

CHAPTER III.—SHIP-BUILDING ON THE OCEAN COASTS.

It is now proposed to note the present state of the wooden ship-building industry on the various ocean coasts of the United States, beginning with Maine and taking up the different localities in geographical order.

MAINE.

Maine has long been the largest builder of merchant sailing vessels, her ship-yards producing the most and the largest of this class in the United States. Cheap timber, low wages, and the nearness of the fisheries, gave her this precedence originally. Her timber is now almost entirely gone, and she only keeps the lead through her low wages and the enterprise of her builders. Ship-building and ship-owning are the only trades the people know in more than fifty towns on the sea-coast, but they practice both callings in dull times because they do not know what else to go into, and in good times they follow them because both are profitable. These fifty towns are composed mainly of ship-owners, ship-carpenters, calkers, riggers, sail-makers, anchor-makers, rope-makers, shipsmiths, painters, boat-builders, lumber dealers, fishermen, sailors, and other persons, who live by the various branches of the industry; in all there is a population of about 200,000 souls dependent on the prosperity of shipping for their support. In some of the smaller places the building, repair, and operation of fishing vessels are the specialties followed; in others the building is all of large class ships and coasting schooners. Since 1857 these towns have had a varying fortune. In some the old builders were ruined by the reaction of that year, and have never attempted an ambitious class of work since; in others, while ship-building is not what it was once, a large vessel or two is built every year, serving to keep the industry so far alive that if there should ever be a large demand for ships the men would be there to build them; but the tendency of late years has been toward a concentration of the business in Camden, Rockland, Thomaston, Bath, Yarmouth, Freeport, East Deering, Portland, and Kennebunkport, to the detriment of the smaller towns, the latter having experienced stagnation and loss of population in consequence.

In the following notes of the state of the industry in different localities no attempt at entire completeness is made, the intention being merely to present such general and important facts as could be gathered from the leading men of each place by necessarily brief personal visits or by correspondence.

At Eastport and Calais, on Passamaquoddy bay, there was formerly an extensive industry in the building of fishing vessels and coasting sloops and schooners, and from 1871 to 1876 every yard on the bay was busy. The people owned the vessels, and but few were sent away. In the five flush years every man who had anything to do with the industry in any way became loaded down with shares in vessels varying from one thirty-second to one-fourth part, and as long as freights were good and fishing paid this activity continued. Vessels cost from \$24 to \$43 per register ton; but freights declined in consequence of the steamboats that were built to run along the coast, and fishing, by reason of the fishery treaty with Canada, as well as the vessels, ceased to pay. The local taxation amounted to about 2½ per cent. annually, and every one then wanted to sell, but no one to buy. Building virtually stopped, and has ever since been confined chiefly to fishing boats of from 16 to 25 feet in length; occasionally a brig or a small schooner of from 10 to 50 tons, with now and then a tug, is built. There has latterly been a change for the better, but it is a slight one, and vessels do not yet pay more than 4 or 5 per cent. clear of insurance and taxes. The woods used are beech, birch, and maple in the bottoms of vessels, with very little oak. Spruce and hackmatack frames and planking are popular; they cost less, and in most cases last as long. White pine is put into the decks. There are few professional builders of either boats or vessels on the bay, and those who build generally hire a master carpenter to superintend the job, who employs the men, while the owner pays the bills. On the islands there are a large number of men, half landmen, half seamen, who farm, fish, and build boats by turns, and so much of the smaller class of work is done by them that little is left for the professional builders. During the census year wages varied from \$1.50 to \$2 per day of ten hours, according to the skill of the man. At Calais there was a marine railway for the repair of small vessels.

On the Aroostook river, in Maine, there is as yet no vessel building. During the census year there was one flat-bottom stern-wheel steamboat, carrying about 50 tons, and that was the only vessel in the whole region. The other craft employed was the batteau, a flat-bottom skiff with pointed ends and flaring sides, which was used in driving rafts of logs down the river. It is estimated that about 75 of these light and fragile boats are made every year for lumbermen. They are constructed of pine boards, at a cost of from \$10 to \$25 each, and will carry about half a ton.

East Machias formerly built many vessels of good size. There are four yards in the town, but they have been lying idle since 1876. In one of them the plant was quite complete and expensive, including a machine-shop, saw-mill, and carpenter-shop. At Machiasport the same state of facts existed, only one small schooner being built in the census year. Local taxation was complained of by the owners, who declared that assessments ought to be made on the net income of the vessel, and not on the cost.

At Cutler the principal builder was M. B. Stevens, who had built 28 brigs, schooners, and barks, during the census year; but none were built during the preceding four years, the losses of capital by armed cruisers during the

war, the taxation of shipping, and the general decline of business having produced the result. Here, as elsewhere, there was much complaint that the national laws were not framed to protect the owners of shipping.

At Brookline coasting was once the life of the place. Fifteen years ago the town owned 40 or 50 good sized vessels, but there were not half a dozen left in the census year. There was no repairing, and a few small sloops and boats were all that were being built.

Harrington, once a prosperous village, is now becoming depopulated by the loss of its main industry, and there has been a heavy loss to the town by the decline in the value of vessel property in the coasting trade, some men having lost \$50,000 each. The large ship-yard of H. W. Ramsdell has been sold for saw-mill purposes, and the inhabitants were moving to other parts of the country, as there was little other business they could follow to advantage at home.

At Millbridge there is still some building, but not much. This town has many skillful workmen, but ship-building is no longer depended upon for a livelihood. Wages, in consequence, were low, seldom exceeding \$1 50 per day. The shareholders in vessels complained of the burdens of tonnage duties, local taxation, and compulsory pilotage at the principal harbors, while the captains of coasting vessels were so familiar with the different ports that they claimed to be able to get into and out of them all in safety without pilots, and the extravagant charges they had to pay, for no good purpose, were a source of constant complaint.

At Bluehill ship-building was the principal business 20 years ago. Several families were engaged in it extensively, owning parts of all the vessels they built, and the town was prosperous. The industry has since entirely died out, and only a few old vessels lingered in the possession of the town in the census year, the owners all hoping soon to be rid of the burden of repairing even those. There is still enough timber on that part of the coast to do considerable building if there was any call for it. A large number of the small towns on this part of the coast east of the Penobscot told the same story as Bluehill.

There is no ship-building at present at Ellsworth, and a gloomy view of the future of shipping was taken there. The cause of this dullness and the desirable remedies were given by builders to the following effect: Tonnage taxes should be abolished, especially in the coasting trade; duties should be remitted on all materials in American ships; a certain amount of the duty on goods imported in American bottoms should be remitted, and some of the heavy consular charges should be abolished.

At Bucksport there is still some work done, a bark of 568 tons and three schooners of 15, 17, and 86 tons each being built in the census year. There are two marine railways in the place, one capable of hauling vessels of 300 tons out of the water for repair, the other for vessels of 1,200 tons. The owner charges a fee of 10 cents per ton for hauling out, which he does with horse-power and windlass, and the vessel employs the carpenters, calkers, and painters to make the repairs. From thirty to fifty vessels are taken out per year; but the business is dull, the maritime interests of the town having greatly decayed. The woods used at Bucksport were: Frames, hard wood, oak, and hackmatack of local growth, worth \$30 per thousand board feet; keelsons, beams, ceiling of hold, and outside planking, pitch-pine from the southern states, worth \$35 per thousand feet; stem and stern posts, white oak; deck plank and cabins, white pine of local growth, worth \$30 per thousand; knees, hackmatack; masts and spars, white pine and spruce. Spruce, being light, able to withstand the heat of warm climates, and costing only \$15 per thousand, is somewhat used in frames. A deterioration in the hard wood now used is noticed, owing to its being from second-growth trees. Carpenters' wages were \$1 75 per day; fasteners, \$1 50; joiners, dubbers, calkers, and spar-makers, \$2 and \$2 25. The Bucksport vessels cost from \$45 to \$50 per register ton, but builders and owners said that taxation, consular charges, pilotage fees, the laws concerning seamen, etc., weighed heavily on shipping.

On both sides of Penobscot bay there are many ship-building communities, the principal ones being Rockland, Camden, Searsport, and Brewer. At Rockland there are several marine railways for hauling coasting schooners out of the water for coppering, repair, and rebuilding. The limestone quarries of this town have given a great deal of employment to coasters, and a great many of the shipping men own from ten to twenty vessels each, either wholly or in part. Repairing and coppering are, however, the principal work of the yards. Spruce from Isle au Haut and other parts of the coast is much used here; the local supply of timber is almost completely exhausted.

Searsport was formerly an active ship-building town. All the vessels built were owned there, and it is said that there never was a vessel built on contract at Searsport for outside owners. A few years ago, when coasters became unprofitable, builders and investors turned their attention to other forms of business, and the industry has nearly died out in consequence, two or three small schooners a year being about the only product of the town. Excellent ship-yards exist, but their value is not rated above one-third what it used to be.

At Camden three schooners of 383, 415, and 436 tons register, respectively (three-masters), were built in the census year, and there is always more or less work going on in the yards of the town, although nothing to compare with earlier years. Ten years ago and previously such wood as could be obtained in Maine was used in Camden vessels, especially in the smaller ones. Floor timbers were hewn from hard wood; that is to say, from beech, birch, or rock-maple, which is what is meant in Maine by "hard wood". Hackmatack and spruce tops were used with oak planking, and sometimes oak frames and oak planking; but of late years Virginia and Maryland white-oak frames have been obtained for large vessels, and southern pitch-pine has come into universal use for ceiling, planking, deck frames, stanchions, plank-sheer, etc. This southern lumber costs very little more than that of Maine; and as the importation of it makes business for the coasting vessels, it has become the favorite at Camden, as well as at many other building

centers. The prices are: Hard wood, hewn, \$29 per thousand board feet; hackmatack, \$38 per thousand feet; pitch-pine, \$26; southern white oak, \$35. Pitch-pine has the advantage of coming in longer lengths than any other lumber; besides it is durable and strong. The Camden builders say that hard wood and hackmatack frames, or white oak frames planked and ceiled with yellow pine and well salted while building in the frame spaces above light water mark, are an improvement upon the old custom of white-oak frames with white-oak plank and ceiling, as oak in contact with oak is said to decay. The wages at Camden varied from \$1 50 to \$2 per day of 10 hours, according to the skill of the men, and the cost of building a vessel ranged from \$45 to \$55 per register ton. One firm, when asked about the prospects of sailing vessels as compared with steam, replied to the effect that they had less fear of steam vessels, except between large ports, than of bad laws in regard to taxation and the shipment and discharge of seamen and of inattention to shipping interests abroad by the consuls. Three months' extra pay and the discharge of the sailor are demanded abroad whenever a technical flaw can be found in the articles of agreement, and it was claimed that the consul too often looked after the interest of an unprincipled seaman rather than after that of an American ship. The seamen are mostly foreigners, and the consul aids them to take thousands of dollars out of the ship. A good seaman need never be without a good ship in any part of the world, as the ship is more often in need of good seamen. The law requiring ships to transfer wrecked or destitute seamen from Calcutta to New York for \$10 was severely condemned, and tonnage dues and local taxation were also deemed hard burdens when a ship was earning little money. One member of the firm said:

I think we shall require sailing vessels, like those of the present model, wide and shoal, for the coasting trade, such as for coal and pitch-pine lumber, and also for lighter cargoes, as steam cannot take their place. A three-masted schooner of 600 tons will pay better for the amount invested than a steamer in the coal business. No one would think of carrying pitch-pine on a steamer. I think that to build up our commerce the burdens on shipping ought to be taken off, so that the man who invests either in a sailer or a steamer shall get back a return equal to that on other investments. There would then be little trouble about our having a commerce, both sail and steam, to compete with any other nation.

It should be explained that on Penobscot bay, as, indeed, throughout Maine generally, the majority of builders are also owners of vessels.

Belfast is one of the old ship-yard towns of Maine, but the industry is quiet at present. Some work was done in the census year, but not much, and very little had been done for the previous five years. The vessels of Belfast are generally coasters, and cost about \$48 a ton. Hard wood (beech, birch, and maple), spruce, and hackmatack are somewhat used for floor timbers and keels; but oak is preferred, especially in large vessels. Oak and pitch-pine cost one-third more, and are now known to be more durable. Hard wood costs \$28 a thousand at Belfast; hackmatack, \$36.

At Brewer the work done is principally repairing, two large marine railways being employed there to haul out the steamboats of the bay and river and any other vessels needing repair. Steamboats and small vessels are occasionally built for the river.

Thomaston is famous for her large ships. The first vessel, so far as can be ascertained, was built in 1787. Some of the early vessels were partly owned by General Henry Knox (the friend of Washington), who lived on a fine estate in Thomaston. Sloops, schooners, and occasionally small ships were built in the early years; but not over three or four were built in any one year until 1825, when the business began to be more active. In 1845 came the first rush, but ships of no larger size than 565 tons were built until 1848. After that large vessels were in order, one of 991 tons being constructed in 1850 and one of 1,146 tons in 1851. Several vessels of about 1,200 tons and upward were launched yearly until after the crash of 1857. Thomaston has given birth to many of the finest builders of vessels and most proficient sea captains in the United States, one of the leading builders, Edward O'Brien, having built since 1850 the following full-rigged ships:

Year.	Name.	Register tonnage.	Register length.	Breadth.	Depth of hold.
1850	Edward O'Brien	797	<i>Feet.</i> 158	<i>Feet.</i> 38	<i>Feet.</i> 16 $\frac{1}{2}$
1854	S. Curling	1,697	205	40	20 $\frac{1}{2}$
1855	Vesper	1,497	213 $\frac{1}{2}$	38 $\frac{3}{4}$	19 $\frac{1}{2}$
1856	Mary O'Brien	1,297	191	38 $\frac{1}{2}$	19 $\frac{1}{2}$
1858	Mary A. Campbell	1,373	195	39	19 $\frac{1}{2}$
1860	Ellen Creighton	1,287	193 $\frac{1}{2}$	37 $\frac{1}{2}$	18 $\frac{3}{4}$
1863	Edward O'Brien	1,552	211 $\frac{1}{2}$	39 $\frac{1}{2}$	19 $\frac{1}{2}$
1866	Wm. A. Campbell	1,585	209 $\frac{1}{2}$	41 $\frac{1}{2}$	24
1866	Andrew Johnson	2,006	215	41	30
1869	John Bryce	1,068	217 $\frac{1}{2}$	42	21 $\frac{1}{2}$
1870	A. McCullum	1,951	215	42	20 $\frac{1}{2}$
1874	Alida	1,672	223	42	24 $\frac{1}{2}$
1875	Belle O'Brien	1,903	237 $\frac{1}{2}$	42	20 $\frac{1}{2}$
1877	Alex. Gibson	2,194	247 $\frac{1}{2}$	42 $\frac{1}{2}$	37 $\frac{1}{2}$
1877	Baring Brothers	2,167	243 $\frac{1}{2}$	42 $\frac{1}{2}$	20 $\frac{1}{2}$
1878	Frank F. Curling	2,201	245 $\frac{1}{2}$	42 $\frac{1}{2}$	20 $\frac{1}{2}$
1879	J. B. Walker	2,178	247	42 $\frac{1}{2}$	27 $\frac{1}{2}$
1881	Gen. Knox	2,218	251	42 $\frac{1}{2}$	26 $\frac{1}{2}$
1882	Edward O'Brien	2,157	259	42 $\frac{1}{2}$	28 $\frac{1}{2}$

The large ships are generally three-deckers, have billet heads and square sterns, and carry sky-sails on every mast. The frames are of white oak from the South; the planking and ceiling, keelsons, deck beams, deck plank, lower masts, and topmasts pitch-pine; the knees hackmatack, from Maine and Canada; the treenails locust; the light spars spruce; and the cabins white pine, oak, and walnut. In the new Edward O'Brien and the Andrew Johnson the lower masts and some of the yards are of boiler iron. When the former was launched an anchor of 4,200 pounds was dragged by her from the yard to the river, plowing a furrow 5 feet deep and pulling large trees from the ground.

There has been one other large builder in Thomaston, Captain Samuel Watts, who has built about thirty full-rigged ships for the merchant service, among them the Samuel Watts, of 2,035 tons; the Loretto Fish, of 1,945 tons; the Joseph B. Thomas, of 1,938 tons; the H. L. Gregory, of 2,020 tons; the Alfred D. Snow, of 2,075 tons; the Abner I. Benyon, of 2,044 tons; and the Cyrus Wakefield, of 2,013 tons. The size of these huge merchantmen will be better appreciated when it is understood that few ships under the English flag approach them in register tonnage. The largest iron clippers of England are in the grain trade from California to Liverpool, and seldom exceed 1,600 tons register; but it is not known that many of 1,600 tons ever visit San Francisco.

The large California ships of Chapman & Flint, of New York, until within a few years have also all come from Thomaston; but a few years ago their yard was spoiled by a new railroad running through it, and it was removed to Bath.

These three firms have always built for themselves, and belong to that class of old shipping families in New England which grew up after 1812 whose enterprise and family pride made the fortune of American shipping. The history of all is about the same. Beginning modestly with small vessels, they put smart young men in charge of them, were prudent in all their expenses, used good judgment and great energy in the management of their affairs, and made money. Every year or two these firms would build a new vessel out of the profits of the old ones and put it in trade along with the others; but as trade expanded they built larger and larger, and in time each came to have a fleet of from ten to fifteen of the finest and largest class of ocean carriers. They would never sell a new vessel, but would keep it until it was about twenty years old, when they would sell it at half price to Germans, Italians, or other foreigners and build a new ship to take its place. Their vessels were put into the trade that paid them best at the time, the cotton business of southern ports and the trade of California and China employing the most of them. Some of them went into the carrying of guano and nitrate from South America to Europe, bringing back iron, salt, and heavy goods; others traded to India; but of late years the grain trade of California has given them the best occupation. The problems of building good ships have all been solved, the cheap labor and fairly cheap materials at the command of the Maine men leaving them little to desire with regard to cost, and whenever they are asked what is needed to revive American ship-building they invariably reply from their point of view as owners. One reply at Thomaston was to the effect that—

One of the disadvantages under which we labor is double taxation, governmental and municipal. Another is the shipping commissioner act, which does not allow a ship to trade for its crew direct and to pay them off whenever desired. The three months' pay business is another. This weighs so hard on us that ship-owners have almost come to look on our consuls abroad as enemies to our shipping. The laws make sailors so independent that there is no inducement for them to try and save a ship from wreck when she is in trouble, as they get their pay whether there is anything saved or not.

Besides the three firms above named other persons have built vessels at Thomaston. The handsome ship Harvey Mills, of 2,186 tons, was built there by a gentleman of that name for himself, and is 231 feet long, 43 feet beam, and 29½ feet deep in the hold.

Saint George's harbor is a little place near the mouth of the Penobscot for the repairing of fishing vessels, and considerable business is done at the marine railways there.

Bristol, Bremen, and Friendship, like a large number of other places on the coast of Maine, are fishing towns. Fishing schooners have been built from time to time at Friendship since 1830, and average about 40 tons in register. Most of the building has been of a class commonly called "shore boats". A few vessels have also been built at Bristol at irregular intervals, and some builders have sometimes employed as many as 25 men at one time. There are only two or three regular yards. Some of the building has been done by men who constructed one or two vessels and then no more. A. & M. Gamage & Co., at Bristol, have built about 55 schooner-smacks since 1854—8 of them ranging from 105 to 127 tons, the rest averaging about 40 tons—nearly all for owners at other places in Maine and Massachusetts. Most of the work in these towns, however, is on fishing boats, particularly in Bremen, which is noted for the number of its boat-builders and the excellent product of their labor. The boats are mostly sailing boats, from 18 to 26 feet long over all and from 6 to 9 feet wide, with center-boards, wash-boards along the gunwales, and with a cuddy forward, in which is placed a small stove. These boats are mostly used as lobster boats, and are largely employed in winter; and as they go out some distance from land a stove is necessary, both for the men and also to keep the lobsters from freezing until they can be transferred to live-cars and sent to market by sailing smacks. The house adapts them also for shore fishing, and in the right seasons they go out beyond the islands of Monhegan and Matineus, take their fish, and then sail with them to the port which promises the best market. The boats are generally built during the winter. The keel of the boat is laid in the early part of the season, and the owner works on it at odd times, taking the entire season to complete it. One man

working steadily could build a 16-foot lobster boat, worth \$80, in about a month, and a 25-foot boat, worth \$200, in two months. The builders are fishermen themselves, and usually have a small shop, in which the molds and tools are kept and the work is done. By long practice some of these fishermen have become expert boat-builders and have got orders for boats from other men, and with the aid of a lad or two it is not unusual for one of them to build from five to eight boats in a winter. Five Bremen builders have already built and sold from 20 to 100 boats each, ranging in length from 15 to 25 feet. In the yards where the smacks are built the workmen are often fishermen who have learned the art of carpentry, but a portion of them are small farmers. The rest consist of regular carpenters, who go to Bristol, Bremen, and Friendship in winter and roam for work elsewhere in summer.

Dennysville is little interested in shipping now, but there has been a great deal of work at this place in the last 15 years, and a large amount of money has been put into coasters. Losses and shrinkage of values being so heavy that it did not pay to repair the vessels, these have depreciated greatly, and the town is depressed in consequence. Complaint was made here of taxation and of the compulsory pilotage fees at New York and elsewhere.

Waldoboro' is a little town supported mainly by its shipping interests. Large vessels have been built for coasting and foreign trade here, and during the clipper-ship period the town was prosperous, carpenters earning high wages and bosses receiving from \$5 to \$7 a day each. Only a bark and a schooner were built at Waldoboro' in the census year, and the manner in which the bark was provided for illustrates the way in which a great many of the Maine vessels originate. One of the owners, having \$7,000 of surplus cash on hand, proposed to build a bark and to pay the carpenters as his share in the vessel. The other shares were taken up by those who supplied lumber, iron work, sails, and other materials and work, each contribution being rated at $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{6}$, or $\frac{1}{12}$, as the case might be. This vessel was built, sent out to sea, and had paid two dividends before application was made for the facts about her for the census. The owners had never had a settlement; no one knew what the shares of the others had cost them and what was the actual cost of the ship, and it had to be figured up especially for the census. Every one in Waldoboro' was discouraged. The ship-yards were idle, with little prospect of anything good ahead; the supply of local timber was exhausted; and to build a ship all the lumber, iron, etc., had to be brought by coasting vessels from other parts of the country. Complaint was made of taxation, pilotage fees at the great cities, and competition of steamboats in the coasting trade. Enterprise was almost at an end, and the town was losing its population. The Waldoboro' vessels cost about \$55 per register ton.

Damariscotta and New Castle, two villages divided by a small stream, have carried on the building of large vessels for a long time, schooners, brigs, barks, and ships having been constructed extensively for local owners, and often by the owners for themselves. Before 1861 packets and clippers were built here, but the later ships have been for the California trade, and are of about 1,300 tons register. Wages are low, owing in part to the stagnation of business, and on that account ships can be advantageously built, as the cost would not exceed \$45 or \$46 per register ton. The death of some of the more enterprising men, and the general decay of the American carrying trade, have seriously affected the town. The ship-yards lie idle nearly the whole year round, and people are moving away.

Wiscasset was formerly engaged in building to a considerable extent, but the business is now virtually dead. In the latter part of 1880 a schooner was launched, however, and there are quite a number of persons who occasionally build scows and gondolas for river use; still they do not follow the business regularly, and what they do cannot properly be regarded as ship-building.

Boothbay was formerly an active town, and before the reaction of 1857 a great deal of large-class tonnage was produced there. At Boothbay and East Boothbay 100 sail of large brigs, barks, and ships had been launched, many of them being built on speculation for the general market; the demand was so great after 1845 that most of them were sold on the stocks long before completion. Boothbay vessels were famous for their excellence, the fruiters, all schooners, being very smart and able vessels, long and sharp, and carrying a great deal of sail. When the crash came building stopped at Boothbay, not to be resumed down to the present time, and many builders were ruined. The vessels on hand were unsalable at any price, and one that was sent to New York to find a purchaser lay there for 11 months before she was sold. Since that time only fishing craft have been built at these little towns, smacks and menhaden steamers being the product. At Boothbay, however, there is considerable repairing done, and the two railways are pretty constantly employed. Fishing vessels are generally hauled out twice a year, once for painting the bottom, and once for a general calking, repainting, and refitting, paint, oakum, pitch, iron, a little timber, cordage, and canvas being the materials consumed. In heavy weather Boothbay is often the resort of hundreds of vessels, which run in for shelter and bring considerable work to the railways.

At Georgetown the first builders were tempted into the business by the fine growth of native white oak and pine on the island. Vessels were built here long before the Revolution, and more than 150 sail in all have been launched from the different yards. The industry saw its best days, however, in the prosperous times before 1857. A great many ships and barks of from 1,100 to 1,454 tons were built in 1854, but the reaction of 1857 ended the business for Georgetown so far as anything except fishing vessels were concerned. A few fishing smacks of from 40 to 100 tons have since been built by the people on the island, but the business has been limited. Those

who went into the construction of smacks did so at first because they owned farms with groves of white oak on them, and the work was generally done in the winter, when the men would otherwise have had nothing to do.

At Phippsburg there is one yard, at which the owner builds a schooner or a large ship every year or two for his own use. There has always been some work at this place.

At Richmond there are two yards, in one of which the owner has built for himself about 50 vessels. He never sold a new ship. His beginnings were small, but he now builds about one ship a year of large size. The *Theo. W. Allen*, finished in the census year, was of 1,537 tons, and the *Eureka*, in 1876, registered 2,101 tons. The timber for Richmond vessels is imported from the southern states, only the knees and a little hard wood being of Maine growth. The cost of building is about \$48 per register ton.

At Bath, the principal ship-building town of the United States, the business dates back to 1745, sloops and small schooners having been built at that early date for the coasting trade. This town enjoyed the advantages of a broad, deep river, which seldom, if ever, froze over in winter, and of an abundant supply of the finest white-oak and white-pine timber, the banks of the river, as well as the whole of the surrounding country, being covered with dense forests of this valuable wood. The roads were bad, and traveling and trade were chiefly by water; but the town prospered more than any other on the coast. The first few experiments were successful, as the vessels made money, and the town went on building, increasing the size of its vessels and the field of their operations year by year. In 1762 Captain Swanton built the first ship-rigged vessel on the *Kennebec*, the *Earl of Bute*, for a merchant in Scotland. He afterward built a ship every year until the revolutionary war, and in 1776 built a privateer of 18 guns, which did good service in the war. After the Revolution quite a number of ship-yards were in existence in the town, launching sloops, brigs, and schooners of from 100 to 300 tons, an occasional bark and ship of from 200 to 400 tons, and now and then a privateer. Both in the building and in the management of vessels Bath men have been successful from the earliest times. About 1800 the cost of building was \$30 a ton. The ship *Reunion*, of 281 tons, cleared her cost three times in as many successive voyages to England. After the war of 1812 this business grew considerably, from 7 to 15 vessels being launched yearly. By 1840 the capacity of the larger vessels had increased to 680 and 725 tons; they were owned on the river, were square-rigged vessels, and were used in the general trade to Europe, South America, and Asia. In 1841 the daring experiment of the *Rappahannock*, 1,133 tons, was made by Clark & Sewall, followed by the construction of other large craft; and the years from 1841 to 1857 constituted a period of great prosperity, in which several Bath families built up large fleets of vessels and accumulated much wealth. In 1851 the town launched 25 vessels, and in 1854 about 35, eleven of them being from 1,080 to 1,580 tons register each. It is remembered that in the latter years 25 large square-rigged vessels lay at the wharfs of Bath at one time receiving their sails and outfits, while a large number of ship-yards were busy along the river all the way up to Augusta. The crash of 1857 wiped out nearly all the ship-yards of the *Kennebec*, except at Bath, Richmond, and Phippsburg, and the bulk of the business has ever since been concentrated at Bath. The principal shipping families of this town have been the Houghtons, the Pattens, and the Sewalls, who owned large fleets of fine vessels. They and others have built an average of one and two large merchantmen every year. A few yards were owned by contractors. Bath finally became the principal building place of sailing tonnage in the United States; a distinction it has enjoyed to the present time. The building of large vessels has brought a great deal of business to Bath, and about 1,300 vessels, of a total of 720,000 register tons, have been built in this enterprising place down to 1882.

The production of fishing vessels never assumed important dimensions in Bath until after the late war. Before that time fishing schooners had been built at irregular intervals by the larger firms, chiefly as a means of keeping their men employed; but about 1865 several firms made a specialty of smacks and fruit schooners of from 50 to 200 tons burden. For ten years a great deal of this business was done, about 20 vessels being launched yearly, and the activity in this branch of the industry was the more appreciated because work in the larger yards was dull. The schooners were of a superior and much admired model, and orders came in for them so fast that there were often two or three building in each yard at the same time. Contracts were generally made in the fall, and the work was completed in the spring; but after 1877 this branch of the business fell off considerably. Bath has no fishing interests of any account, and the tendency of fishermen is to have their vessels built near their own homes, nothing except very low cost tempting them to go far for their craft. Besides, 1877 was a time of losses and shrinkage. Owners were not always willing and able to take what they had ordered and pay for it, and vessels built for sale found no buyers. One smack of 82 tons which cost \$4,100 was left on the builders' hands for 18 months, and was finally sold for \$2,800. At present few smacks are built in Bath; but the yards launch plenty of schooners, principally coasters and fruiterers.

There are at present eleven ship-yards in Bath; the proprietors of six of them build only for themselves. One firm has been known for making remarkably good vessels, which always sailed in the cotton trade to Liverpool, bringing back salt and manufactured goods. This firm brought the first southern pitch-pine to Bath to use for planking. The lower deck beams would not always be planked, and pine lumber was taken on in the southern ports and laid in loose, to aid in storing cargo. On returning to Bath after a round trip the masters left the dunnage lumber behind, and it was used in ceiling new vessels. Yellow pine came in such long pieces that its value was

appreciated as soon as it was necessary to build large sized vessels. This firm now builds full-rigged ships only of from 1,700 to 2,000 tons register, employing them in the California trade, and, to some extent, in the great ice business of the Kennebec to American ports. The durability of these vessels has been great, owing to care in the selection of materials and judicious salting. The ordinary mode of salting a ship is to fill the frame-spaces from the plank-sheer to the stops, put in at light water mark, with mingled shavings and rock-salt, and sometimes with salt alone, from 50 to 70 tons of salt being required for a large vessel. This firm often bored auger holes in the top timbers, filling them with brine, which percolated through the heart of the timbers the whole length of the stick. Timbers thus treated were often as bright after 20 years' service as when first put in.

The Sewalls began just after the Revolution, being led into the business, in part, by the possession of a large farm, coming down to the bank of the river, heavily timbered with oak, hard wood, and pine. The regular building by the concern began in 1823, and the brig *Diana* and several other vessels were made from timbers cut from this farm. This house first engaged in the lumber trade to the West Indies and the cotton trade to Europe, some of their vessels also doing packet service. The list of vessels built by them and a description of the Rappahannock have been given elsewhere in the paragraphs speaking of the increase of size in shipping. The house is now extensively engaged in the California trade, building 1,900- and 2,000-ton ships at the rate of about one a year, besides a few schooners.

At two other yards the owners build vessels of the largest class for themselves. In clipper times their vessels were sharp, and were heavily strapped with iron. Iron knees 25 feet in length and weighing 1,700 pounds were used in some of them. The ships are all large class, and are of about 2,000 tons register.

The Pattens have built about sixty square-rigged vessels, all for themselves. They began small, but all the later vessels have been from 1,000 to 1,500 tons register. Adams & Hitchcock and the Morses also build only for their own use. Their product is all in large coasting schooners, principally for carrying ice and coal.

There are other concerns in Bath who build their own vessels from time to time, but the work, other than that of the houses named above, is chiefly contract work for the general public. William Rogers generally has two or three vessels under way at once; and Goss & Sawyer and Goss, Sawyer & Packard have seven or eight schooners, barks, and ships, with an occasional propeller or steamboat. At the two yards last named there were built, in 1881 and 1882, 44 vessels, registering 34,000 tons.

The workmen in these yards are mainly Americans, three-fourths of whom have houses and families in the town; some have bank accounts. Although working for day's wages, their regular employment and prudent habits enable them to lay up money. They are nearly all men of middle age and upward, as few young men have been learning the trade in Bath of late years, owing to the gloomy outlook for American shipping.

Bath vessels are famous for their excellent models and their handsome appearance, and are popular with captains on account of the pains which have been taken to fit up the cabins in style and comfort. Nearly all the New Bedford vessels are now built in Bath, and business has been brought here from all the principal shipping towns of the north Atlantic coast, as also from the Pacific coast. A great many lumber vessels owned in San Francisco and on Puget sound were built in Bath.

All the early Bath vessels were built of native oak and hard wood, with white-pine houses, decks, and masts. Oak and hard wood were put into the keels, elm rarely, and sometimes black gum from the South. The stem and stern-posts, as also the planking, were always of oak; and this fashion, even after the introduction of pitch-pine, was retained for a while for the bow. The knees were formerly of oak. But the local timber of any value has been all cleared away, a century and a half of active ship-building and a large export trade in lumber having destroyed the old forests of this region. A little hard wood is still hauled in for use, and is prized for the bottom of a ship. White oak, beech, yellow birch, and maple are used indiscriminately for keels. Beech, birch, and maple are good for floor timbers where they are covered with salt water, Goss & Sawyer considering them better than oak, as they are stiff woods, and, being free from the acid contained in oak, do not rust the fastening. Many of the frames, even of the smaller vessels, however, and nearly all of those for the larger ones, are cut in Delaware, Maryland, and Virginia in the winter time from the superior white oak of that region. Hackmatack (or tamarack, as it is sometimes called) is used now to a large extent for the top timbers of the frames, as it is lighter than oak and more durable, and holds the iron fastening as does no other wood, its resinous nature protecting the bolts from corrosion. Ships with "hack" tops carry more cargo and are a trifle more stable than those with oak tops. The keelsons and all the other parts of the vessel are of southern pitch-pine, save the decks, houses, and spars, which are of white pine and spruce, and the knees, which are of hackmatack, brought in by rail from the backwoods or from Canada; the white-pine masts come from Michigan. Two cargoes of Oregon pine (yellow fir) have been brought to Bath and utilized for decking, masts, and spars. It is a remarkable fact that while Bath builds the cheapest wooden vessels in the United States at present, nearly every ton of timber, iron, pitch, hemp, salt, canvas, etc., entering into their composition is imported into the town from places outside the state. As the cost of material is two-thirds the cost of the ship, the state of Maine has a smaller interest in her own vessel building than the rest of the country. The price now paid for ship timber delivered in Bath is as follows: Oak plank, \$45 per thousand feet; oak timber, hewn to the molds, \$33; pitch-pine, sawed, \$28; hard wood

in the round log, \$20, for what can be squared out of the log; white pine, \$35; hackmatack timber, \$35. Knees cost about as follows, the prices being governed by the siding thickness and freedom from defects:

5-inch knees	\$0 75 to \$0 90
6-inch knees	1 25 to 1 30
7-inch knees	2 25 to 2 50
8-inch knees	3 50
9-inch knees	4 20 to 4 50
10-inch knees	7 00
11-inch knees	8 00
12-inch knees	9 00
13-inch knees	10 00

Prices vary somewhat with the season of the year and the demand for them. Knees are obtained from the root, and rarely more than one can be obtained from a tree. A two-deck ship of 2,000 tons requires about 650 knees; one of 1,600 tons, about 550 knees; a bark of 850 tons, two decks, 425 knees; a large single-deck schooner of 450 or 500 tons, 260 knees; and a schooner of 300 tons about 210 knees.

The cost of building vessels at Bath is kept low on account of the system of operation, the low rate of wages, and the great efficiency of the men. The system prevails of contracting for the frames, which are cut in the South by cheap hands and delivered in Bath ready for putting together. In the contract yards such of the local hard-wood timber as is utilized is sawed to the proper shape by a steam jig-saw which will tilt to any angle and cut the timber of any bevel, two men doing the work more rapidly than a dozen men would with axes. The fastening, blacksmith work, joinery, calking, spar-making, sail-making, and rigging are all done by contract. The system practically amounts to this: The labor is divided among men skilled in their respective branches, and is thus more quickly and efficiently performed; and the contractor makes \$2 or \$3 per day more than the men, and that is about all. The carpentry work is all done by the day, the men getting from \$1 50 to \$2, according to their efficiency. One system which prevails in Bath, as well as throughout the whole of the United States, is that carpenters, calkers, and joiners supply their own tools. The outfit of a carpenter or joiner costs from \$50 to \$75; of a calker, \$15. The fastening requires a special outfit of augers, etc., which is supplied by the contractor, costing about \$175. The blacksmith contractor's outfit costs him about \$400, the rigger's \$300, the sail-maker's \$200, and the block-maker's \$1,200. This system saves the builder a great deal of expense. During the census year the average cost of building large vessels in Bath was \$45 per register ton. Schooners cost \$55 and \$60, but there was a difference between the cost of contract work and that which the large houses did for themselves. In the latter case a good ship, regardless of expense, was the object, and large ships ranged from \$43 50 to \$54 per register ton in consequence. By taking time, watching the market, and buying when materials were low, a first-class ship did not need to cost over \$45 per register ton, and a large schooner not over \$53.

The Houghton Brothers supplied the following data about the cost of materials and of building large ships in the following years:

	1825.	1833.	1845.	1855.	1865.	1880.
White oak, Maine..... per thousand feet..	\$21	\$25	\$27	\$27	\$33	\$35
White oak, southern				35	33	35
Pitch pine..... do.....			26	28	50	30
White pine..... do.....	10	24	26	30	40	35
Hard wood	15	15	21	22		
Iron bolts..... per ton..	85	80 to 90		45	90	60
Cost, per ton, to build	45	50	45	60	70	45

There was much complaint in Bath of excessive taxation of vessels and of governmental regulations which interfered with the freedom of a ship both at home and abroad, the payment of compulsory pilotage at such ports as New York and Boston being especially complained of. The code with regard to the shipment and discharge of seamen was also strongly condemned, and the consular service was much criticised. Bath is the home of not only a large circle of ship-builders and ship-owners, but of a large number of men who have followed the sea all their lives. They have visited every part of the world, have had every possible opportunity to study the workings of the American consular system from the shipping point of view, and are unanimous in declaring that a complete remodeling of the system is necessary.

As to taxation of vessels in Bath, I give the following letter from Captain George A. Preble, the surveyor for the Bureau Veritas, in Bath:

Taxation of shipping in Maine is the same as that on all other kinds of property—a state tax, a county tax, and a town or municipal tax. The state tax is assessed on the several towns on a valuation established for every ten years. This valuation includes all the property of the towns, shipping included, and the tax varies, from year to year, usually about $\frac{1}{2}$ per cent. The county tax is assessed, like that of the state, on the valuation of each decade. The municipal tax is levied each year by the towns, and is more or less, according to the expenses, indebtedness, etc., of the different municipalities. This tax is upon a valuation taken each year.

Take Bath for an example: Our state tax is \$26,600; county tax, \$3,550. To cover these and our municipal expenses, interest on debt, etc., requires a tax of 2½ per cent. on all the property, real and personal, owned in the city.

Here you see we have a tax of 2½ per cent. on the value of our shipping. In Portland the rate is the same. In other towns it ranges from 1 to 2½ per cent., and in some cases even higher.

April 1, 1879, there was owned in Bath 82,627 tons of vessels, valued by the assessors at \$2,000,536; tax, at 2½ per cent., \$50,013. At the same date, as returned by the assessors of the cities and towns, the valuation of all the tonnage of the state was \$10,045,835, the taxation on which would probably average about 2 per cent., amounting to about \$200,916.

Of course immunity from this load of taxation would be a great boon to our ship-owners, and the question is as to its practicability.

The constitution of the state of Maine provides that all property shall be taxed equally, a provision which I believe is in the constitution of nearly all the states. To exempt shipping from taxation would require amendment of the constitution, which can only be effected by a two-thirds vote of each house of the legislature, and must be ratified by a majority vote of the people.

As the shipping is owned in a few towns along the coast, and none of it in the interior of the state, it would be impossible to get the required vote in the legislature or by the people. Men never vote to exempt others from taxation if the amount exempted is to be laid upon themselves. It is in the power of the general government to relieve the shipping interest from federal taxation. The tonnage duties or tax ought to be taken off. Oppressive laws, such as the law requiring three months' pay to seamen discharged abroad, ought to be repealed.

The consular service ought to be overhauled and its many abuses corrected. All materials entering into the construction and equipment of vessels ought to be admitted free of duty.

All these measures of relief to the navigation interest are within the power of Congress.

Yours, very truly,

GEORGE A. PREBLE.

In Freeport there was once much building. In 1854 ten yards were actively employed, and 13 vessels were launched. It was the era of big freights, one Freeport vessel clearing \$21,000 more than her first cost on one voyage of 21 months. After the reaction of 1857 building declined, and only two yards are left in Freeport, which produce one large vessel each per year for the owners of the yards. A good deal of local timber is used here: hard wood for floors, oak for center work, and hackmatack for tops. Yellow pine is used for the keelsons, beams, and planking in and out.

Brunswick, once extremely active, is now dull and depressed, one or two large vessels a year being the only product of the town.

Yarmouth, the next building point going down the coast, still has two yards and builds a few vessels every year. The experience of the town is the same as that of others on the coast, and what is left of building here is merely to keep up the fleets of local owners. The vessels are large, however, and engage principally in the California and the East India trade.

Portland is a large and ancient shipping town. Coasting and fishing vessels were employed here as long ago as 1700. Before the Revolution this was one of the principal lumber ports for the exportation of masts, spars, and ship timber, generally to England. The royal charters had always reserved to the crown the timber suitable for masts and spars, and a great many large vessels came to Portland to obtain cargoes. These vessels were of about 400 tons register, carrying crews of 25 men, and took away from 45 to 50 masts, with a large quantity of lighter spars and timber, at a time. Masts 36 inches in diameter were worth \$750 each delivered in England. A ship was built at Portland as early as 1728, but the tonnage of the town was chiefly in large sloops and schooners for coasting and for the West India trade. Many privateers were sent out from this town during the Revolution, and a sloop of 10 guns is spoken of. After the war was over the shipping of Portland increased rapidly; there were several yards around the harbor, and the building industry was active; but of late years the business has fallen off, and while the several large commercial houses still own considerable fleets of coasters and some large vessels, the ship work at the port now consists chiefly of repairing and of ceiling large vessels for the carrying of cargoes of grain. A large number of ship carpenters here devote their whole time to repair work, while a great deal more of that kind of business is done by the owners themselves at their own wharves. Portland has one large fixed dry-dock, built with stone walls, the gateway closed with a heavy caisson and the dock emptied with powerful pumps. This dock is the resort of a large number of the new ships built in Maine to receive their copper sheathing, the vessels also obtaining their outfits of sails, rigging, anchors, chains, etc., in the city while there. There is one shop at which good engines are made for steamers. At Cape Elizabeth, across the bay, a small marine railway, worked by horse-power, is used in the service of coasters and fishermen for hauling out the vessels to calk, paint, and repair. There are two or three yards for new work in the town, and two good ones over at East Deering. A propeller of 18 tons, one of 286 tons, and a barkentine of 349 tons were built in the census year; the steamers, barks, and schooners of the port are chiefly produced at East Deering, the high prices, and consequent higher wages, of the city tending to keep the industry down at Portland. One drawback of late has been the decline of the fishing business. In 1878 and 1879 several menhaden steamers, worth about \$20,000 each, were built at East Deering, but the fish ceased to come into those waters and the demand for steamers fell off. W. S. Jordan & Co. replied to a question in regard to the future of the sailing vessel and the burdens on American shipping as follows:

Although steam is driving sailing vessels from one trade after another, and although improvements are constantly being made in marine engines, and it is impossible to tell where these improvements will end, still, on account of the relative cheaper cost of sailing vessels as compared with steam, they will be used for the freighting of the less valuable cargoes, such as lumber, coal, iron, and also for cargoes

not easily and quickly handled, for many years to come. Steam has superseded sailing vessels for these cargoes to a large extent in the Mediterranean, the Black sea, and the Red sea trade; but it has a peculiar advantage there on account of the narrowness of the seas. Congress, by the removal of several annoying laws and exactions, could assist the navigation interests largely. These exactions are: 1. The payment of three months' extra wages to a crew when discharged in a foreign port; 2. Consular charges and extortions; 3. Compulsory pilotage on coasting vessels; 4. Our laws for admeasurement should be amended so as to conform to the English law, which measures cargo space only.

Kennebunkport is an old ship-building town. It originally enjoyed the advantage of an abundance of local timber, and in the prosperous days before the war of 1861 large numbers of trading vessels of all classes were built both for Boston houses and for local owners, the cotton ships being reputed able to carry more cargo to the register ton than any except those built at Boston. Losses and shrinkage of values have borne heavily upon the town. Two years ago the principal builder built a bark and a ship, which, in consequence of the decline of vessel property, brought \$20,000 less than they had cost. Two or three large vessels a year, a few smacks, and a few menhaden steamers are the average product of the town. Fishing steamers register from 70 to 130 tons, and cost from \$20,000 to \$30,000 each. The local timber supply is now exhausted, but in early years, about 1830 for instance, Kennebunkport could build vessels of 1,000 tons and upward for \$23 a ton. The price rose to \$70 after 1861, and has latterly been about \$55.

At Saco ship-building is now a thing of the past, as there has been nothing built at that port for seven or eight years except a few fishing smacks of 10 or 12 tons. Formerly a great deal of large tonnage was built there, but the general causes affecting the interests of owners have made the Saco people cautious about investing in new shipping property. The same is true of the York district, and for fifteen years there has been little or nothing done in that region.

At Kittery, on the western boundary of the state, there is some building and a good deal of small repairing at a marine railway.

It will be seen from the foregoing notes that ship-building in Maine is now carried on chiefly by those who build only for their own use. Contract work for other parts of the country is done at Bath and Kennebunkport, and fishing and other schooners are occasionally ordered from a number of the smaller places for owners in Massachusetts, Connecticut, and New York; but nearly all of the large ships and coasting vessels constructed in Maine are owned in the towns, usually by the firms that built them, and if not wholly owned by one house the shares are all taken up in the town. The large majority of fishing boats and vessels are also built by their owners. This peculiarity of the industry in Maine will account for the fact that the state possesses so few well-equipped ship-yards. The contract yards at Bath have the modern appliances of bevel steam saw, bolt-cutters, planers, treenail machines, etc.; on the other hand, the proprietary yards of Maine are almost wholly without these things, the work being performed by hand, and the difference in cost between ships built by contract and those built by owners for themselves is due in part to this fact. Some of the ship-building towns are fast going to decay; the young men are going off to other parts of the country, while the old men linger idly in towns they dislike to leave, but which provide them with little work by which they can live. The eight ship-building counties of Maine have not gained in population in 10 years, while the rest of the United States has gained an average of 30 per cent. The population of those counties, as shown by the census, is as follows:

	1870.	1890.
Hancock.....	36,495	38,129
Knox.....	30,823	32,863
Lincoln.....	25,507	24,821
Penobscot.....	75,150	70,476
Sagadahoc.....	18,603	19,272
Waldo.....	34,522	32,463
Washington.....	43,343	44,484
York.....	60,174	62,257
Total.....	324,907	324,765

A slight development of general manufacturing interests in a few places in these counties and the rise of summer resorts on their sea-coast are all that have prevented a marked actual decline.

NEW HAMPSHIRE.

Ship-building was carried on extensively at Portsmouth, New Hampshire, in early years, as there was a large supply of superior white oak and white pine in the neighborhood of the town. Several cargoes of masts were shipped to the royal navy-yards in England every year, and agents were employed to go into the woods, mark the best trees, and procure them, roughly formed into spars. The shore fisheries gave the first impulse to the building business, shallops, sloops, and ketches being built in great numbers for local use. Afterward the people went into coasting, and did a great deal of building for foreign owners. Ships of 200 and 300 tons were built on

speculation, and were loaded with fish, oil, provisions, lumber, etc., and sent to the West Indies. If they returned, they brought sugar, molasses, coffee, rum, etc.; but they were often either sold with their cargoes in the West Indies, or, going to England, were sold there, and with the proceeds the owners bought canvas, anchors, cordage, and outfits for new vessels. When the revolutionary war began a considerable balance was due to the people of Portsmouth from England, about a dozen ships having been sold every year. There was also considerable trade to the southern states, and West-India goods, with fish and provisions, were sent, to be exchanged for rice, naval stores, corn, and flour. The Portsmouth builders made a great reputation, and in consequence large vessels and frigates were ordered from them. The Faulkland, a 54-gun ship, was built as early as 1690; the America, 50 guns, in 1740 for the British government; and one of the same name, of 74 guns, was begun for the American Congress toward the close of the revolutionary war, but was afterward presented to France. Portsmouth vessels whose ownership was retained at home have been used chiefly in the West India, coasting, and cotton trades, and since 1853 have ranged in size from 900 to 2,000 tons register. The course of the building of the port since 1800 has been as follows:

VESSELS BUILT IN THE DISTRICT OF PORTSMOUTH FROM THE YEAR 1800 TO 1881.

Years.	Vessels.	Ships.	Barks.	Snows.	Brigs.	Schooners.	Sloops.	Total tonnage.
1800	18	5	1		12			3,403
1801	14	9		1	4			2,925
1802	11	5			3	2	1	2,045
1803	14	9			3	2		2,790
1804	18	10			1	7		3,238
1805	16	11				5		3,258
1806	13	8			3	2		2,702
1807	10	4			2	4		1,608
1808	11	5				6		1,666
1809	9	3			2	2	2	1,514
1810	10	8			1	1		2,300
1811	15	10			5			4,375
1812	4	1			1	2		626
1813	1					1		21
1814	11	1			3	7		1,315
1815	13	2			3	8		2,057
1816	14	2			2	9	1	1,612
1817	7				2	5		594
1818	20	3			6	10	1	2,733
1819	13	3			1	9		1,626
1820	9	3			2	3	1	1,450
1821	7	3			2	2		1,379
1822	9	4			1	4		1,656
1823	10	4			4	2		2,429
1824	12	5			3	4		2,650
1825	15	5			3	7		2,874
1826	6	4	1		1			1,977
1827	11	4	2		1	4		2,402
1828	10	5			1	4		2,113
1829	10	1				9		916
1830	7	2				5		1,308
1831	3	2			1			993
1832	7	3			2	2		1,798
1833	8	5			1	2		2,030
1834	8	4			1	3		2,348
1835	9	4	2		1	2		2,813
1836	8	0			1	1		3,553
1837	5	5						2,982
1838	9	5				3	1	2,959
1839	5	4				1		2,603
1840	8	4	1			3		3,243
1841	5	4			1			2,067
1842	1	1						526
1843	3	1				2		841
1844	5	3			1	1		2,280

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VESSELS BUILT IN THE DISTRICT OF PORTSMOUTH FROM THE YEAR 1800 TO 1881—Continued.

Years.	Vessels.	Ships.	Barks.	Snows.	Brigs.	Schooners.	Sloops.	Total tonnage.
1845	7	3	1		2	1		2,720
1846	9	4	1		1	3		4,113
1847	12	7	3			2		6,822
1848	9	4	2			3		4,277
1849	10	5	2			3		6,010
1850	9	9						8,258
1851	12	7	1			4		8,778
1852	12	11				1		10,271
1853	10	9			1			10,809
1854	9	8			1			9,096
1855	13	10			1	2		12,039
1856	13	13						13,419
1857	7	6			1			6,246
1858	6	5				1		4,683
1859	7	4				3		4,017
1860	7	3	1			3		3,543
1861	3	2				1		2,042
1862	1					1		24
1863	6	3				3		3,315
1864	7	1		2		4		1,933
1865	8	1				7		2,105
1866	6		1			5		2,374
1867	7	1	2	1		3		2,316
1868	6	2	2			2		2,732
1869	5	1	2	1		1		1,993
1870	1		1					494
1871	3	1				2		1,268
1872, none.								
1873	3	2				1		5,283
1874	2	1				1		422
1875	3	2					1	2,780
1876	6					6		111
1877	5	2		1		1	1	2,374
1878	3			1		2		539
1879, none.								
1880, none.								

Until within ten or fifteen years New Hampshire vessels were built out of native white oak. Of the 30 vessels which have been launched by one builder only two or three have had southern frames. The quality of the local oak was remarkably good, and vessels were sometimes built of it almost wholly, frames, stems, keels, keelsons, planking, ceiling, and beams, although hard wood was used in the floors and keels. These vessels were not, of course, so buoyant as they might have been, but they were lasting, being good for at least 20 or 30 years, and the rate of insurance on them was so low that it gave them great celebrity. Of late years southern oak and pitch-pine have been used at Portsmouth; but this is not entirely on account of the destruction of native timber, as the timber for ships of 2,000 tons can still be obtained in the state.

Builders attribute the complete stoppage of building in New Hampshire to the burdens of taxation and the growth of steam navigation and in part to the building of railroads alongshore, limiting the business in coasting vessels. There is now almost no ship work done at Portsmouth. The yards are abandoned, except in one or two cases, where repair work is done, the boat-shops are going to decay, and the principal work is now done at Seabrook, where a number of dories and small fishing boats are made every year.

Vessels are taxed in New Hampshire the same as other property, without regard to whether they are employed or not. In Portsmouth the rate is about \$1 75 per \$100 of valuation.

MASSACHUSETTS.

The first place in Massachusetts, coming down the coast, where there are any ship-yards is Newburyport. The Merrimac is navigable for small vessels for about 20 miles from the sea, and on this short reach are situated Newbury, Newburyport, Amesbury, Salisbury, and Haverhill. These towns were all active building places after 1650. The vessels ranged in size from sloops of 20 and 30 tons to ships of 300 tons, and a multitude of small fishing vessels

were also built. Good oak grew abundantly near the river, and was not only used for the Merrimac vessels, but was exported extensively to England. Before and after the Revolution vessels of the largest class were built in great numbers, a large proportion of them for English owners. The vessels on this river suffered great loss during this war; 22 of them, with more than a thousand men, sailed from Newburyport and were never heard of again, while there were other heavy losses by capture and wreck. On the other hand, the privateers of the Merrimac brought back fortunes for some of their owners. The famous frigate Alliance was built at Salisbury point in that war. After the Revolution building was a prosperous industry for more than 75 years, from 20 to 35 vessels being built yearly. At first the Merrimac river merchants owned the vessels in large part and sailed them to the East Indies, Europe, and the West Indies, but afterward the East India trade went to Salem. Building continued, however, for such trades as were open to the Merrimac owners. From 1783 to 1882 there have been constructed in this locality 1,600 vessels large enough to register, two of them steamers of 3,000 tons each, measuring 380,000 tons, besides a vast number of small fishing craft. John Currier, jr., built 95 vessels, aggregating 86,000 tons; and about 50 vessels of from 1,000 to 1,600 tons register have been built, but the owners are now merely looking after their old vessels. It is related at Newburyport that among the vessels built many years ago there were a few of the class popularly known as "Jew's rafts". These vessels were constructed of good timber and lightly calked, and were dispatched with cargoes of lumber to Europe, where they were taken to pieces and sold for lumber. The majority of these rafts were safely navigated across the Atlantic, but one, at any rate, was never heard from after leaving port. The following is a summary of vessels built on the Merrimac from 1781 down to 1880:

	Sloops.	Schooners.	Brigs.	Barks.	Ships.	Steamers.	Total.	Tonnage.
1781 to 1789	10	21	12		5		48	4,148
1790 to 1799	19	89	96	1	56		201	32,133
1800 to 1809	9	86	93	3	98		284	47,406
1810 to 1819	11	121	70	1	44		247	37,042
1820 to 1829	1	93	10		30		143	20,265
1830 to 1839		106	14	10	36		166	10,097
1840 to 1849		55	15	22	43	1	136	43,484
1850 to 1859		47	2	13	66		128	72,156
1860 to 1869		34	0	20	32	4	96	57,910
1870 to 1880		51	2	12	19	8	92	45,936

These vessels were built in the following places: Newbury, 473; Newburyport, 427; Salisbury, 291; Amesbury, 256; Haverhill, 120; Bradford, 30; Rowley, 2; Ipswich, 2.

At present, except at Newburyport, ship-building has been completely abandoned on the Merrimac, and that town in the census year presented a desolate array of abandoned ship-yards, boat-shops, and rope-walks. The reaction of 1857, the war of 1861, and the burdens on shipping had nearly killed the industry. There was a boat-shop in the town in which the decay of the business was forcibly illustrated. A firm which had been in business in that shop for 54 years, and had made 1,300 yawls, gigs, and other boats for vessel use, had on hand in the census year 3 yawls made two or three years before, for which they could not find a purchaser. The repairing of vessels, the launching of an occasional scow or schooner, and work on a few small fishing and pleasure boats were all there was of the industry in Newburyport in 1880. Owners have put considerable capital into government bonds, railroads, and factories, and the old carpenters have become scattered, many of them being in the factories of the town, where they like their new work and will not leave it. The timber is pretty much all gone, and all that is at command must come from a distance. However, gloomy as was the prospect in 1880, there has been a change for the better, and a ship of 1,800 tons has been launched, one of 1,600 tons is building, and a schooner or two have been built.

Marblehead was once famous for her large fishing vessels, and the town did much building; but Essex has drawn away her business, and the town is running down in population.

Essex has always lived by ship-building. Her Chebacco boats brought her into prominence at a very early period, and the little town grew into existence and thrived for 200 years on this one industry of building fishing and trading boats, aided by the occupation of fishing. It has had its ups and downs, but in the main was prosperous until the fishery treaty with Canada made trouble and the use of tug-boats on the coast robbed her of a part of her business. Nearly all the clipper fishing schooners of Gloucester are built at Essex, and trading vessels and pleasure boats, as well as fishing craft, have been produced there in goodly numbers. In former years Essex vessels were all rigged in the town, and sail-making and rigging work flourished actively; but the invention of the steam tug-boat has wrought a change, and nearly all the new vessels are now towed to Boston or Gloucester to be fitted out. Essex vessels were formerly built of oak that grew near the town, the material, except the pine boards for cabins, which came from Maine, being hauled in by teams from within 25 miles of the place. Vessels are still framed and planked with oak, maple being used for the keels. Pitch-pine is also somewhat used for planking, and the keelsons are of either pitch-pine or oak. The decks and houses are of white pine. Oregon pine has been used for decking one or two vessels, but it is too expensive to compete with white pine on this coast. The pine spars come largely from Pennsylvania. Hackmatack supplies all the knees. There are now five yards in Essex, and all of them had

something to do in the census year. In one of them a yacht was built 90 feet long, decked with Oregon pine and planked with pitch-pine. The other yards built schooners, and one yard had a wooden coasting propeller in course of construction. The builders were all despondent, and their business was steadily declining; and every year they were doing less work, as they had to compete so for contracts that there was no chance left for profits. Besides that, work was irregular, and they had great difficulty to keep gangs of men together large enough to build a schooner when they had got a contract. The men were scattering away to other towns and getting work at house-building, and in boot and shoe factories, cotton-mills, and other establishments; sometimes these men came back to the ship-yard when called for, but were showing more and more reluctance to do so, preferring the regular work and sure pay of the factory, and the result was the same as along the whole coast north of them. There were fewer old carpenters than there used to be, and no young men were learning the business. One leading builder had not taken an apprentice for twelve years, and did not know of one in the town.

The most profitable vessels that are built at Essex are sharp two- and three-masted schooners of from 150 to 250 tons register, as the river is not large enough to launch and float out a large hull. The model for which the town is famous is described in the chapter on fishing vessels, and is sharp, broad, low, and fast, sacrificing capacity to speed. Essex vessels are the best that can be put into the fruit business and for trading round the West Indies, as they can beat to windward with remarkable speed, and when loaded with fruit, if there is any wind, blow which way it may, they will make their passage quicker than any other vessel except a steamer. The cost to build and equip for sea at Essex is about \$60 or \$65 per register ton, but it must be remembered that the smaller a vessel is the more it costs in proportion to size. The above figures are not excessive, considering the tonnage of Essex vessels. Wages here were from \$1 50 to \$2 a day in the census year. Spar-makers got \$2 25 a day; riggers, on account of the irregularity of work, \$3; the joiner work, calking, blacksmith work, cabins, and spars were usually sublet to contractors, who, however, made no money on their contracts except to get a little more wages than the men.

Gloucester was once a large building center. Notes of the early operations in this line here have already been given in the chapter on fishing vessels. This town is the center of the fishing business of New England, and of late years has devoted itself almost entirely to enterprise in that direction; but all the timber in the vicinity having been cleared away, the building industry has been gradually transferred to towns where it could be carried on to better advantage. Of the 475 vessels in the district in 1880 (tonnage, 27,456), more than 215 had been built in Essex, about 133 in Gloucester, and the rest principally in Maine. The town retains its repairing business, and perhaps is better off than it would be if it did all its own building and none of its repairing. At Gloucester there are three marine railways, upon which fishing schooners are hauled out twice a year regularly, once to paint the bottom, and once to calk, repair, and paint the whole vessel. A great deal of repairing of sails, refitting of rigging, blacksmith work, and the replacing of lost anchors, cables, boats, and fishing apparatus are also done every year. One large boat-shop in town, at which seine- and whale-boats, dories, and pleasure boats are made to the number of about 300 yearly, had produced 3,700 boats down to the date of the census. Gloucester is one of the most interesting ports in the United States, its harbor being crowded with hundreds of fishing vessels of every description known on the New England coast. There was much complaint among fishing firms of the operations of the Canada treaty.

There are several other towns on Cape Ann at which some small work is done, Beverly and Rockport being the principal. The work is all in the way of sloops and fishing boats; but some of the small craft are yachts, and are used for the pleasure of summer visitors.

Salem, once the leading ship-building center of New England, does nothing in building now except to construct pleasure yachts and repair vessels of small tonnage on its one marine railway. The ship-yards of the town and the mercantile houses in the West India, East India, and South American trades were what made the place originally. Her people began with fishing and boat-building, but their maritime business gradually changed to the coasting and foreign trade. Salem sent the first vessel around Cape Horn to the East Indies, and many of her ships were extremely profitable. The first marine railway in America was established here. It was necessary to provide facilities for taking large square-rigged ships out of the water for repair, and Endicott Peabody is said to have been sent to Europe about 1822 to get plans and designs, the railway being built on his return. A windlass was planted to haul the hulls on the ways and was worked by means of horse-power, and the gearing was so crude that the horse was driven around in a circle a distance of 17 miles in order to get the vessel up the bank a distance of 450 feet. The first experiment was with a large ship of 700 tons, which was successfully handled and repaired; but when the time came to let her go back into the water some men took hold of the capstan bars to ease her down, and the momentum of the vessel was too much for them. After she started the capstan began to revolve at great speed, and the men lost control of her, and one of them had some bones broken; they afterward learned to knock out a pin from the gearing and let the vessel go. From 1781 to 1834 the building at Salem amounted to 61 ships, 4 barks, 53 brigs, 3 ketches, and 16 schooners, measuring 30,557 tons; but since 1834 the building interest has run down, the East India trade has gone to Boston, New York, and Philadelphia, and with it has departed nearly all that had kept the ship-yards alive. Schooners, brigs, and sloops have since been built, but not to any great extent. The cost of new trading vessels of late years has ranged from \$60 to \$80 a ton, the yachts costing from \$100 to \$150 per ton, according to the style in which they are fitted up. Salem schooners of 160 tons have

been sent on long voyages, one going as far as California, paying 100 per cent. on its cargo. There is no timber or any especial advantage enjoyed here, and the merchants and capitalists who once had to have vessels for their business have gone into other branches of enterprise.

BOSTON.—More than one-half of all the vessels other than fishing craft built north of Narragansett bay before the Revolution were owned in Boston, and the enterprise of that port naturally took the direction of the coasting and foreign trade. The people of other portions of the New England coast caught the valuable fish that swarmed in the ocean in that latitude, and the merchants of Boston took the large proportion of the catch and marketed it abroad, bringing back West India and other foreign goods for sale in the communities that did not trade direct. Boston had no particular advantage for building vessels except the deep water of her harbor, as timber was so scarce that a large fleet of sloops was employed every year in bringing to her wharves even the fire-wood needed for cooking and for heating the houses. However, indeed for a long period, Boston was the first of American cities in the amount of merchant tonnage owned by her merchants, and she has always ranked as one of the first four. Her merchants, devoting themselves to trade, rather neglected ship-building, and bought their vessels at Salem, Scituate, Medford, Duxbury, Charlestown, and other places having timber. Medford was more immediately the resort of the Boston ship-owners after 1812, as a number of smart builders had established large yards there, who did a flourishing business as long as vessels were not required of any larger size than could be floated down the little Mystic river. After 1840 the Mystic men became cramped for room. Large ships were the order of the day, and large yards were established by them and by others in East Boston, where there had previously been some little building, and the industry sprang up almost all at once to magnificent proportions. Samuel Hall came from Duxbury and Donald McKay from Newburyport, various of the builders of the Mystic river transferred their yards to the place, and the thriving community of East Boston came rapidly into being, deriving its chief importance from this one trade. The principal builders in the great period from 1845 to 1855 were Donald McKay, Samuel Hall, Paul Curtis, Robert E. Jackson, A. & G. T. Sampson, and D. D. Kelly, the vessels built by them being packets for the Liverpool, Havre, Mediterranean, East Indian, South American, and Australian trades, and afterward clippers for the California trade. One of the first jobs of work at East Boston was the construction by McKay, at the instance of Enoch Train, of four packets to sail to England; he built many ships for Mr. Train in after years. The building business reached large proportions about 1854 and 1855, there being in one year 30,000 tons of shipping in process of construction at one time in the port of Boston. The wharves were crowded with vessels receiving their spars, rigging, and sails, and every shop and loft was crowded with orders and driven to its utmost capacity.

Few of the Boston builders took shares in their vessels, but built on contract or on speculation. Studying closely the requirements of trade, they devoted themselves to the production of vessels especially suited for the various employments of the day, leaving to others the operation and management of the ships. They often made voyages to Europe and to the West Indies, and even to the Mediterranean, in order to study the behavior of vessels at sea and the various considerations that should govern form of hulls and arrangement of the spars and sails, and it is probable that the superior excellence of Boston vessels sprang from the particular fact that builders gave their whole attention to the art. Their success depended on the making of good ships. In order to employ the force of skillful and well-trained men which they had got together and the capital which they had accumulated they were often forced to set up a ship without waiting for a contract. In such cases, as it would not do to build anything except a good vessel, their ingenuity was taxed to devise improvements in models and rig, and they were compelled to exercise sleepless care in regard to materials and the manner of putting them together. In the yards north of them, where people built for themselves, there was not the same attention to fine points in construction; but in Boston building was differentiated from owning, and the result was the natural one of superiority in the work produced. The Boston yards launched the best, largest, and finest specimens of marine architecture in New England; their packets were unexcelled, their clippers were the finest in the world, and their cotton ships carried more than any other vessels. The building on contract and speculation also compelled Boston men to do everything in their power to save labor, and their yards adopted every appliance that could be thought of for that purpose—bolt-cutters, derricks for lifting, steam-saws, treenail machines, etc.; and while they had to contend with high wages, and often with dearer materials, their ability as builders enabled them to keep their business until some time after 1861.

The best era at Boston was from 1840 to 1860, and during that time there was an astonishing production of packets, clippers, cotton ships, and coasting schooners. Some of the shipping houses of the port owned large fleets in the foreign trade. One firm had more than 20 vessels sailing to Australia; another once owned 33 ships and barks, with several steamers; and besides there were numerous packet and clipper lines of from 6 to 12 vessels each. It was seldom that a contract to build was given out to other parts of the coast, and when steamers were required for the coasting trade, they, too, were built in East Boston. The business reached large proportions, and about 1855 gave employment to several thousand men. The reaction of 1857 was a hard blow to the place, the establishment of subsidized lines of British steamers a still worse one, and the war of 1861 was still another disaster. Few builders of the clipper period survived all these shocks, and nearly all of them failed. There was much work at the yards through the war in the way of government vessels; but after 1865 the industry was a struggling:

one, and steadily declined. High wages and strikes among the carpenters and calkers gave the finishing blow; nearly all the old builders went out of business so far as new work was concerned, and the few that kept their yards going have had a hard time of it. In the census year the only merchant vessels built at East Boston were three coasting schooners, a few barges and tugs, and two ferry-boats, and there was nothing else, except a number of small yachts, pleasure boats, and ship boats. At South Boston, where large vessels have often been made, there was nothing except sail-boat building; at Chelsea the same; and on the Boston side a little boat-building was all that was done.

The principal ship work at the port of Boston now is the repairing and coppering of vessels, the necessary incident of every great commercial port. The water front of East Boston and Boston is lined in places with long rows of shops of shipwrights, joiners, riggers, sailmakers, and blacksmiths, who live by repair work, and there are several marine railways and three large fixed and two floating dry-docks, at which the heavy work is chiefly done. The fixed dry-docks are of the following sizes: One is 165 feet long, 46 feet wide, 32 feet at the gate, and 13 feet depth of water. The second is 250 feet long, 75 feet wide, 45 feet at the gate, and 16 feet depth of water. The third is of large dimensions, namely: 365 feet in length, 86 feet wide, 68 feet at the gate, and 17 feet depth of water. The docks are built on solid foundations. Repairing can be as advantageously performed in Boston in respect to materials, workmanship, and dock fees as in any part of the country; like the other branch of the business, however, it is in a state of decay. The business saw its best days in the era of the clipper sailing ship. The Boston vessels never returned to port without giving a good job of work to all the trades, and often spent from \$5,000 to \$8,000 in repairs of various kinds; but the old clippers have been driven off by British steamers and by foreign sailing vessels, both wooden and iron, which now throng the port almost to the entire exclusion of American tonnage. The master of a foreign ship will go to extraordinary trouble to avoid spending money on this side of the water. Repairing has declined as well as building. One firm of shipwrights that used to do \$120,000 worth of business yearly did only \$40,000 worth in the census year; another that used to do \$18,000 worth only did \$3,500 worth in that year, while the business of another shipwright had fallen from \$22,000 to \$6,000. A firm of ship painters, who in 1849 were painting 32 vessels at one time, had work in the census year only occasionally. Four-fifths of the old-time rigging work, sail-making, and boat-building has gone, and so much has repair work fallen off in late years that the painters, joiners, carpenters, and blacksmiths are often compelled to take up other work to make a living. Nothing except the coasting trade keeps this branch of the business at all alive.

The vessels coppered at Boston in the census year numbered 128, consuming 625,830 pounds of metal and nails. Wages were from \$2 25 to \$2 50 per day for carpenters and calkers, \$2 for fasteners, \$2 50 for painters, blacksmiths, and spar-makers, and \$3 for riggers.

The timber used by the Boston builders was originally oak and white pine, but Donald McKay and others used pitch-pine when the era of large ships came on. During the war of 1861 oak was again resorted to; but since then the builders have returned to pitch-pine for planking, keelsons, and beams, using southern oak for the frames and center work. The spars were of white pine and spruce from Canada and Maine. Here, as elsewhere, oak and hackmatack frames, with yellow pine for planking, ceiling, beams, and keelsons, were regarded as making the best ship, and that combination of timber was said often to be strong and staunch for 30 years. Nothing was so good for iron and metal as hackmatack and yellow pine.

At North Weymouth, on the lower side of Massachusetts bay, a little work is still done, either a bark or a schooner being built at the one yard there nearly every year. Massachusetts white oak is used for frames, although it costs a third more than southern oak, and yellow pine is used for planking, ceiling, beams, and decking. A bark of 858 tons, built there in 1879, cost \$46,000 fitted for sea, or about \$54 a ton. The builder at North Weymouth complained that there is little profit in a contract now, not enough to encourage a contractor to build on his own responsibility.

South of Boston ship-building, except at a few scattered points, has ceased entirely. At Scituate, Cohasset, and Duxbury there is nothing left of the ancient industry. It is said that in 1846 and 1847 Duxbury built as many large and small vessels as were built at Medford, and of about the same class. There is good timber left for frames at Duxbury, and every facility for building exists; but the industry is dead, and nothing has been built since 1876. At Provincetown, on cape Cod, a little repair work and the building of a few whale-boats were reported, and at Wellfleet and Mattapoisett, where once there was a large business, amounting to hundreds of thousands of dollars, there are now built a few boats and yachts for the sea-side summer resorts. At Hyannis there was a marine railway, but it was out of repair, with no prospect of ever being used again, while from Nantucket and Martha's Vineyard building has fled completely. At Edgartown, on the latter island, there is some repairing and metaling of whaling vessels owned on the island and of vessels wrecked and stranded, amounting to perhaps \$40,000 a year. No new vessels have been built for 14 years.

At New Bedford, an ancient and active ship-building port, there is nothing left except whale-boat building and repair work. From 25 to 30 whaling vessels are repaired and refitted at the port every year, and a number of coasting schooners, fishing-smacks, sail-boats, and steamboats are calked, painted, and kept in order. There are two marine railways employed; several firms are engaged in boat-building, and this trade at least is active and prosperous, though it does not compare with that of 30 years ago.

At Taunton there is now little or no building. This place once built a great many vessels for the coasting trade, now supplanted in great degree by barges towed by steamers. The first firm to come from New York past Point Judith with coal barges in tow of steam-tugs began business in 1872 with a steamer and three barges of 500, 600, and 800 tons, respectively. This firm was running two steamers and seven barges of from 800 to 1,100 tons in 1881, and other barges were being built. Other firms followed, running barges of from 1,500 to 1,800 tons. This business is growing every year, and there are now some 20 or 25 barges running on Long Island sound to points east of Point Judith with coal. The Taunton barges have each taken the place of as many as 15 or 20 vessels of from 400 to 500 tons.

It is in Massachusetts, taking the state as a whole, that the decay of American ship-building is most apparent. In 1850 the state built 121 vessels large enough to register a total of 36,000 tons; but in 1880, counting even the coal barges, yachts, and tug-boats, there was a total of only 39 vessels, measuring 5,600 tons. A part of the old business of the state has been transferred to Maine, but four-fifths of the decline is an actual loss to the United States, that much of the business having vanished completely. There are more and larger vessels than ever in the foreign commerce of the state, but they are built mostly in Scotland, on the Clyde, are owned in England, and are managed by foreign-born men. Massachusetts has just passed a law relieving vessels from taxation, except on their net income, and this has given general satisfaction.

RHODE ISLAND.

There is now no ship-building in Rhode Island save in the way of pleasure craft and small vessels, but repairing is carried on to some extent. Newport was once an active shipping port, and a gentleman of New York city has a letter, written over a hundred years ago, in which a Newport merchant says: "We must look out now, lest New York get ahead of us." The town had large interests in vessels and carried on an active trade. Sloops, schooners, and whaling and square-rigged vessels have been built at different places on Narragansett bay; but the business declined soon after 1812, and is now in a state of decay. The tonnage of the bay is small, and there is little left to the once busy ship-yards and boat-shops except small work. At Newport there are a few boat-shops and one large marine railway and yard for the repairing of steamboats. The port is a harbor of refuge in storms, and is much frequented by fleets of yachts from New York and elsewhere, each of which brings work to the town. At Bristol the Herreshoffs build steam yachts and vidette boats, and there is a marine railway for hauling out coasting vessels, and at East Providence there is a large marine railway for coasting vessels, on which about 480 vessels have been taken out of water for coppering, painting, and repair. There are boat-shops at Tiverton and at Providence. This comprises the interest in Rhode Island, even repairing, the chief feature of the business, being a dull trade in comparison with earlier years, a change in the coasting trade having produced this result. Coal in enormous quantities is consumed in the New England factories reached by the railroads which touch Narragansett bay. This was brought to the bay in former years by two- and three-masted schooners, of which there were probably 300 engaged in the business; and the building and the coming and going of this fleet, with the repair work, boat-building, and outfitting to which the business gave rise, gave active employment to the carpenters of the bay. But the schooners have been largely superseded by coal carriers of another class, the Reading railroad having built a fleet of 13 iron steam vessels exclusively for the coal trade. The first vessel, launched in 1869, was of 420 tons register; but the later vessels are of 1,280 tons each, carrying 1,650 tons of coal. Each steamer has a capacity equal to that of four schooners of medium size, and makes three voyages to a schooner's one, averaging about thirty-three voyages a year each to New England ports. Other firms have gone into the coal trade with large flat-boats and keel barges, which they make up into fleets of from 2 to 6 vessels, carrying from 2,000 to 4,000 tons of coal. These fleets will carry the freight of a dozen medium schooners, and at less expense, though they consume more time. The combined operation of the steam colliers and barges has been too much for the schooners, and they have been unable to withstand the competition. There are now from 100 to 200 schooners less in the trade of Narragansett bay than there were in 1861, and the general decline of all branches of ship work on the bay is the consequence. At Newport there were once 17 boat-shops on Long wharf engaged in making yawls for the trading vessels of the bay. The shops remain, but the occupants of most of them are gone; the doors are locked for weeks, and the few that remain live by work on pleasure boats, fishing, and stray orders for yawls. Some of the boat carpenters have gone to Maine to practice their art there. No vessels of over 20 tons register have been built in Newport district for several years.

The Herreshoff boats are built by a man who has been blind from boyhood; they will be more particularly referred to in the chapter on steam vessels. They are composite; that is, they have iron frames and wooden planking. The shop is a prosperous one, and could probably build large iron vessels if called on for that purpose. It is one of the small resources of the country in the way of iron building establishments.

The tonnage built in the state in the census year amounted to 17 vessels, registering 380 tons. The general industry of building and repairing both employed an average of 343 men ten months in a year, producing \$518,600 worth of completed work.

CONNECTICUT.

The shipping interests of Connecticut now center in fishing craft, steamboats for the trade of Long Island sound, and coal barges. The state owns some coasting tonnage, however, as also a few brigs and barks for the West India and the general trade. Originally there was a brisk building business all along the Sound and on the Connecticut river. Every little village had a ship-yard, and a great deal of capital was employed in operating sloops, brigs, schooners, and barks in whaling and fishing and in the coasting and foreign trade. In 1840 there were built 49 vessels large enough to register, measuring 4,100 tons; in 1850, 47 vessels, measuring 4,800 tons; and in 1860, 35 vessels, measuring 7,700 tons.

The best days of the industry in this state were just before and during the war of 1861, when so many gunboats were built; but at present there is almost nothing doing for the foreign trade, and no whalers are built, the only work being on vessels for local use in and near Long Island sound.

At Mystic there were before the war of 1861 five ship-yards in active operation, building two and three large vessels each every year. Many packets and clippers were built here. Native timber was used largely, the state being well stocked with oak and chestnut, but pitch-pine and southern oak were used when local timber gave out. No large vessels have been built for several years; the old ship-yards are deserted, the town has lost nearly all its carpenters, and its growth is arrested. Only two small yards did any work in the census year, one of which built a schooner yacht, the other a small screw steamer. The location of the town is far up the river, and lacks trade of any kind, so that no repairing is done, the only orders being for an occasional pleasure yacht or a fishing steamer. The decline of the shipping interest of Mystic is attributed, first, to the cruisers of the war of 1861, and next to the general increase of burdens and expenses from the high prices and taxes. The opinion was expressed that the government could reasonably aid in the revival of shipping by taking off burdens, and with that aid, and the decreasing interest on money and government bonds, the shipping trade would gradually reach a state of new prosperity.

Noank is a little fishing village situated in New London county. This place has received an impetus from the building of a large marine railway especially for taking out of the water, for repair, the large steamboats of Long Island sound running from New York to Stonington. The Narragansett, which was wrecked by a collision in the Sound, was rebuilt on this railway, and other large jobs have been done. This railway owes its origin to the high prices of New York city, which made it desirable to create facilities for heavy repairs in some locality where labor was less costly; it is the largest on the Atlantic coast outside of New York, and is operated by steam-power. The cradle holding the vessel is drawn up the ways by a 20 horse-power engine, geared so as to develop several hundred horse-power, and acting on a massive iron chain, attached to the cradle at one end and winding around a windlass at the other. The repair work which comes to this yard keeps a force of from 50 to 100 men steadily employed. This yard has been supplied with a complete equipment of steam saws, bolt-cutters, derricks, and other modern appliances, which puts it in a position to build new vessels to advantage. A large wooden propeller which had been partly built on Long Island was completed at the Noank yard in the census year, as also a schooner and some barges for carrying coal and freight cars in New York harbor. The yard is run chiefly on work ordered from New York. The freight-car floats cost \$11,000 each; the barges, having an individual capacity of 400 tons of coal, \$9,000 each.

New London, at the mouth of the Thames river, has a broad, deep harbor, into which coasting vessels run for refuge in heavy weather, and sometimes 300 schooners and brigs are lying at anchor in the deep and safe waters of this excellent port. The place is visited annually also by large numbers of pleasure yachts, these visiting vessels furnishing the principal part of the ship work that is done in New London. There are two yards here near the fort, one with two, the other with four small marine railways. The only vessels building in the census year were a sloop yacht of 25 tons and a small schooner of 70 tons, but over 300 coasting vessels and yachts were taken out of the water for painting, coppering, and repair. There used to be some ship-building in New London, and it had extensive whaling interests. Many schooners, brigs, and barks of good size were required, and large numbers of whale-boats were built annually; but the business suffered the decline which took place everywhere when petroleum came into use, and a heavy blow was dealt to the New London firms particularly by the burning of their whale ships in the north Pacific by confederate cruisers and from losses by wreck. The catching of sea-elephants and seals has kept a very few whalers employed, and a few whale-boats are built in the town yearly; but the trade is dull and fast declining.

Along the Connecticut river, from Saybrook as far as Hartford, there was formerly a great deal of ship-building. The valley of the river was covered with a luxuriant growth of excellent timber (principally chestnut and white oak), and large numbers of sloops and schooners for fishing and for the river and coasting trades were built. The Gildersleeves, the oldest firm on the river, beginning in 1821, and building sloops, brigs, and schooners only for 20 years, began in 1841 to send forth barks and ships, of which they built 15 in all. The keels, keelsons, stem and stern-posts, and frames were of oak and chestnut—the oak prized for its strength and elasticity, the chestnut for its lighter weight, ease in working, and durability; the ceiling and planking were of oak, both on account of elasticity and because the hard, tough fiber fitted it to resist chafing and cutting by ice; the deck frames were of

oak at the hatchways, with chestnut elsewhere, and the decking was of white pine. Just before the war pitch-pine was introduced for keelsons, ceiling, and beams, and it has ever since been used. This firm has built many steamboats, and during the war constructed several gunboats; but since the war it has built about 17 sail vessels of small size, only one, however, in the last eight years. Of late years the Gildersleeves have built scarcely anything except coal barges. Their principal business is repairing; but they have a marine railway at their landing, and keep a force of 25 men steadily employed. In all they have built 125 vessels.

At Rocky Hill there is a yard for barge building.

At Goodspeed's landing, in the town of East Haddam, there was once much building; but there is none at all now, the only work at present being the repairing of the steamboats of the Hartford line. Ships, schooners, war vessels, and steamboats have been built at this yard, the pay-roll sometimes carrying as many as 400 men, and a year's transactions amounting to over a million dollars. The carpenters are scattered, and a year's work now scarcely supports 25 men.

Essex is a little fishing village lower down the river with a small railway and two boat-shops. There was once some ship-building here, but there has been none worth mentioning of late years. The small boats of the town have been sold extensively in the South, but there is little left of this business.

Middletown, Middle Haddam, and other places on the river once aspired to be ship-building towns, but now the business is entirely extinct.

On the headwaters of the Connecticut river about 20 pine board batteaux are built every year for driving rafts of logs.

At Madison there is a ship-yard where a bark or schooner is still built every year, the cost of which is about \$75 per register ton. Chestnut is used in the frames to some extent, as it is in all Connecticut yards, but the main dependence is on southern oak and pitch-pine. The wages in this yard were a little higher than at the extreme east, owing to the proximity of New Haven and New York, and ranged from \$2 25 to \$3 a day of ten hours.

At New Haven the product of the census year was one sailing vessel of 450 tons, a few coal barges, a few small fishing boats not large enough to register, a few row-boats, and a little repairing at one marine railway in Fair Haven. The town can scarcely be said to have any ship-building other than in the building of coal barges, and what is done is an insignificant fraction of the general business of the town. The first two coal barges were built in 1876 for the Empire Transportation Company. They were almost square, 38 feet long on the bottom, 40 feet on top, 24 feet wide, and 11 feet deep, each with one cross bulkhead amidships and a narrow deck 2 feet wide around the gunwales. The rest of the top was open. The floor timbers were 2½ by 10 inches square, spaced 24 inches; the top timbers 4 by 6 inches, both sets tenoning into a square bilge log; the outside planking 2½ inches; and the grub strake, or what should be a grub strake, 5 by 12 inches. The whole boat was built of yellow pine and oak, the frames being of oak, and each boat weighed about 20 tons and carried 200 tons of coal. These boats had a square resistance against the water, but they have proved a success so far as profitable coal carrying is concerned, and a large fleet of them has been built. They are towed back and forth between New York and New Haven by tug-boats in fleets of from 10 to 20. Seventy-nine box barges were built for this company, including 27 of different shapes and dimensions, but with the same sizes of scantling; the bow and stern were given a rake, to lessen the resistance. The new boats are able to carry 325 tons of coal each. The company built 10 more last fall, carrying 300 tons each. In 1881, inspired by the success of the old company, a new one, which took the name of the New England Transportation Company, was formed in New Haven, and built barges, lighters, coal-hoisters, and all the apparatus required for coal handling and transportation. Mr. Langly built for this company 30 square barges, 30 feet wide, 40 feet long, 11 feet deep, and carrying 250 tons of coal each; also 35 boats 30 feet wide, 11 feet deep, and 55 feet long on the bottom, with ends raking 45°, making them 71 feet long over all, and carrying 450 tons each. The latter boats were partly decked and had two cross bulkheads, and the hatches were 21 feet wide and 50 feet long, with 30-inch coamings, protected with light hatch covers; they were planked with 2½-inch yellow pine, ceiled with 2-inch spruce and decked with 2¾-inch spruce. These two fleets do an immense business in coal transportation from New York harbor to New Haven, as one of them can carry 27,000 tons and the other 24,000 tons of coal at one trip. The fleets are made up of square boats and those with raking ends. They are all lashed closely together, with the bevel-bowed boats ahead and behind, and when in tow of a strong propeller they make pretty fair time and have reduced the cost of coal carrying to a point where coasting schooners and colliers can no longer compete. The boats are often wrecked and sunk, and sometimes capsize. Their flimsy construction makes them unable to withstand much of a shock, and they are loaded down so far as to be in danger of foundering; but if one of them is occasionally lost, it only costs \$300 to replace it. These barges are only adapted to the waters of Long Island sound, as they could not venture past Point Judith, nor into any waters where they would catch the heavy ocean swell. They have driven a whole fleet of schooners out of the coal trade of the Sound.

At the Fair Haven marine railway about 60 fishing vessels are taken out of the water yearly, and a few thousand dollars' worth of work is done on them.

At Bridgeport ship-building ended 16 years ago. There was a large ship-yard here, and another at Black Rock, a short distance west. One builder has built 25 or 30 vessels at Bridgeport, many of them square-rigged, and one of his ships, now 33 years old, is still a good vessel. A builder at Black Rock used to build a bark

or a ship once a year. The war of 1861, high wages, and foreign competition have destroyed the business of the two ship-yards referred to. The timber in that region has been pretty thoroughly cleared off, large quantities of it having been sent to New York before the war. Chestnut is yet cheap, not exceeding \$12 a thousand in the round log, delivered at the saw-mill; but the low price comes from the lack of demand, and a little ship-building would send up the price at once and rapidly exhaust the supply. The only relic of the yard at Black Rock is a small marine railway, worked by horse-power, which lies idle most of the time.

After passing Bridgeport there is no trace of ship-building on the Connecticut coast except at South Norwalk, where there are a marine railway, one large boat-yard, and a few boat-shops, and at Cos Cob, where there are two small railways for the repair of fishing and coasting schooners. Sharpies and fishing boats are owned in large numbers all along the coast, and many are built every year, partly by amateurs and partly by regular builders.

NEW YORK.

The early vessels of New York consisted of yachts, ketches, brigantines, barks, fishing boats, and sloops, and quite a number were built by the Dutch under the auspices of the Dutch West India Company. A three-masted vessel is spoken of as early as 1650, the shares in her being twenty-five in number; but vessels did not exceed from 100 to 120 tons each. About 1683 New York owned 3 ships, 3 barks, 23 sloops, and 41 small boats; in 1696 there were 40 square-rigged vessels, 62 sloops, and 60 small boats; but after 1700 the business was neglected at New York for many years, probably owing to the superior activity of the people of New England. The sloop was the popular boat at that early period, and having been developed from the old Dutch yacht it kept the round full bottom and broad beam which characterized all Dutch vessels of the seventeenth century. Its light draught fitted it for floating over the shallows of the Hudson river, and it was the universal boat for traveling and freighting on the river to Albany. A sloop cost from \$500 to \$600 about the year 1650, a canoe \$10 or \$12. By 1771 the sloops of the Hudson river had become large, powerful boats, and there were 125 sailing between Albany and New York. When occasion required, deep ones were built to venture to places as far away as Barbadoes, Surinam, Santa Cruz, etc., whither many of them did actually trade, and for such small vessels they carried valuable cargoes. For instance, the Olive Branch went to the West Indies in 1770 with 7 tons of flour, 47½ barrels of herring, 7,000 staves, 11 horses, 1 negro, and apples, poultry, onions, etc., to the total value of £591; the return cargo, mostly rum, was worth £448. In 1785 the Experiment, of 50 tons, was fitted out from Albany for China, being manned by 7 men and 2 boys, and carrying an assorted cargo. She left December 18 and was gone 18 months; the return trip, with tea, chinaware, etc., took 4 months and 12 days. These sloops ran out from the Hudson all along the coast, trading and carrying passengers, but were best fitted for the river trade and other local uses, such as fishing and pleasure sailing in the bay. A large fleet is now employed on the Hudson. The rise of New York in commercial activity was slow. The merchants traded to the West India islands and built many vessels to sell in those islands, but neglected the trade of Europe, and were far behind Boston in general enterprise until after the revolutionary war. The best business between New York and Europe was in English hands. The packet lines which were started in 1756 to run to Falmouth with letters, passengers, and freights were all English, and it was not until after the Revolution that New York merchants began to show the energy which has ever since characterized them. Privateering was a marked feature of New York enterprise before the Revolution. During the French war and up to 1758 the port had sent out 48 privateers, 695 guns, and 5,660 men, and others continued to be sent out until the city was captured in the revolutionary war. The privateers were brigs and schooners, long, deep, and sharp on the floors, sitting low in the water, and sailing with a drag, built in defiance of the rules and prejudices of the age, and so fleet that they were seldom overtaken even by the best frigates. New York had a few vessels of the same class in the slave trade, and their forms came down to the years following 1812 in the brigs and fruiting schooners of New York, and are perpetuated in some respects in the pilot-boats and yachts of to-day.

A few large ship and brig rigged vessels were built after the Revolution, but the shipping interests of New York were so limited that when the Manhattan, of 600 tons, was built for the East India trade by Samuel Ackerly in 1799 the yard drained the city of its carpenters, and the ship, when launched, took off nearly every sailor left in the port.

The ship carpenters in New York after 1800 comprised many able men, among them being Samuel Ackerly, Henry Eckford, Christian Bergh, Forman Cheeseman, Sneadon & Lawrence, and Adam & Noah Brown. These men were smart in improving their ships, and constructed a great many vessels, both for local and foreign owners, including a number of war ships. The frigate President, built by Mr. Cheeseman, was so famous in the war of 1812 that strenuous efforts were made for her capture. She was fast and able, but was finally taken by three English vessels and sent to England, and by order of the admiralty was there dismantled and taken to pieces for the purpose of ascertaining the secrets of her construction and excellent qualities. This proceeding has often been resorted to in the history of shipping. To Christian Bergh is said to belong the credit of the invention of the close rudder. Rudders had previously been made with a straight stock, and swung on their pintles in such manner that a large opening in the counter was required. This opening was clumsily closed with a piece of tarred canvas nailed to

the rudder-stock and the counter. Mr. Bergh fashioned the stock so that the whole apparatus turned on its center, instead of on the fore edge of the rudder. The wood-work around the rudder-head was then fitted close, and the water was thus effectually excluded without the aid of canvas. Ship-building was dull in the harbor of New York during the war of 1812, but privateers were built from time to time, and the art was kept alive. Many builders, including Mr. Eckford and Adam Brown, found employment during the war on the northern lakes, where they built the vessels that won the battles of lake Champlain and lake Erie. After the war of 1812 many large vessels were built in New York; but there was at first a lack of carpenters, which embarrassed the yards extremely, and it was at this period that the practice sprang up of taking a large number of apprentices to train in the yards. Regular work soon made an abundance of new shipwrights and attracted some from other towns, especially from New England, so that by the time New Yorkers began to go extensively into the building of packet ships there was no lack of good men.

Packet building was the best work of the New York yards after the war of 1812. Up to 1814 the best ships on the middle Atlantic coast had been produced at Philadelphia, the fashions of the day having nearly all been set there; but after 1814 building went ahead strong in New York, and the fashions were thereafter set by the builders on the East river. In the construction of packets the best talent of the day was employed; and these vessels and the river steamboats, which were then coming into prominence, gave work to a long row of ship-yards extending from Pike street, all along the East River front of the city, for a mile and a half. A few yards were also employed over in Brooklyn. The timber first used was New York state oak and white pine, oak and chestnut from New England, live oak from Florida, and locust from Long Island, strength, durability, and finish being the main requisites so far as the carpenter's art was concerned. When business had finally become brisk 20 ship-yards and 6,000 men were employed. In early years the majority of the Liverpool packets were built by Smith & Dimon, Isaac Webb & Co., and Brown & Bell, while the London and Havre ships were generally built by Christian Bergh, Thomas Carnely, Jacob H. Westervelt, and William H. Webb. The other builders worked on barks, brigs, schooners, sloops, and steamboats, among them being Fickett & Crockett, Westervelt & Mackey, Eckford Webb, Perrine, Patterson & Stack, and George Steers on sailing vessels, and Lawrence & Folkes, Devine Burtis, Bishop & Simonson, William Collyer, Thomas Collyer, and Capes & Allison on steamboats. After 1850 the New York yards went into clipper-ship building, and then began the greatest period of activity which the port had ever seen, from 50 to 100 vessels being built yearly, or from 30,000 to 60,000 tons. Twenty or thirty grand vessels were often building at one time, and the whole river side echoed with the ring of calking-irons. Bustle and excitement prevailed on every hand. Oak and pitch-pine timber began to be brought from the South, and the enormous quantities of all kinds of wood consumed gave busy employment to large numbers of coasting-vessels and made the port the largest lumber-yard in America. The cost of building was about \$55 per register ton, the vessel being fitted out at that price ready for sea. This was in ordinary years. The majority of the vessels built were for New York city owners, and every ship launched for a house in the packet, tea, or California trade meant not only the disbursement of from \$20,000 to \$30,000 for labor among the mechanics of New York city, with a further outlay of from \$50,000 to \$70,000 for materials, but it had still another significance; it meant the steady support of thousands of skillful men at high wages in the annual repair of the large fleet of wooden vessels produced. The packets and clippers were continually subject to heavy repairs. They were put in charge of men who would put on all sail and drive through all sorts of weather, and it is known that one American clipper, a well-built ship, had to have \$15,000 worth of work done on the return from her first voyage. The repair bills of all of them were large, and as long as the bulk of the tonnage that crowded New York harbor flew the banner of America from the peak the repairing at the port was one of the largest and the most profitable of all the industries there carried on.

William H. Webb, the great builder of packets and clippers at New York, and afterward of wooden steam vessels, built more tonnage on foreign account than any other builder at this port (138 vessels). One of his ships was the Ocean Monarch, of 2,145 tons, and another the great iron-clad steam ram Dunderberg, considered in her day the most formidable fighting ship in the world. He probably trained more apprentices than any other builder, and gave an immense impulse to American ship-building thereby, his apprentice boys, now full-grown men, being at this day scattered all over the United States and doing good and honorable work wherever found.

The list of his ships will be useful, as illustrating the growth of the building industry in New York, the size and character of the vessels built in each year being about what was required from all leading builders at the different stages of the history of the port. The list is as follows, the data being obtained partly from the custom-house books at New York and partly from the records of the yard, and is as complete as can be made in the time allowed:

Year.		REGISTER DIMENSIONS IN FEET.			Tonnage.	Year.		REGISTER DIMENSIONS IN FEET.			Tonnage.
		Length.	Breadth.	Depth of hold.				Length.	Breadth.	Depth of hold.	
1840	Brig Malek Adhel	80	21	7½	120	1852	Bark Robert Mills	120½	30½	14	488
	Ship James Edwards	122	31	20	500		Ship Australia	102	40½	27½	1,448
1841	Ship Agnes	122	28	19	450		Steamer George Law	272	40	32	3,000
	Ship Helena	130	32½	20	650		Ship Flying Dutchman	187½	38½	24½	1,200
1842	Ship Liberty	143	28½	20	750		Schooner Reamplaco	77	21½	7½	113
	Ferry-boat Wallabout	94	23	8½	199		Steamer Augusta	220	35½	22	1,600
	Ferry-boat New York	94	23	8½	199		Steamer Knoxville	220	35½	22	1,600
	Fishing smack Prouta	45	15	6½	30	1853	Brig Volante	113	26½	11½	307
	Fishing smack Viva	45	15	6½	38		Brigantine Fanny	80½	22½	9½	158
	Fishing smack Ligera	58	19	8½	70		Ship John Bright	191½	40½	28½	1,444
1843	Ship Montezuma	100	35½	21	918		Ship Young America	236½	42	28½	1,982
	Ship Cohota	145	33	20	720		Steamer San Francisco	281½	41	24½	2,272
	Ship Yorkshire	174	36½	21½	1,165		Steamer George Law	278½	40	32	2,141
	Schooner Vigilant	55	19	5	50		Bark Snap Dragon	142½	30½	18½	619
1844	Ship Zurich	130	35	20	680		Ship Flyaway	190½	38	21½	1,275
	Ship Montauk	127	10½	14½	540		Bark Milton	134	31	14½	536
	Brig Ramon de Zaldo	90	22	8½	160	1854	Ship Cultivator	192	40½	23½	1,448
	Ship Panama	130	33	20	670		Ship Harvest Queen	188½	40	28½	1,383
1845	Ship Havre	160	36	21½	1,000		Ship Thornton	191½	40½	28½	1,422
	Ship Silas Holmes	145	33	20	730		Bark Houston	132½	30½	14	518
	Ship Fidelia	160	35	21	1,050		Steamer Pelayo	198½	30½	14	811
	Steamer Genil	161	28	10	174		Ship Aurora	201½	42	29	1,639
1846	Ship Marmion	160	36	21½	1,080		Ship James Foster, jr	191½	40	27½	1,410
	Ship Columbia	170	36½	21½	1,180	1855	Ship New Orleans	160½	35½	21½	924
	Ferry-boat Williamsburg	115	26	10	315		Ship Neptune	191	40	28	1,406
	Ship Admiral	160	35½	21½	1,080		Bark Alamo	133	30½	13½	507
	Ship Sir Robert Peel	160	35½	21½	1,080		Bark Texas	135	30½	14½	554
	Ship Splendid	130	33	22½	750		Brig Josephine	129	23½	9½	259
	Ship Bavaria	160	35½	21	1,000		Brig Sabine	123	28½	12½	309
1847	Ship New York	164	37	22	1,185		Side-wheeler America	170½	28	12	545
	Ship Isaac Wright	170	38	22½	1,180	1856	Ship Silas Wright	191½	40½	28	1,443
	Ship Ivanhoe	170	38	22½	1,180		Bark Fanny Holmes	142	33	17½	700
	Ship Yorktown	170	38½	22½	1,150		Ship John H. Elliott	173	36½	23	1,077
	Ship London	170	38½	22½	1,145		Bark Alice Taintor	139½	32½	18	667
	Steamer United States	244½	40	30½	1,857		Propeller Astoria	159½	23½	12	425
1848	Ship Caleb Grimshaw	170	37½	22½	1,160		Steamer Cuba	200	30½	14	821
	Steamer Ajax	140	24½	10½	370		Steamer Guatemala	127	22	8½	218
	Steamer California	199½	33½	20	1,057		Ship Intrepid	179½	37½	23	1,173
	Steamer Panama	200½	33½	20½	1,087		Ship Ocean Monarch	240	46	30½	2,145
	Steamer Cherokee	214	35	22	1,450		Ship Uncewah	160	35½	22	988
	Steamer Tennessee	214	35	22	1,450		Side-wheeler William H. Webb	200	33½	12½	655
1849	Schooner S. M. Fox	98	28½	11	250	1857	Ship Black Hawk	180	36½	23	1,108
	Tug Gollah	145	31½	10½	411		Ship Roger A. Heirn	173½	37	23	1,089
	Ship Guy Mannering	190½	40½	28½	1,419		Bark Trieste	136	30	14½	550
	Ship Gallia	171	39½	27½	1,191		Steamer Moses Taylor	246	34	17	1,372
	Ship James Drake	180	28½	20½	483		Ship Resolute	189½	40½	28	1,413
	Ship Albert Gallatin	192½	40½	20½	1,435		Revenue-cutter Harriet Lane	179	30½	13	750
	Ship Catherine	135½	31½	19½	611	1858	Steam-frigate General Admiral	302½	55	34	4,600
	Ship Manhattan	182	39½	27½	1,299		Propeller Japanese	217	36½	17½	1,530
	Ship Isaac Webb	188	39½	28	1,369		Bark Martinho de Mella	138½	31½	18½	623
1850	Ship Vanguard	176½	38½	22½	1,196		Steamer Yorktown	250	37½	16½	1,500
	Steamer Florida	214	35½	22½	1,261		Bark Harvest Queen	115	17	11½	316
	Steamer Alabama	214	35½	22	1,300		Steamer Mississippi	251	38½	23½	1,500
	Ship Celestial	158	34½	19	860		Steamer A. Marshall	178	33½	22½	1,450
	Ship Joseph Walker	161½	40	23	1,325	1861	Steamer Constitution	342½	44½	22½	3,315
	Steamer Union	214	34	22	1,400		Steam-frigate iron-clad Red'Italia	275	54	33½	3,500
1851	Steamer Golden Gate	269½	40	30½	2,067		Steamer Re Don Luigi de Portu- gallo	273	54	33½	3,500
	Ship S. M. Fox	170½	36½	26½	1,062						
	Ship Isaac Bell	171	37	26½	1,072	1863	Steamer Golden City	343	45	23	3,373
	Ship Challenge	230½	43½	27½	2,000		Steamer Colorado	340	45	31½	3,728
	Schooner Clifton	26½	21	7½	106		Iron-clad steam-propeller Dun- derberg	380	72½	22½	5,090
	Ship Great Western	191½	40½	20½	1,443	1864	Steamer Sacramento	304	42½	20½	2,647
	Ship Gazelle	184	38½	22½	1,244		Steamer Henry Chauncey	320	43½	27½	.....
	Ship Invincible	221½	41½	24½	1,769		Steamer Montana	320	43½	27½	.....
	Ship Sword Fish	169½	36½	20½	1,035		Steamer Bristol	360	47½	22	2,692
	Ship Comet	229	42	22½	1,336		Steamer Providence	360	47½	22	2,692
	Steamer Edgar	137	24½	9½	310		Steamer China	363	48	31½	.....
1852	Schooner Plandome	100	26½	11	250		Bark James A. Borland	143	32	18½	637
	Schooner Manhasset	100	26½	11	250	1869	Ship Charles H. Marshall	183½	41½	23½	1,030
	Ship Annawan	153	33	20	800						

In addition to the above, Mr. Webb built, by subletting the contracts, the following: Schooners Mary C. Allen, Antonia, Cayatino, and Bonita, of from 80 to 107 tons, in 1851; the steamship James Adger, 215 feet long, 33 feet beam, and 21 feet hold, in 1852; the steamboat Pittston, 120 feet long, 19 feet beam, and 6 feet hold, in 1852; and the side-wheel tow-boat Leviathan, 175 feet long, 29 $\frac{1}{2}$ feet beam, and 11 $\frac{3}{4}$ feet deep. He also rebuilt the ship Elisha Dennison, 107 $\frac{1}{2}$ feet long, 27 $\frac{3}{4}$ feet beam, and 17 $\frac{1}{2}$ feet deep, only the stem and keel of the original ship remaining after the repairs were completed.

Since 1865 there has been a steady decline at New York. The running of foreign lines of subsidized steamers from Europe to New York resulted in a complete annihilation of the packet lines and of the few American steam lines to Europe, and, followed as it was by the war of 1861-'65, this competition gave a crushing blow to the industry. It is probable, however, that the building of ships would have ceased at the port in time, in consequence of the high prices for labor and plant, even had there been no other moving cause. Property became too valuable in both Brooklyn and New York for use as ship-yards, and the cost of living became so high that the workmen were repeatedly compelled to demand higher wages, and always gained the advance demanded until 1866, when a great strike occurred, in which they were beaten. Wages rose from \$1 75 and \$2 a day in 1861 to \$3 25 and \$3 50 in 1865. This advance was a serious embarrassment to the builders of New York, and the strike of 1866 permanently drove the construction of large sailing vessels away from the port. While the men were out a vast amount of work was sent to places farther east, and very little, except part of the repair work, came back; and it has not been possible to build ships of any size at this port since 1865 in competition with the eastern yards. In New York city proper the business is completely extinct. The old ship-yards have been converted to other uses, and are now occupied by wharves, factories, lumber yards, and blocks of buildings; and four floating dry-docks of various sizes, a row of scattered boat-shops and sail-lofts on South street, and a few pump- and block-shops and shipwrights' offices, are all that are left of the original industry. In Brooklyn there are ten yards devoted in part to the construction of small vessels, such as tug-boats, scows and lighters, pilot-boats and yachts, and small pleasure boats. Now and then a ferry-boat or a steamboat is built; but the yards do very little new work in the aggregate in the course of a year, and are all, in the main, supported by repairing. One or two of them are lumber yards, where scow-building is carried on as an incident of the business; but general ship-building appears to have come to a permanent end in this harbor.

Repair work, the coppering of wooden vessels, and the sheathing of grain ships are the principal branches now carried on, the port having immense and admirable facilities for this work. It appears from the returns of the shipwrights of Staten island, New York, and Brooklyn that about 7,000 vessels were repaired on the New York side of the harbor during the census year, the total cost of the work being \$4,500,000, and an average of 2,500 men were employed during ten months of the year. The work consisted of carpentering, calking, painting, and metaling. A total of 297 vessels were entirely or in part coppered below water, the old metal being stripped off, the hulls tarred and felted or papered, and new yellow metal put on. In round numbers, the weight of sheathing metal consumed was 2,999,000 pounds, large sailing ships taking from 23,000 to 26,000 pounds each and small schooners from 5,000 to 8,000 pounds. The ship buys the metal, has the nail holes punched by a machine on South street, and then sends the sheets to the dry-dock in New York or Brooklyn, where the ship is being repaired. The average charge for the labor of cleaning the vessel and putting on the metal was 35 cents per sheet, but on a new vessel the charge was 23 cents, including tarring and felting. About half the copper used was foreign, and cost 13 cents a pound; the rest was American, at 16 or 17 cents a pound. On account of the preponderance of foreign tonnage in the port of New York the greatest number of jobs of coppering and of all other branches of repair work were for foreign vessels, which were chiefly Italian, Norwegian, German, and British, and it was the universal testimony that whatever a vessel required could be done here more promptly and substantially than in the majority of other large shipping ports of either America or Europe. As repairs were more costly, however, than in Europe, foreign vessels habitually avoided every possible dollar of expense, and ordered nothing done except that which was strictly required to obtain a fair rate of insurance after the vessels had secured a charter. The repairs to British vessels were very slight, the best and largest jobs being generally upon American vessels, namely, on ships in the California and the East Indian trade, coasting schooners, yachts, tugs, river steamboats, ferry-boats, and coasting steamers.

The ceiling of grain vessels is a special business. As about 2,900 cargoes of wheat, corn, and oats are exported by sail and steam every year, the insurance companies have made regulations for protecting grain from injury in transit and for preventing the cargo from shifting and throwing the ship over on her beam ends. It is required that the bottom of the hold shall be completely floored with two thicknesses of inch board, breaking joints, which is supported on scantling from 12 to 15 inches above the ceiling proper of the vessel. The sides of the hold are clapboarded grain tight, the stanchions are boarded up, so as to make a fore and aft bulkhead, and about four cross bulkheads are required, one away forward, one in the stern, and the other two between them. The pump well has to be cased up in such manner that a man can go to the bottom of it and work there, and the masts and tanks are also cased. A vessel thus fitted up is allowed to carry grain in bulk in the lower hold, with a little loose grain on the lower deck, which is allowed to run down into the hold as the grain settles to keep it constantly full. Between decks the grain is in bags. All grain vessels have to be ceiled; and

as one ceiling lasts only about a year, the business gives steady employment to three large concerns. From 8,000,000 to 10,000,000 feet of spruce, pine, and hemlock are consumed yearly, worth from \$250,000 to \$300,000, the labor amounting to between \$380,000 and \$450,000. Ship ceiling began in New York 30 years ago, the Liverpool packets being fitted for bulk grain about that time, and the business has grown gradually ever since.

Another branch of business is that pursued by the Coast Wrecking Company. This company has a yard and a wharf at Staten island, and engages in the specialty of saving vessels that are stranded on the coast or have been sunk by collision or otherwise in and around New York harbor. It owns 2 steamers and 2 schooners, and employs from 60 to 110 men. An idea of the nature of the work may be gained from the report of its operations in the census year. The company's submarine divers examined the bottoms of 1 bark and 4 steamers, pumped out 1 ship and 3 steamers, and stripped the following vessels, which had been driven ashore or saved their cargoes: 7 schooners, 2 barks, 1 brig, and 2 steamers. It raised 1 steamer, 1 schooner, and 1 bark, which had sunk in the harbor, and rescued the following stranded property: 2 schooners, 3 brigs, 1 ship, 6 barks, and 3 steamers. The compensation of the company varied from 10 to 33 per cent. of the value of the property saved in the case of stranded vessels, but in vessels stripped it was about 50 per cent. Large as was the income, the expenses were larger yet, owing to the cost of maintaining the system, and the company made no profit during the census year.

On Staten island there used to be some activity. Oak and chestnut were plentiful, and workmen could live on the island for less than it cost to live in New York. A few vessels were built before 1861; but timber is now scarce and dear, and building is nearly gone. There are three yards on the northern part of the island, all kept alive by repair work, and at one of them, in Stapleton, a large marine railway was constructing in the census year for future use. On the southern end of the island, at Tottenville, there is a little community of 8 ship-yards, each of which does repairing and some building. There are 8 marine railways in these yards, all worked by horsepower, which take out from 400 to 500 small vessels yearly for painting, calking, and repair. Labor costs from \$1 75 to \$2 75 a day, being from 25 to 50 cents cheaper than in New York. This is a fishing locality, with coal depots in New Jersey, and the work is largely for smacks, tugs, and coal barges. The new work is in the way of steam tugs and propeller yachts chiefly.

Long Island, New York, was the scene of some of the earliest boat and sloop building in the country. The eastern end of the island was engaged in whaling by boats and sloops from shore as early as 1690, and the northern coast has been engaged from the time of the Revolution in sailing wood sloops to New York with lumber and fire-wood. Greenport and Sag Harbor once had large whaling interests. This island had the advantage of some good timber, the best and largest growth of locust on the Atlantic coast being found here, and there was besides some good oak. On the sea front the water is not deep enough for the building of large vessels, and the work has always been confined to fishing boats and to the small sail and row boats called for in the summer time by visitors at the summer hotels, which are scattered along the whole length of the island. In the census year there were built at Patchogue, Islip, Blue Point, Belle Port, and Bay Shore 17 cat-rigged boats and sloops, ranging from 5 to 24 tons register, and costing from \$800 to \$2,500 each. The builders have regular yards, and employ 3 or 4 men in building boats and from 6 to 8 on sloops, paying from \$1 50 to \$2 50 per day. A large sloop takes 8,000 feet of lumber. At Islip there is a marine railway; at Sayville, Blue Point, and Belle Port, each one; and at Patchogue three; all for small work, and each doing from \$300 to \$1,500 worth of business annually. At Sag Harbor there is now nothing except repair work.

At Greenport a barkentine of 667 tons was built of southern oak and pine in the census year for local ownership, at a cost of \$49 per register ton—a cheap vessel. Labor here was from \$1 50 to \$2 per day. There is a marine railway for coasting vessels, which keeps about a dozen men busy during ten months of the year.

Port Jefferson is the principal locality on the Sound coast, and ship-building is of ancient date here. In early times large numbers of wood boats came to this little hill-locked harbor to load for the New York market. As the business grew up the young men wanted to go on the water themselves, first going as sailors, and then, after vessels were built for them, as captains. Oak, locust, and hickory grew densely over all the neighborhood, and in the busy years before 1857 there was a large industry, there being 10 or 12 yards and seventeen vessels on the stocks at once. One sail-maker employed 16 men and cut up 50,000 yards of canvas yearly. Since 1866 it has been the practice to build six or seven vessels a year, but within five years there has been a change. In the census year only 4 coasting schooners, aggregating 1,326 tons, were built; and the sail-maker above referred to employed only 3 men and cut up 14,000 yards of canvas. The local supply of timber being now exhausted, southern pitch-pine and oak, with some oak and chestnut from Connecticut, are used. A second or third growth of locust and oak covers the hills, but it is small, and is good only for stanchions and treenails. There are three yards in the harbor, employing from 75 to 100 men. Labor was from \$1 50 to \$2 a day, and the cost of building was from \$50 to \$60 per ton, according to the completeness and quality of the outfit. Good schooners are built here, the port being an excellent place for this work, and two of the yards have each two large railways. The nearness to New York brings work from that city; but the principal part of the business is on large yachts, sail and steam, the harbor being crowded with these handsome vessels. The active business in repairing keeps the workmen together and enables the builders to take an occasional building contract at low figures, but bitter complaints were heard about compulsory pilotage at New York.

At Setauket, before the war, five or six large schooners and square-rigged vessels were launched yearly. They had oak and chestnut frames, oak planking, chestnut beams, and white-pine decks, houses, and spars. Originally the timber was cut near the town; afterward it was bought in Connecticut, but now it comes from the South. The price for oak is now \$30 per thousand feet; chestnut, \$20; southern pine, \$30. In 1870 the ship *Adorna*, of 1,460 tons, was built here for the cotton trade at a cost of \$110,000. Her floors and lower futtocks were of oak and chestnut, the cant frames and top timbers of live oak and locust, the transoms, apron, and knight-heads of live oak, the keel, stem, and stern, as also the planking, of white oak, and the keelson, ceiling, and beams of pitch-pine. The *Adorna* was a heavy vessel, but, being built full, was a good carrier. The owner was also a merchant, and made \$50,000 profit on one voyage. This decided him to build a big ship. She was to be 234 feet long on the keel, 250 feet over, 48 feet beam, and 31 feet deep in the hold, of about 2,700 tons register, a three-decker, and the largest sailer afloat. She was built of live oak, locust, white oak, and pine, the same as the *Adorna*; but after \$62,000 had been spent on her the owner failed. This vessel was sold to a coal company and cut down one deck, and was finished at Noank, Connecticut, as the steam-collier *Wilkesbarre*. This failure stopped the work at Setauket, and there was nothing doing in the census year.

Northport has been at times a busy place. A few years back a vessel of from 500 to 700 tons was built every season; sometimes two. A little repair work at 2 yards was all that was reported in the census year. There is a railway here for small vessels, and an unfinished schooner yacht had been standing a long time in the frame in 1880.

Huntingdon and one or two other small places on that coast do small jobs of building and repairing.

On the other side of Hell-Gate channel, at City island, New York, there are two large yards, with marine railways for building and repairing, which get much business from the coasting craft that throng the Sound. At one of them there were built in the census year two schooners of 156 and 212 tons, respectively, and a sloop of 14 tons, at a cost of \$35,000, or \$92 a ton, for the hulls and spars alone. Two barges of 500 and 700 tons respectively were built for \$22,500.

At Rye, on the same side of Hell-Gate channel, is an establishment for the building and repair of yachts, the owner of which has a loft and a numerous collection of valuable models. In the census year this shop produced the following boats: Sail-boat, 22 $\frac{3}{4}$ feet long, costing \$350; sail-boat, 22 $\frac{3}{4}$ feet, \$373; sail-boat, 22 feet, \$450; sail-boat, 25 feet, \$510; hull of a steam catamaran, \$600; yacht, 41 feet, \$2,550. Oak, white pine, and cedar, with some yellow pine, were used in these boats.

On the Hudson river the yards are all on the west shore. There has been a great deal of building on the east side in times gone by, but the railroad which runs at the river's edge has cut off the good sites and the water is generally too shallow for large vessels. Yonkers, Peekskill, and Poughkeepsie do boat-building only. The first place going up the river is Nyack, where many sloops are built, and river vessels go there in large numbers for repairs. Three sloops, of 130 tons each, were built in the census year.

At Newburgh there are two marine railways for repairing tugs, barges, and sloops. The firm which owns them has a yard for building iron yachts and ferry-boats. Four tugs of 274 tons and a ferry-boat of 414 tons were built in the census year.

Rondout is the river port of the Delaware and Hudson canal. There are ten yards on both sides of the canal engaged principally in canal-boat and barge work, but one owner has a yard with large shops for the repair of his own fleet of 30 towing steamboats. Oak and pitch-pine from the South and chestnut from the river are the timber used at Rondout; some oak from the river is also used. In the fitch, oak costs \$25 and \$30 per thousand; good plank, \$35 and \$40; best, \$60. Chestnut costs \$25; southern pine about \$30. Wages were from \$1 50 to \$2 50 per day.

Athens has long been the principal place for the building and repair of river vessels of the larger class on the Hudson. It is a little village on the western bank of the river, and has two large boat-yards, at which there is work for from 50 to 150 men. Several ice-barges, tugs, and steamboats are often drawn up on the bank at once for repair, and there are generally two or three new boats building at one time. In the census year the new work consisted of five screw tugs, a large ferry steamboat of 1,200 tons, and two ice-barges, at a total cost of \$185,000. The ice-barges are keel-boats, broad and full, sharp at both ends, with deck-houses nearly their entire length, and are run from the ice-houses, which line the river all the way to Albany, to the city of New York in the summer time. Each of the two above referred to was 130 feet long, 32 feet broad, and 10 feet deep in the hull, cost \$11,000, and consumed about 110,000 feet of oak, yellow pine, white pine, and chestnut. The prosperity of Athens is much retarded by the high cost of timber, frame oak costing \$40 per thousand feet, planking \$60, pitch-pine \$30, and white pine \$50. Wages are from \$1 50 to \$2 50 per day.

Malden, once an active building town, now does very little work.

The scarcity of timber along the Hudson is producing its inevitable result. When good oak plank costs \$60 a thousand feet and frame timber anything like \$40 the hulls of small vessels might as well be built of iron, as the small excess of first cost would be quickly compensated by the diminished cost of yearly repairs. The change from wood to iron is now rapidly going on on the Hudson, the new steamboats, tug-boats, and ferry-boats being frequently built of iron.

New York state has always taxed her tonnage the same as other property. In 1881, at the strong suggestion of prominent men, a law was passed by the legislature exempting all vessels of the state engaged in foreign trade from state and local taxation of all kinds, with the expectation that this would benefit the port of New York materially, and, while not helping to restore its old building industry, would, at any rate, encourage its shipping houses and aid in the establishment of ocean-steamship lines.

New York has the first and most important requisites for maritime development, her deep harbor, her railroads, and her river and canal connecting with the great lakes having made her the gateway through which flows the bulk of the foreign commerce of the United States, besides a vast coastwise trade. Two-thirds of the value of the whole foreign trade of the country passes through New York harbor, and of the 21,000 vessels which arrive at American seaports every year 8,000 enter at the port of New York alone. In all, about 7,000,000 tons of shipping engaged in the foreign trade come to this busy harbor annually, being just half of the total tonnage arriving on our coasts from foreign ports. About 800 vessels are constantly in port at New York, among them a great number of the largest steamers afloat. If but one-half of the commerce of New York were transacted in American vessels, the tonnage of our merchant marine would be double what it is now, and the United States would have a larger shipping interest than ever before in her history; and if the bulk of it were done in American vessels, as it used to be before 1855, the United States would have a larger fleet than Great Britain. But the facts of the case are that the bulk of the trade is now transacted in foreign vessels. Of the 7,000,000 tons of shipping in the foreign trade which come to the harbor annually only 1,500,000 tons are American. There is no expectation in New York of a revival of ship-building in the harbor itself, as wages and prices are too high, and the work would be done in country places.

NEW JERSEY.

New Jersey was originally stocked with a heavy growth of white-oak and hard-wood timber, with a valuable variety of yellow pine and a great deal of cedar on the sand barrens and swamps along the coast and on the lower part of the peninsula. The early population did little in vessel building except at Salem and Burlington, where river sloops and fishing boats were built. At the time of the Revolution the state had no ships and no foreign commerce of any account. Since 1815 there has been some building at various localities, and of late years a large repairing business has grown up in Jersey City, on New York harbor, and at Perth Amboy, below Staten island, where there is a coal depot. In the lower part of the state many streams exist large enough to float coasting vessels, and on some of these ship-building is quietly carried on with the aid of such timber as remains available. On the Atlantic front sail-boats for fishing and pleasure sailing are built, and on the Delaware river repairing and small building go on at two or three places. At Camden, the principal building center of the state, there is a considerable industry.

The Jersey City yards are 18 in number, and have 2 railways and 10 floating dry-docks for hauling out vessels. They get their business from the various classes of vessels which throng New York harbor. The small dry-docks and railways make a specialty of barge and canal-boat work, but the large ones handle sailing vessels, tugs, and steamboats. About 250 men are employed during ten months of the year, the number of vessels repaired ranging from 1,500 to 2,000. If the year is a good one, repairs are freely made, and all the yards are crowded with work; but if profits are small, the vessels economize and the yards are dull. Jersey City is an important auxiliary to the resources of New York harbor; one of the largest yards is owned by a ship-owner who repairs his own fleet of excursion and passenger steamboats. Wages and prices are the same as in New York, but proprietors all speak of the fact that foreign vessels, especially steamers, avoid having work done here. Business was better when the bulk of the tonnage in port was owned by Americans.

At Elizabethport there is one railway for the repair of coal-boats and schooners.

At Pamrapo there is a little yacht-building from time to time, but the total is small.

Perth Amboy has 3 busy yards and 2 railways. The work here is for the coal trade, and is mostly repairing. The companies have had barges built here ever since 1860 for sending coal up to the city and points accessible from the harbor. Originally built for capacity only, the newer barges have been designed as well for small resistance. The Lehigh Valley Company ordered six new barges in 1880, and one was building at Perth Amboy when the place was visited. This barge was perfectly flat on the floor amidships and square on the bilge, the floor being carried well forward and aft. The bow and stern were sharp, the stem perpendicular, and the counter overhung the water about 5 feet. This boat was 125 feet long, 28 feet broad, and $11\frac{1}{2}$ deep amidships, with $2\frac{3}{4}$ feet sheer, and on 9 feet draught would carry 700 tons of coal. The floor timbers were of yellow pine, in one piece each, the top timbers 8-inch oak, and the bilge was strengthened by a pitch-pine log 12 inches square, fitted into the angle and well bolted to the timbers. A binding and a standing strake, each 6 by 12 inches, were fitted close to the bilge log, while a shelf, 12 by 12, supported the beam ends; amidships the beams rested on strong stanchions, heeling on a pitch-pine keelson 12 by 24 inches square. A long bar of iron ran down by the side of each stanchion and was bolted to the beam above and the keelson below; a light ceiling covered the whole interior of the boat. The deck was laid flush fore and aft, and was furnished with bitts, cleats, and a house for the boatman and his family.

New Brunswick, on the Raritan river, once built largely for the coasting and a little for the foreign trade. Oak was originally abundant; but the wood is now scarce, and frame timber costs \$40 per thousand. Repairing is now the principal work.

In the region of Barnegat, Tuckerton, Greenbank, and West Creek there has been considerable building of coasting schooners for 40 or 50 years. Vessels of 400 tons have been built at Barnegat, and at Tuckerton one yard launched 17 vessels in all. About 300 men in Tuckerton once found a living in the different branches of this industry, but there has been no work done for several years, except upon small fishing boats, a dozen or twenty of the latter being built every year in door-yards by fishermen and half-professional builders. At Greenbank several large schooners, each carrying from 400 to 550 tons of coal, have been launched into the Mullica river, but there have been none launched since 1877. The timber used has been chiefly Jersey pine. It is resinous, though less so than Georgia pine, and is durable. The large main pieces of the frame, the stem, keel, and stern-post, and the outside planking were native white oak; all the rest of the vessel was Jersey pine. Thus built, Jersey schooners were good and lasting, and there are many in existence from 18 to 30 years old. They cost about \$50 and \$55 per register ton. Southern pine was used to some extent after the local timber grew scarce.

May's Landing, on the Great Egg Harbor river, lies buried in a pine wilderness, diversified with clumps of oak in the wet lands and on the river banks. Several hundred white-oak trees, from 12 to 30 inches in diameter, averaging 200 years old, grow in and about the village. Ship-building was once the life of this place. There were three yards, and from 2 to 5 vessels were launched every year, nearly all coasting schooners of from 200 to 750 tons actual burden. The work was done by contract for owners in New York, Philadelphia, Baltimore, and various parts of New Jersey. One vessel of 740 tons was named *The Twenty-one Friends*, from a peculiarity in her ownership. Two barkentines of 643 and 679 tons register respectively were built about six years ago, each for \$45,000. One builder has built about 35 vessels here and at Somers Point, 12 miles away; another 20 vessels. Nothing had been built for four years when the town was visited in the census year; but a center-board schooner, with 130 feet keel, 35 feet beam, and 12 feet hold, was then under way, with a frame 21 by 10 inches, spaced 26 inches, and was to cost \$25,000. The May's Landing yards have always built with Jersey pine in the frames, ceiling, keelson, deck beams, and decking; the planking and center pieces of the vessel only were of white oak. The pine is cheaper, costing only \$25 a thousand feet, sided and delivered in the yard, but it is usual to buy from the saw-mill, hewing the frames from the flitch with axes. The May's Landing vessels have been durable, but clumsy. The ceiling and planking are not fitted on with edges faying so closely as in the eastern yards, and daylight can be seen through the side of the vessel sometimes before it is calked. The cant frames are arranged after a fashion which went out of use in eastern yards a long while ago. The space just aft of the stem is filled in with fore-and-aft cants heeling on a perpendicular frame, and sometimes the second frame is set more than one frame space aft of the first and the interval is filled in with cants heeling on the second frame. There are few labor-saving appliances in the May's Landing yards, everything being of the cheapest and simplest character. Wages, however, are low—from \$1 25 to \$2 a day. Business is depressed here, notwithstanding the abundance of good and cheap timber; good carpenters are lacking, and the spirit of enterprise is dormant.

There is very little else doing, going down the coast, except the construction of fishing boats and yachts at Atlantic City. Building was once active at Somers Point, Port Republic, and Tuckahoe, but the decay of coal carrying in schooners has depressed the business; besides, timber is scarce. Since the railroads have been opened through the pine wilderness to Atlantic City forest fires have repeatedly swept away large tracts of timber, causing a destruction equal to that of the ax, and the places named have been left without the original mainstay of the industry, the only work now done being of an occasional and purely local character.

Mauricetown and Leesburg, on the Maurice river, both close together, are the only places of any activity in the southern part of the state, the prosperity of the village first named being dependent on building and navigation. There are 50 or 60 sea captains living in the place, and almost everybody owns shares in vessels; it is the same with Leesburg, Dennisville, Millville, and Dorchester, all near by. The majority of the vessels owned on the river are for fishing and oystering, but there are many large coasters and barkentines. The three-masted schooners *Harry B. Ritter*, 643 tons; *Thomas J. Lancaster*, 653 tons; and *Charles Platt*, 632 tons, each carrying nearly 1,000 tons of cargo, have all crossed the Atlantic with grain cargoes from Philadelphia. They make triangular voyages—grain to Liverpool, coal to Cuba, and sugar to the United States. These vessels carry square canvas forward, and are really barkentines. The building on this river has been active for 50 years, the calculation being to launch a schooner or a barkentine from the yard at each of the several villages above named every year. Two schooners were under way in the census year. The wood used was formerly native pine and oak; but the home supply is now nearly exhausted, and the accessible large trees are gone. The frames, knees, and planking are wrought out from white oak; the rest of the vessel is yellow pine; and the outfit and top gear are usually bought in Philadelphia. The cost of building here is about \$52 or \$55 a ton. The builders claimed that the cost could be kept down to \$45, but with a good outfit \$55 was the standard cost. Small schooners of 60 tons and under cost as high as \$150 per register ton. Wages are from \$1 50 to \$2 a day. Dorchester is the principal place for repairing river vessels, and two railways, worked by hand or by horse-power, exist there. The nearness of this river to the southern timber supply and the vicinity of the iron regions, with Philadelphia near at hand to provide outfits, are points of advantage for builders.

At Port Norris and Salem there are small railways for the repair of fishing vessels.

There is a good deal of small building here and there on the Delaware river, but it does not take the form of an active industry except at Camden. Its public importance consists entirely in its being a field in which ship-carpenters can be recruited in an emergency.

Camden has five large ship-yards, employing 300 men and a capital of \$500,000, one being used for the construction of iron vessels. There is a large floating dry-dock, capable of taking out of water the largest steamers in the trade of Philadelphia, across the river, which is engaged mainly in repairing. The other yards chiefly thrive by the same branch of industry, but two have large marine railways, where calking, painting, coppering, carpentry, and blacksmith work are done. The large repair business gives them great advantages for the building of new vessels, as they have a force of skilled men employed and a complete equipment of labor-saving machinery. An occasional contract to build enables them to keep the men busy, and they can employ men for lower wages than they would have to pay if work were irregular. Large schooners of southern oak and yellow pine are built here nearly every year at from \$52 to \$55 per ton. The wages of the best men were \$2 75 a day on new and \$3 on old work. The building of the census year was 3 propellers, aggregating 457 tons; 1 schooner of 673 tons, and a sloop of 6 tons, valued in all at \$80,000. The new iron vessels were 4 tugs, aggregating 382 tons, and worth \$76,000. The yards of Camden all handle large vessels, and are of great value to the shipping interests of the river; but it is the testimony of all the yards that work is less active now than it was 25 years ago. The river was formerly thronged with coal schooners and American sailing vessels, but steam colliers have nearly superseded schooners, while the large sailing ships have been driven off by coasting and foreign steamers. The change is detrimental to Camden. The finest facilities in New Jersey for building wooden vessels exist in this town, as the yards have steam saws, bolt-cutters, derricks, and all the large and small tools which have been invented; but their proximity to a large city leaves little or no profit in building, wages and taxes being too high. Philadelphia is full of large lumber yards, but the timber for a ship cannot be bought sufficiently low to compensate for high wages and taxes.

PENNSYLVANIA.

Pennsylvania had a great wealth of forest growth at the time of its settlement, and one of the masts of the first European vessel that ascended the Delaware river caught in the branch of a tree standing on the shore where Philadelphia was subsequently founded. Oak and pine grew in profusion from the edge of the river to a vast distance inland. The early population were traders, and after they had fairly embarked in commercial enterprise their progress was rapid. Eighty-five vessels cleared from Philadelphia in 1723, 171 in 1730, 212 in 1735, and from 1749 to 1752 over 400 a year. Some of these were ships from the parent country, some were from the West Indies, and some belonged in New England, but a large proportion were of local build and ownership. It will be recollected that in 1730 the British West India islands asked that the continental colonies be required to buy West India produce from them alone. The request was resisted by Philadelphia, and the colony threatened to retaliate by developing her manufacturing interests at the expense of England, and the movement was beaten for the time. The imports in 1730 were £48,592, the exports £57,500. In 1763 and 1764 Mr. Grenville convened the colonial agents in London and explained his plan for drawing a revenue from America. His taxes promised to stop all trading with the French and Spanish colonies. The trade was even then unlawful, but it had been connived at, as it provided the continental population with gold and silver for their remittances to England. This time the plan to concentrate the trade in the ports of the British islands could not be defeated, and by making the officers of naval vessels officers of the customs nearly the whole colonial trade with the French and Spanish colonies was destroyed. This bore hard on Philadelphia, and the province was soon drained of specie, for in 1764 her imports were £700,000 and her exports only £300,000. Philadelphia did not submit quietly, but, like the other colonies, built fast vessels and evaded the English regulations when she could, and the commerce of the port grew to be so large that in 1773 a total of 426 square-rigged vessels and 370 sloops and schooners entered and cleared. Pennsylvania vessels carried grain, flour, flaxseed, timber, iron, pork, and beef to the West Indies, Portugal, Spain, and the Mediterranean, and were often sold abroad with their cargoes; they were cheaper than those of European build, and, owing to their having been built for a half-smuggling business, were fast and good vessels. Philadelphia was known long before the Revolution for what Gordon calls the "noble manufacture of ships".

During and after the Revolution ship-building was extensively carried on, and it is known that the city produced the finest craft in the New World; certainly many famous war vessels and large trading ships were built. After the war of 1812 building was again active. Philadelphia had a large East India trade, and was noted for her smart captains and big vessels. Her ship-yards were numerous, and the talent employed in them was good; but the business of the port declined after the Erie canal had given New York an impetus, and during the packet and clipper-ship periods the production of tonnage fell behind that of New York, although many excellent vessels were built. Since 1865 it has steadily declined so far as wooden sailing vessels are concerned, wages and all the cost of carrying on a ship-yard having risen too high. A schooner is occasionally built, but it costs \$55 and \$60 a ton, although oak is only \$27 in the fitch delivered, and captains can do better by going to Maine. The tonnage of

the river has gradually been converted into steam vessels, and, so far as new work is concerned, the yards have been devoting their attention for 20 years chiefly to tugs, steamboats, and coasting propellers. There are two great establishments in the city, with enormous capital, building iron vessels.

At Philadelphia facilities for repair work are good, and there are six yards devoted chiefly to this business. One firm has a fixed dry-dock capable of admitting the largest ocean steamer in the port and of taking in two of the smaller class at once, and the repair of iron vessels is made a specialty; another has two large railways, operated by a steam windlass, for steamboats and sailing vessels, the yard being equipped in the most modern manner. Another firm has a large floating sectional dry-dock, built in place of the old railway which was started in 1828; 49 vessels were coppered there in the census year. The yards all complain of a decline of repair work, owing to the change in the tonnage of the port from sail to steam and from wood to iron. The one thing which has affected the business most has been the construction of the Reading railroad iron steam colliers. The company used to give cargoes to several hundred coasting schooners yearly, but began in 1869 to buy vessels. The following iron steam propellers were built, at a total cost of \$2,656,510:

Years.	Names.	Register tonnage.	Number of voyages up to May 11, 1881.	Tons of coal at a cargo.	Cost of vessels.
1860.....	Rattlesnake.....	417	389	500	\$71,925
1870.....	Centipede.....	436	402	500	71,925
1870.....	Achilles.....	763	326	1,000	115,120
1870.....	Hercules.....	764	328	1,000	114,430
1870.....	Leopard.....	609	242	800	105,125
1870.....	Panther.....	609	338	800	104,925
1873.....	Reading.....	1,283	218	1,650	283,570
1874.....	Harrisburg.....	1,283	241	1,650	283,570
1874.....	Lancaster.....	1,283	207	1,650	283,570
1874.....	Perkiomen.....	1,035	235	1,200	224,600
1874.....	Berks.....	553	236	600	146,930
1874.....	Williamsport.....	1,283	207	1,650	283,570
1874.....	Allentown.....	1,283	216	1,650	283,570
1874.....	Pottsville.....	1,283	197	1,650	283,570

Each vessel makes from 30 to 35 trips a year. The fleet will now deliver to points along the Atlantic coast from 450,000 to 500,000 tons of coal yearly; they run mainly to Boston and nearer points this side, but often go as far as Portland, Maine. This traffic would employ from 150 to 250 schooners steadily. The public has been benefited by the reduction in the cost of freights, but the ship-yards of the Delaware have lost by it, as the schooners used to have a great deal of repair work done. Another cause of the decline of business is the care taken by foreign vessels to avoid every possible dollar of expense in an American port.

One branch of the business which is quite active yet in Philadelphia is the fitting out of vessels; nearly all the hulls built on streams flowing into Delaware bay are sent up to the city in tow of a tug and receive their masts and spars, sails, rigging, spar iron work, anchors, and chains there. Some are fitted out at the yards, but the outfits are bought in the city, several prosperous firms living by this outfitting business.

Chester is the only other building town in Pennsylvania. The work there is exclusively on iron vessels.

At Marcus Hook there is a small railway for painting and repairing fishing craft and small vessels.

As a state, Pennsylvania is devoting substantially its whole attention to the building of iron vessels, and a revival of the old wooden-ship industry is not now looked for.

DELAWARE.

There are many good points for building on the Delaware river and along the streams that flow through the lower part of the state. The supply of oak is large, and the quality of the wood is the best, Delaware white oak having long been regarded as the finest, toughest, and most durable on the whole Atlantic coast. Growing on lands never too dry and generally full of swamps, and near enough to the ocean to get the benefit of the salt air, the timber reached perfection. For the last fifty years at least its cost has been less in Delaware by from \$6 to \$10 a thousand than when delivered in New England, the freight alone by coasting vessel having been \$5 and \$6 per thousand feet. Labor-saving machinery has not been introduced, except at Wilmington, and all the ship-yard work in the lower part of the state is done in the old-fashioned way, by hand-power, requiring the expenditure of several hundred days more of manual labor in making the vessel than where machinery is fully used. Building has been restricted also by sand-bars at the mouths of streams; on some of the rivers a great industry could be developed if the channels were deepened so that vessels drawing 10 or 12 feet of water could float out to sea.

Wilmington has four large yards, two of them engaged exclusively in iron work. The other two build wooden boats, schooners, barges, tugs, and steamboats. One yard has two marine railways, the other one a railway for the

repair of coasters. There is also one dry-dock. Wilmington vessels have been prized for their speed and durability. The bark Sarah S. Ridgeway, of 869 tons, built in 1877, once ran from Rio to New York, laden with coffee, in 26 days 14 hours, her time beating by two days that of two steamers which sailed with her. Wilmington orders come chiefly from Philadelphia, and wages are \$2 and \$2 50 per day. The present industry of the city in the way of building will be described in the chapter on iron vessels.

At Bethel, in Sussex county, there is a small marine railway for repair work.

At Milford, on the Mispillion river, there are four yards, all in active operation. One firm has built about one vessel a year, or 25 in all. They began with a river schooner of about 50 tons, 50 feet keel, 22 feet beam, and 5 feet deep, which traded to Philadelphia, but of late years they have built schooners of 200, 500, 600, and even 1,000 tons actual burden, the three-masted schooner Annie Miller, lately built, carrying 1,000 tons of coal. Originally vessels were mainly built of oak, deck frames and all. In the census year a schooner was nearly finished measuring 130 feet on the keel, 33 feet beam, and 11½ feet hold, with center-board, flat on the floor, but with sharp bow and run; frames sided 15 inches and molded 12 inches over the keel, tapering to 10 by 7 at the plank-sheer; room and space, 22 inches; transoms, 12 inches; keelson, 27 by 14 inches; sister keelsons, 15 by 9 inches; keel, 14 by 18 inches; center-board, 20 feet long; ceiling, 3½ inches on the floor and 6 on the bilge; outside planking, 3½ inches; water-ways, 9½ by 5 inches; deck-beams, 12 by 10 inches in the center; carlines, 9 by 6 inches; decking, 3 inches. The schooner is of oak throughout, except the deck frame, ceiling, water-ways, and stanchions. The decking and houses are of white pine. At another yard a barkentine (two-decker) finished in the census year was 140 feet on the keel, 35 feet beam, 16½ feet deep in the hold, the between-deck space being 5½ feet. Another firm began here about 12 years ago and built one coasting schooner of about 450 tons burden every year, but lately have launched about three a year. This firm build on contract for owners in the state and along the Delaware river chiefly. Their three-masted schooner, the Governor Hall, of 1,000 tons burden, was 130 feet on the keel, 34 feet beam, and 16¾ feet deep in the hold, the between-decks being 6 feet; frame, oak, 12 by 16 inches; room and space, 23 inches; keelson, oak, 28 by 15 inches; sister keelsons, 15 by 8 inches; center-board, 7-inch oak and 22 feet long; center-board keelson, 22 by 14 inches; clamps, 5-inch pitch-pine; bilge ceiling, 5-inch oak; lower deck and deck frame, pitch-pine; upper deck, 3-inch white pine; outside planking, 3½-inch oak; wales, 5 inches; knees of oak roots. The fourth was also building in the census year. The four yards build from three to six vessels a year. They get their oak from the saw-mills of the surrounding country, paying from \$18 to \$22 a thousand for fitch delivered in the yard. Oak planking costs about \$33 a thousand, the price in Philadelphia being \$45, as in the eastern yards; pitch-pine, \$28. The frames are all hewn by hand from the fitch, and, while a derrick is sometimes used to set them up, the carrying of the beams and timbers is generally on the shoulders of the men. Labor ranges from \$1 25 to \$1 75 a day, but sometimes \$2 is paid for the best men. The carpenters are usually white men, but a few colored men have been trained to ship-yard work and make very fair mechanics. The cost of building varies from \$50 to \$55 per register ton for first-class vessels, the smaller ones costing from \$70 to \$100 per ton, according to the way in which they are fitted out. One firm had been offered twenty-four contracts, which they could not take owing to lack of facilities and of carpenters. The narrowness of the river here was once an embarrassment in launching vessels of any size, but this has been overcome by planting the ways so as to launch down-stream and by sapping away the opposite bank. The yard owners were all anxious for the removal of the sand-bar at the mouth of the river.

At Milton, 12 miles away, vessels have been built for 50 years or more. There are oak forests all around, and half the face of the country seems to be under timber. Originally the curved pieces of the frames were cut from trunks having a natural crook, and when none except straight oak trees were left it was thought that ship-building would be seriously embarrassed. However, it was found that good frames could be cut from straight-grained timber, and the industry has thrived in a quiet way at this woodland village down to the present time. There are now three yards at Milton. In the census year 4 schooners were built, aggregating 1,362 tons, costing \$79,700, an average of \$59 a ton; but larger vessels were built for \$50 per register ton.

The yards at Milford are of the most primitive description, a shop to keep the tools in, the hand-tools themselves, and a steam-box comprising the outfit in each case. A builder hires about 15 men when he has a vessel under way, or just enough to handle the heavy timbers, beams, and plank, and when a large stick is to be placed in position or a plank brought from the steam-box all hands are called off. Building is accordingly a slow process, as each yard can only finish about one large schooner yearly. Although slow in building, both the Milton and the Milford vessels rank well with insurance companies. The length of time they stand on the stocks exposed to wind and weather is an advantage, as the timber becomes thoroughly seasoned; and they all are salted above light-water mark, and are good for 20 or 30 years. Originally the Milton vessels were entirely of oak; they are still mainly of oak, but yellow pine is used in the deck frames and clamps, and perhaps in the keelsons. The knees are all from oak roots or branches. Oak in the fitch, hauled in from local saw-mills, is \$18 and \$20 a thousand feet; oak plank, \$28 and \$30; yellow pine, \$29; white-pine decking, from \$35 to \$37. Oak is so plentiful, that here, as elsewhere in Delaware, fine trees stand even in the ship-yards and cast their shade over the men at their work. Labor costs from 75 cents to \$1 50 a day. Many colored men are employed, and they take to the trade willingly and make fair mechanics. Milton and Milford vessels both are generally sent up to Philadelphia by tug to receive their sails, rigging, and outfit.

Frederica, Delaware, does some building, and Seaford used to do some; but at the latter place nothing is now done. Seaford is situated on the banks of the Nanticoke, a fine stream, penetrating dense forests, but a few bad years in coasting caused people to invest their money in other property. A bar at the mouth of the river has also been a source of injury to the business. A little repairing of small sailing vessels is all that is left to Seaford.

A Delaware schooner of 600 tons requires 190,000 feet of oak, 100,000 feet of yellow pine, 35,000 feet of white pine, and 30 tons of iron for fastenings, castings, spar work, etc., and in the purchase of the timber a saving of from \$3,500 to \$4,000 could be made over what the Maine men, for instance, have to pay. Wages are lower than in Maine, for a great deal of colored labor can be utilized. The state is close by the greatest iron-producing region of the country, and iron can be bought to advantage. Outfits can also be bought at a lower cost than in the east. With a proper equipment, such as derricks, steam-saws, etc., vessels could be built in Delaware, to class A 1, with a red star in Lloyds for 11 years, at \$45 a ton.

MARYLAND.

Chesapeake bay has been known from the earliest times for the speed and beauty of its vessels. The peculiar form and rig of the fishing craft of this region have already been described. The rakish air of the boats has also been shared by the larger vessels of the bay. The schooner rig was popularized at an early day, and schooners and brigs were the principal trading vessels until long after the Revolution, though there was occasionally a larger vessel employed. Chesapeake bay vessels engaged in the trade to the West Indies, the same as did all the others of the continent, and were also built largely for the slave trade, both employments calling for speed and a handy rig. In its origin the slave trade was regarded as a proper mode of obtaining workmen for the West Indies and the continent of America, and was carried on mainly by the British, French, and Portuguese. In 1761 the British had 28 vessels (3,475 tons) in the trade, and in 1776 they had 192, measuring 22,296 tons. By a return to parliament in 1789 it appears that 38,000 slaves were carried annually in British vessels to America and its islands, 20,000 in French, 10,000 in Portuguese, 4,000 in Dutch, and 2,000 in Danish vessels, about 74,000 in all. Slaves cost from £8 to £22 in Africa, and sold for from £28 to £35 in the West Indies. It was a profitable business, and appears to have been engaged in to some extent by American vessels built on the Chesapeake and in New England. Those of the Chesapeake were the swiftest, and were all brigs and schooners. They were generally built especially for the trade, and were sold in the West Indies and elsewhere to those who carried on the business. The between-deck space of 5½ or 6 feet was divided by bulkheads into rooms for the men, women, and boys, respectively, and in a large brig there was room for 600 people. The hold was about 10 feet deep, and carried from 30,000 to 40,000 gallons of water, stores for a cruise of about 100 days, and the ballast. The schooners and brigs of the Chesapeake, both merchantmen and slavers, were broad of beam before the center and above the water-line and sharp on the floor, often having about 20° of dead rise. The bow was sharp and flaring above the water, the front of the fore-castle deck being often as round as the section of an apple. The hulls were lean aft, and thus sailed with considerable drag. They were long in proportion to breadth, had low bulwarks, looked low in the water, and carried raking masts, in order to bring the effort of the sails farther aft, where the lateral resistance of the vessel in the water was located. The topmasts were so slender that they sometimes bent to the wind like whips; a circumstance thought favorable to speed. These vessels were able to carry a heavy press of canvas, would go into the wind remarkably fast, were smart and handy, and had a world-wide fame. Cheap, good, and abundant timber made Chesapeake bay an active ship-building region even before the revolutionary war, and after the independence the shipwrights of Baltimore were among the first to petition Congress for legislation in behalf of the maritime interests of the country. The legislation that followed was a great benefit to Baltimore, and made her one of the principal ship-yard centers of the continent.

The history of the industry in Baltimore is about the same as that of the other large commercial ports, except that her tonnage was chiefly in fore-and-aft-rigged vessels and she would build 125 schooners in a year to 20 ships and brigs. The fisheries and local trading of the bay called for the production of large numbers of small schooners; and the same style of vessel was employed in coasting and in the large trade to the West Indies which sprang up in course of time. In the busy years after 1840 there were as many as 15 ship-yards in south Baltimore and elsewhere in the harbor actively engaged in building schooners, brigs, clipper ships, and steamboats. Some of the old builders, still living, remember the time when from 20 to 25 vessels were on the stocks at once and everybody was making money, and the industry was growing so fast that in the large yards there were anywhere from 15 to 20 apprentices at a time learning the trade. The clipper ships of Baltimore had many of the peculiarities of the schooners. They were as sharp on the floor, sailed with a drag, had flaring bows and raking masts, and were noted for their quick voyages, but carried high bulwarks to keep the ship dry. The extreme vessels ceased to be built after the California excitement was over, as their tendency to sag at the ends and get out of shape operated against them; but improvements were made in the model, and some of the best vessels in America were then launched from the Baltimore yards. The Cyane, a clipper bark built in Baltimore 35 years ago, is to-day a strong and good vessel. She is 132 feet long over all, 24 feet beam, and 12½ feet hold, having one deck, but with a second and open tier of beams to strengthen her. The bulwarks are 5½ feet high. She requires ballast when empty, being so sharp as to be top heavy; but when loaded to her draught of 13 or 14 feet she is a good carrier, easy at sea,

and a fast sailer. The war of 1861, with the changes which took place in that period in favor of steam vessels and the strikes and high wages, put a virtual end to ship-building in Baltimore, few merchant vessels, other than side-wheel steamboats and propeller tugs, having been built since that time.

The principal business of Baltimore now is the repairing and outfitting of vessels, and the city is to Chesapeake bay what Philadelphia is to the Delaware river and bay and Boston is to Cape Ann. Sails and outfits are supplied by a few large firms, which operate on an extensive scale and are able to buy cheap and to undersell all their competitors on the bay. There are 17 ship-yards in the city, with 19 railways and 3 floating dry-docks. One yard, near the fort, is devoted to the building and repair of iron vessels, and has a full outfit of machine, boiler, and other shops, besides a large fixed dry-dock built of masonry. The length from the groove of the outer gate to the head of the dock is 470 feet; from the inner gate, 450 feet; greatest width on top, 113 feet; width on bottom, 45 feet; depth, 26 feet, leaving, with the blocks, 23 feet for a vessel. The dock is elliptical in plan, the sides descending in steps. Over 8,000 piles were driven to support the sides, in which about 2,000,000 feet of lumber were used. The width at the entrance is 123 feet; at the gate 83 feet. The gate is a caisson built like the hull of a vessel, to displace water enough to sustain its weight. It has two decks, the lower one for the machinery. The pumps are operated by steam on shore, and can empty the dock in two hours. Congress ceded the land for this structure on condition that government vessels should be docked free of charge. The other docks and railways of the city are large enough to accommodate wooden ships of the largest class. A large number of the smaller vessels of the Chesapeake are owned by colored men, and in order to secure prompt and inexpensive repairs of their vessels they organized a stock company a few years ago with a capital of \$40,000 and established a yard with two marine railways. Originally there were 300 stockholders in this enterprise, but the number has been reduced to about 150. The yard employs 70 men, nearly all of them negroes, and pays them the current rate of wages in the city. They haul out about 460 vessels a year. The shipwrights of the port have formed an association, with rules, which bring a great deal of work on foreign vessels to them. The Italian, Norwegian, and British grain ships avoid expense where they can, and used to go upon the railways, paying hauling fees only, and doing as much as possible of the calking, painting, etc., themselves; but the association requires that the repair work shall be done by the yard hauling out the vessel, so that the system in vogue in New York of running a dry-dock merely for the hauling fees does not prevail here. These rules have, however, driven a great deal of the work on the bay vessels from this port to the country railways scattered along the bay. The fees for hauling in Baltimore were as follows: Side-wheel steamers, 15 cents per register ton, or $7\frac{1}{2}$ cents a ton a day for 5 days, and 5 cents a ton a day thereafter; propellers of 800 tons and over, the same; of from 600 to 800 tons, 12 cents a ton, or 6 cents a ton a day for 5 days, and 5 cents a ton a day thereafter; tugs under 100 tons, \$10, or \$6 a day for 5 days, and \$5 a day thereafter; from 100 to 150 tons, \$15, or \$8 a day; sailing vessels of 800 tons and over, 15 cents a ton, or $7\frac{1}{2}$ cents a ton a day for 5 days, and 5 cents a ton a day thereafter; from 600 to 800 tons, 12 cents, or 6 cents a ton a day for 5 days, and 5 cents a ton a day thereafter; from 100 to 600 tons, 10 cents a ton, or 5 cents a ton a day; from 50 to 100 tons, \$10, or \$6 a day; from 25 to 50 tons, \$8, or \$5 a day; under 25 tons, \$6, or \$4 a day; scows of over 100 tons, 10 cents a ton, or 5 cents a ton a day; under 100 tons, \$10, or \$6 a day.

Builders also charge a regular commission on the labor bills and materials used. There are no spar-yards here, each yard making its own spars, nor is there any machine for punching the nail holes in sheathing metal, the work being all done by hand. A punching machine was once tried, but the workmen objected to its use. Wages were \$2 50 and \$2 75 a day. The timber used has always been Maryland and Virginia oak and pitch-pine and Pennsylvania white pine until late years, when Georgia pine has been imported, on account of having more heart and less sap-wood. Spruce spars come from West Virginia. Oak has always been cheap; but it used to range from \$15 to \$20 per thousand feet, though by watching for chances the yards at times have got it as low as \$5. Oak in the fitch now costs \$25, and planking and heavy pieces, for keelsons, \$45. Georgia pine is \$35 per thousand feet. One firm in Baltimore ceils ships for grain and fits them for cattle transportation, using about 4,500,000 feet of white and yellow pine yearly.

Hayre de Grace has a marine railway and ship-yard. Scow schooners for duck shooting and coal barges are the principal new work, but the repairing of coal-boats and schooners is the main support of the yard. There was on the stocks in the census year a barge 170 feet long, 21 feet beam, and 13 feet deep, with 4 feet sheer. The floor was flat, the bilge square, the sides slightly flaring, the bow and stern sharp, stem straight, and the stern broad on deck and overhanging. The whole boat was built of oak, 140,000 feet being required. The frames were 98 in number; the top timbers 6 by 8 inches; side planking, 3 inches; ceiling of sides, 5 inches; bottom plank, 4 inches; ceiling of floor, 2 inches, and about 400 bushels of salt were used above light-water mark. Carpenters were hard to get.

At Annapolis, on the bay below Baltimore, there is a small marine railway, and a small fishing boat is occasionally built.

At Cambridge, on the eastern shore of the bay, there are 3 yards, including 2 railways, and a little community of sail-makers, riggers, and blacksmiths. The moving spirit of this town is one of William H. Webb's apprentices, a builder of long and varied experience, who has plied his art both on the Atlantic and Pacific coasts and in China. Several coal barges for the Lehigh Valley Company were built here of the same model as those at Perth Amboy. The building at Cambridge has been confined to sloops and schooners for the bay and tugs and barges;

but the place is favorably situated for an extensive business, as it is in a county which is clothed with fine oak and pine timber down to the coast and on the islands of the coast. Although this region has furnished frames for the New England ship-yards for fifty years, and although large quantities of planking and oak of all sizes for the construction of wharves, houses, etc., are exported annually, yet many tracts of first-growth oak and pine remain untouched. When Cambridge was visited a tract was passed at Airey's station, a few miles from the town, through which were strewn the frame timbers for a large vessel, hewn to the proper shapes and lying on the ground, ready for shipment to some New England yard. Probably building can be carried on to the best advantage here when the builder is also the owner of his own timber. His oak frames would not cost him over \$15 per thousand feet; when bought from the saw-mills in the fitch the cost was only \$25 per thousand, or \$10 less than in New England. Three small schooners and a tug were built in the census year. Wages were from \$1 25 to \$2 a day, a few men getting \$2 50.

At Pocomoke City there are 2 yards, which produce a few bay and river vessels of small size every year. In the census year these yards built 4 schooners, registering 162 tons, and costing \$16,500. Much repair work is done. Wages range from \$1 to \$2 per day, the average being less than \$2. There were no labor-saving appliances in the yards, but one yard was run in conjunction with a saw-mill. This county is heavily wooded with oak and pine, and the saw-mill was paying not to exceed \$10 per thousand for large oak trees in the round, delivered in the yard, the cost for sawing being about \$2 50 per thousand. A great deal of the heavy timber around here has been cut off and exported from the bay. South of Pocomoke there have been camps for several years employed in cutting timber for the ship-builders of Maine, their operations being now carried on nearer Accomack, and some of the forests have been culled for everything above 12 inches in diameter; still, much heavy timber remains in other places, and there is an abundance for a local ship-building industry. In the fitch oak is sold at Pocomoke for \$22 and less per thousand.

Crisfield is also a building town. The work here has already been referred to in the chapter on fishing vessels.

Solomon's island, on the Patuxent river, has two yards and two railways. The fishing industry supports this place. Bug-eyes and pungies are the vessels built.

At several places on the bay, notably at Oxford, Saint Michael's, Broad Creek, Sharptown, Whitehaven, and Salisbury, there is a good deal of repairing of vessels at small railways.

What makes a ship is principally wood, iron, and men's labor. Large schooners, barks, and ships each consume from 280,000 feet of lumber, 18 tons of iron, and 4,300 days of labor, to 960,000 feet of lumber, 120 tons of iron, and 9,000 to 14,000 days of labor, according as steam saws, derricks, and other labor-saving appliances are used in the yard or not. If Maryland were to become an active ship-building state, it is probable that the cost of labor would rise to the scale paid in Maine; but in the purchase of oak and pitch-pine her builders would enjoy an advantage of from \$10 to \$15 a thousand feet for oak and about \$3 to \$5 a thousand for pine. With labor-saving machinery they could build the cheapest wooden vessels on the Atlantic coast.

VIRGINIA.

The ship-building of this state began in 1622. The home company, at great trouble and expense, sent out Captain Thomas Barwick with 25 carpenters in order to build the pinnaces, shallops, and large vessels needed for trade and transportation in the new province, and on their arrival they began to build small sail-boats for the river and bay trade. The magnificent extent and the excellence of the timber were noted in all reports on the colony's resources. Oak and pitch-pine covered the face of the country; but the population never took much interest in ship-building, as there were other occupations that paid them better, the best industry being agriculture, to which they devoted their whole attention, leaving to the inhabitants of the rugged and poor soils of New England the construction and management of ships. A number of small vessels and boats were made, but seldom in the whole history of the colony and state down to the present time has more than 2,000 tons of shipping been built in any one year. The town in which the industry has principally flourished is Norfolk, and from 1840 to 1855 barks and ships were occasionally built there for the West India and the Brazilian trade for local shareholders. In 1853-54, at the Norfolk yards, 10 vessels were launched, registering a total of 3,600 tons; but since 1855 there has been no building of large vessels, except a few steamboats.

At Alexandria there are two ship-yards, with a marine railway. The principal concern, started in 1874, had built two large three-masted schooners and one tug and repaired a large number of Potomac river vessels when the yard was visited in the census year. Schooners cost \$50 per ton. Vessels have been built here occasionally from the earliest days, and there was a public ship-yard during the Revolution for the construction of government vessels. Alexandria enjoys some advantages with reference to timber, and is a convenient point for the repairing of steamboats and sailing craft plying to and from Washington. A new yard has been started within two years, and is now building its second vessel. Squared oak costs from \$20 to \$22 a thousand at the yard, pitch-pine \$23 and \$25; but in the log oak can be delivered for about \$15 a thousand for what can be squared out of it. The yard has a complete outfit of steam saws, and does its own squaring of the timber. A boat of a style peculiar to Chesapeake bay and the Potomac river was building here in 1881. It was a "long-boat"—an undecked center-board schooner with two fore-and-aft sails and a large jib—many of these vessels being employed in carrying cord-wood to Washington. A

few years ago, owing to a scarcity of wood for fuel, the "long-boats" had a profitable season or two, and as a consequence many were built. These boats are shallow, flat on the floor, have round sides, straight bodies, and sharp bow, with quarter decks and cabins aft, draw only 18 inches of water light and 3 feet loaded, and will carry from 60 to 80 cords of wood each. A long-boat lying at the wharf at Alexandria measured 77 feet in length from stem to stern, 14½ feet beam, and 2-7/12 feet in depth of hold below the gunwale. The frames were single, 5 by 3 inches, and extended from gunwale to gunwale. They were bent at the bilge, the ends being sawed in two longitudinally, to enable them to bend without breaking. The new boat was larger, and the frames were double. This boat was 82 feet over all, 77 feet keel, 23 feet beam, and 3½ feet deep in the hold. The double frames were sided 7 inches and molded 6. In each one floor extended from bilge to bilge, having one curved top timber at either end, the other half of the frame being composed of one short floor, with a futtock to turn the bilge and a top timber. Room and space, 21 inches; keel, 15 by 6 inches, laid flat, narrowing to 7 by 6 inches at stem and stern; center-board keelson, 15 by 10 inches; center-board, 20 feet long; side keelsons, 7 by 7 inches; one bilge strake, 5 inches, with a clamp under the beams; no ceiling. The planking was of 2-inch oak, and the beams were spaced about 4 feet apart to support the sides. A washboard extended the whole length, with a short deck forward for working the jib and a small one aft for the helmsman, the latter surrounding the cabin. The vessel was all open amidships. These boats are loaded by laying the cord-wood fore and aft on the frames until the hold is full, and the gunwales are then piled with sticks laid transversely. The space within is then filled up with sticks, laid athwartships as high as convenient. They are fit only for river use, being too flimsy for rough water. Preparations are making in Alexandria for the cheap manufacture of rolled iron by a new process, with a view to iron-ship building; but so far the company has only been making blooms, not having put in the necessary machinery for rolling iron. Confidence is felt in the experiment, and an iron-ship yard is the ultimate object in view. Few places have better advantages than Alexandria for the manufacture of iron ships in materials, climate, labor, and cheap transportation.

Going down the Potomac and the Chesapeake one passes headlands, rivers, and bays in profusion which seem to have been qualified by nature for ship-building. The water is deep, and the shore is covered with oak and pine, and in spite of more than half a century of cutting there is a great deal of large timber left. Tracts can be bought where the stumpage, as it is called, does not exceed \$1 a thousand feet; that is, the trees standing in the woods will sell for what can be squared out of them at the rate of \$1 a thousand. There is no building in these beautiful bays of the Virginia coast, however, other than canoes and small fishing and trading schooners, the work being on canoes principally. There are few regular builders, except at Pocason, Back Bay, and Hampton.

At Norfolk there are four yards, and, in addition, two or three in which something is occasionally built. In all, the yards have five marine railways for repairing, one of them sectional. The latter will hold two vessels at once, one of which can be launched without disturbing the other. Ship work here was originally on small vessels, but in the years of general maritime excitement the city ventured into full-rigged ships, four ships of a total of 2,900 tons register being built in 1853-'54, as well as a number of brigs and schooners. The yellow fever broke out in 1855, destroying this prosperity completely. There has been some small building since in different years, but the vessels have not exceeded 300 tons register, except the Rockaway, a steamboat of 1,950 tons, 275 feet long on the keel, 293 feet on deck, 38 feet wide in the hull, 66 feet over all, 11½ feet deep, drawing 6 feet of water, which was built in 1876, and was calculated to make 20 miles an hour. The empty hull was sent off to New York in the spring of 1877 to receive her machinery, but she broke adrift in a storm, went ashore, and was dashed to pieces. The work of the city is now chiefly on tugs, barges, canal-boats, river steamers, and the large fleet of small produce schooners employed in this locality, and consists principally of repair work. The builders say that the presence of the navy-yard has the effect to keep up prices and wages, which is detrimental to the private yards. Wages were from \$2 to \$3 a day in the census year; laborers got \$1 50; the average was about 50 cents a day higher than in Maryland and Delaware. Oak was \$22 50 a thousand in the fitch, \$30 for short plank, \$40 for long plank; pitch-pine about \$28, the price varying from \$20 for short stuff to \$40 for the finest, the fair average of a cargo being \$28 a thousand. Black gum (*Nyssa multiflora*) has been much used here for keels, on account of the great lengths obtainable, its tenacity, and strength. The worms are thought to bite it quicker than oak, but by coppering this can be prevented. In 70- and 80-foot lengths gum costs \$25 a thousand; in short lengths from \$15 to \$18. Vessels have been planked with gum at Norfolk, and the wood was found to be serviceable. A marine railway was built with gum in 1838, and when the ways were repaired two or three years ago the wood was sound and bright and the iron bolts in it were scarcely corroded.

The trading vessels peculiar to Norfolk were the little farming sloops and schooners, which flock into the harbor in large fleets in the summer time, bringing vegetables for the New York and Baltimore steamers. Often 150 of these little vessels enter the harbor about two hours before the departure of a steamer, racing at full speed, with everything set, and loaded high above the deck with a profusion of boxes and barrels packed with melons, cabbages, tomatoes, and vegetables of nearly every description. They dash straight in to get the best positions nearest the wharves, and often crowd in so thick that the steamer cannot make its berth. In consequence, a number of them are obliged to cast off and go swarming out into the bay, and cruise back and forth like a swarm of butterflies until they are allowed to return, when in they come again with a rush, jostling and crowding, the air being torn with the good-natured jabbering and arguing of the crews. There are a good many bug-eyes and canoes in this "trucking" fleet. These boats, large and small, are owned largely by negroes, and their crews

are principally negroes. They are built on the vegetable farms all around Norfolk and across the James river on the peninsulas above. There are a few regular builders on the Nansemond, Chuckatuck, and Back rivers. A sloop 26 feet long, 11 feet broad, and 3 feet deep will cost about \$300; a large sloop 45 feet long, \$2,000. An average size, 9 tons, would be 35 feet in length, 13½ feet beam, and 3½ feet hold. Owners follow their own fancy in rig, some preferring the sloop rig, others the schooner. The majority of the boats are schooners, but they seldom have topmasts or topsails, and the space amidships is open. The boxes and barrels are stowed in this hatchway until the hold is full, and are then piled clear across the deck and as high as the sails will allow. Aft there is a little house. These boats have no bulwarks, but only a chock or low rail around on the plank-sheer. They are full and flat, partaking of the canoe model. Some of the sloops are of a flat-iron shape. The smart boats each make from \$8 to \$12 a day in the summer time. The charge for freighting vegetables is 3 cents for a box and 6 cents for a barrel, or from 4 to 10 cents, according to distance. Oysters are carried for from 3 to 5 cents a bushel, and sometimes the boats can make two trips in one day. The colored men make money with them, and when of a frugal disposition save money, and are often able to buy schooners of larger size.

SOUTHERN ATLANTIC AND GULF COASTS.

At various times since the Revolution vessels of good size have been built at the principal ports on the southern coast, a large number of flat-boats and small fishing vessels for local use having been built every year; but on the whole the industry has received no special development in this part of the country.

At Elizabeth City, North Carolina, there are two yards, one of which has a railway, and both do repairing. There are good facilities here for building, and before the war they were employed, but since the war business has been dull. A sloop and a small steamboat for shoal-water use were built in 1880.

Bell's Ferry, North Carolina, occasionally builds a small stern-wheel steamboat; Tarboro' the same.

Washington, North Carolina, could build large and good vessels. There are two yards in the town, but business is irregular. At one time these yards had 30 men employed, at another only 4 or 5, but since the war there has been little done here. A schooner of 175 tons and 3 barges were on the stocks in 1880, and a sloop of 29 tons and 2 steamboats of 69 and 97 tons were built.

Beaufort and New Berne, North Carolina, are both dull. At New Berne vessels of the largest class can be built at one yard, which, however, produces only 3 or 4 fishing and sail boats yearly. Some repairing is done.

Charleston, South Carolina, has a few repair shops and four yards. The building in 1880 was a sloop of 10 tons, 2 steamboats of 21 tons each, and 4 schooners averaging 16 tons each. The cotton and lumber vessels and steamboats that visit the harbor make quite a little industry in repairing, and that is the chief work done by the shipwrights of the city.

Coosaw, South Carolina, has a small private railway. Barges are built and repaired there for a local mining company.

At Georgetown, South Carolina, a clumsy steamboat of 69 tons was built in 1880 by house carpenters.

The state of Georgia does not build extensively. In 1880 the only new work was 2 steamboats of 243 and 296 tons respectively for river service, built at Wellborn's Mills and Lumber City. At Savannah a few shipwrights find some repair work to do.

Florida builds fishing boats in large numbers on the coast, with an occasional steamboat at Jacksonville. The state has been referred to at length in another chapter.

Along the Gulf coast there is now little ship work east of the Mississippi.

New Orleans has a number of boat-shops, repair shops, a few small yards, and four large repairing establishments with dry-docks. The new vessels of 1880 were 3 schooners, 60 tons; 1 lugger, 7 tons; and 1 steamboat, 149 tons, the steamboat being the largest vessel built in the whole state. An average of 173 men were employed in repairing, doing \$222,000 worth of work. New Orleans might be a building port if yellow pine were sanctioned by the insurance companies for frame timber. Seventeen luggers, schooners, and steamboats were built in the state outside of the city in 1880, a total of 290 tons. There were besides numerous sail-boats too small to register on the lakes and bayous, but the yards where the latter are made are modest affairs. Information gathered from various sources shows that a considerable number of excellent carpenters are scattered all over Louisiana who could be collected into large yards and utilized for important work if there were great need for so doing. In order to encourage ship-building, Louisiana has a law on her statute-books, almost forgotten, that any vessel built in the state shall be free from tolls and wharfage dues.

Texas has a little ship-building at Lynchburg, in the Galveston district, and at Indianola and Matagorda. Two schooners of 248 tons each were built at Lynchburg in the census year; and in the whole Galveston district, 5 sloops, 68 tons; 6 schooners, 618 tons; 1 tug, 8 tons; and 2 steamboats, 51 tons. Vessels have to be built for shoal water in this region. They are full on the floor, with not over 4° of dead rise, and are nicely modeled fore and aft. Nearly all the schooners built now in Texas are from 65 to 95 feet on the keel, 20 to 28 feet beam, and from 5½ to 8½ in molded depth. The first question asked by an owner is, "How many tons will she carry on 5 and 7 feet draught of water?" The cargoes are lumber, wood, bricks, sugar, molasses, cotton, and oysters. Most of the vessels built are of from 10 to 20 tons.

ARIZONA.

In Arizona there is as yet no ship-building. The Southern Pacific Railroad Company has a yard, with ways, at Arizona City, on the Colorado river, for the repair of river boats, with ample facilities for construction, and it is thought that steamers and barges will be hereafter required to connect the navigable portions of the river with the railways that cross it when all the plans are perfected.

CALIFORNIA.

The ship-building industry would have sprung up quickly in California after the discovery of gold if there had been any timber available out of which vessels could be made; but the state was destitute of material near the coast, and lumber had to be brought from the eastern states, and so little available wood was there in California that wooden houses had to be gotten out in the East, frame and all, and brought around cape Horn for the people to live in. Up in the mountains there was some timber, but it was too far away. Down to 1865 the vessels used on this coast were nearly all built in the East; but lumber was finally brought from Humboldt bay and the Columbia river, and then ship-building began to be followed in California as a native industry. Carpenters were attracted to the coast at an early day. They came from Maine, Massachusetts, and New York, and built a few vessels here and elsewhere on the coast as experiments; but many of the men went off into other trades, and the majority in California settled down to the profitable business of repairing vessels at San Francisco. The high cost of labor was always a great drawback, and at a time when gold could be washed out of the sand of any mountain stream, and when fortunes were being made every day by lucky prospectors, there was no inducement which would keep mechanics at work at their trade except twice and thrice the pay they could get on the Atlantic coast. Wages have always been \$4, \$5, and \$6 a day on the Pacific coast, as compared with \$2 and \$2 50 in the East, and this has always been a drawback to the industry. The shipwrights who came from the East comprised many men of talent and experience, who were both good mechanics and smart managers; but labor has been so high that for the higher class of vessels, such as steamboats, it has been almost impossible to build in competition with eastern men. A number of the California vessels have been set up in the East, knocked down, shipped to San Francisco, and then completed, while others have been built and sailed around cape Horn to the coast; in fact, as before stated, Pacific coast vessels were mainly of eastern build down to 1865, and the majority of them have been since. Within the last fifteen years, however, a large number of small vessels have been built on the Pacific coast.

The timber of the Pacific coast is the yellow fir, which grows in dense forests all the way from northern California to the boundary of British Columbia and beyond it for some distance, and covers the face of the whole country, except the Willamette valley, as far inland as the Cascade mountains. White cedar, sugar pine, and other useful varieties of wood are scattered through the forests, while south of the fir belt there stands a dense growth of redwood, with here and there on the banks of streams a light growth of white laurel, a low, crooked tree, suitable for stem and stern posts, for which it is popularly used. The early vessels of the coast were necessarily built of fir, there being no other suitable material. On the lowlands in various parts of California there is some live oak, but it is of poor quality. Twenty years of modest experiment and some tests at the Mare Island navy-yard showed that fir was a good timber, as it proved tough, strong, and durable, and was lighter than oak. The balsam with which it was impregnated preserved iron bolts from corrosion. It had one peculiarity, which especially endeared it to the ship-builder's heart. The trees grew from 150 to 300 feet in height, good commercial trees being an average of 200 feet high. Keel and keelson pieces and plank could be obtained of any length, and a vessel could be built with a far less number of butts and joints than in any other part of the United States. The immense supply made the timber cheap, which was another valuable point, and as soon as durability and strength were proved lumber schooners, steamboats, river barges, and grain ships were built with great success. Vessels were entirely built of fir except the stem, stern, and rudder posts, which were of laurel, and the cabins, which were of white cedar and redwood. The industry has now become a flourishing one, with every prospect of rapid development.

At San Francisco there are three yards devoted to new work. The Dickie Brothers have built 7 steamers for the trade of the Sandwich Islands, 3 government vessels, a large propeller of 2,000 tons for the trade to Mexico, and lumber schooners and barkentines to complete a total of 20. The propeller was launched in 1882, and had a flat floor with about 4° dead rise, straight sides, and a quick bilge, with a long sharp bow and good run, being, in fact, of the most approved propeller model. She was built of fir throughout, except the stem and stern posts, which were of oak and laurel, and the cabins, which were of white cedar finished with fine woods, was 288 feet long over all, 35 feet beam, and 28 feet in depth from the spar-deck, and was a three-deck vessel. Sticks of 76, 106, and 108 feet composed the keel, and the keelson was in length from 113 to 117 feet. The planking was from 40 to 100 feet in length. The fir for this vessel cost from \$20 to \$32 a thousand in San Francisco, according to length, but the average cost was not over \$25. When visited, the yard was preparing to build a barkentine 165 feet long,

38 feet beam, and 14 feet hold, which was to carry 750,000 feet of lumber, and it was intended to complete her for \$75 per register ton. This yard had a band-saw for getting out the frames, derricks for hoisting, bolt-cutters, and a complete equipment generally. For the large Mexican steamer they were able to saw out five frames a day with the labor of two men, but nine frames a day was the average for a barkentine. The members of this firm are of Scotch descent, and back to their great grandfather have all been in the business. One result of this long experience was the perfection of a set of books, in which the accounts of the yard were kept in a way seldom seen in the United States except in the iron-ship yards of the East and a few steamboat yards on the Ohio. Every detail of the labor and materials of their ships is classified, the labor in some cases being divided into thirty-three branches, and the utility of this system is found in close bidding for work, especially repair work, for the books show what it costs to do everything required on a ship, even to taking off and putting on a single streak of planking. Mr. Turner began in 1868, and had built 56 vessels, aggregating 5,115 tons, up to 1882. Of this number 44 were yachts and brick and lumber schooners; the others were brigs, barkentines, propellers, and sloops. Among his schooners were several fleet and famous yachts, but his largest vessels were a barkentine of 395 tons and a brig of 348 tons. He discarded the old plan of the broadest beam at two-fifths the length from the bow, made his models long and sharp forward and full aft, giving the stem more of a rake than is usual in the East, and by giving the masts a good rake and bringing the anchors, chains, and weights generally farther aft he produced a class of stiff, fast vessels which have won popularity on the coast and have been widely imitated. In several of his vessels he has put in the masts in one piece from heel to truck; the lower mast and topmast are in one stick, a top being added above the lower sails for convenience. Sticks of 106 and 108 feet have been used by him several times, but longer ones might be employed, for they are easily obtained. He has also introduced the Bermudan sail for the spanker of brigs and the mainsail of two-masted schooners. The boom is long, but at the head the sail tapers to a point, as in the Chesapeake bay boats. The topsail in such cases is a long stretch of canvas, passing down by the head of the mainsail and spread by a sheet running down to the outer end of the boom. This rig has been found useful in squalls, and as the Pacific ocean is one of sudden and violent winds it is there that the rig has been found of value. Turner's yard has a full equipment of modern machinery. At another yard in San Francisco yachts and small vessels are built.

There are a large number of firms of shipwrights, sailmakers, riggers, and boat-builders in San Francisco who do work for the whalers, grain and lumber vessels, and steamers which frequent the port. There are two floating dry-docks and one large fixed dry-dock, the latter intended for the Pacific Mail and other heavy steamers. The fixed dock was built at Hunter's point, up the bay a short distance, by a company organized in 1867, and is 421 feet long on the keel-blocks, 120 feet wide on top, and 60 feet in the clear on the bottom, 32 feet deep, with 22 feet of water on the miter-sill. It is quarried out of the serpentine rock, the sides being made of Puget sound fir, in beams 10 inches square, so arranged as to form a series of steps, and secured with 1½-inch bolts of California manufacture, sulphured into the rock. The keel-blocks are of laurel from Russian river. The gate is a caisson of Oregon fir, calked, coppered, and fastened with treenails and composition bolts and spikes, and is 92 feet long, 20 feet beam, 68 feet keel, and 24 feet hold. A double steam-engine, with pumps, is placed within the caisson. The two engines to pump out the dock, with cylinders 22 by 48 inches, are run on high pressure, and are supplied from 4 tubular boilers, each 16 feet long and 54 inches in diameter. Each pump lifts 30,000 gallons a minute. This dock cost \$675,000, and is an important element in the shipping resources of the port. The floating-docks are of different sizes. One is 80 feet wide by 210 feet long, and takes out sailing vessels and steamboats; the other is for tugs and small craft. Repair work of more than \$600,000 in value is done at these docks and at the wharves and sail-lofts of the city every year.

At Oakland, across the bay, there are two large yards owned by the Southern Pacific railroad and the ferry companies. Two wooden side-wheel steamboats were put together there in the census year, the materials having been gotten out in the East and shipped to California. The work at these yards, each of which has marine railways, is mainly in repairing the steamboats of the companies.

At various places on the bay of San Francisco and up the Sacramento river there is some building of vessels. Flat-boats and stern-wheel steamboats are required on the river, and short scow-schooners are required for the brick, wood, and hay trades of the city. There are few regular yards, the work being done by carpenters, who are hired to do the job, or by amateurs. Scow-schooners are about 50 feet long, 18 feet broad, and 5 feet deep, and on deck are about 9 feet broad at the ends, with the bow and stern raking considerably from the flat of the floor.

Humboldt bay ranks second in importance on the Pacific coast for ship-building, and is the center of the red wood lumber region. The bay is thronged with lumber schooners engaged in that trade to San Francisco, and excellent facilities exist for the building of vessels. In the years 1874, 1875, and 1876 the bay produced 31 schooners, registering 4,059 tons, but latterly the vessels built at Humboldt have been schooners of 250 and 300 tons register, which are smart and handsome, and are noted for their speed and good qualities. The yards are in close proximity to the saw-mills, and get their timber for \$10 and \$12 per thousand.

The general custom in building vessels on this coast, so far as payments are concerned, is that seldom anything is paid when the keel is laid. Sometimes the builder receives a small amount when the contract is signed, but the

payments are usually divided into four parts; one quarter when the frames are all up, another when the vessel is ceiled and the deck-frame is in, another when it is planked and the decks are laid, and the last quarter when it is complete for sea, with the exception of provisions. Others only contract for hull, spars, and iron work, the owner furnishing the outfit. When a builder starts a vessel and has little money, the owner supplying him with materials and money, his claim is good after the vessel is launched.

OREGON.

Few sailing vessels are built in Oregon. There is an abundance of timber, but as the population of the state lives in the valleys of the rivers the production of the ship-yards is almost entirely in the line of vessels for river transportation. A small schooner was built in 1845 at Astoria, near the mouth of the Columbia river, by traders for their own imperative needs, and it is believed that this was the pioneer vessel of the Pacific coast. A few other small schooners have been built from time to time on the rivers, but the production has not been numerous. As it belongs properly to the chapter on steam vessels to describe the industry in this state, reference is made to that chapter.

At Coos bay, Oregon, on the sea-coast, one, two, or three schooners, ranging from 200 to 500 tons register, have been built annually for 20 years for the lumber trade. The yards are near the saw-mills. These schooners are flat, one-decked vessels, with long bows, handsome square sterns, and broad beam, and are excellent sea boats. The schooner Isabel, of 185 tons, was 103 feet in register length, 29 feet beam, and 9½ feet depth of hold; the George C. Perkins, of 389 tons, 142 feet long, 33½ feet beam, and 11½ feet hold; the barkentine Kikikat, of 493 tons, one-decker, 163 feet long, 39 feet beam, and 12½ feet hold; the schooner Trustee, of 281 tons, 133½ feet long, 35½ feet beam, and 9½ feet hold; and these are the average sizes of vessels in the lumber trade of that bay. It was difficult to learn the cost of these schooners accurately, but they probably cost \$70 per register ton. Wages have been \$3 50 and \$4 a day, and fir costs not to exceed \$12 per thousand feet. A few large vessels have been built on the bay. The Western Shore was constructed there for a San Francisco firm, and it is said that this ship made the fastest three consecutive runs to Liverpool on record. Her best time was 97 days from the Columbia river to Liverpool.

WASHINGTON TERRITORY.

There are 11 ship-yards in Washington territory, all of them on Puget sound and its branches. Small sloops and schooners were built at various places more than 25 years ago. The names of some of the first of any size are:

	Tons.
1859. Schooner General Harnoy, built at Whatcom.....	60
1863. Steamboat J. B. Libby, built at Utsaladdy	119
1865. Steamboat Colfax, built at Seabeck	83
1867. Schooner Alaska, built at Port Townsend	139
Schooner Cora, built at Port Orchard	155
Steamer Chehalis, built at Turn Water	89
Bark North West, built at Port Madison	515
1868. Bark Tidal Wave, built at Port Madison	603
Schooner Clara Light, built at Steilacoom	179
Barkentine Grace Roberts, built at Port Orchard.....	269
1869. Schooner Alice Haake, built at Port Blakeley.....	253
Propeller S. L. Mastick, built at Port Discovery.....	194
Bark Forest Queen, built at Port Ludlow	511
Steamer Alida, built at Seattle	114
1870. Steamer Favorite, built at Utsaladdy	257
Steamer Etta White, built at Freeport	97
1871. Steamer Zephyr, built at Seattle.....	161
Ship Wild Wood, built at Port Madison	1,099
1872. Steamer Blakeley, built at Port Blakeley	176
Schooner Serena Thayer, built at Port Blakeley	206
1873. Steamer Empire, built at Port Madison	732
Barkentine Modoc, built at Utsaladdy.....	452
Schooner Z. B. Haywood, built at Port Ludlow by Hall Brothers, their first on Puget sound.	

Since 1873 there has been a regular building business at Port Ludlow, Port Madison, Port Blakeley, Seabeck, and Seattle. The largest vessel was the ship Olympus, of 1,110 tons, built at Seabeck in 1880.

The vessels of Puget sound have been mainly schooners and barkentines for the exportation of lumber to the lower coast, the Sandwich Islands, and Australia, and steamboats (stern-wheelers) for the local trade and passenger traffic of the Sound and the rivers flowing into it. A few large sailing vessels, not exceeding half a dozen in number, have been built for the grain trade to Liverpool. All the tonnage of the Sound has been built from yellow-fir timber, with pine and cedar for the cabins and laurel and white oak for the stem and stern posts.

The leading and most profitable industry of Puget sound is lumbering. Fir forests completely cover the face of the land to the water's edge, and the view from the steamboats is an unbroken wilderness of dark-green trees as far as the eye can reach, with towering snow-clad mountains rising here and there from its surface. There are 15 or 20 saw-mills at different points from Port Discovery to Tacoma and Olympia at the head of the Sound, and lumber camps have been established near them, often within a stone's-throw of the water's edge. The ship-yards have all been established in the saw-mill towns, and as near as practicable to the mills. At Port Blakeley a lightly built railroad track has been made from the mill to the yard, to carry up what lumber is required. The nearness to the mills enables a builder to order the timber as fast as he needs and to save the cost of transportation.

Port Townsend is a small place on the edge of a bay near the entrance to the Sound. There has been some building and a good deal of trade here. All the coasting propellers from San Francisco call at this point, and extensive wharves have been built for their accommodation. All back of the town are fir forests, and the shore is lined with vast quantities of fir drift-wood. The only vessel building in 1881 was a small propeller, which a carpenter was making largely out of stuff he had picked up on the beach. There was no saw-mill here.

On Discovery bay, back of the town a few miles, is located a large saw-mill, at which a few vessels have been built. This beautiful bay is 10 miles long, the water deep and clear as crystal, and the shores are covered with dense woods. The bay is well fitted for ship-building. Two schooners of 475 tons, a propeller of 194 tons, and a barkentine of 450 tons have been built close by the saw-mill. It was stated here that fir is as good as hackmatack for its tenacious grip on an iron bolt and freedom from corrosive acids, but in spiking on the harpings and rib-bands to hold the frames in position builders have to use iron washers under the head of the spikes, otherwise it would be impossible to get the harpings off. The mill sells ship timber, taking the vessel right through, long and short together, for \$12 a thousand; the frame stuff costs only \$10 a thousand. The woods hereabout are full of gigantic white cedar trees, an excellent material for cabins and houses. Laurel trees were noticed growing on the banks of the bay often two feet in diameter, and all gnarled and crooked.

Port Ludlow has been a building town for 20 years. The village has the largest saw-mill on the Sound, and the only one that can cut a log which is 8 feet in diameter. It was idle in 1881, owing to the non-arrival of certain expected machinery, but a barkentine was being built then with lumber towed up from Port Gamble. The principal firm of builders in the territory established themselves here in 1873 and built a schooner or barkentine nearly every year down to 1880, when they moved to Port Blakeley, opposite Seattle. A few years ago labor could be had for \$2 50 and \$3 a day; now the men are paid \$3 a day, and are supplied with cabins to live in and with food at a cook-house run by a Chinaman. Their pay thus amounts to \$4 a day. A barkentine 160 feet long, 38 feet beam, and 14 feet hold, built when wages were low, cost \$34,500; the same vessel would now cost \$38,500. The saw-mill here supplies sawed timber for ship-building for \$12, taking the ship right through. The ordinary pieces for frames and planking are sold for \$10 a thousand; finishing lumber for \$20 a thousand; but the price is sometimes \$12 and \$22 a thousand, respectively.

The barkentine building at Port Ludlow was 172 feet long on water and 182 feet on deck, molded; 39½ feet beam molded, and 21½ feet in molded depth amidships—a broad and full vessel, calculated to have great stability, and to carry 800,000 feet of fir, 350,000 feet of it on deck. Her scantling will show the best results of experience with the yellow fir. Keel, 166 feet long, in two lengths, one of them of 112 feet, the keel in two depths; total size, 16 by 30 inches; shoe, 8 inches. Frames, double, 22 by 15½ inches, molded 12 inches at the bilge and 7½ inches at the gunwale. Double floors amidships; room and space, 28 inches. Keelson, 16 by 56 inches; sister keelsons, 16 by 16 inches, with pieces 112 feet long in the keelsons. Ceiling, on the floor, 4 inches thick, 16 inches wide; 10 feet on the bilge, 10 inches thick; clamps, 8 inches. Planking of bottom, 4 inches, 16 inches wide; garboards, 7, 6, and 5 inches; wales, 5 inches thick, tapering to 4 inches at the hooding ends, and 7½ inches wide. Beams, 14 by 16 inches, spaced 4 feet, with one lodging knee and a heavy hanging knee at each beam end. Water-way, 12 by 20 inches; plank-sheer and rail, each 6 by 18 inches; decking, 4 by 4 inches. Stanchions to beams, 10 by 16 inches, strapped to the beams and keelson with 3 by ½-inch iron. Composition bolts were used under water, galvanized iron above. The vessel was square-fastened with 1 bolt and 3 locust treenails in every frame, as many of the latter as possible going clear through, and wedged. The whole vessel was of yellow fir, including the stem. The dead-eyes of the rigging were put on with an iron key, which could be quickly knocked out to clear away the shrouds, for convenience in loading and discharging heavy lumber. Amidship there were planted four short masts, or shifting posts, heeling on the keelson and projecting 12 feet above the deck, to keep the deck load of lumber from moving about in a sea-way, and iron rods were to be carried over the top of the lumber from the posts to temporary stanchions lashed to the bulwarks of the vessel. It took 400,000 feet of lumber to build this barkentine, but her cost was not known when the yard was visited. The lumber for this vessel cost not to exceed \$10 per thousand feet. Wages were equivalent to \$4 a day.

Port Gamble is a large saw-mill town at the entrance to Hood's canal. A fleet of from 5 to 10 schooners, barkentines, and barks are constantly loading there with lumber, and the proprietors of the mill own most of them. Being Maine men by birth, their vessels have mostly been ordered from the Maine yards, but they are now beginning to build on Puget sound.

Port Madison built no vessels in the census year. The Wild Wood, a bark built there in 1871, was opened in 1882, and was found as sound and bright as when new.

Seabeck, a saw-mill town on Hood's canal, is in the heart of a dense fir forest, and faces a magnificent range of snow-clad mountains, which lie across the country many miles away. The yard is a stone's-throw from the mill. The builder had built on Puget sound up to 1881 the bark Forest Queen, of 511 tons, at Port Ludlow, which carries 650,000 feet of lumber; the two-masted lumber schooner Leads; the bark Cassandra Adams, of 1,127 tons, now in the grain trade, which cost \$72,000; the tug Holyoke; the ship Olympus, of 1,110 tons, at a cost of \$80,000; and the barkentines Mary Winkle and Retriever. The Retriever was 161 feet long to the after-side of the stern post, 37 feet beam, and 13½ feet depth of hold, and was of about 600 tons register. She had lumber ports in her bow and stern. Her greatest breadth was amidships. The bow was sharp, with hollow water-lines, and was cut away at the fore foot, as in all lumber vessels.

The Cassandra Adams is a two-decker, and carries 1,950 or 2,000 net tons of wheat as her cargo. She has made the trip from San Francisco to Liverpool in 114 days (good fair time), and has brought 1,500 gross tons of coal from England home in 110 days. Her register dimensions are: Length, 196½ feet; breadth, 40½ feet; depth of hold, 22 feet; total length from chock to taffrail, 210½ feet; keel, 184 feet. The frames, double, are 24 by 18 inches over the keel, molded 10 inches at the lower deck and 7½ at the upper deck; room and space, 30 inches; lower-deck beams, 15 by 18 inches; upper-deck beams, 12 by 18 inches, spaced 6½ feet; ceiling for 13 feet on the bilge, 14 inches, tapering to 8 inches above; outer planking, 5 inches; decking, 4 inches. The vessel was over-sparred originally, the fore and main yards being 90 feet long and the lower topsail yards 80 feet; but she was altered after a few voyages, the long lower yards being removed and the 80-foot yards lowered to take their places. Other alterations were made to reduce the weight of the top gear. Her dead rise was about 13°.

The Olympus was the largest single-decked ship in the world. She was built for the lumber trade from Puget sound, and her ordinary cargo was 1,250,000 feet of fir; but on one trip she carried 1,450,000 feet, of which 700,000 feet was on deck. In her first 11 months this ship earned \$40,000 in freights, which paid half her cost. She was burned at sea north of cape Flattery, a fire having started in some bales of hay in the hold, into which a spark had been accidentally dropped. The Olympus was built full, with about 28 inches dead rise, and over 1,400,000 feet of lumber and 65 tons of fastening were consumed in her construction. The stem raked considerably, as in all Pacific coast vessels. Her dimensions and scantling were: Keel, 210 feet long; 223½ feet long on deck; beam, 43½ feet; hold, 17½ feet. Keel, 20 by 48 inches. Frames, double, 24 by 19 inches over the keel, molded 9 inches at the deck; room and space, 30 inches; keelson, 20 by 81 inches; sister keelsons, 20 by 40 inches; a strake next to them, 9 by 16 inches. The long keelson bolts were over 11 feet long, and were of 1½-inch iron, a 250-pound hammer being used to drive them, pile-driver fashion. Ceiling on the floor, 5 inches; on bilge and up to the deck, 16 inches, the thick strakes edge-bolted in every space with 1½-inch iron; garboards, 12 inches; bottom plank, 5 inches; from bilge to deck, 6 inches, plank square-fastened with through treenails; beams, 18 by 22 inches, spaced about 7½ feet; 8-inch lodging knees, fir, and two 10- and 11-inch hanging knees at each beam end, the knees spreading diagonally below the beam; hanging knees molded 26 inches in the throat, with arms of 5 and 9 feet; water-way, 3 strakes of 12 by 14 inches; plank-sheer and main rail, 8 by 22 inches; decking, 4 by 4 inches; stanchions of bulwark, 8 by 12 inches; beam stanchions, 12 by 22 inches, strapped to beam and kneed to keelson, and 4 Sampson or shifting posts, projecting 13 feet above the deck. The yards on the fore and main masts were 80, 72, 63, 50, 41, and 34 feet, while those on the mizzen-mast were 62, 57, 50½, 40½, 34, and 30 feet, and the main rigging was susceptible of being cast loose when loading and discharging cargo. The ship spread about 5,200 yards of canvas, being sparred in accordance with long experience in the coasting trade of the Pacific. She carried a donkey-engine in a deck-house forward.

The yard at Seabeck has a jig-saw and works out all the frames by steam-power. The town presents great advantages for ship-building, as the water of Hood's canal, which is a broad lagoon, is deep and free from rocks, and never freezes in the winter time. Timber covers the whole country in almost inexhaustible supply. This territory is rapidly filling up with American, Swedish, and German labor, and there is no lack of good mechanics, and with a thoroughly systematic way of doing business large vessels ought to be built at Seabeck for \$45 a ton.

At Port Blakeley there is one yard. The Halls built a few large ships in their earlier years at Cohasset, Massachusetts; but when the clipper era began they went to Boston and engaged in the general ship work of that port. In 1873 one of them came to Port Ludlow, whither the others followed him the next year, and in 1880 they came to Port Blakeley. Up to 1881 they had built a pilot-boat of 59 tons, a yacht of 52 tons, 15 lumber schooners, 3,348 tons; 8 Sandwich Island schooners, 853 tons; 4 barkentines, 1,578 tons; and 2 steamers, 475 tons; a total of 31 vessels and 6,365 tons. The average cost of these vessels has been about \$70 per register ton, but in consequence of good management and the use of machinery this cost is being steadily reduced, and it is now not in excess of the cost of vessels of similar sizes on the Atlantic coast. The owners have fitted up the Port Blakeley yard at considerable expense, and have sent a delegate to Bath, Maine, to report on the labor-saving appliances there employed and to purchase steam saws, planers, and a full equipment for their yard. Their schooners are fast, handsome, and popular, and have long, sharp bows, with slightly hollow lines, the top sides having a faint curve home, and at the stern round in sharply over the arch-board in a strikingly graceful fashion. There is not a straight line on the surface of the hulls anywhere. Located near a large saw-mill, the Halls have run a light railroad track down to the mill and bring up their lumber on platform cars. For keelson pieces over 90 feet in length they pay \$16 a thousand; for less than 90 feet, \$11 a thousand; for bed logs for center-board schooners and rough, clear lumber for

stanchions, \$16; planking clear of heart and knots, \$12; deck plank, planed, \$22 50; for all the rest of the material in the ship, \$11; but the average of the vessel does not exceed \$12, and the average length of stuff is 20 feet more than that of eastern yards. In the mold-loft of the yard there are fir battens "for laying down" 90 feet in length.

A barkentine 180 feet in length, 162½ feet on the keel, 38 feet beam, and 15 feet hold was in frame in the winter of 1881. The keel was in two pieces, one of them 126 feet long and 26 by 15 inches wide, with a 6-inch shoe in addition; scarfs 15 feet. The frames were 22 by 16 inches, spaced 31 inches; filling pieces between the frames, 6 feet long, to receive the chain-plate bolts; keelson, 16 by 40 inches; sister keelsons, 14 by 14; beams, 13 by 15 inches, spaced 3 feet; decking, 4 inches; stern-post, 26 by 28 inches; stanchions, 8 by 15 inches, strapped to beams and keelson; stem, fir, with root at the heel; gripe piece, laurel. The planking was 5 inches thick. The rudder-post projects below the planking to avoid leaks—a practice now general on the coast.

At Seattle there are two small marine railways, besides one other small yard, and there are two or three persons in the town other than the owners of the above property who occasionally build small schooners and steamboats. The first steam mill on the Sound was set up at Seattle in 1853, and although it has been in operation for 30 years the only observable impression that has been made on the dense fir forests is the clearing of a space for the town to stand on. The town is a large collection of houses, spreading all over the side of a hill which rises at the head of a deep bay, and stumps of trees are scattered all through. The bay is the only considerable harbor on the Sound with an abundance of good anchorage ground for vessels. There are valuable deposits of coal a few miles inland which are being mined, and a large number of coal ships visit the wharves of the town every year. Four iron steam colliers have been recently built in Pennsylvania to carry this coal from Seattle to San Francisco. The owner of the marine railway has been in Seattle for 20 years, and has built many small vessels, schooners, and stern-wheel steamboats. Most of the stern-wheel boats of the Sound have been made on this bay. In 1881 the cost of fir, delivered in the ship-yards, was \$10 a thousand feet for frame timber, \$12 for timber over 45 feet in length, and \$15 for pieces from 60 to 100 feet in length. The decking and finishing lumber cost \$20 a thousand; for a 500-ton vessel the material could be bought for from \$12 to \$15 a thousand right through. Builders had noticed a difference in the lasting qualities of fir cut in winter and that cut in summer, as some of the early boats whose frames were hewed out in the woods in winter in the eastern fashion proved lasting and serviceable, while others built from timber taken from the saw-mill without regard to the season of cutting decayed rapidly. Fir vessels have been known to last from 27 to 35 years. There was a great deal of talk all along the Sound about this, and most of the builders intend to select their timber hereafter from winter-cut trees. The vessels built at Seattle in the census year were: 2 stern-wheel steamboats, 321 tons, 1 propeller and 1 side-wheel boat, 473 tons. The side-wheeler was for the navigation of the open Sound, for which stern-wheel boats are not suited in the winter time, as the wind catches in their high sterns and makes them hard to steer. They are therefore used for the rivers of the territory. Seattle has the only repairing business of the territory, and wages are \$3 75 and \$4 a day.

At Tacoma, New Dungeness, Utsaladdy, and a few other places on the Sound small vessels and boats were built in the census year for local use. When William H. Seward visited these towns he said: "Sooner or later the world's ship-yard will be located here."

The cost per ton of new vessels on Puget sound closely approximates that of the East, and, except for the cost of labor, the cost on Puget sound would be less than in any other part of the United States. The immense and growing grain trade of the Pacific coast seems to guarantee a cargo to a ship immediately after launching, and when the Northern Pacific railroad has completed its lines through to Tacoma and Seattle from the wheat-fields of Oregon and Washington the new ship can load before leaving the Sound. It was a Bath-built ship, the Dakota, which in 1881 carried away from Tacoma the first cargo of grain. The ships for this trade were built in a state 3,000 miles away, which is utterly destitute of local ship-building timber and pays an average of \$35 a thousand feet for her timber, when on Puget sound timber can be bought for \$12 a thousand feet—a saving of from \$20,000 to \$25,000 on a big ship. Puget sound has great advantage also in the length of the timber it can furnish.

ALASKA.

Portions of Alaska have plenty of timber. Its production is chiefly in the way of Indian canoes, of which there are estimated to be 3,000 in the territory, each made from a single spruce or cedar log and owned by natives. Some of the canoes will hold 60 persons. The records of the custom-house at Sitka show only the following vessels:

Date of papers.	Vessel.	Tonnage.
April 13, 1880	Schooner Lesnoy	9
September 7, 1880	Schooner Mary	11½
September 14, 1880	Schooner Mary Caton	8
September 25, 1880	Schooner F. F. Feeney	9
March 18, 1881	Scow-schooner L. L. Martin	32½
May 23, 1881	Schooner Onward	6½
June 11, 1881	Schooner Flying Scud	26

These, with the exception of the scow-schooner L. L. Martin, were all built at Kadiak and Oonalashka. In January, 1882, there were five small schooners of about 20 tons each constructing at Kadiak island. The yellow cedar of Alaska is admirably adapted to ship-building purposes, and in a report to the Treasury Department by Collector William Gouverneur Morris, dated November 25, 1878, this subject was alluded to.

NORTHERN LAKES.

The facts about the building of sailing vessels on the northern lakes are introduced in this chapter because the vessels built are of large size and resemble in character the sailing tonnage of the ocean coasts.

The northern lakes seem to have invited navigation as early as 1679, and it is supposed that the little 60-ton schooner Griffin, built on the Niagara river in that year for La Salle, the Catholic missionary, was the first vessel on the lakes. This schooner, carrying La Salle, and manned by a crew of six persons, set sail in August for Mackinaw, where she arrived safely, and was there loaded with furs for a return voyage, but was never heard from after her departure. In accordance with the fashion of the times, this schooner carried a square sail on the forward mast. Sloops and small schooners were occasionally seen on lakes Erie, Huron, and Michigan during the years of exploration and settlement of the country, but it was not until after the revolutionary war that any great number were constructed. It is believed that the first vessel on lake Ontario larger than an Indian batteau was the one built at Sodus Bay, New York, in 1789. During the 20 years preceding the war of 1812 a flourishing commerce sprang up between the principal towns and ports on the lakes, and quite a number of sloops and small schooners were required for the transportation of mails, freight, and passengers. The ship-building industry, however, had not reached any special development when that war broke out; and it will be remembered (as elsewhere stated) that in order to construct the vessels required for public defense it was necessary to bring master builders and carpenters from the city of New York. The first brig on the lakes is believed to have been the Union, of 96 tons, built in 1814.

It is hardly necessary to relate in detail the story of the growth of the merchant marine of the lakes, as in its general features it is the same as that of the shipping of the ocean coasts. As the country filled with people vessels increased in number and size; they were often built too large for the times, and there were several periods of reaction and depression. Builders originally followed sea-coast ideas, but as the special requirements of the lake trade became apparent they made experiments of their own with models and rigs, and finally departed entirely from the traditions of the sea-coast and developed a class of tonnage especially suited to the lakes and having its own peculiar character.

The first ship on the lakes was the Julia Palmer, of about 300 tons, built at Buffalo in 1836. Several other ships and a number of barks were employed after that date in trading to the upper lakes, but the experience of a few years demonstrated the entire unsuitability of the square rig for these waters.

The first clipper schooner was the Challenge, which was built at Manitowoc, Wisconsin, in 1851, by William W. Bates. She was 80 feet long on the load-line, 22 feet wide on the main beam, and 6½ feet deep in the hold, and differed from the ordinary type of lake vessels in having greater proportionate breadth, lighter draught, a longer and sharper bow, and greater lifting power at the bow. The dead-flat section was located amidships. She carried a center-board, and a red stripe was painted on her side to show the light-draught water-line. During the construction of this little vessel a great controversy raged in the shipping circles of the lakes in regard to the innovation on established models. The Challenge reimbursed her owners in two years, and the Clipper City was then built in 1853 by the same constructor for the same owners. When the Clipper City was ready for sea there was put into her cabin, in a frame, a scale of displacement, showing her weight at any depth of immersion, the object being to supply the means for a close estimate of the tally of a lumber cargo. This scale of displacement was drawn by a man who was afterward governor of Wisconsin. These two schooners introduced the clipper idea.

It is reported that the first vessel on the lakes to have her load-line marked on her sides was the R. B. Hayes, built at Gibraltar, Michigan, by Linn & Craig. The rules for free-board and load-line on the lakes are to be found in the book of rules for construction of lake vessels, prepared for E. P. Dorr, of Buffalo, in 1876, free-board being slightly less than in deep-sea craft.

The clipper idea is suited for schooners on the lakes that draw less than 10 feet of water, as their greater proportionate breadth would give them a lower percentage of shell to gross displacement and help their capacity and burden. Nevertheless, it must be said that the ideas of 40 years ago govern the vast majority of owners and builders on the lakes, and the preference is for the full model. The big vessels are limited to a draught of 14 or 15 feet, there being only that depth of water over the reef known as the Lime-Kiln Crossing, in the short river leading from lake Huron into lake Erie. The larger sailing craft are all constructed with that fact in view, and, in consequence, are either perfectly flat on the floor or have not to exceed 18 inches of dead rise. The midship section is a rectangle with the lower corners rounded, the curves of the bilge amidship being swept in with a radius not to exceed 18 inches. With reference to passing through the Welland canal, and also to the navigation of the narrow channels of the rivers that constitute so many of the harbors of lake cities, the beam of sailing vessels is kept narrow, while the bows are full and the stem is perpendicular, or nearly so. The lake model, so called, is therefore characterized by great length and fullness, the body of the vessel being nearly straight. The broadest part

is rather forward of amidship, and the sterns are square and very broad on deck. The visitor from the Atlantic coast, accustomed to the untrammelled models of deep-sea schooners, is greatly struck by the odd appearance of the lake hulls. Nevertheless, the lakers are admirable vessels, and are exactly adapted to the commerce in which they are employed, being fast, great carriers, cheap, and profitable. No more can be said of any vessels. The difference in dimensions between the lake and ocean models will appear from the following data, showing the approximate register measurements of fair average schooners of various sizes:

300 tons	{ Lake schooner: Length, 146 feet; beam, 26 feet; hold, 12 feet.
	{ Ocean schooner: Length, 125 feet; beam, 32 feet; hold, 10½ feet.
650 tons	{ Lake schooner: Length, 186 feet; beam, 34 feet; hold, 14 feet.
	{ Ocean schooner: Length, 145 feet; beam, 34½ feet; hold, 16½ feet.
850 tons	{ Lake schooner: Length, 210 feet; beam, 36 feet; hold, 16 feet.
	{ Ocean schooner: Length, 175 feet; beam, 40 feet; hold, 17½ feet.
Four-masted schooner.....	{ Lakes: Length, 278 feet; beam, 39 feet; hold, 21½ feet.
	{ Atlantic coast: Length, 205 feet; beam, 40 feet; hold, 22 feet.

The popular style of vessel on the lakes is the three-masted schooner with a center-board (Fig. 43), carrying at least one large lower yard on the foremast, although frequently having two or three. Its rig presents a very different appearance from that of the schooner of the Atlantic coast, owing to the square sails and the difference in the length of the masts. On Atlantic vessels the masts are usually nearly of the same length, but this is not the case on the lakes. A comparison will be interesting:

MASTS OF ATLANTIC COAST SCHOONERS.

500-ton schooner: Foremast, 89 feet; mainmast, 90 feet; mizzen-mast, 91 feet; all three topmasts, 52 feet.
 600-ton schooner: Foremast, 91 feet; mainmast, 92 feet; mizzen-mast, 93 feet; all three topmasts, 56 feet.
 750-ton schooner: Foremast, 93 feet; mainmast, 94 feet; mizzen-mast, 95 feet; all three topmasts, 58 feet.

MASTS OF NORTHERN LAKE SCHOONERS.

500-ton schooner: Foremast, 88 feet; fore-topmast, 65 feet; mainmast, 92 feet; main-topmast, 65 feet; mizzen-mast, 80 feet; mizzen-topmast, 58 feet.

650-ton schooner: Foremast, 98 feet; fore-topmast, 74 feet; mainmast, 102 feet; main-topmast, 74 feet; mizzen-mast, 86 feet; mizzen-topmast, 57 feet.

850-ton schooner: Foremast, 100 feet; fore-topmast, 80 feet; mainmast, 106 feet; main-topmast, 80 feet; mizzen-mast, 94 feet; mizzen-topmast, 75 feet.

The rake of the masts varies from $\frac{3}{4}$, $\frac{1}{2}$, and 1 inch to the foot, going aft, to $\frac{1}{4}$, 1, and 1½ inch to the foot.

The lake schooners spread so large an area of canvas that the spectacle they present while passing and repassing certain points in the summer time is a beautiful one. At Detroit, for instance, past which city they must nearly all go, and where the panorama of lake commerce is seen to the best advantage, the scene on a fair summer's day is always an interesting and sometimes an exciting one. A curious feature is the practice of collecting from three to six schooners, arranged tandem, in tow of a large freighting propeller or a large tug. The vessels are about 500 fathoms apart, and are each attached by a heavy tow-line of that length to the one ahead of it. Each vessel spreads all the sail it can profitably carry, the tug or propeller puts on every pound of steam, and the tow passes rapidly along to its destination. When out on any of the lakes, if a storm should arise, the tow-lines are all cast off and each vessel takes care of itself.

The shape of the hulls of the lake schooners permits the use of a great deal of straight timber in the frames. The floor timbers, and for a long distance amidship the top timbers also, are nearly straight. It is the practice, therefore, to cut the frames out of heavy plank (or fitch, as it is called), 5, 6, or 7-inch fitch being used, according to the size of the vessel, the spacing of frames being, as a rule, from 20 to 22 inches. The comparative thinness of the timbers rendering injudicious the use of treenails for fastening on the plank, iron bolts and spikes are used instead. The planking is usually square-fastened with two spikes and two iron bolts in each frame, but the practice varies, in some vessels three spikes and one bolt being used, in others four iron bolts. In the larger hulls the ceiling and sometimes the planking is edge-bolted. The main keelson is laid with two tiers of logs only. There is a sister keelson on each side of the main keelson, and the floor out to the bilge is strengthened with a number of floor keelsons, varying in depth from 10 to 16 inches, placed from 2 to 2½ feet from center to center. The flooring of the hold is laid with two thicknesses of light pine or hemlock plank, and in order to save storage room the heavy wooden knees characteristic of ocean vessels are dispensed with, the purpose for which they are introduced being accomplished by employing a strong shelf of white oak, usually 5 inches thick and often 30 inches wide, edge-bolted to the frames and strongly bolted to the beams. This shelf is composed of either two or three streaks of plank, one streak being thicker than the others, the beam end being so grooved as to fit down over the thicker streak and bear firmly on the whole width. White oak is the material used throughout the vessel, except in the beams, which are often of white pine, and in the decking, houses, and spars, which are also of white pine, some of the lighter spars being of spruce. Further reference is made to the details of construction in the chapter on steam vessels; but it is believed that all the main points in which the carpentry of lake vessels differs from that of the sea-coasts are represented in the above data.

The standing rigging of almost all the lake vessels is now of wire, and nearly all carry topmast shrouds. Poop decks are a regular feature, and there is a cabin aft on the poop deck, while a small house abaft the foremast shelters the crew. The vessels have topgallant forecastle decks and patent windlasses. All the fittings of lake vessels are of the most improved character.

Within a few years it has not been uncommon to build four-masted schooners for the lake trade. A handsome one was on the stocks at Huron, Ohio, in the census year. She was 278 feet long on the keel, 39 feet on the main

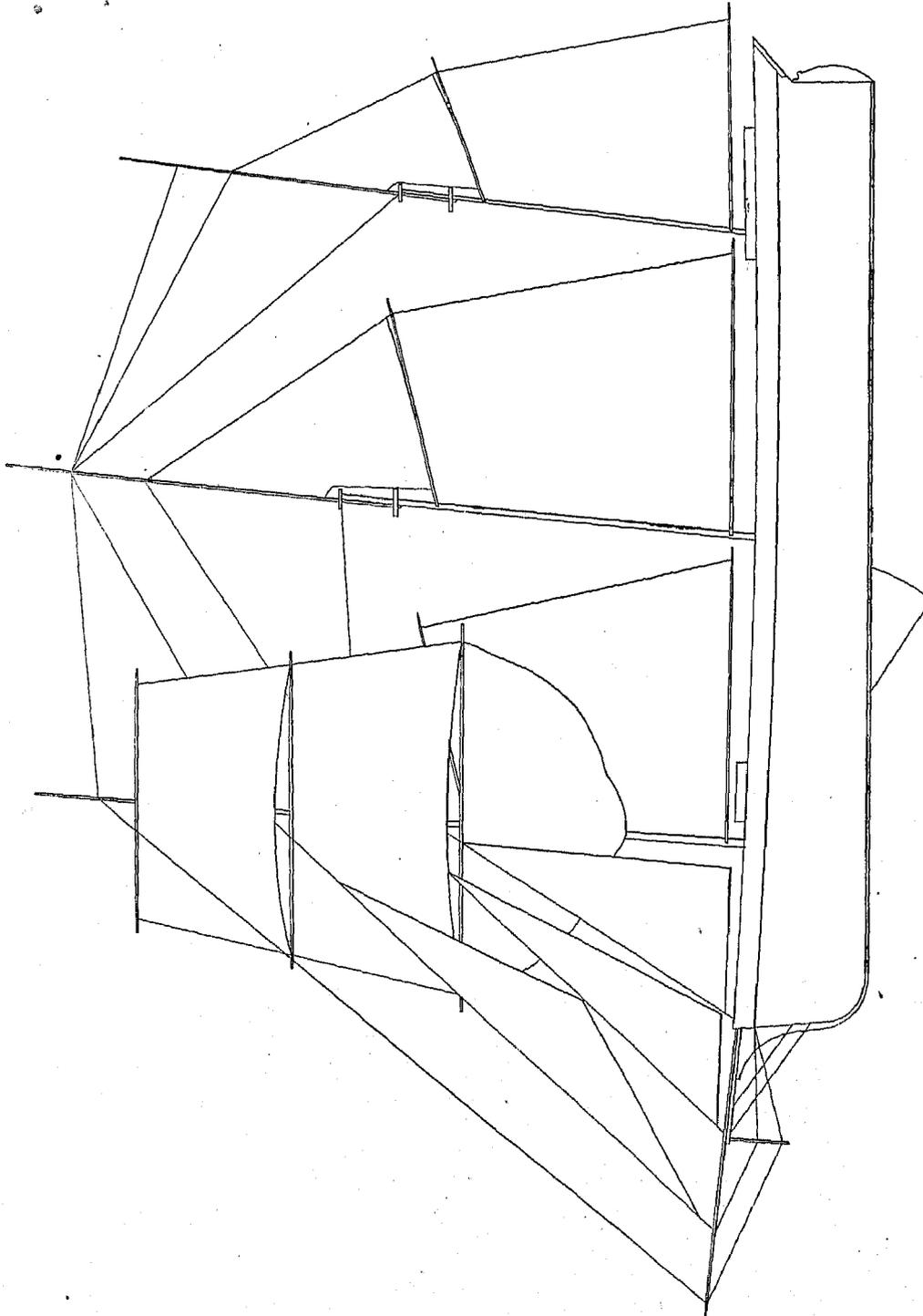


Fig. 43.—SAIL PLAN OF A LARGE THREE-MASTED SCHOONER OF THE NORTHERN LAKES.

Length of the vessel on the water-line, 194 feet; beam, 36 feet; depth of hold, 16 feet; canvas, about 3,500 yards. Some three-masted vessels carry, including sail covers, tarpaulins, etc., 4,500 yards. Standing rigging, wire; 5 shrouds on foremast, 4 shrouds on mainmast, and 3 shrouds on mizzen. Topmast shrouds and back stays. Arrangement of fore-and-aft stays varies slightly in different vessels, but the above is the usual practice.

beam, and $21\frac{1}{2}$ feet deep in the hold, and the overhang of the stern was about 9 feet. The frames were cut from 6-inch flitch; they were triple on the floor and double on the sides of the vessel, and were molded 16 inches over the keel, 15 inches at the bilge, 14 inches just above the turn, and 8 inches at the main rail. Room and space, 22 inches. The main keelson was 16 by 17 inches; the sister keelsons, 16 by 16 inches; the assistant sister keelsons, 14 by 14 inches. There were 7 floor keelsons on each side of the group in the center, the first one on each side sided 10 and molded 14 inches, and all the others sided 8 and molded 14 inches. Spacing, 30 inches from center to center. Flooring of

the hold, 2-inch hemlock, two thicknesses; ceiling 8, 9, and 7 inches thick on the bilge, diminishing to 6 inches at the plank-sheer; outside planking, all 5 inches. The ceiling and planking are edge-bolted every 4 feet. There were about 300 tons of iron fastening in this vessel, and its capacity was expected to be from 3,300 to 3,500 tons of cargo dead weight.

One five-master has been built of such dimensions as to make her the largest schooner in the world. This vessel, the *David Dows* (Fig. 44), was constructed at Toledo, Ohio, and was finished in 1881. She is 275 feet long over all, 260 feet on the keel, 37½ feet on the beam, and 18 feet deep in the hold, and registers 1,419 tons, with a carrying capacity of about 2,500 tons. The frames of this vessel (double) were 14 by 18 inches over the keel, spaced 21 inches; the ceiling 7 and 9 inches on the bilge, 6 inches on the sides, tapering to 5 inches at the plank-sheer, and the planking 4 inches. The hull was strapped on the outside with iron. A middle row of deck beams was introduced, but were not decked. The masts, going aft, were respectively 93, 97, 97, 93, and 88 feet long; the topmasts, 65 feet, except the jigger-topmast, which was 55 feet; bowsprit, 37 feet; jib-boom, 65 feet; yards on the foremast, 75, 65, 55, and 45 feet long; booms, 50, 50, 46, 43, and 36 feet long; gaffs, 40, 40, 40, 38, and 30 feet. The *David Dows* carried five jibs and gaff topsails, and was a noble-looking vessel.

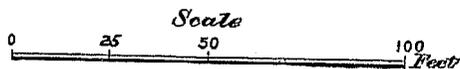
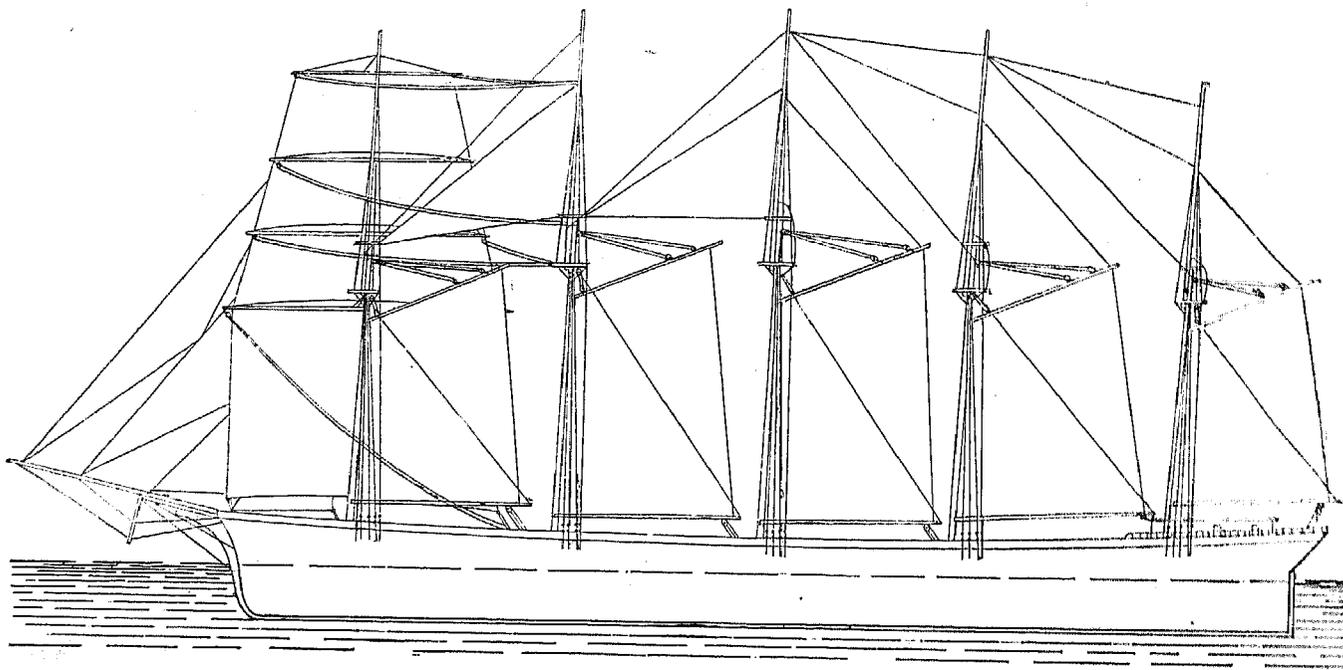


Fig. 44.—FIVE-MASTED SCHOONER DAVID DOWS.

Built at Toledo, Ohio, for the grain trade of the northern lakes.

The lake fleet finds its best employment in transporting the lumber, iron ore, and grain of the West to the lower ports, where the cargoes are transferred to the railroads for dispatch to inland cities or to Atlantic seaports. The vessels carry back large quantities of coal and some miscellaneous merchandise.

There are few places on the lakes where ship-yards are devoted exclusively to the construction of sailing craft. The tendency now is strongly in the direction of steam, and Toledo and Huron, Ohio, were perhaps the only places found in the census year at which propellers were not building. A description of the industry on the lakes can more appropriately be given in the chapter on steam vessels.

GENERAL REMARKS.

In large cities like Boston, New York, Philadelphia, and Baltimore, where the old sailing-packet and clipper-ship business has passed into the control of the foreign steamship lines, the common expression is, "The day of the sailing ship is past; hereafter nothing will do except steam." This is especially the opinion of old houses at New York, which have sold off their big sailing ships one by one. These houses depended almost entirely on the passenger, mail, and fast-freight traffic of the ports at which they were established, the very traffic for which the foreign lines of steamers especially competed. Having seen this traffic taken from them by the steamers, the proprietors of the old packet and clipper lines look upon steam vessels as the only carriers of the future.

On the other hand, there is a different feeling in the country towns, whose ships are built for the general trade, and seldom, if ever, sail in regular lines, but go hither and thither to every part of the world. On the Pacific coast particularly the current opinion is anything but a gloomy one. In many country localities the cost of building is reasonably low. The old shipping houses keep on constructing new sailing ships year after year, and though feeling the competition of steam to some extent, they have, as a rule, operated in trades in which it has not yet been successfully introduced, and have put their vessels into long voyages to California, China, Australia, and the East Indies, or in certain branches of the coasting trade, such as lumber and ice carrying, for which sailing vessels are better adapted than steamers. The causes which have affected the prosperity of ship-owners who do not live in large cities are not so much traceable to the development of steam navigation as to high taxes, unfavorable regulations, excessive port charges, and the unequal tonnage dues which tax a sailing ship as much as a steamer which does five times the business. The country ship-owners, therefore, believe that with favorable national legislation they can employ sailing tonnage profitably and successfully and for the good of the public.

Considering that steam has made such progress in the trade between large ocean ports, it is remarkable that, so far as the country at large is concerned, the bulk of the business is still done by sailing ships. On the 25th of January, 1882 (as shown by the *Maritime Register* of New York, which prints every week a list of all the vessels engaged in the foreign trade of the United States), there were 5,351 vessels actually so engaged that week, of which only 546 were steam vessels, as follows:

Nationality.	Sailing vessels.	Steamers.	Nationality.	Sailing vessels.	Steamers.
Total	4,805	546	Portuguese	21	.....
American	837	24	Italian	336	5
British	1,974	387	Austrian	130	.....
Norwegian	736	.....	Russian	59	.....
Swedish	93	.....	Greek	2	.....
German	355	39	Haytian .....	.....	1
Dutch	25	12	Chilian	5	.....
Belgian	1	18	Mexican	2	3
Danish	18	4	Costa Rican	3	1
French	55	20	Hawaiian	6	.....
Spanish	91	32	Miscellaneous	6	.....

This is a fair average showing of the respective number of sailers and steamers now in our foreign trade at any one date. By reason of its larger size and its more frequent trips, a steamer is reckoned as equal to five sailing vessels; but even on that basis the sailing tonnage exceeds the steam in our foreign trade.

Looking now at the cargo carried rather than at the vessels, it will be found that the sailing ship still transacts by far the largest part of the foreign commerce of the United States. The statistics on this point are fragmentary, and no complete statement can at present be made, as no government report on this subject has heretofore been prepared; still, the general fact is well known. Inquiries have been made for this report at nearly all the principal custom-houses of the country, and the testimony is uniform on that point. The only exact data which can be given are those of 1880 at the port of New York, this being the one American port at which steam has gained the most upon the sailing vessel. The grain trade of that port in 1880 was as follows:

Nationality.	SAIL VESSELS.		STEAM VESSELS.	
	No. of cargoes.	Bushels.	No. of cargoes.	Bushels.
Total	1,760	62,621,000	1,148	44,117,000
American	29	1,176,000	.....	.....
British	522	24,644,000	807	36,816,000
German	46	2,072,000	110	2,480,000
Belgian .....	.....	.....	52	2,308,000
Dutch	8	338,000	23	806,000
Danish	4	63,000	16	426,000
Norwegian	475	13,374,000	.....	.....
Swedish	32	864,000	.....	.....
French	24	548,000	19	457,000
Spanish	21	358,000	7	180,000
Portuguese	8	163,000	.....	.....
Italian	369	12,370,000	14	664,000
Austrian	209	6,276,000	.....	.....
Russian	12	370,000	.....	.....
Haytian	1	4,000	.....	.....

Besides exporting most of the grain from New York, the sailing vessels carry nearly all the petroleum, lumber, and coal and a vast quantity of provisions and general merchandise. Taking the whole business of the port, the sailing fleet does fully half the whole business, and probably more. The same state of facts exists at all other American ports, and on the Pacific coast the export trade is almost wholly in sailing vessels.

For general trading, especially for long voyages, there is every reason to believe that sailing ships will continue to be built, as they can carry a cargo at a lower rate of freight than steamers. A ship of 2,000 tons register, built in Maine, will cost close upon \$100,000, carry from 3,000 to 3,200 gross tons of freight, and sail at an average rate of speed of 6 miles per hour, which can be increased to 8 miles by sharpening the bow of the vessel. If a propelling engine were now to be put into the same ship, so as to convert her into a cargo steamer, there would be added to her weight 225 tons of boilers and machinery and 600 tons of coal, and a large proportion of her cargo space would be rendered useless. This would increase her cost from \$30,000 to \$40,000, and she could carry only 2,200 or 2,500 tons of cargo. If the ship were built with an iron hull, as a steamer ought to be, there would be a further increase to the first cost of \$20,000 if she were built in England, and perhaps \$30,000 if she were built in America. In either case, whether wooden or iron, her running expenses would greatly exceed those of the sailing vessel, as she must have a large crew. She burns coal continually, interest must be paid on the large investment in her, and in spite of her more frequent trips and ability to live at a smaller margin of profit the steamer could not carry freight at the same low rate as the sailing ship. Both for the owner and for the public at large, therefore, the sailing ship is the more profitable vessel which can be employed.

In the coasting trade, especially in carrying lumber, ice, and some other classes of goods, the schooner is pre-eminently the best carrier. Steamers are expensive, and their draught is too great for the hundred shallow harbors and small places on the southern coasts.

There is as yet little demand for sailing ships in this country of any other material than wood. Three or four vessels have been built of iron, and several more which had been wrecked on our coast have been repaired and put under the American flag; but up to 1880 there has been no progress in the direction of iron sailing tonnage. The reason of this is the high cost of iron. England went into iron sailing tonnage because her forests had become exhausted and timber was so dear that it mattered little, so far as cost was concerned, whether a vessel was built of iron or of wood; and as an iron vessel was more durable, a strong preference grew up for it. In America there has, thus far in our history, been plenty of timber, the cost of which has been moderate, and in spite of the gradual destruction of the Atlantic-coast forests a wooden ship can still be built in this country for less money than it costs to produce an iron ship of the same capacity in the most favored locality. First-class oak and pine vessels are built in America at the present time for from \$45 to \$50 per register ton; in Glasgow the cost for iron sailing vessels is \$60 per register ton. The difference in cost on a vessel of 2,000 tons is from \$20,000 to \$30,000 in favor of the oak and pine vessel, and when the fir of Puget sound is thoroughly utilized this difference will be more marked.

The following return, showing the cost of iron sailing vessels, angle iron, iron plating, and oak wood in Glasgow, has been furnished for this report by Hon. Bret Harte, United States consul at that port:

Year.	Iron ships, cost per register ton.	Angle iron, per gross ton.	Plate iron, per gross ton.	Oak wood, per thousand board feet.	
	£ s.	£ s.	£ s.	£ s.	£ s.
1852.....				7	1 to 8 4
1853.....				8	4
1858.....				8	8 to 9 4
1859.....	14 5	7 7½	8 13½		
1860.....	14 18	7 12½	8 15		
1862.....	14 13	7 12½	8 15		
1863.....	14 16½	7 12½	8 15	9	8 to 11 9
1864.....	16 0	7 0	9 1½		
1867.....	16 5	7 16½	8 15		
1868.....	14 14	6 13½	7 13½	8	8 to 9
1870.....	14 5	6 15	7 13½		
1873.....				18	6 to 14 7
1875.....	17 12½	9 10	10 0		
1876.....	15 14	7 10	8 1½		
1877.....	14 16½	7 1½	7 13½	8	8 to 10 5
1878.....	13 12	6 12	7 2½		
1881.....				12	6 to 12 10
1882.....	12 17½	5 5	6 5		

A letter from John Lloyd, esq., Deptford yard, Sutherland, England, dated February 17, 1882, obtained for this report by Hon. E. A. Merritt, American consul-general in London, states that in 1857 the price of British oak per thousand board feet was from £6 5s. to £9 11s., according to the size of the ship. Plate iron was £9 15s. per gross ton in 1857, £8 5s. in 1861, £11 in 1865, £10 15s. in 1872, as high as £14 in 1873 for a short time, £9 10s. in 1875, and £5 in 1880.

Hon. S. B. Packard, American consul at Liverpool, has gathered for this report the prices of English oak. From various firms of old standing in different parts of England was learned the fact that the average price of English oak 15 or 20 years ago ranged from £12 10s. to £20 10s. per thousand board feet for navy timber and from £8 7s. to £12 10s. per thousand feet for merchant ship timber. About the end of the last century the price was £12 per thousand. The prices of Canadian oak, imported, have been, per thousand:

Years.	Price.		Remarks.
	£ s.	£ s.	
1823.....	13 2	to 15 12	With 16s shillings duty in British vessels.
1824.....	11 16	to 13 17	Do.
1825.....	13 2	to 15 12	Do.
1830.....	6 12	to 9 14	Do.
1835.....	8 16	to 12 10	Do.
1840.....	10 12	to 12 10	Do.
1845.....	7 12	to 12 10	With 20 pence duty in British vessels.
1850.....	6 12	to 8 13	Do.
1855.....	9 7	to 13 2	Do.
1860.....	7 13	to 10 12	Do.
1865.....	9 14	to 10 12	Do.
1870.....	9 14	to 10 15	Do.
1875.....	11 2	to 12 3	Free of duty.
1880.....	7 12	to 11	Do.
1881.....	10 12	to 13 3	Do.
1882.....	9 7	to 13 3	Do.

An examination of these returns shows that oak has been too expensive in England for 30 years past for the building of cheap vessels. With oak at \$45 and upward per thousand feet and iron at \$40 per ton and less iron ships and wooden ships of the same tonnage cost about the same price, and with iron about \$30 or \$35 per ton and oak at \$55 and \$60 per thousand, as at present, the iron ship is much the cheaper vessel of the two. In America the conditions are reversed. Here the cost of materials always has been in favor of the wooden ship. For instance, to build a sailing vessel of 2,000 tons register about 950,000 feet of oak, pitch-pine, and white-pine lumber and 150 tons of iron and copper are required. These materials can be bought for \$42,000. A vessel of the same capacity, built of iron, requires about 1,100 tons of that metal, rolled into plates and angles, and the material could not be bought for less than \$70,000 or \$80,000. The ship would cost from \$85 to \$100 per ton, against \$45 to \$60 per ton for the wooden ship, and with a difference in cost like that it would seem as if wooden tonnage would continue to be preferred in America for all trades in which the winds are the propelling power. The wooden ship, in fact, is the cheap ship of the age, and its low cost, with its buoyancy, stability, and general excellence as a carrier, makes it still the popular vessel in America.

It must be said, however, that a sentiment is growing among the larger owners of American sailing vessels in favor of iron, as it has been discovered that in the California grain trade, and in all the ports of the world where wooden and iron vessels come into competition, the insurance companies favor iron vessels, and the latter get cargoes quicker and earn higher rates of freight. A curious point in favor of iron is, that should a wooden vessel go ashore or be damaged by storm in transit the cargo must bear a part of the loss under the "general average" insurance rules. An iron vessel, if in serious trouble, is more apt than a wooden one to be a total loss, in which case the cargo bears no part of the loss; and if properly insured the whole value is recovered from the insurance companies. American owners now say that they will buy iron ships as soon as the cost of them is reduced to a point at which they can afford to buy.