. Daniel Webster, Secretary of State.

Franklin, N. H., *July 16th*, 1852.

My dear Sir,—

I thank you for a present of a copy of "The Naval Dry Docks of the United States," by Gen. Chas. B. Stuart. The subject of the work is indeed of the first importance to the commercial world, and from a glance at the letter-press, I am inclined to believe that the work has been prepared with great ability. It proposes much information, which cannot but be of essential service to the General Government, and especially to the Navy Department, to which the author has for a long time been attached as Engineer-in-Chief.

With regard to the typographical character of the work, I must say that I do not remember to have seen a more beautifully printed volume, or one more carefully and elegantly illustrated.

With high regard, I am, sir, your obedient servant, DANIEL WEBSTER.

To Chas. B. Norton, Esq., *New York.*

Letter from the Private Secretary of the Prince Albert.

Osborne, *August* 18, 1852.

Sir,—

I have received the commands of His Royal Highness the Prince Albert, to return you his best thanks for your interesting and valuable work, on the "Naval Dry Docks of the United States," which you have been good enough to send to him. I have the honor to be, sir, your obedient humble servant,

C. B. PHIPPS.

To Gen. C. B. Stuart, *Engineer-in-Chief U. S. Navy, Washington City.*

From the Duke of Wellington.

London, *August* 14, 1852.

Sir,—

I returned from Walmer Castle last night, and had the honor of receiving your Excellency's note, with the beautiful volume transmitted me by General Stuart, Engineer-in-Chief of the United States Navy, being the History of the Naval Dry Docks of the United States.

I am much flattered by this valuable gift, which I receive with pleasure, and shall refer to for information on a scientific subject of great importance to all maritime nations.

I have the honor to be, with the highest consideration,

Your Excellency's most humble and obedient servant,

WELLINGTON.

To His Excellency the Hon. Abbott Lawrence, &c., &c., &c.

From the Hon. Abbott Lawrence, U. S. Minister to England.

Legation of the United States, London, *August* 14, 1852.

My dear Sir,—

I had the honor to receive, by the hands of Lieutenant O. W. Bartlett, U. S. Navy, your note of the 1st July, with your magnificent work on the "Dry Docks of the United States."

As a citizen of the United States, I confess that I am proud that we have scientific men competent to present to the world such a work as this—a work which reflects the highest honor, not only upon the author, but on the country at large, and which I have never seen equaled in point of execution.

I shall examine the volume with great satisfaction, and beg you to believe me, dear sir,

Your obliged and obedient servant, ABBOTT LAWRENCE.

To Gen. Chas. B. Stuart, *Engineer-in-Chief U. S. Navy, Washington City.*

LETTERS.

INSTITUTION OF CIVIL ENGINEERS, 25 Great George Street,
WESTMINSTER, *August* 18, 1852.

SIR,—

I am directed by the Institution of Civil Engineers to acknowledge the receipt of "The Naval Dry Docks of the United States," and to convey to you the thanks of the Institution for this mark of attention to its interests.

I have the honor to be, sir, your obedient servant,

CHARLES MAULEY, *Secretary*.

To GEN. C. B. STUART.

From the Governor-General of Canada.

QUEBEC, *Sept.* 13, 1852.

SIR,—

I have received the scientific work by Gen. Charles B. Stuart, Engineer-in-Chief of the U. S. Navy, which you had the kindness to transmit to me by a private hand. I beg that you will convey to Gen. Stuart my best thanks for this most valuable and interesting gift, and that you will accept my very grateful acknowledgments for your courtesy in forwarding it.

I have the honor to be, sir, your obedient servant,

ELGIN KINCARDINE.

To B. HAMMETT NORTON, Esq., *U. S. Consul, Pictou, Nova Scotia.*

From the Governor of Prince Edward's Island.

GOVERNMENT HOUSE, P. E. ISLAND, *August 9th*, 1852.

SIR,—

I have to request that you will return my thanks to the author and donor of the splendid volume on the "Naval Dry Docks of the United States," which was delivered to me through you.

I beg you will assure the Engineer-in-Chief, that I prize his present very highly. The volume is splendidly got up, in a manner worthy of the subjects, which its beautiful plates so well delineate. I am in possession of the works of most of our eminent Engineers, on Docks and Harbors; these volumes are now in England, and I feel proud to add to them the work of the distinguished United States Engineer, a copy of which he has been so kind as to present me with.

I remain, dear sir, yours faithfully,

A. BANNERMAN.

To MAJOR B. H. NORTON, *U. S. Consul, &c., &c.*

From the Governor of Nova Scotia.

GOVERNMENT HOUSE, HALIFAX, NOVA SCOTIA, *August 31st*, 1852.

SIR,—

I am much indebted to you for your kindness in forwarding to me, at the request of Gen. Stuart, a copy of his work on the "Naval Dry Docks of the United States;" and I beg you will express to that gentleman my best thanks for the same, and also, that you will assure him how much I feel flattered at his kind consideration and attention, in presenting me with a work of so much value and interest.

I beg also to return to you my acknowledgments for your kind congratulations on my arrival in Nova Scotia.

I have the honor to be, sir, your obedient servant,

J. GASPARD LE MARCHANT.

To B. H. NORTON, Esq., *U. S. Consul, &c., &c., &c.*

LETTERS.

From Sir Allan N. MacNab.

QUEBEC, *Nov. 9th*, 1852.

MY DEAR SIR,—

Accept my sincere thanks for your kind consideration in sending me a copy of your very splendid work on the "Naval Dry Docks of the United States," which shall be placed in my library to remind me of our very agreeable and satisfactory acquaintance, which I hope may yet be renewed at no very distant period; and with the best wishes for your happiness and prosperity,

Believe me, very sincerely yours, ALLAN N. MACNAB.

TO GEN. CHAS. B. STUART, *Washington City.*

From the Chief Engineer of the Canandaigua and Niagara Falls Railway.

CANANDAIGUA, *August* 13, 1852.

DEAR SIR,—

Your elegant work on the "Naval Dry Docks of the United States" is received. I am glad you can find time, and have the inclination, to forward the general interests of the profession, by giving to the public so good a work. It is equal in merit, and in the style of its execution, to the best English productions, and I may add, better adapted to the wants of our country, than the works generally sent to us from England. I hope you will not stop with this successful effort. Enclosed please find ten dollars for the volume.

Yours sincerely, MARVIN PORTER.

TO GEN. CHAS. B. STUART.

From the Engineer of Bureau of Yards and Docks.

WASHINGTON, *Dec. 29th*, 1852.

MY DEAR SIR,—

I have just received from your publisher a beautiful copy of your work on "Naval Dry Docks," for which please accept my sincere thanks.

I shall value this book very highly, feeling, as I do, a deep interest in the great national works of which it treats. The descriptions of the several parts of the Docks appear very full and clear, and the drawings accurate and sufficiently in detail to be of great assistance to engineers engaged in the construction of similar works. It contains a vast amount of interesting and valuable information, and the mechanical execution of the work reflects great credit on all engaged upon it.

From the examination I have been enabled to bestow upon it, I regard the book as among the most valuable that have been presented to the public, and trust the demand for it may be such as to remunerate you for your labors, and justify you in prosecuting your design of publishing the contemplated volume on Steamers, &c.

With great respect, your obedient servant, W. P. S. SANGER.

GEN. CHAS. B. STUART, *Engineer-in-Chief U. S. Navy.*

From the Chief Engineer of the North Branch Canal, Pa.

HARRISBURG, *Nov. 1st*, 1852.

MY DEAR SIR,—

I have much pleasure in acknowledging the receipt of a copy of your beautiful work on the "Naval Dry Docks of the United States," and I beg you to accept my warmest acknowledgments for your kind consideration. Since its reception I have been constantly under a pressure of professional duty, and have not had time to give it such attentive perusal as I desire and design doing; but have examined it sufficiently to assure myself of its merits, and to speak of its value to our profession.

The want of reliable information upon this subject is supplied in the splendid work you have produced, and I sincerely hope that such governmental and other aid may be extended as will enable you to prosecute the design of farther publications upon kindred subjects, alike creditable to yourself and to the profession, and highly useful to our common country. I remain very truly yours,

Wm. B. FOSTER, Jr., *Civil Engineer.*

Gen. Chas. B. Stuart, *Engineer-in-Chief U. S. Navy.*

From the Chief Engineer of the Northern Railway.

Ogdensburg, *Oct. 30th*, 1852.

Dear Sir,—

Your favor of the 27th is this moment received.

I had only time to glance through the magnificent work you have given to the public, but saw sufficient to make me proud of the proof you have given, that we are not behind the age of European improvements. The engravings are beautifully executed, and the letter-press very perfect. As soon as I can find time to give the attention to your work which it deserves, I will write you again. Enclosed find ten dollars.

Very truly yours, CHARLES L. SCHLATTER.

Gen. Chas. B. Stuart.

From the Division Engineer of the Great Western Railway.

Havana, *Nov. 4th*, 1852.

My dear Sir,—

The copy of your great work on the "Naval Dry Docks of the United States," mentioned in your communication of the 27th Oct., was duly received.

The profession are indebted to you for furnishing, in this volume, information in relation to our naval structures, of immense value. The style of getting up the work far exceeds my anticipations; indeed, I know of nothing of the kind in this country or Europe that will compare with it.

I hope your labors will be duly appreciated by the American public, and that you may meet with abundant success in your future enterprises.

Enclosed is ten dollars, the subscription price.

Very respectfully and truly yours, C. W. WENTZ.

To Gen. C. B. Stuart, *Engineer-in-Chief U. S. Navy.*

NOTICES OF THE PRESS.

"We have recently alluded to the great advances which every year has made, and is making, in the comfort, convenience, luxury, and garniture of our homes. The architecture that floats on the unstable wave, is also advancing in speed, comfort, and efficiency.

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"Fortunately, we have had no occasion to display our naval power in any of those hostile demonstrations in which the early glory of our Navy was won. Our ships rock only to the thunder of cannon fired in salutation. But, meantime, our sea-mechanic has not been idle. That ingenuity which shows itself in every department of American labor, has been also at work upon the sailor's homes. The quickest passages, by steam or sail, are recorded in the log-books of American vessels. Scarcely has an American steamer struck out a day from the accustomed distance between the Old and New World, when a New York yacht runs ahead of the royal fleet, and soon, again, the English Press announces that a Yankee ship has made a passage of unprecedented quickness from Canton to London.

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"For these, among other considerations, we hail every triumph of American skill in nautical architecture with earnest joy.

"We hope our national condition, in respect to our shipping, our defences, our naval equipment, may be placed more clearly before the people. The projected works of General Stuart, having this object in view, will thus render an efficient service to the country. He has given us one installment. May the other soon follow.

"One man wins a victory, and another man records it. The generation passes away, and the record remains for the information and instruction of after ages. So also with the progress of the peaceful arts; but here, more frequently, he who invents, discovers, and executes, also records. We have a distinguished example in the noble work of General Stuart on the Naval Dry Docks of the United States. The author, the Chief Engineer of the Naval Department of the United States, under whose immediate supervision the Dry Dock at Brooklyn—the largest and most costly structure of the kind in the world—was completed, has given us, with beautiful plans and illustrations, the record of the labor of himself and his predecessors. The Brooklyn Dock is a proud monument of the engineering skill of the nineteenth century, and it is a subject of gratulation that it has found so able an historian as the pen of the Chief Engineer who completed it. This work of General Stuart deserves a place in every American library. We have reason to know that it was undertaken without the hope or expectation of deriving any pecuniary compensation for the labor. The author has published it at his own expense and risk—has omitted nothing to make it perfect, and looks to liberal, patriotic men to purchase enough to meet the actual outlay of publication. This he can hardly fail to realize. But however this may be, he is not the man to hesitate in the great undertaking which he has marked out for himself—to follow up this production with kindred works on the Steamboats, Steamships, and Railroads of the United States. General Stuart holds, that in all this mechanical skill, in these evidences of a nation's civilization, this country, at the present day, stands in the front rank—that it leads the vanguard—and he intends to make a record, showing the condition of these enterprises as they now exist. His history and illustrations of the Naval Dry Docks of the United States may be considered as the pioneer history of the enterprises referred to. If the drawings, illustrations, and letter-press of his future works shall equal those of the present volume, the author will have discharged, most faithfully and ably, his portion of that duty, which, it is said. every man owes to the profession to which he belongs.

"While all these marine statistics remain in the tortuous windings of the Custom-House labyrinth, or hidden in the archives of a Department, the people cannot come at the knowledge of the actual state of our Naval affairs. The land forces are patent to view. But our floating armament recedes from sight. Now, only those few who have access to the somewhat difficult information, can judge of the excellencies, resources, and deficiencies of the Naval arm. Let the knowledge be popularized, and then a thousand ingenious intellects will be busy on the subject, where, now, only a few can work."—*New York Daily Times.*

"A more splendid book externally has never been published in America; and a more complete and thoroughly scientific work on the subject of Dry Docks has never been given to the world. The volume is a large quarto, printed on the best of type and paper, and illustrated by twenty-five engravings, executed in the most beautiful style of art.

"The following is a copy of the Dedication:

"*This volume is dedicated by permission to His Excellency* MILLARD FILLMORE, *President of the United States, with sentiments of grateful esteem, by his sincere friend and devoted servant, the author.*"

"General STUART is entitled to great credit for the enterprise, industry, and skill which he has exhibited in the preparation of this magnificent work. Although some seven millions of dollars have been expended by the Government of the United States in the construction of the Docks at the Navy Yards of New York, Philadelphia, Boston, Portsmouth, Norfolk, Pensacola, and San Francisco, yet from the fact that no adequate description of these works has ever been given to the public, neither the American people, nor the "powers" abroad, have any adequate conception of our achievements in the Department of Naval Engineering. General STUART's work is entirely national in its subject, monumental in its character, and patriotic in its influence upon the popular feeling and the scientific energy of the country."—*New York Mirror.*

"In a very brief and appropriate preface, Mr. STUART states that the object he had in view in the preparation of this work, was, to show in the most practicable manner, the mode of constructing and working the Naval Dry Docks of the United States. In doing this, he has elaborated a work highly creditable to himself, to the profession of which he is a member, and to the artistical skill of every department of industry employed in its construction. The illustrations are, as promised, not only 'in the fullest detail,' but of elaborate and finished execution: the letter-press is perfect, the paper of the best and most durable quality, and these the taste of the binder has embodied in a quarto volume of exquisite beauty."—*New York Courier and Enquirer.*

"This elaborately prepared work will be of great public utility, containing, as it does, a description of these important national works. The statesman, the merchant, engineers, mechanics, and the people generally, will derive from it considerable assistance and information. The plates which embellish this publication are admirably explicit, and are prepared in the first style of art. The work cannot fail to fill the niche to which its good design and beautiful execution entitle it."—*New York Herald.*

"What a superb specimen of typography! Baker, Godwin & Co., corner of Nassau and Spruce streets, are the printers, and highly creditable to them, as artists in their way, is it. It is dedicated, by permission, to Mr. President FILLMORE, by the author, who has really given to the world a magnificent work. It gives full information as to the construction of Dry Docks, with clear and lucid illustrations, among which are the details of the principal works of that kind in this country."—*New York Express.*

"It has been prepared at great cost, and is probably the most complete and thoroughly scientific work on the subject of Dry Docks ever published. The style and general appearance of the volume is worthy of its contents. The people of this country, to whom these splendid monuments of engineering science, and indeed national greatness, belong, have, in general, no adequate conception of their magnificence; and General STUART has done the public a service in directing its attention to objects so eminently adapted to excite emotions of patriotic pride and pleasure. The book is dedicated to President FILLMORE."—*New York Journal of Commerce.*

"This splendid quarto volume fitly illustrates one of the great features of American industry. Mr. STUART, who is the Chief Engineer of the United States Navy, takes a just pride in his honorable profession, and has evidently engaged *con amore* in the compilation of this work. European engineers will doubtless have something to learn from this elaborate and accurate treatise." —*New York Commercial Advertiser.*

NOTICES OF THE PRESS

"The work is dedicated, by permission, to President FILLMORE, and thus has an official endorsement as a truly national work, which the nation ought to be proud of, and the Navy in particular ought to prize most highly.

"The author has devoted the hours spared from his official duties to the labors of this work, which consists of elaborate and scientific descriptions of the Naval Dry Docks of the United States, at the Navy Yards of New York, Philadelphia, Boston, Portsmouth, Norfolk, Pensacola, and San Francisco; the Granite Dock in New York, (the largest in the world,) the Floating Sectional Dock, Philadelphia, and the Floating Balance Dry Dock, Portsmouth. No description that we could give would do justice to the merits of this splendid publication. It enters into all the minute details of the vast and costly Government works it describes, and gives the history of each, from the time of the passage by Congress of the act authorizing its construction, up to its completion. Each description is accompanied by large and elegant steel-plate illustrations. Navy and Army officers, engineers, machinists, and all scientific men, should possess themselves of this work, as well on account of its intrinsic value as for the sake of encouraging the author and publisher in their enterprise in getting up such a superb publication."—*Philadelphia Evening Bulletin.*

"The nature of the subject, and the source from which it emanates, conspire to give it an importance which will be appreciated by engineers and scientific men, and generally all connected with the Naval interest throughout the world. We do not know that any country can boast, in a similar illustrative work, so splendid a monument to its public Dry Dock system, or the energy of Government which has built up, and the individual talent and skill which have carried such a system into execution."—*Philadelphia North American & United States Gazette.*

"No American work on engineering has been issued from the press that will compare with this work in the beauty of its execution, or the intrinsic value of its contents. While the English press has issued book after book, until there is hardly a subject that has not been fully explained, or a public work that has not been illustrated, we have been quietly purchasing their publications, being satisfied that it would not pay to attempt any thing of the kind in this country. This is certainly a melancholy fact, if true. When we reflect that in railroads, water works, gas works, steam ships, sailing ships, dry docks, and bridges, we have works of greater magnitude, built at much less cost, it does appear hard that books fully descriptive of such works, illustrated in a manner commensurate with their importance, cannot be made to pay sufficiently well to justify the expense. This has been the opinion of the past. Mr. STUART thinks *that time* has gone by, and having been engaged for several years on the Stone Dry Dock at New York, the Sectional Docks of Philadelphia and California, and the Balance Docks of Portsmouth and Pensacola, he has concluded to publish a part of his labors, and hence the present work. It is illustrated with twenty-five engravings on steel, made to an accurate scale, so that, if measured, each dimension will be found to agree with the description. Every engineer will appreciate the value of such drawings, for, unfortunately, the engravings of many publications in this country and Europe, if judged by this standard, will be found mere pictures. The work also contains the history of each dock, the nature of its foundation, the quantity and kind of material used, the time and cost of its construction, the names of the engineers and contractors, and a great deal of valuable information to those at all interested in the public works of the nation. We trust that Mr. STUART has not over-estimated the amount of support that his book will receive in this country, and we hope the American people will come forward, in a liberal spirit, and sustain a publication so creditable to the country."—*Journal of the Franklin Institute.*

"This is a truly elegant volume, and one every way worthy of the great national works it is designed to illustrate and explain. It will do much towards disseminating correct ideas of the magnitude and importance of the public works of this country, and of the science, ingenuity, and skill of our engineers, as displayed in their projection and construction, both of which have very generally been underrated. The first and greater portion of this work is devoted to a complete history and description in the fullest detail of the Granite Dry Dock at Brooklyn, New York, the largest in the world, and which, from the admirable plans and principles upon which it is built, and the many serious obstacles which were encountered and overcome in its construction, will 'remain for ages one of the proudest monuments of engineering and mechanical skill of the nineteenth century.'

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"It is understood that this work has been produced by Mr. STUART at his own expense, and at a cost of upwards of nine thousand dollars. We trust his enterprise and public spirit will be suitably rewarded, and that the encouragement given may be such as to enable him to publish in a similar style the history of the rise and progress of steam navigation in this country, upon which he is now engaged."—*Washington Union.*

"No work has ever been issued from the American press that is more suited to gratify the national pride. It presents an imposing view of American enterprise and skill, as applied to the construction of our public works, which gives a cheering evidence of the progress of mechanical industry and engineering resources in this country.

"The manner in which this volume is got up, deserves more than a passing word of commendation. Rivaling the best specimens of London typography, its match for firmness and beauty of paper, brilliancy of type and accuracy of execution, has never been issued from the New York press. The printers, Baker, Godwin & Co., are entitled to the highest credit for the professional skill with which they have devoted all the resources of their art, to bring out an important national work in a style worthy of its intrinsic character. The engravings, by Ormsby, are highly finished productions. It is rarely that a scientific work is illustrated with so much magnificence. Nor should we forget the binding, which is of the most sumptuous character, uniting an appropriate richness of ornament with solidity of workmanship.

"We understand that it is the intention of Gen. Stuart to publish a volume, similar to the present one, annually, until a series shall be completed, embracing the naval and mail steamers, the railroads, the canals, the water works, and other great public constructions in the United States.

"The plan is one which must command the interest of every friend of internal improvements, of every American patriot, of every lover of scientific progress. We rejoice that the work has fallen into such competent hands as those of the present author. He has shown himself in this volume an effective writer, as well as an accomplished engineer. His descriptions are remarkable for their clearness. He uses no superfluous words. His style is business-like, economical, and well proportioned. Few makers of books have done so much themselves worthy of an enduring record; and still fewer have written a narrative, in which their own deeds figure largely, with so much modesty and good taste. We hope this expensive work will not fail to receive the appreciation which it ought to command. It is an honor to the country, and should be sustained by every true American."—*New York Tribune.*

"A careful inspection of this valuable work enables us fully to endorse the above description of it, which we find in the New York Tribune."—*Boston Transcript.*

"This volume is worthy of the noble works it illustrates and describes—of the extent of which, and their importance, we had vague and inadequate ideas, until we examined this splendid volume, which is, in itself, an honor to the typographic art of our country.

"The chief subject of the first part of this work is the Dry Dock in the Navy Yard at Brooklyn, of which it may well be said, 'It will remain for ages one of the proudest monuments of engineering and mechanical skill of the nineteenth century.'

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"Such works as these in England are published with the aid of the Government: as, for example, 'The Eddystone Lighthouse,' a very splendid volume, showing all the details of that monument of modern science and mechanical art; and so, too, the great work by Tredgold on Engineering. The value of these and like works is of such acknowledged necessity to all boards of public works and men of science engaged in engineering, that the Government of England has made the publication of these works, of great cost and vast public value, possible. And we hope this view will govern Congress in this matter in our own Government. This work has cost Mr. Stuart, we are told, upwards of nine thousand dollars for one thousand copies, a sum of money only to be repaid to him by Government subscription. And we are the more anxious that Mr. Stuart shall be sustained in this enterprise, as he has ample materials for an authentic and accurate history of the origin and progress of steam navigation in the United States, and also of the naval and mail steamships of the United States, for two volumes similar to the one now printed, illustrated, in like manner, with the best of steel-plate engravings. The value of these works, if they were now published, would be great. The questions now before Congress would be soon settled, and a perfect and accurate knowledge of the whole subject be placed within the reach of every gentleman called upon by his vote to decide a question of such national importance as the creation and support of an efficient steam navy."—*Washington National Intelligencer.*

NOTICES OF THE PRESS.

"This magnificent volume, we understand, is the first of a series designed to illustrate the most important public works of the United States.

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"This volume will form an appropriate addition to all public, state, and national libraries; it will be found interesting to statesmen and the officers of the Government, particularly of the Army and Navy; and useful to engineers, mechanics, and contractors, for the minute statistical information it contains in regard to the cost of the works described. It has been got up at very great expense; and in the paper, typography, engravings, and binding, it is by far the most beautifully-executed American work that has ever fallen under our observation. It is a work, indeed, of which the nation may be proud, as honorably illustrating its progress, not only in mechanics, but in the arts; and we hope that General STUART may be amply remunerated for the time, trouble, and expense which he has bestowed upon it. The volume is dedicated, by permission, to MILLARD FILLMORE, President of the United States."—*Washington Republic.*

"This beautiful and interesting work has been prepared with no small degree of labor by Mr. CHARLES B. STUART, Engineer-in-Chief of the United States Navy, and is dedicated to His Excellency President FILLMORE. The elaborate and accurate description of these large and costly national structures will convey to the reader an idea of the liberal and enlightened views of the Government, and it evidences at the same time the great mechanical ingenuity, as well as the practical and scientific skill of our people.

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"We learn that it is the intention of the author to prepare and publish another volume, on the 'Naval and Mail Steamers of the United States,' to be followed by a third, on the 'Railways of the United States.' These subjects will no doubt be ably treated, and the works will not fail to receive at the hands of the public the most favorable consideration."—*Baltimore American.*

"This is a work of great utility. It embraces a succinct history of all the Naval Dry Docks in the United States.

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"The volume is got up in the most attractive form, and is calculated as well to adorn the parlor of the man of taste as to enrich the study of the statesman and scholar.

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"Indeed, it is a valuable addition to any library, and is a book that all classes may study with profit."—*Owego (N. Y.) Advertiser.*

"This very valuable and truly interesting work has been prepared with an elaborate completeness of finish in all its departments, and is brought out, regardless of cost, in a style superior to any thing in the book line ever before accomplished in the United States. The Governments of Europe sometimes produce works of this character in gorgeous style and at enormous expense; but in elegance of finish, faultless typography, paper and binding, and the skillful execution of engraved illustrations, they scarcely excel this extraordinary result of private and individual enterprise. Gen. STUART deserves the hearty praise of his countrymen for the splendid manner in which he has recorded and commemorated those great national works, the Dry Docks of the United States; and we hope that the success of this, his first undertaking of the kind, will meet with such a liberal reception on the part of the people, as to enable him to go forward, as is his purpose, and bring out, in the same style, a second number of the series, on the 'Naval and Mail Steamers of the United States,' to be followed by a third on the 'Railways of the United States.' He has given the country, at the cost of its production, a work of which the people have every reason to be very proud, and which demonstrates our ability to rival the oldest nations of the world in the character and magnitude of our public works, and in the skill of describing and illustrating them."—*Albany Daily State Register.*

"We call the especial attention of engineers, builders, and architects to it, as one of the most valuable works in their profession, and perhaps the handsomest book of the kind ever published in America. It is worthy a place in the library of every engineer."—*Rochester Daily American.*

"The book is the result of careful labor and study, and the valuable information it contains, in regard to important national works, will be of great public utility."—*Albany Evening Journal.*

NOTICES OF THE PRESS.

"This elegant quarto is a monument not only of American skill and ingenuity in the construction of our most important national works, but of the high degree of excellence to which the arts of printing and engraving have attained in this country.

"The volume is well worthy of the style in which it is published, and of the illustrations which adorn it. In its faultless paper, clean type, and neat typographical execution, it has rarely been surpassed by any volume issued from the American press.

"It contains historical notices of the origin and progress of each work, of the acts of Congress authorizing its construction, its cost, the time and number of men employed in building it, and other useful details. The plans and specifications are minute and intelligible. The scientific descriptions are drawn up by Mr. STUART in a clear and comprehensive form, and illustrated by steel engravings executed in the highest style of the art. Although it may be of little interest to the general reader, still every American must take pride in a publication which exhibits such evidence of the progress of the useful arts in this country."—*Buffalo Commercial Advertiser.*

"It is certainly one of the most elegant volumes ever issued from the American press. It is a quarto of 218 pages, not surpassed by the best specimens of London typography, and it is conceded that its match for firmness and beauty of paper, brilliancy of type, and accuracy of execution has never been issued from the New York press.

"The statistics of these great public works, in addition to the engineering descriptions, are of the highest utility to civil and mechanical engineers, and furnish information of value to our national legislature, and are of interest to the public at large."—*Troy Daily Whig.*

"This is the title of a book that *is* a book, by CHARLES B. STUART, Engineer-in-Chief of the United States Navy. This work is now before us, and we must pay it the compliment of being far and away the most beautiful work on engineering ever published in our country, and perhaps any other—at least without some Government support. As a private undertaking it is an extraordinary one. It will stand a monument of the author's taste, skill, great acquirements, and spirit, for centuries.

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"As a work for its own intrinsic merit we hope it will have a most extensive sale, and we also bespeak for it the attention of our countrymen, in order that it may be followed by the two other volumes spoken of, for such subjects are in the hands of the very person who can do them justice."—*New York Scientific American.*

"A very splendid quarto volume, containing a minute description of the Naval Dry Docks of the United States, has been prepared by CHARLES B. STUART, Esq., Engineer-in-Chief of the United States Navy.

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"The volume is got up in a costly and beautiful manner. The paper, printing, engravings, and binding, are in a sumptuous and rich style, and the volume is appropriate to the substantial and magnificent public works it is designed to explain and illustrate."—*Boston Daily Advertiser.*

"This is, we believe, without exception, the most splendid mechanical work ever published in the United States; and it will not suffer by comparison with any French or English work of a similar character, that has fallen under our notice. Regarded merely as a specimen of elegant typography, it is fully equal to the most costly issues of the American or European press. But apart from all this it has a higher value as a descriptive treatise on some of the most important enterprises ever undertaken in this country. As such we most cordially commend it to all scientific readers, and to those gentlemen of taste and fortune who are desirous that this knowledge should keep pace with the progress of mechanical science. Though a very elaborate work, and one in the getting up of which no expense has been spared, it is sold, as we understand, at the low price of six dollars a copy; and it is thus brought within the means of many who cannot afford to purchase foreign works upon similar subjects."—*Boston Traveller.*

"No American volume has ever been issued more creditable to the getters up, and the plates, twenty-four in number, are specimens of artistic correctness and execution.

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NOTICES OF THE PRESS.

"This volume will form an appropriate addition to all public, state, and national libraries; it will be found interesting to statesmen and the officers of the Government, particularly of the Army and Navy; and useful to engineers, mechanics, and contractors, for the minute statistical information it contains in regard to the cost of the works described. It has been got up at a very great expense; and in the paper, typography, engravings, and binding, it is by far the most beautifully-executed American work that has ever fallen under our observation. It is a work, indeed, of which the nation may be proud, as honorably illustrating its progress, not only in mechanics, but in the arts; and we hope that General STUART may be amply remunerated for the time, trouble, and expense which he has bestowed upon it."—*Boston Saturday Gazette.*

"The 'Naval Dry Docks of the United States' is, we believe, without exception, the most splendid mechanical work ever published in the United States.

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"Regarded merely as a specimen of elegant typography, it is fully equal to the most costly issues of the European press; but describing, as it does, in a clear and masterly manner, some of the most important enterprises ever undertaken in this country, it is well calculated to interest the statesman, instruct the man of science and mechanical skill, and furnish reliable data for the political economist.

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"It is illustrated by twenty-four engravings, representing most fully all the plans and machinery, and doing infinite credit to the skill and taste of the artist who executed them.

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"The appendix is prepared with great care and minuteness of detail, and contains various statistical facts in reference to the cost of the principal operations, and many other important connected subjects.

"We understand that this magnificent work is attracting great attention in Washington, and we see it suggested that Congress should order a large number of copies for its own library, for foreign exchange, and for the members of both houses. It is emphatically a national work, and very properly dedicated to the President of the United States: and those who wish a valuable addition to their libraries of a purely national work, will certainly do well to procure copies.

"We learn also that Gen. STUART intends this as the first of a series of national works, which, when completed, will be of inestimable value, preserving, as they will, the history of our navy, steam marine, and the canals and railroads of our country. His next volume will contain a full and correct history of 'The Naval and Mail Steamers of the United States.'

"Gen. STUART deserves well of the nation for his enterprise and energy, and Congress certainly should make a liberal order for copies, so that Gen. STUART may be encouraged to prosecute his works with vigor to an early completion."—*Charleston (S. C.) Courier.*

THE NAVAL DRY DOCKS OF THE UNITED STATES. BY CHARLES B. STUART.—This elegant volume, by the Engineer-in-Chief of the United States Navy, is dedicated with great propriety to President FILLMORE. It is an important national work, presenting a forcible illustration of the scientific and industrial resources of this country, and of the successful application of the practical arts to constructions of great public utility. The Dry Docks at the principal Navy Yards in the United States are described in detail —copious notices are given of the labor and expense employed in their building—with a variety of estimates, tables, and plans, affording valuable materials for reference to the contractor and engineer. General STUART has devoted the toil of many years to the preparation of this volume, which forms the first of a series, intended to give a history and description of the leading public works in the United States. He has accomplished his task with admirable success. Every page bears the marks of fidelity, diligence, and skill. The historical portions are written in a popular style, and as few professional technicalities have been employed as were consistent with scientific precision. In its external appearance, this publication is highly creditable to American typography; a more splendid specimen of the art has rarely, if ever, been issued from the press in this country. The type, paper, and binding, are all of a superior character, and worthy of the valuable contents of the volume. The scientific descriptions are illustrated by twenty-four fine steel engravings, representing the most prominent features of the Dry Docks at different stages of their construction. We trust that this superb volume, in which every American may well take an honest pride, will not only attract the attention of scientific men, but find its way generally into our public and private libraries. —*Harpers' New Monthly Magazine.*

NOTICES OF THE PRESS.

The Naval Dry Docks of the United States.—By Charles B. Stuart, Engineer-in-Chief of the United States Navy. 4to. 24 fine engravings on steel. New York, 1852. C. B. Norton.—This book is a novelty in the history of American engineering, and we might add, in book publishing. The style of mechanical execution of the plates, the text, and all the accessories, is such as we have been accustomed to regard as almost peculiarly English; and those who delight in the luxury of good workmanship and material, will here find their taste gratified. Engineers must regard with great satisfaction works, like this, designed to perpetuate and record their labors in the most honorable manner. The achievements of American skill and science are worthy of the vindication which this work supplies to the distinguished gentlemen of this profession in the United States, who have devoted their talents to our great works of public utility or defence.

This work is divided into two parts. The first describes the Granite Dry Dock; the second, the *Floating Dry Docks.* To give any of the details, or even the results of these great public works, is foreign to our present purpose; and we will only add the hope, that the success of this fine publication may be such as to induce our distinguished author to undertake the treatment of other departments of our public works in the same elaborate and thorough manner.—*Silliman's Journal, New Haven.*

A Valuable Work.—We have received from the author, Charles B. Stuart, Engineer-in-Chief of the United States Navy, a copy of the *Naval Dry Docks of the United States.* We have deferred noticing the magnificent work for a few days, that we might give it the careful examination that its transcendent merits deserve. The authority of the book is unquestionable; for the author is a gentleman of eminent attainments in his profession, and from his official position, as Engineer-in-Chief of the Navy, he enjoyed the opportunity of access to official records for valuable and reliable information. We cannot, therefore, from any source extant obtain a more minute and faithful description of those valuable public works, the Dry Docks of the United States, than from this authentic work.

Mr. Stuart gives us not only a complete history and description of these several Dry Docks, but the mode of constructing and working them, the machinery and tools used, the names of contractors, the prices paid, the eventual cost and expenditures, the regulations on the works, and in fact every thing appertaining to the subject—thus making the work interesting not only to the statesman and the various officers of Government, but eminently useful and valuable to mechanics, engineers, and contractors.

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The description of the New York Dock is more elaborate than that of the others, inasmuch as it is the largest and most costly; but Mr. Stuart has likewise given all the particulars and details of the nature and mode of construction and use of the Granite Dry Docks at Boston and Norfolk, and of the Floating Dry Docks at Philadelphia and California, and of the Balance Floating Dry Docks at Portsmouth and Pensacola. The work is a mass of most valuable information in every department connected with the construction of Docks; conveying not merely to unprofessional men a comprehensive idea of their magnitude and usefulness, but instructing the man of science, the mechanic and workmen of every class, in all the details of the various incidental and essential works connected with these stupendous achievements of ingenuity and skill, and which are among the proudest memorials of the engineering and mechanical skill of the nineteenth century.

Mr. Stuart's book is not only rich in the material of which it is composed, but it has been most splendidly got up by the publisher, Charles B. Norton, New York; it is illustrated with twenty-four fine engravings on steel, and both in typography and binding the work is a beautiful specimen of the American arts.—*New Orleans Bulletin.*

NOTICES FROM THE FOREIGN PRESS.

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"The work now before us, in which, under the title of the 'Naval Dry Docks of the United States,' General Charles B. Stuart, the Engineer-in-Chief of the United States Navy, describes not only the Floating, Sectional, and Balance Dry Docks, but completes the subject by giving the description of those great works lately constructed by the Navy Department, and which we better understand by the name of Dry Dock. We should observe that the work of General Stuart, who has had part in the constructions, is one which is an accession to professional literature, and very honorable to the country which produces it. It is one of those works which must become a standard in the professional library, taking its place by the side of the productions of our leading men. The letter-press and the engravings, which are of so much more importance to practical men, have been produced in New York: they are of a very handsome style, and the latter numerous and copious in details. General Stuart has by this publication done a service, which will be as much esteemed by his brethren and countrymen on this side of the Atlantic, as by those beyond the broad sea, among whom he was born.

"It is one of the most important professional contributions we have yet received from the other side, and to us not without great practical utility, because, with the extension of our relations, there are many places in our Indian empire, and in our colonial possessions, where works of a like character are required, and indeed in many foreign countries on the Baltic and the Mediterranean, where our engineers practice, and where the value of this guide will be sensibly felt. * * * * * * *

"Our space will not permit us to avail ourselves to any great extent of those portions of the text, in which the writer enters upon many practical points of interest, which arose during the progress of works, so great and so difficult, and we must therefore content ourselves with a partial description.

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"In concluding this short sketch of the work, we can but repeat what we said in the beginning, that it is one of a class which raises the character of the profession, as well as that of the engineer by whom it is written; we hope to welcome many like productions from General Stuart, and our fellow-countrymen;—no longer so far distant from us, but brought by the power of steam within a few days' reach."—*The Civil Engineer's and Architect's Journal*, (*London.*)

"American mechanical works have not been received with much favor in this country hitherto, owing to the prevalent practice of drawing largely on English works of a similar character, and, in most cases, without any acknowledgment of the source whence the information is derived. That an ample fund of original information exists in the United States, there can be no doubt, but it is rarely the information is presented in such a form as to render it valuable. Not that we lay any stress on expensive engravings or letter-press, but we protest against the substitution of mere pictorial representations, for bona-fide working drawings. We rejoice to notice a few exceptions, amongst which we find 'Bartol's Marine Boilers,' Colburn's 'Locomotive Engines;' and the work before us. Gen. Stuart's work gives us the history and details of construction, and cost, of the various Dry Docks built for the United States Government; and which are not surpassed in size or importance by any other in the world. The work is most expensively got up, all the plates being on steel, and very highly shaded, whilst the typography and paper is superior to anything issued from the American press. Gen. Stuart's official position has given him access to all the information which the Navy records are capable of affording, and they seem to have been selected with judgment and care. That portion of the work which presents the greatest novelty to English engineers, is the description of the *Floating* Dry Docks, a method of which we have no examples on this side of the Atlantic. On a future occasion we will discuss some other points suggested by this important work, which reflects the greatest credit on the American engineering profession generally, and will serve as a standard, which we hope to see future works attain, but which they can hardly surpass."—*From the "Artizan," London.*

THE NAVAL DRY DOCKS OF THE UNITED STATES. (*Second Edition.*) "This magnificent work, illustrated by twenty-four engravings, of the highest excellence in art, contains, 'The Mode of Constructing and Working the Naval Dry Docks of the United States.' Such a work as this, is, at present, highly interesting in this country, as well as in America. The latter country is at this moment astonishing the world with achievements in practical science, and the efforts she has been long making are *now* beginning to be known and recognized. We understand that this is, by far, the most costly work of the kind ever brought out in America. It cost Gen. STUART nine thousand dollars for the first thousand copies. It is to be followed with similar works by him, on the 'Naval and Mail Steamers of the United States,' the "Water Works,' 'Railways,' 'Bridges,' 'Canals,' and 'River and Lake Steamers,' of the United States. * * * * * * * *

"With regard to the work before us, all we can say is, to declare with the Governor of the State of New York, that we have seen no work 'better calculated to gratify a just national pride.'"—*British Army Dispatch, (London.)*