

46.—THE AMERICAN SARDINE INDUSTRY IN 1886.

By R. EDWARD EARLL and HUGH M. SMITH.

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INTRODUCTORY NOTE.

In view of the important questions arising out of the fishery trade between the State of Maine and the Province of New Brunswick, that had been pending since the expiration of the Treaty of Washington and prior thereto, Prof. Spencer F. Baird, then United States Commissioner of Fish and Fisheries, deemed it advisable to have at hand available for reference full and accurate information on this subject. Accordingly, in the fall of 1886, Mr. R. Edward Earll was instructed to proceed to Maine and make as extensive an inquiry as the time would permit into the effects of recent legal procedures on the mutual fishery interests of the adjoining countries, especially the sardine, smoked herring, and frozen-herring trades, and the condition and needs of these industries. The investigation of the American sardine business was naturally the most important topic under consideration, and the accompanying report, which, in the absence of Mr. Earll, has been prepared under my direction from his field notes, is the result of that inquiry. Mr. Earll was ably assisted in the field-work by Mr. Merwin-Marie Snell, to whom

much credit is due. Mr. Snell has also rendered me valuable aid in the elaboration of the notes. The sixth division of the report, on factories and products has been prepared by him, principally from notes furnished by Mr. Earll.

HUGH M. SMITH.

WASHINGTON, D. C., *July 12, 1888.*

I.—EARLY HISTORY OF THE INDUSTRY.

The first experiments in the manufacture of sardines occurred just twenty years ago, when Mr. George Burnham, an extensive packer of lobsters and other canned goods, conceived the idea of utilizing the small herring which occurred in such abundance in the vicinity of Eastport by packing them in oil as a substitute for the French sardines. In order to familiarize himself with the methods employed in the preparation of sardines he went to France and made a tour of inspection of the sardine canneries of that country, having with him a man who hired out as a laborer that he might thoroughly acquaint himself with the details. Returning to the United States he came to Eastport and began experiments in putting up the herring, but his studies in France had proved too superficial and he met with obstacles which he was not able to overcome. Again and again the little herring were packed in oil, but upon opening the cans they were invariably found to have a strong and unpleasant flavor which forcibly reminded one of rancid herring oil, and all attempts to keep them for any extended period proved ineffectual. Mr. Burnham soon became discouraged and abandoned the work. The failure, as he has since informed me, was principally due to his not having removed the moisture from the fish before canning them; and this moisture remaining in the cans mixed with the oil and soon became tainted, thus imparting an unpleasant flavor, not only to the fish but to the pure olive oil in which they were packed.

Nothing more was done in this business till near the close of the Franco-Prussian war. At this time a large trade had been developed in oil sardines from France, and in Russian sardines and anchovies. The war in France seriously interfered with the packing of these fish, and with their exportation to this country, and the trade was so thoroughly disorganized that the New York importers began looking about for some other fish to take their place. Hearing of the abundance of herring at Eastport they sent an order for a small quantity, thinking that possibly they could be utilized as Russian sardines. On their arrival in New York they were carefully examined, and the firm were of the opinion that with the proper methods of preparation they could be utilized for this purpose, and additional quantities were ordered and packed for shipment to the trade.

It was soon found more profitable to have the fish prepared in Eastport than in New York, and Mr. Henry Sellmann went to Eastport and gave his attention to the work. After examining the freshly-caught her-

ring he felt satisfied that there was a future for the herring as a sardine fish, and informed Messrs. Wolff & Reesing, with whom he was at that time associated, to that effect. The firm entered enthusiastically into the work, encouraging Mr. Sellmann in his experiments, which were at first carried on in the kitchen of his boarding-house. Soon fish of medium quality, though far inferior to those now packed, were prepared, and in 1875 about two or three hundred cases were put up.

From that time the business increased with marked rapidity and others became interested in it. Prior to 1880, however, it was confined wholly to the village of Eastport. During this season a factory was built at Robbinston, a few miles to the northward of the Saint Croix River, and one or two others were started at Lubec, while others still were built at Jonesport, Millbridge, Lamoine, and Camden. During that year there were packed on the coast of Maine, in all, \$800,000 worth of the various grades of sardines, including Russian sardines, anchovies, and sardines in oil, mustard, spices, and tomato sauce.

II.—PRESENT STATUS OF THE BUSINESS.

The following table contains a statement of the sardine canneries in operation in Maine in 1886, with their location and date of establishment. In 1880 there were but nineteen canneries running, which number had increased to forty-five in 1886. Of the factories operated in 1880, eleven were still used in 1886, although some were under different management.

Name of firm and location of factory.	Date of establishment.	Name of firm and location of factory.	Date of establishment.
A. H. Wentworth & Co., Robbinston.....	1881	Hiram C. Comstock & Co., North Lubec.....	1881
Frontier Packing Co., Robbinston.....	1880	Reynolds & Avery, North Lubec.....	1886
Saint Croix Packing Co., North Perry....	1886	E. P. Lawrence & Co., North Lubec.....	1885
Quoddy Packing Co., Harris Cove, Eastport.....	1886	Lubec Packing Co., North Lubec.....	1880
Charles H. Brewster, Eastport.....	1882	Parker & Pike, Lubec.....	1883
Peter M. Kane, Buckman's Head, Eastport.....	1876	New England Sardine Co., Lubec.....	1881
William A. Balkum, Eastport.....	1883	A. W. Lamson & Co., Lubec.....	1884
American Sardine Co., Eastport.....	1879	E. W. Brown & Co., Lubec.....	1881
Hiram Blanchard & Sons, Eastport.....	1880	Green & Kelley, Cutler.....	1886
Daniel McCullough, Eastport.....	1881	Stimpson & Young, Jonesport.....	1881
E. A. Holmes, Eastport.....	1880	Jonesport Packing Co., Jonesport.....	1882
M. C. Holmes & Co., Eastport.....	1881	William Underwood & Co., Jonesport.....	1880
Stimpson & Young, Eastport.....	1880	H. F. Sawyer, Millbridge.....	1885
George O'Grady & Co., Eastport.....	1881	Millbridge Packing Co., Millbridge.....	1881
J. D. Young, Eastport.....	1881	Lamoine Packing Co., East Lamoine, Hancock.....	1880
Eagle Preserved Fish Co., three factories, Eastport.....	1875	Bass Harbor Packing Co., Bass Harbor, Tremont.....	1882
	1881	Brooklin Canning Co., Brooklin (or Center Harbor).....	1883
	1882	S. B. Morey, West Deer Isle.....	1886
Capen & McLain, Eastport.....	1881	Deer Isle Packing Co., Green's Landing, Green's Landing Packing Co., Green's Landing.....	1886
John Henderson, Eastport.....	1886		1886
Hallett Brothers, Eastport.....	1884		1886
R. C. Green & Co., Eastport.....	1880		1886
Pembroke Packing Co., East Branch Pembroke River, Pembroke.....	1885		1886
The West Branch Sardine Co., West Branch Pembroke River, Pembroke....	1886		1886

Several additional canneries have been started at other points and run with varying success for one or more seasons. Among these was

one at Round Pond, located in the old menhaden factory of L. Bightman & Co., which was bought by Wolff & Reesing and fitted up for the canning of sardines and mackerel at an expense of \$30,000. It had a capacity of 50,000 cases of mackerel per season, in addition to the sardines, and the steamer David H. Wilson was fitted out for purse-seining to supply the mackerel needed for the purpose. The weir fisheries of the regions in which this and the other unsuccessful factories were located were not sufficiently extensive to keep them supplied with herring, though most of those who have given any attention to the matter agree that small herring are very abundant along nearly all portions of the coast of Maine east of the Penobscot River and in certain localities farther west. They seem to prefer a bold and rocky shore, with numerous islands and ledges, about which they gather in large schools for the purpose of feeding. Twenty years ago quite a number of weirs were fished along certain portions of the coast of eastern Maine, the catch being pressed for oil and fertilizer, and quite a profitable business was carried on; but, with the decline in the price of oil, the weirs were abandoned, and during the years that have elapsed the fishermen of the coast have given no attention to the capture of these little fish, and seem to have quite forgotten that they were present in any quantities in the waters. Since the erection of sardine canneries a few of the fishermen have been induced to rebuild their weirs, and the herring prove to be fully as abundant now as formerly. Indications lead to the belief that within the next few years a large number of new factories will be built at various points between Eastport and the Penobscot, in which case Eastport will no longer control the sardine industry.

During the season of 1886 herring suitable for canning have been exceedingly abundant all the way from Machias to Deer Isle. The weirs now existing, although in many instances provided with extra "pounds" in which the fish can be kept alive, have in a large number of cases been utterly unable to keep the fish which have entered them.

This large run of sardine herring will doubtless stimulate the westward movement already begun, which will be further strengthened by the strong competition among the eastern factories, which leads them to pay the fishermen a very much larger figure for their fish than the business will warrant. The rivalry among the factories has of late been on the increase, as one can not be contented to remain idle while others are fully employed; and if there is a tendency on the part of the owners of a cannery to withdraw from competition, the workmen become dissatisfied and seek employment in the factories that are more constantly in operation.

Eastport, if we include the villages of Lubec, Pembroke, and Robbinston, only a few miles distant, is still the center of the industry; and while the fisheries farther west are at best only partially developed, those of Eastport and the surrounding islands of New Brunswick are developed to their fullest extent, and a very large percentage, in fact a

large majority, of the people, both along the American shore and on the British islands, are wholly dependent upon the sardine industry for a livelihood, some giving their entire attention to catching the fish, others to transporting them, while the remainder are employed in various ways in the canneries.

III.—THE WEIR FISHERIES.

THE WEIRS.—By far the largest part of the fish are caught in brush weirs, which so far as we know are peculiar to the coast of Maine and the Bay of Fundy. These were employed by the white settlers in the capture of herring in this vicinity before the beginning of the present century, having no doubt been copied from those used earlier by the Indians. During the season of 1886 there were on the American shore, between Robbinston and West Quoddy Head, including Cobscook Bay and its numerous branches, 88 herring weirs, besides the salmon weirs of the St. Croix River between Robbinston and Calais; 83 weirs on Deer Island and small adjoining islands; 21 around Campobello Island; 58 in St. Andrew's Bay, and 80 along the Canadian mainland between St. Andrew's Bay and Point Lepreau. There are also 23 weirs within a radius of 8 or 10 miles of Cutler; 46 weirs between the mouth of the Little Kennebec River and Prospect Harbor, supplying the factories of Jonesport and Millbridge, with 46 others around Mount Desert and adjoining islands, supplying those at Bass Harbor, Southwest Harbor, and Lamaine; and 12 from Deer Isle to Carver's Harbor, upon which the factories of Deer Isle and Brooklin depend.

Prior to 1880 the weirs were built in the more sheltered coves, and were comparatively small and inexpensive; and this is true to-day of a large majority of the weirs along the coast of Maine west of Lubec, and also to a greater or less extent of those between Lubec and Robbinston, and of those in St. Andrew's Bay and along the main shore of New Brunswick; but at Deer Island and the other British islands in the vicinity, which are now the center of the herring fishery, the weirs are now considerably larger and more expensive than formerly, being often located on the extreme points of land or even in the deep tide-channels among the islands and ledges. Their average depth is now about 20 feet. Five years ago the average cost of the weirs on Deer Island did not exceed \$300 or \$400; but later it advanced to \$600, and the weirs recently built will average little, if any, short of \$800, one or two of the largest and most expensive costing as much as \$3,000. Those along the coast, from Cutler to Millbridge, cost about \$200 each, besides \$75 for the boat and \$50 for the seine used in fishing them. Two or three men ordinarily constitute a weir crew on the American coast.

The weirs are as a rule made of brush, the stakes or posts being driven firmly into the ground and strengthened by large horizontal stringers which are securely bolted to them. The portion below low-water mark is closely woven or "wattled" with branches of trees running horizon-

tally, these being pushed to their place below the surface of the water by means of a forked stick. The upper part of the weir is ordinarily of more loosely woven brush placed perpendicularly, the upper extremities extending to a point 2 or 3 feet above high water, and as the rise and fall of the tide averages 20 feet, and in spring tides nearly 30, the amount of material used is considerable. Formerly only pine, spruce, and other soft wood was employed, but in the larger and more exposed weirs hard wood is now almost invariably substituted, and the size of the posts and stringers is considerably increased. Of late some of the fishermen are replacing the brush by heavy netting in that portion of the weir which is exposed at low water.

The principle upon which the weirs are constructed varies considerably, according to the locality in which they are to be placed. The principal forms are known as bar weirs, channel weirs, shore weirs, and patent weirs. The first named is so placed that a ledge runs across its mouth, this being covered by the tide to a depth of 8 or 10 feet at high water, but gradually approaching the surface as the tide recedes and being left dry at half ebb, thus effectually preventing the escape of the fish. Channel weirs are built in the strong currents between the islands and ledges or between the main-land and an island. They have brush wings running out to either shore to turn the fish toward the mouth of the weir, which is so constructed that they find difficulty in escaping. The shore weirs vary endlessly in shape, but in most cases a wing extends diagonally outward for several yards from the mouth of the weir, which is usually just at the edge of the water-line at low water, another often running diagonally from the opposite side of the mouth to the shore, while the shore forms the inner side, the fish being retained in the weir proper, which resembles slightly a semicircle in shape. The patent weir is constructed on a principle similar to that of the pound-nets so extensively employed in the Great Lakes and along the southern shores of New England. It consists of a leader of brush extending at right angles to the shore into 15 or 18 feet of water at low tide, with an inclosure for the fish from 20 to 50 feet across at the outer extremity. Where the bottom is hard and stakes can not be driven ballasted weirs are built. These are similar in form to those already described, but have the stakes strongly secured and braced to a large platform, corresponding in shape to the bottom on which it is to be placed, this being heavily weighted with stones and sunk into place, the stones holding it securely against the current. Nearly half of the weirs built at Deer Island during the present season are of this kind. From year to year the material for building the weirs has become more scarce, and, consequently, more expensive. As a result, the fishermen now usually take out the brush above the line of low water and keep it on shore during the winter, replacing it when the weir is put in order the following spring. A weir properly constructed will last for five or six years, the stakes at this time usually being so badly worm-eaten that they are

worthless. They are more or less injured by drifting ice in winter, and considerable expense is incurred in putting them in repair for the fishing season in the spring, the annual expense of repairs being 15 to 25 per cent. of the original cost of construction.

The catch of the average weir can not be predicted with any certainty. It is estimated by Mr. Schroeder, a gentleman well informed on this subject, that not more than one-third or one-fourth of the weirs built during any season will catch fish enough to pay for tending them. Those not successful are seldom kept up more than one or two seasons, after which they are abandoned. He further states that the few weirs that are successful catch fish only three or four years, after which the quantity taken gradually decreases until it is found desirable to abandon them. After remaining out of repair for a number of seasons they are rebuilt and are often as successful as during the first years of their fishing. Ncthalf a dozen weirs out of the entire number in the vicinity have fished regularly since the beginning of the sardine industry, and the result is that the fishermen are constantly on the lookout for better privileges, and are moving them about from season to season in the hope of finding better fishing. It is claimed that the number of weirs about Deer Island is not incre asing, but that while new weirs are being built yearly others are allowed to run down, so that the total number remains constantly about the same. This would not be true of the north shore between St. Andrew's Bay and Lepreau, as the weir fisheries there are increasing rapidly.

PROFITS OF WEIR FISHING.—While the catch of some weirs is so small as to be unremunerative, that of others is often very large, and the price paid for herring is such that the majority of the weir fishermen are rapidly improving their financial condition, as shown by both the interior and exterior of their dwellings, and by the character of their boats. The largest catch of which we learn was from a weir in Letite Passage, which stocked nearly \$20,000. Another weir, on Adam's Island, recently stocked over \$10,000 in one season, while a weir at Deer Island caught \$800 worth of herring at a single tide. One weir at Letite Passage, which is now considered the best in the region, is owned by Canadian fishermen, but controlled by Eastport parties, who, beginning with 1886, have agreed to pay an annual rental of \$2,000 a year and \$3 additional per hogshead for all fish that are taken in it; and notwithstanding these seemingly exorbitant figures, they find it advantageous to make this arrangement, as the catch of this season has been unprecedentedly large, and owing to the high prices at which fish have been selling elsewhere, the difference between their contract price of \$3 and the average market rates in the vicinity has been sufficient to very nearly pay the entire three years' rental in advance, thus leaving a handsome profit on the fish that may be caught in the future.

MOVEMENTS OF THE HERRING.—The fish enter the weirs at different times according to their location with reference to the shore. With

some weirs it is during the last quarter of flood tide, while with others it is at the beginning of the ebb, though the time of their entrance is almost without exception within two hours of high water. The little herring are said to remain well out in the channels during moonlight nights, and to come in much closer to the shore when the nights are dark. They also swim well in on the flood tide, seemingly feeding upon the marine life that has been left dry by the receding tide and floats about freely as it is taken up by the incoming one. Some of the fishermen claim that they are drawn in by the higher temperature of the water rather than by any increased abundance of food; as the water flowing in upon the rocks that have been exposed to the heat of the sun is raised several degrees in temperature, and the herring find it more agreeable. Whatever be the cause, there seems to be little question that the fish approach closer to the shore on the flood than on the ebb tide, and the weirs are most successful when high water occurs very shortly after sunset or at sunrise. The wind, too, seems to have a greater or less effect upon the catch; and when it blows with any considerable force from certain quarters the fishermen know from experience that they are to get no fish, and hence do not take the trouble to visit their weirs.

FISHING THE WEIRS.—The weirs are fished at low tide, regardless of whether this may occur during the day or night. The fishermen usually go out in their boats about two hours before slack water to see if there are any herring. At night a torch is lighted on entering the weir, and the herring, attracted by it, gather around the boat, thus enabling the fishermen to judge of their abundance. If a sufficient quantity is found to warrant the seining, they proceed at once to the seine-float which is anchored near by, and unreel the seine, stowing it carefully in their boat. They then re-enter the weir and, after making one end of the netting fast to one of the posts, usually at the back or deepest portion of the weir, which varies from 12 to 20 or even 25 feet, row the seine around the fish and bring the two ends together, after which the circle is slowly lessened until the fish are huddled close together in the bunt of the seine, when, by means of large dip-nets, holding several barrels, they are "rolled" into the boat.

It occasionally happens that more fish are caught than can be utilized, in which case it is desirable to keep them alive for a day or two. For this purpose, several weirs are provided with "pockets," which are brush inclosures resembling the weir proper in construction and placed just behind it. The inclosure communicates with the weir by a gate, through which the fish are driven and retained until needed.

Five or 6 men are required to fish the largest weir, and 2 or 3 are needed for the smaller ones. A fair average for the weirs on Deer Island would be 4 men, while those in other localities would not exceed 3, and would possibly fall a trifle below that figure. Several persons usually own and fish a weir together, but where men are hired the price paid is from \$25 to \$30 per month and board.

THE WEIR-BOATS.—The weir-boats are well built and substantial, ranging from fifteen to twenty feet in length and holding from two to four or five hogsheads of fish. They cost from \$50 to \$350 each, the average being about \$200. The number required for fishing a weir depends wholly upon the strength of the tide and the size and depth of the weir. Some of the largest have 4 or 5 boats, while the average has only 2.

THE REGULATIONS OF THE WEIR FISHERIES BY THE CANADIAN GOVERNMENT.—The Canadian Government exercises a jurisdiction over its weir fisheries. It claims to have entire control of the water below high-water mark, and before a weir can be constructed the fisherman is obliged to obtain a license, for which he pays \$5. When the locality of the weir has been decided upon, the fisherman makes out his application on a blank, which requires from him certain information, including the statements that the privilege selected is not within 600 feet of any weir already built; that the building of a weir there will not interfere with the fishing of any weir in the locality, and that it does not interfere either with private rights or with navigation. If considered favorably by the local fishery officer, it is indorsed by him and forwarded to the head inspector for the province, who issues the license in due form. If the place selected has not previously been occupied, the owner of the land is given preference, and is allowed to put up the weir if he desires, but, if he does not care to utilize the privilege, the applicant for same must obtain from him a written statement that he has no objection to his utilizing it. When once the privilege has been granted the man holding the license has preference over any other, and as long as he is willing to pay the yearly license of \$5 he can retain it, even though he may not see fit to keep his weir in repair; or, in fact, it is not necessary that he should build the weir, for as long as he pays the license he controls the privilege. It sometimes happens that a fisherman will purchase numerous privileges which he considers valuable and sell them at an advance to his neighbors, though ordinarily the man who takes up the privilege builds and fishes the weir. When for any reason the fishing has been unremunerative, and the fisherman is unable or thinks it inexpedient to rebuild the weir, he is not compelled to pay the license until such time as he finds it desirable to resume active fishing operations. He, however, does not forfeit his right to preference in case a new license is to be granted unless after another application has been made for the same privilege, he refuses to pay the license fee.

PREVENTION OF DAMAGE TO WEIRS FROM MOVING ICE.—Owing to the amount of drift-ice in this locality the weirs are often badly damaged, and sometimes entirely destroyed, during the winter months. A fisherman at Letite has devised a plan for overcoming this difficulty. He selects large fragments of rock, weighing from 1 to 1½ tons each, drills holes in them and inserts eye-bolts. To these the stakes are

fastened by means of an iron link in such a manner as to be movable. The rocks, with the stakes attached, are then lowered into position, and the tops of the stakes are connected by means of the horizontal stringers and strengthening stays, after which frames containing the wickerwork are inserted, and the weir is ready for fishing. When the season is over, the brush frames and the stringers and stays are removed, thus relieving the strain from the poles, which are pushed aside by any obstruction that may come against them.

USE OF LARGE WEIR HERRING FOR SMOKING AND BAIT.—The weirs are usually put in order for fishing early in March, at which time herring too large for sardine purposes are abundant, and, while some of the fishermen do not care for them, others save all that are caught, and smoke them or carry them fresh to the smoke-houses at Eastport and Campobello. Considerable quantities are sold to fishing vessels from Gloucester and other fishing towns of Massachusetts and Maine, quite a large fleet of these vessels coming to Eastport and vicinity to purchase their supply of bait at this season.

FISHING SEASON FOR SARDINE-HERRING.—About the middle of April the large herring have disappeared, and smaller ones, suitable for sardine purposes, arrive. By the 1st of May the fishing is at its height, and the fish continue to be abundant about Deer Island (New Brunswick), until June, when the weir fishing in this vicinity becomes less extensive, as the fish distribute themselves in the small coves and bays along the main shore, where they remain during the summer months and are taken in limited quantities by the weirs there. The weir fishing of Passamaquoddy Bay begins to improve early in September. By November the catch is again large, and the fishing continues to be profitable until the middle of December, when the factories are closed. Fish of suitable size may be taken in winter, but they are in poor condition, and the collecting boats are liable to be detained so long by storms, that the fish become stale and worthless before reaching the factories. The packers of Maine were agreed upon the desirability of suspending operations in winter, and through their efforts a law was placed upon the State statute-books requiring the canneries to be closed from December 15 to April 15 of each season. According to Mr. Sellmann, the weir season for herring in Penobscott Bay is from the first of June to the middle of October, while the weirs about Jonesport and Millbridge usually begin catching fish early in May, and the run is practically over by the middle of September.

INTERFERENCE OF SQUID AND MACKEREL WITH WEIR FISHING.—The movements of herring are much interfered with by the presence of squid and mackerel, the former of which is a deadly enemy of the tiny fish, which from experience has learned to keep as far away from it as possible. For the past three years large schools of squid have entered the Bay of Fundy early in July and have remained until the 1st of October. They seem to follow and feed upon the small herring, and effectually break up and scatter the schools. Their presence is a great

annoyance to the weir fisherman, as after a school of herring has entered a weir the squid may put in an appearance and drive every fish out, the herring darting quickly through the openings in the brush in order to escape. The presence of mackerel also is injurious to the weir fishing, though to a less extent than the squid. For the past few years they have not been sufficiently abundant to interfere with the fishing to any extent.

IV.—TORCHING AND SEINING FOR HERRING.

TORCHING.—Up to the last two or three years a favorite method of catching the herring was by “torching” or “driving,” as it is locally called. This method has for many years been extensively employed by the inhabitants of the region during the winter months for securing herring for smoking, and prior to the passage of the law which forbids the canning of sardines between December 15 and April 15 almost the entire supply of herring obtained during the winter for canning purposes was secured in this way. Torches have long been used in fishing by the savage and semi-civilized races in many parts of the world, and were employed by the Indians of this locality prior to its first settlement by the whites. The white man soon adopted the method and has continued it to the present time.

A 16-foot lap-streak boat, with 4 to 6 men, is required for “driving.” An iron frame or basket projects from the bow of the boat, in which is kept a quantity of blazing birch-bark. One man at the stern steers the boat; another, armed with a dip-net, stands at the bow ready to secure the fish, which gather in large numbers, keeping just in front of the light, as the remainder of the crew rapidly row the boat along the shore. It is said that the fish will not readily follow a light in summer, and torching at this season is seldom attempted, but by the last of November the driving begins and continues without interruption until the following spring. Formerly a good many herring were obtained in this way in the vicinity of Eastport, but within the last few years the principal torching grounds have been along the north shores of Passamaquoddy Bay between L’Etang Harbor, New Brunswick, and Lepreau, New Brunswick, and between 8 and 10 hogsheads of herring are often secured by one crew in a single night.

Year by year the supply of birch-bark in the vicinity has decreased, and the fishermen have been obliged to go farther and farther after it. Many of them have of late substituted for it cotton batting saturated with kerosene. This has excited the prejudice of the weir fishermen, who claim that the continual dropping of oil upon the water is liable to drive the fish away from the shore and beyond the reach of their weirs, and a Canadian law which has remained inoperative for some time is now revived, and driving is now practically discontinued,* though

* Mr. R. C. Green, one of the leading sardine packers of Eastport, stated in September, 1886, that “the torching has increased a good deal here this season. In the late fall [October and November] the factories are getting a large part of their fish in this way.”

possibly the closing down of the canneries in winter has had as much influence upon its discontinuance as the laws upon the Canadian statute-books.

There seems to be a general impression that herring caught with torches are not so firm and will not keep half so long as the weir herring, but no satisfactory explanation is given.

SEINING.—With the increased demand for herring which the sardine canneries have developed fishermen have exercised their ingenuity to discover new methods of catching them, and, as a result, both the drag-seine and the purse-seine have been introduced. While drag-seines have been extensively employed in the herring fisheries about the Magdalen Islands, on portions of the coast of Newfoundland, and in other localities, they were, as far as we can learn, never used for small herring in this locality prior to 1880, when Mr. McVickers, of Deer Island, purchased a large seine to be used for this purpose. This was tried for several weeks with poor success, and it was finally considered too large and was cut into four pieces, each constituting an independent seine; but for some reason seining never became extensive until the summer of 1884, when, owing to the abundance of the squid, which interfered with the fishing of the weirs, seines were generally resorted to, and, during the months of September, October, and a part of November, nearly the entire supply of the factories was derived from this source. As the few haul-seines used in the locality were very successful, the weir fishermen could not resist the temptation to tie two or three weir seines together and use them for the same purpose; and catches of 50, 75, and even 100 hogsheads of herring were frequently made by them with this apparatus.

During the past two autumns there have been at least 50 or 60 seining crews, averaging 5 or 6 men each. The seining was done chiefly in the early evening. The seines were loaded on large boats and kept in readiness for use at some convenient point. The men would then row into the little coves along the shore and light a torch to see if the herring were there, and if a school was found the seine would at once be brought and the fish surrounded and hauled into the shoal water near the beach, when they would be quickly transferred to the boats by means of dip-nets.

The principal seining grounds were in St. Andrew's Bay, Back Bay, and farther east along the main shore to Point Lepreau.

The average seine used in this fishery is from 30 to 50 fathoms long, 30 to 40 feet deep, and 1 to 1½ inch mesh; but the length of any seine can easily be extended by adding one or more weir seines to it when necessary.

With so large a crew of seiners and a large fleet of collecting boats following close behind them, the excitement was considerable, and frequently several hundred men with a large fleet of boats would be collected in one locality. The noise and confusion resulting was used as

a pretext by certain of the more successful weir fishermen whose income from fishing during the summer was so large that they did not care to engage in seining. These drew up a petition, representing that the rights which were granted them by the license to fish their weirs, and for which they paid the Canadian Government, were being interfered with. This petition was met by another from the less fortunate weir fishermen, who were glad to improve the opportunity for catching and selling the herring which they had not been successful in securing in their weirs during the earlier months. The Government finally decided that as weir fishing had become an established industry, and a considerable amount of capital had been invested in it, any methods of fishing that would in any way break up the schools of fish, or interfere to any extent with the catch of the weirs, ought not to be encouraged, and they therefore decided to prohibit it. This regulation first went into operation in August, 1886, and at the present time (September 6) the fishermen are uncertain how rigidly it will be enforced. The owners of the canneries are very anxious that seining should be continued, as without the seine-fish they think the supply will not be sufficient to keep their employés work.

Some years ago there was a strong feeling of opposition on the part of the shore line and net fishermen of the State of Maine to those engaged in catching menhaden for use as oil and fertilizer. They finally succeeded in getting a law passed to prevent the further fishing for menhaden in that State. The law was framed so as to prevent evasion if possible, and the fishermen now find that it was so worded as to include not only menhaden, but mackerel and herring, and that purse-seining was not particularly specified, but that the broader word, seining, was used, so that the American fishermen, as well as the Canadians, are prevented from catching herring in this way. A recent attempt on the part of an American fisherman to seine herring in Cobscook Bay resulted in the seizure of both seine and vessel.

After the haul-seines had been successfully introduced the proprietor of one of the canneries decided to try a purse-seine. A seine 250 fathoms long by 12 fathoms deep in the bunt, of 1½-inch mesh, and a small seine-boat, were ordered. On the arrival of the seine it was loaded into the boat, which was taken in tow by the small sail-vessel that cruised about in search of herring, the sardine-boat following after to carry away to the factory any fish which might be taken. The crew consisted of six men, one or two of them rowing about in a small boat in search of the herring, while the remainder staid on the vessel, waiting a signal that the fish had been found. When a school was discovered the seine was set around them and the fish were secured. It occasionally happened that the fish were in too shallow water to warrant the pursuing of the seine, in which case it was used as an ordinary haul-seine for dragging the fish into shoaler water. On several occasions as many as 50 hogshheads were obtained, while the average haul was from

10 to 25 hogsheads. There are at present four purse-seines owned in the vicinity of Eastport, but the law which forbids the use of haul-seines prohibits these also, and none of them are employed at present.

V.—TRANSFER OF HERRING FROM THE WEIRS TO THE CANNERIES.

UNIT OF MEASURE.—The unit of measure for sardine herring is the hogshead, equal at Eastport to five flour barrels or fifteen bushels. The fish are measured in baskets holding a bushel and a half, ten baskets constituting a hogshead. Farther west a somewhat larger measure is employed, the basket holding about a bushel and three-quarters, ten of them being counted as a hogshead.

THE COLLECTING-BOATS.—Formerly the fish were brought to the canneries by the men who caught them, but the desire of the canners to secure the largest possible quantities led them to introduce the practice of sending for the fish, which has since become universal. A fleet of one hundred and twenty-five boats, with about two hundred men, are now regularly employed in collecting and running them to the factories. Some of these boats are very large, strongly built, and suitable for any weather, while all are well built and substantial. They average from eighteen to twenty-five feet in length, and readily carry from six to twenty hogsheads of fish. All have holds in the center, covered with hatches, to protect the herring from the sun and from the water. The largest ones, sailed by two men, are worth about \$1,000; while the smallest, worth \$125 or \$150, are easily handled by one man. The average for the whole fleet would be about \$275 to \$300.

A majority of these vessels belong to men living on the Canadian shore, in the vicinity of the weirs, though quite a number are owned and manned by Eastport parties.

PRICES OF FISH AND WAGES OF FISHERMEN.—Some hours before the weirs are to be seined, the collecting-boats start out and make a circuit of the shore, for the distance of a mile or more, to see which contain fish.

They usually select those having the largest quantities, and remain there until the herring have been taken out. The boatmen act as agents for the canneries, with instructions to purchase the fish as cheaply as possible. When the boats from several canneries meet at a weir, the fishermen find it advantageous to put up their fish at auction and sell them to the highest bidder; and rivalry between the boatmen usually leads them to bid until they have reached the extreme limit named by the factory, and the one who can afford to pay the highest price takes the fish. From personal motives they are also interested in securing as large a quantity of fish as possible, regardless of the price which they are required to pay, as their salary now depends largely upon the quantity of fish obtained. Formerly the boatmen were employed at wages ranging from \$50 to \$60 a month for the man and boat, and in the case of the largest boats the factory employed a man or a boy to assist him. By this arrangement there was no stimulus for

the fishermen to be on hand promptly when the weirs were seined, and the more faithful and energetic ones thus secured the bulk of the herring. By way of reward for faithfulness the wages were changed so that the boatmen should receive about \$30 per month, with about 50 cents additional for each hogshead of fish landed; and some of the factories now make a practice of paying no stated wages, but give the boatman \$1 for each hogshead of fish obtained.

During the season of 1885, the owners of the canneries organized an association for the purpose of regulating the price both of fish at the weirs and of the manufactured product, and held a meeting each week to confer regarding proposed changes. The average price for the season, prior to November, when the compact was broken, was about \$5 per hogshead. From this date, when the canners ceased to be under obligations to restrict themselves to certain figures, the price of fish advanced enormously, and as high as \$30 was frequently paid, while in exceptional instances the rivalry was so strong as to cause them to bid upwards of \$100 per hogshead on small lots. As the majority of the fish were bought at the lowest figure named, the average price would be between \$6 and \$7.

The present season the packers have acted independently, and the fish have varied in price from \$2 to \$30, averaging between \$8 and \$10. The price can never fall below \$2, and ought not to go below \$3, for if the herring are of good size, the fishermen can sell them for about that price to the herring smokers, or, as many of the weir fishermen own smoke-houses, they could utilize their own catch. They are probably worth at least \$2 a hogshead for use in the manufacture of oil and fertilizer.

METHODS OF COLLECTING THE FISH.—As soon as the fish have been purchased, the boats start immediately for the cannery, as a few hours will suffice in warm weather to render the fish worthless, while even in winter they ought not to be heaped together in any considerable quantities for more than ten or twelve hours. During the summer months the boats are often so long delayed by calm weather that their fish are injured and perhaps rendered worthless for canning purposes. To overcome this difficulty, a small steamer is employed in towing the collecting boats to the canneries, the owner receiving 50 cents per hogshead, in addition to the price paid to the boatmen, for each hogshead of fish contained in the boats which he assists. The boatmen, however, are supposed to depend upon their sails when they have a fair wind, and to accept a tow only when they consider it necessary in order to insure the arrival of the fish in good condition. At Jonesport a small steamer is employed by one of the canneries for collecting the fish, these being placed in baskets and carried in the hold of the steamer, and one of the canneries at Robbinston also owns a steamer which is employed in a similar manner. At Eastport and Lubec all of the fish are now brought in by collecting boats, but at Robbinston, Pembroke, and places farther

west a large percentage of the fish are brought in by the men who own and fish the weir.

The greatest distance that the young herring are carried is about 20 miles, and under ordinary circumstances 15 miles is as far as they can safely be taken. The fishing for any particular factory is therefore limited to this radius.

PROPORTION OF AMERICAN AND CANADIAN FISH CONSUMED.—As already stated, the principal fishing grounds for herring that have thus far been developed are among the Canadian islands in the vicinity of Eastport, but the duty of \$2.50 per case on sardines prevents the building of factories on the Canadian side of the boundary, these being located, with the exception of a small one at Saint Andrews which is engaged in packing fish for the Canada trade and for exportation, on the coast of Maine, in close proximity to the boundary line.

The factories at Robbinston have always obtained a considerable percentage of their fish from weirs located along the adjacent coast of Maine, and the present season between 50 and 60 per cent. of the entire pack of these factories has been caught in American waters. The canneries at Eastport are more extensively dependent upon foreign fish than those of any other locality. In 1885, at least 95 per cent. of the fish packed were caught in the waters of New Brunswick, and this year about 90 per cent. were caught in the same locality. The quantity of Canadian-caught fish put up in Lubec and Pembroke varies from year to year. In 1885 at least 90 per cent. of the pack at the former place were caught by New Brunswick fishermen, and fully two-thirds of those caught in the latter were from the same locality. During the present season, however, the catch in the American weirs of Cobscook Bay and of West Quaddy River has been much larger than for a number of years, and it is estimated that half of the pack of the Lubec factories consists of American-caught fish, while at least 90 per cent. of those packed at Pembroke were caught within a few miles of that village. All of the fish put up in the factories farther west were caught along the coast of Maine.

VI.—THE CANNERIES AND THEIR PRODUCTS.

DESCRIPTION OF CANNERIES.—The buildings used for sardine canning are two-story wooden structures, usually containing separate rooms for each of the principal kinds of work. Their value, including the land occupied and all the fixtures which they contain, ranges from \$2,000 to \$24,000. The largest and best constructed are, generally speaking, those of Eastport, which average nearly \$10,000; those of Lubec being worth only a little over \$6,000 apiece, and those of Pembroke, Robbinston, and North Perry about \$5,000. Farther southwest there is great variation in the size and completeness of the different factories. There are several large ones, notably at Millbridge, Bass Harbor, and,

Brooklin, which bring up the average for that section to over \$9,000. The canning capacity, though of course dependent largely upon the size of the building, is much increased by the use of ovens and other improvements. The canneries at Eastport can put up, on an average, something over 200 cases of sardines daily; those of Lubec, about 170; those of Pembroke, Robbinston, and North Perry, from 100 to 125, and the western canneries about 180.

The buildings are of an inflammable nature, especially when, after long use, their floors have become saturated with oil, and the employment of fire is necessary in many of the operations connected with the canning. By these causes the danger of conflagration is much enhanced, and the rate of insurance is correspondingly high. The best built factories obtain their insurance for 4 per cent. premium, but many have to pay as much as 6 per cent.

METHODS OF PREPARATION.—The different modes of preparing sardines in use up to the year 1880 have been minutely described in a previous report on this subject.* The following is an outline of the process which the little herring undergo, with a note of the principal changes which have taken place since the date named:

On coming to the factory they first pass through the hands of the cutters, who remove only the heads and viscera, as it is no longer customary to cut off the tails. After this they are left in brine from fifteen minutes to three-quarters of an hour, according to their size, before being placed upon the drying flakes. The cutters are usually small boys, and the flakers women or girls; but in some cases both operations are performed by the same persons.

Sometimes the fish are dried in the sun, but, owing to the dampness of the atmosphere and the frequent periods of cloud and rain, even those factories which make use of this method whenever possible are obliged to supplement it by artificial ones. The factories are, one after another, discarding entirely the sun-drying process, occasionally depending entirely upon the drying-room, but more frequently adopting a patent drying apparatus or the oven. Sometimes the drying is done by heat from steam-pipes, but this is not thought to be so good as the stove-drying method. The condition of the air has considerable effect upon the drying, especially when it is done by natural heat; the dried fish are in damp weather much less firm in flesh than under other circumstances.

The time taken for the drying varies considerably. In the sun or in a drying-room it may take the greater part of a day, in a furnace-heated drying apparatus two to seven hours, and in an oven only a few minutes. The use of ovens has grown much more common during the last year or two, and nearly half of the Eastport canneries, as well as most of those at Lubec and Millbridge, are now fitted with them.

* *Fisheries and Fishery Industries of the United States. History and Methods of the Fisheries. Section V, Volume I.* Quarto. Chapter on the Sardine Industry, by R. Edward Earll, pp. 489-524.

When the fish are oven-dried they need no further cooking before being packed, but in other cases they are fried in oil at a temperature of 260° Fahr., the oil being boiled either by direct furnace heat or by the passing of steam through coils of pipe in the frying tank. The Brooklyn Canning Company claims to have invented the process of frying by steam, which has many advantages over the old method of direct furnace heat. They produced the first successful apparatus for the purpose in 1884. Experiments had been made by other parties at an earlier date, but without satisfactory results. About a third of the factories which fry their fish do so by means of steam, and, as is the case with other improved methods, the number is on the increase.

It is doubtful whether the ovens will ever supplant entirely the frying apparatus, for it is said that the fish which have been fried have a better flavor, and, having absorbed more oil, keep longer than the others. It is claimed, however, by those using ovens, that by the baking process very much depends upon the skill of the baker, and that, when at its best, it may produce results equal, if not superior, to those of the old system. It appears that the first fish fried in a given quantity of oil are better than the best baked fish, but that as it is necessary, in order to keep the expenses within reasonable limits, to use the same oil for frying successively a great many pans of fish, the fluid soon becomes filled with scales and small particles of fish, which burn on the bottom and impart to the product a bitter and unpleasant taste. In baking, on the other hand, when it is properly done, the fish are all of a quality equally good.

After coming from the frying-pans or the oven the fish go into the hands of the packers, who are almost invariably women or girls, by whom they are sorted and placed in the boxes, which are then filled with oil, or, in some cases, mustard or spices. A few years ago, although other oils were used in the frying, the sardines were packed in olive oil, either alone or mixed with inferior kinds; but at present its use has been almost entirely superseded by cotton-seed and nut oils. This change is accounted for by the facts that the heavy duties make olive oil very expensive, that it will not keep as well as the cotton-seed oil, and that the latter can be made exceedingly palatable. Peanut oil, which is sometimes used, is said to be even better than the cotton-seed oil. The olive oil used in France for sardine packing is often largely adulterated with American cotton-seed oil, as well as with palm and other oils.

When the herring are of the most desirable size they are packed with a dozen in each can; the number is never smaller than seven or eight.

The making of the tin cans or boxes in which the products are packed is quite an important branch of the work at the cannery. Two sets of men are employed, the can-makers who manipulate the machines by which the tin is cut, bent, and stamped into the various shapes and sizes required, and the seamers, who, with a soldering-iron, join the ends

together and insert the bottom. In some of the factories solder wire is used for this purpose; in others, the old-fashioned stick-solder is much preferred. Some of the small factories do not make their own cans, but purchase their supply from one of the larger ones.

After the cans have been filled with fish they go to the sealers, who solder on the covers, making them perfectly air-tight. The filled cans are then ready for bathing, and are placed in boiling water, where they are allowed to remain for about two hours.

It was formerly considered necessary to puncture all the cans after the bath had been completed, to allow the remaining air to escape, the aperture being then closed with solder. It has been found that by the use of slightly concave covers this necessity may be done away with, as all of the air is driven out in sealing, and the custom has now become obsolete in the case of cans of the ordinary quarter size, though it is still adhered to in the treatment of the half and three-quarter cans.

Formerly all of the sardines packed on the American coast were sold under French labels, but the better practice of using American labels, showing by what firm they have been put up, is now rapidly gaining ground. This has been brought about principally by a law recently enacted by the New York legislature, forbidding the sale in that State of any canned goods not bearing the name of the maker. The fish sold under honest labels are of better quality than those pretending to be of French origin, as the factory owners allow only their best products to go upon the market under their firm name, and pack the stale or broken fish under the fictitious French labels which do not throw upon them any responsibility.

The description given above of the methods of preparation applies equally to all the different brands of sardines properly so-called. The favorite variety is the "quarter oil," the smallest sized can of oil-packed fish. When the fish are too large for use in this way, they are put up in half-pound cans, or much more frequently, with mustard in the place of oil, in three-quarter cans. Occasionally three-quarter cans of oil sardines, half cans of mustard sardines, three-quarter cans in tomato sauce, and half or three-quarter cans in spices are put up, and in rare instances small fish are put up in mustard or spices in quarter cans.

In 1885 the pack of oil sardines was smaller than usual owing to the scarcity of small fish suitable for quarter cans. A few experiments have been made in the canning of smelt as a substitute for herring in the manufacture of sardines, but they were found to be dry and hard, and deficient in flavor, and efforts in this line have been discontinued.

Two or three factories still retain the practice of putting up a few cans annually of large herring in cans bearing the trade name of "brook-trout," but as this brand has never been received with any favor, the quantity put up has been decreasing year by year.

The manufacture of Russian sardines is still an important part of the business. They are made of fish of a size somewhat larger than those

usually canned in mustard or spices. In this way the canneries are able to utilize the large fish which otherwise would have to be used in the manufacture of oil and fertilizers. They are first washed and salted, after which they are packed in fish-barrels and shipped to New York for repacking and further preparation. In this condition they will not keep more than two months. The barrels are worthless in New York, and at least one firm in Eastport saves that item of expense by preparing its own Russian sardines for market. The process consists in packing in wooden kegs or pails containing about 4 quarts each, where they are well covered with whole spices, including cloves, allspice, mustard seed, and pepper, with a liberal allowance of bay leaves. A quantity of vinegar is then added, the package is headed up, and it is ready for use; but it is considered better after it has been in stock for some time and the fish have been thoroughly flavored by the spices.

We were informed by one of the factory owners that Russian sardines of American make were going out of the market, as the foreign were much preferred, but comparative figures for 1885 and 1886 show a considerable increase in their manufacture during the latter year, and the importation is steadily decreasing.

CHANGES IN MANUFACTURE SINCE 1880.—The principal changes in the methods of preparation since 1880 may be summed up as follows: The tails of the sardines are not removed; the stove-rooms are more complete, and there is less drying in the sun; much of the frying is now done by steam instead of by furnace; ovens are used in many factories instead of frying apparatus; a concave cover has been substituted on the quarter cans for a flat one, so that it is no longer necessary to vent them after bathing, and American labels are placed upon the most creditable fish instead of the foreign ones universally used several years ago.

COST OF PREPARATION.—With fish at \$6 per hogshead the actual expenses incurred in putting up a case of 100 quarter cans of oil sardines amount to from \$3.75 to \$4, divided approximately as follows: About 40 cents for fish, 40 cents for oil, \$1.20 for tin, 60 cents for solder, 10 cents for the box, 8 cents for salt and coal, 5 cents for miscellaneous items, and \$1.17 for labor.

As remarked in an earlier portion of this report, the price of fish varies considerably. It averaged about \$7 per hogshead in 1885, and \$9 in 1886. From one hogshead of fish an average of about 16 cases of quarter cans or 13 cases of half cans may be put up, the extremes varying from 12 to 22 cases according to the condition of the fish. From a gallon to a gallon and a quarter of oil, at 40 cents a gallon, is required for each case.

The tin of which the cans are made is usually got direct from England, but in some cases is bought in New York. Three cases of tin are used in making 20 cases of cans, one for the sides, one for the bottoms, and one for the covers. The duty on tin is \$1.12 a case. The bronzing of the tin

and the stamping of the label upon it are done in New York. The tin is first printed and then baked. Six firms are engaged in the business, three of them devoting their entire attention to supplying the sardine canneries.

The solder used in putting together the cans and sealing the covers is a mixture of pig tin and lead in equal proportions. The amount used varies according to the skillfulness of the employés who handle it. In sealing, for example, the poorest workmen will use 2 pounds and 13 ounces for a case of cans, while the best will not exceed 1 pound and 15 ounces. The average amount required for each case is $4\frac{1}{2}$ to 5 pounds, including something over 2 pounds for sealing. A cannery will often use more than 100 tons of solder during a single season.

The expenses of operating a cannery are, as may be readily seen, very great, and it is therefore necessary in most cases for the factory owners to turn over their working capital several times in a year. This is illustrated by an instance where a factory with a cash capital of \$8,500 pays out \$52,000 a year.

WAGES PAID.—The cost of labor amounts to from a fourth to a third of the entire expenses of a cannery. The price of labor is lower and less variable in the factories outside of Eastport. A large percentage of the operatives employed in the industry of that town are young persons of both sexes, who come from their homes in the neighboring portions of the Provinces, to which they return at the close of the season. The factories being so numerous there is considerable competition for labor among the factory-men, who, when there is a rush of fish, bid against each other for the services of the workmen, who go wherever they can get the best pay. When fish are received by any factory the cutters and flakers are summoned by a steam whistle, each cannery having a signal peculiar to itself which is easily distinguishable from that of any other.

The following is a schedule of the average wages paid by the Eastport factories. A working day for ordinary labor is ten hours, and those who are paid by the day receive extra remuneration for every hour's work which they do in excess of that time. Skilled laborers are usually employed at piece-work or by the hour. They are, as a rule, occupied only a few hours each day, as they do not assist in the general work of the cannery, but return to their homes after their special work for the day is completed.

Boatmen.—Formerly \$50 to \$60 a month; now \$1 per hogshead, or \$30 per month and an additional 50 cents per hogshead.

Cutters.—Paid by the box and average ordinarily \$5 to \$6 per week, or, when the factories are working full time, \$2 or more per day. Sometimes when fish are abundant they will make very large wages, and a child of twelve or thirteen years will occasionally earn from \$18 to \$20 a week. If the cutters had all that they could do, they would earn more than any other class of employés. This results from the fact that

the principal competition is for this class of labor, for if the cutters are not on hand in sufficient numbers immediately after the fish arrive the whole lot may be spoiled before they can be cared for.

Flakers.—Usually 10 cents an hour.

Packers.—One dollar and a quarter for the first three hours' work, or 10 to 12 cents a case. The best workmen pack at least 20 cases in a day of 10 hours, and earn \$10 to \$15 a week under ordinary circumstances.

General laborers and bathmen.—Two dollars per day and 20 cents an hour for overtime.

Seamers.—One dollar and a half to two dollars per day, or 6 cents per 100 cans.

Can-makers.—Fifteen to twenty cents per hundred cans. In some cases the combined wages of the seamers and can-makers amount to 30 cents a case.

SHIPMENTS AND MARKETS.—Many of the factories are owned or controlled by New York firms, and most of the others have permanent arrangements with some particular dealer, who acts as their agent in placing their goods upon the market to the best advantage possible. Others sell through various brokers, and it is now becoming a common practice for wholesale grocers to speculate in sardines and order their supply directly from the canneries. All the regular agents for the East-port canneries, as well as most of those for the ones at other places from Mount Desert Island eastward, have their headquarters at New York City; but the canneries on Deer Island and at Brooklin ship to Portland and Boston. The products are usually shipped by steamer, but sometimes go to New York in sail vessels. The price received for quarter oils in 1885 was from \$4.50 to \$7 per case, averaging \$5. The average prices in 1886 were, for quarter oils, \$4.50; half oils, \$7; quarter-mustards, \$5.50, and three-quarter mustards, as well as the brands prepared with tomatoes and spices, \$3.50. Russian sardines sell for 45 cents a keg, or 13 cents less than the imported article.

When a shipment of canned goods is made to the New York dealer it is customary for the firm owning the factory to draw a certain amount from him on its bill of lading. The dealers then, according to the nature of their instructions, either sell as soon as possible or hold for better prices, transmitting the balance due the factory as soon as the sale has taken place. When the market is known to be poor the shipment of goods is often delayed until a more favorable opportunity arises for disposing of them to advantage.

In the spring of 1885 there was a stock of between 140,000 and 150,000 cases on hand at the factory; but in 1886 the season opened with a stock of only 40,000 cases.

The combination entered into by the factory owners in 1885 resulted in considerable profit, controlling, as it did, the prices both of fish and of goods; but the best-established firms got the most trade and succeeded in obtaining the largest share of fish. It was finally broken

up by certain wealthy weir fishermen of Deer Island, who, seeing their profits curtailed by the fixing of a uniform price for their fish, put up a factory near Eastport and began independent operations. This factory, refusing to enter the combination, and paying for the fish more than the price fixed by the exchange, caused the other factories to break their agreement and renew the competition. As the run appeared to be light, they bought at exceedingly high figures, but the supply of fish kept up all summer and the business suffered from over production.

There is some foreign trade, the American factories supplying Canada and shipping 6,000 cases a year to South America. The brand most commonly placed upon the Canadian market is the half-pound can of sardines in mustard, as the duty is proportionately much less than that upon the quarter-oils. Several lots have been sent to Australia, but the last shipment resulted in loss on account of the serious competition of the English sprat sardines, which prevented further exportation to that country. The business of preparing sprats in the form of sardines began in England three years ago. The headquarters of the business were in the vicinity of Dover. Several thousand cases of this variety of sardines were sent to the United States a year or two ago, while the price of the American product was comparatively high; but the American firms fear no further competition from this source as long as they are able to place their goods upon the market at anything like the present figure. With the existing tariff it is impossible to import the British sardines at a cost of less than \$7.75 per case, while those of American preparation are offered in London at 19s., equivalent to \$4.60. The French sardines are unquestionably superior to the best which we have thus far produced, but the price is so much higher that the American article is usually preferred.

DEPENDENCE OF EASTPORT AND SURROUNDING COUNTRY ON THE SARDINE INDUSTRY.—All of the large amount of money required for carrying on the sardine business of Eastport, with the exception of that used in the purchase of tin, solder, and boxes, is expended locally, going either to the residents of the town or to the neighboring islands. Since the development of this industry the population of Eastport has increased 50 per cent., notwithstanding the failure of other means of livelihood which had formerly been the principal dependence of the inhabitants; and the Calais trade is visibly affected by the prosperity of the factories.

The Canadian islands and shores within a wide radius of territory depend entirely upon the canneries on the American side. The people give most of their attention to fishing for the small herring with which to supply the factories; and their children are employed as factory-hands for eight months out of the twelve. The "sardiners" as a rule spend their money as fast as they earn it, so that probably not 10 per cent. of the total amount which they receive in wages goes back to the islands with them in the fall.

VII.—INTERNATIONAL AND ECONOMIC QUESTIONS INVOLVED.

EFFECTS OF TERMINATION OF TREATY OF WASHINGTON.—During the last few years of the continuance of the Treaty of Washington the sardine interests developed with surprising rapidity. With the termination of that treaty grave fears were entertained on the part of all concerned lest the business might be so seriously interrupted as to render it unprofitable. The Collector of Customs at Eastport, appreciating the importance of the situation, gathered statistics to show that the magnitude of the industry warranted the Government in giving special attention to its interests, and wrote a detailed letter explaining the situation, which was the natural result of an industry in which the citizens of both the United States and Canada were equally interested.

A considerable percentage of the herring were caught by fishermen living on the Canadian side of the boundary, while the entire packing interest was controlled within the limits of the United States; hence any regulations which interfered with the bringing in of fish would result disastrously to both parties. He explained that for many years the fishermen had been accustomed to go out in their small boats and fish with trawl and line indiscriminately in British and American waters, bringing their catch home to be salted and sold. He then asked whether these boats, which were of less than 5 tons burden and hence not recognized as vessels, could not for purposes of fishing be considered as vessels of the United States, and their catch, when manned by American citizens, be admitted free of duty as the product of the American fisheries, even though the fish might have been caught in Canadian waters. This question, if answered in the affirmative, would allow the few boat fishermen that remained to continue their fishing without interruption, and would remove difficulties which would otherwise prove annoying.

A second question was submitted asking whether American boats manned by American citizens would be allowed to go to the weirs and to the fishing grounds along the Canadian shores, and obtain fish caught there, and bring them home in said boats free of duty as the product of the American fisheries. The Secretary of the Treasury submitted the questions to the Attorney-General, who decided both in the affirmative.

These decisions having been made, it was in the power of the Collector to make such minor arrangements as were necessary for continuing the business. A large percentage of the vessels employed in transporting sardines from the weirs to the factories were owned by men living on the Canadian side, but as their boats were open boats of less than 5 tons burden, and hence not recognized by the United States as vessels of a foreign country, they would be treated as wagons or other vehicles for transportation, and could be brought to Eastport, entered, appraised, and duty collected, after which they would be regarded as American boats. At least seventy of these boats were thus made over into

American boats, and such of their owners as could be naturalized took out the necessary papers and became American citizens, while others disposed of their vessels to Americans or employed Americans to navigate them. Thus the business went on without serious interruption, and the canneries were allowed to obtain their supply of fish without the payment of duty, which would amount to between \$5 and \$6 per hoghead.

ACTION OF CANADIAN GOVERNMENT.—The disposition of our Government to deal generously with the industry was in marked contrast with the early action of the Canadian government, which, after the boats had been made over into American craft, and had paid a duty of 35 per cent., raised the question whether these boats, having been Americanized, should continue to have the same privileges as were accorded to English boats; and an effort was made to break up the general trade which had for half a century been carried on between Eastport and the islands. Eastport being the natural market for the islanders they had been in the habit of coming here in their boats to obtain flour, sugar, dry goods, and such other things as were needed by themselves and families. The government agent worked up several cases against the inhabitants of the islands; in one case where a fisherman had bought boots worth \$4, demanding \$50 in settlement; in another where one had purchased cloth for a sail for his boat, settling for \$25; and numerous other cases of a similar character were compromised. Later an agent was sent into the locality to inquire into the influence of hostile legislation upon the New Brunswick weir fishermen, and into the practice of allowing the selling of herring to the boats that had been entered in the United States and thus become American. It was finally decided that should the government interfere in any way with this arrangement it would result in serious loss to their own fishermen, and they concluded to allow the practice to continue, but required that these boats should enter and clear at the custom-house when coming for their cargo. The perishable nature of the small herring rendered compliance with this regulation impossible, and it was later decided by the customs authorities that the boats could get their load of herring and then come to the custom-house and enter and clear at the same time; but as the fish were often obtained at night, when the customs offices were closed; and to wait for morning would cause the entire loss of the fish, the customs regulations were finally amended so that the boats could come once a week and obtain permits, or in other cases permits were issued lasting a week or authorizing the conveyance of a stated quantity of herring. The English boats were also required to carry papers, in order that they could be distinguished from those belonging in the United States. This practice has continued and the officials have ceased to be very stringent in insisting upon the regulation, until now many of the boats go to the custom-house only when they find it convenient. An officer from the Canadian cruiser stationed in the locality frequently boards the boats and asks for their papers, but

in no case, thus far, has any sardine-boat been seized, though two or three were warned out of St. Andrews Bay during the early part of July.

The customs officers on this side have been as lenient as the law would allow, not being disposed to cause any trouble or annoyance; and it was not until the Canadian cruiser had seized two boats belonging to semi-professional fishermen, who had been engaged in catching pollock for their own use, that very careful scrutiny was made of the sardine-boats to know whether they had entered and paid duty, or whether they were still English boats. On September 4 a fisherman of Leonardsville, Deer Island, brought a quantity of herring to one of the canneries in an English boat, and the collector of customs, ascertaining the facts in the case, required him to either pay duty or take the fish back. As he could not afford to pay the duty, he carried the fish home and threw them away.

PRESENT NEEDS OF THE SARDINE INDUSTRY.—Both the canners and the fishermen seem fairly well pleased with the present arrangement, though several of those engaged in the general fishing business urge that it would be much better if some arrangement could be made whereby fresh fish that had not been preserved in any way, either by salting, freezing, or other process, should be admitted free of duty. Others contend that all that would be necessary would be to allow herring for canning purposes to enter free, regardless of whether they were brought in American or English boats. This would enable fishermen getting small quantities of fish, when no collecting boat chanced to call at their weirs, to take their fish to market. Under the present arrangement, as they can not bring their own fish to the canneries, they are obliged to lose them, and the factory hands in turn lose the amount that they would otherwise receive for packing them.

PROBABLE EFFECT OF COLLECTING IMPORT DUTIES ON CANADIAN FISH.—The canners differ as to the probable result of the collecting of a duty of half a cent per pound on fish for canning purposes. Those at Pembroke and at points along the coast of Maine west of and including Cutler, would be benefited if the duty should be imposed, as they would be able to get their fish free out of American weirs and thus easily undersell their Eastport rivals. The Eastport packers naturally oppose the collection of a duty which they claim would, at the schedule rate of half a cent per pound, be excessive, as it would be equal to about 100 per cent. of the actual value of the fish. A hogshead of herring is estimated to weigh between 1,000 and 1,200 pounds, which, at half a cent per pound, would bring the duty up to between \$5 and \$6. When we take into consideration the amount of waste in stale fish which can not be used for packing, and in large fish which must be thrown out or used for other purposes, and the other species which get mixed in with the herring, the duty on a hogshead of fish suitable for canning would probably be increased to nearly \$8. They claim that if any duty is

levied it ought to be reduced so as to be in fair proportion to the value of the fish. Others claim that it would make little difference, aside from the influence of the cheaper fish put up farther west, and as, in their judgment, the quantity of fish there is not sufficient to supply the demand for sardines, the Eastport canneries could still continue at a fair profit. The result of a duty of half a cent per pound would be that the canneries could never get fish at less than \$8, while the average cost would probably fall little, if any, short of \$10, for the fish are worth \$2 or \$3 at least per hogshead for smoking or for the manufacture of oil and pomace, and the fishermen would not seine their weirs unless the fish should net them as much as that. Some of the canners who are interested in other fisheries claim that they would much prefer to pay a duty on herring to be used for canning purposes than to throw open our markets free to Canadian fish.

The effect of a duty would unquestionably prove disastrous to the New Brunswick fishermen, as it would have a tendency to cause our own fishermen about Eastport to build a larger number of weirs, and would further develop the fisheries to the westward, where to all appearances there is a much larger quantity of herring than is generally supposed. This would lead to the building of factories there, and would in time probably cause the factories at Eastport to suspend operations, thus resulting in serious loss to the town, and of the greater part of the fixed capital now employed in the industry.

There is a natural limit beyond which the price of American sardines can not advance, for the English canneries have an abundant supply of sprat, and with the cheaper labor and the absence of duty on tin and on olive oil they are enabled to put up fish and import them into the United States, paying the duty of \$2.50 a case, at \$7.75 to \$8.25 a case, and these, being equal if not superior to the American sardines, would naturally drive our goods out of the market if for any reason the price of same should advance beyond that figure. During the last three years at least 10,000 cases of these goods have been imported; but the unusually low price of American sardines during the present season has checked this importation, and no sprats have been imported for some months.

The price of the lowest grade of French sardines is seldom below \$10.75 to \$11, including the duty of \$2.50 per case on the quarter oils and \$4.50 to \$5 per case on the larger sizes. Were it not for the English sprat we would still be enabled to manufacture and sell at a considerable advance on present prices.

Another argument used by canners in favor of the admitting of herring for canning purposes free of duty is that these fish are practically raw material, and that about one-third of their value when canned represents the labor required in putting them up.

They further argue that if the fish were subject to duty it would be impossible, owing to the nearness of the factories to the Canadian bor-

der, to prevent smuggling to a greater or less extent by those so disposed, and that the factories doing a legitimate business would thus be placed at a great disadvantage.

All parties are agreed that the removal of the duties on the manufactured sardines of \$2 50 per case would result in the transfer of the business from Eastport to New Brunswick, which would throw the labor and profit of the business into the hands of Canadians.

VIII—STATISTICS OF THE INDUSTRY.

Table showing by towns the number of persons employed in the American sardine industry in 1886.

Location of canneries.	No. of canneries.	Total number of persons employed.	Sealers and can-makers.		Packers.		Cutters and flakers.		General laborers.	Smackmen.
			Sealers.	Seamers and can-makers.	Male.	Female.	Male.	Female.		
Robbinston	2	132	19	16	.....	23	30	10	31	3
North Perry	1	62	10	10	.....	10	12	8	10	2
Eastport	19	2,146	440	292	.....	332	366	261	354	101
Pembroke	2	113	15	5	.....	22	21	15	25	10
North Lubec	4	251	47	17	.....	56	47	32	43	9
Lubec	4	374	55	49	.....	77	64	55	51	20
Cutler	1	161	36	.....	.....	35	39	26	20	5
Jonesport	3	263	40	23	.....	43	69	47	35	7
Millbridge	2	229	33	27	.....	40	55	30	40	4
East Lamoiné	1	69	20	10	.....	22	10	4	19	4
Bass Harbor	1	92	13	8	2	16	25	9	14	5
Brooklin	1	155	26	24	.....	28	35	13	23	6
West Deer Isle	1	57	6	.....	.....	15	10	10	10	6
Green's Landing	3	185	20	30	.....	36	65	5	24	5
Total	45	4,315	780	516	2	755	848	525	702	187

NOTE.—This table does not include the weir fishermen, nearly all of whom fish their own weirs and sell their catch to the canneries most conveniently located and paying the highest prices. In 1886 they numbered 1,110, of which 650 were Canadians and 460 Americans.

Table of apparatus and capital employed in the American sardine industry in 1886.

Location of canneries.	Number of canneries in 1886.	Average weekly pay-roll.	Value of shore property.	Collecting boats.		Additional cash capital.	Total capital invested.
				Number.	Value.		
Robbinston	2	\$400	\$13,500	3	\$1,450	\$1,400	\$16,350
North Perry	1	600	5,000	2	10,000	20,000	35,000
Eastport	10	720	*196,160	68	39,640	477,800	723,540
Pembroke	2	200	5,000	5	1,150	15,000	21,150
North Lubec	4	412	13,500	8	1,650	15,700	30,750
Lubec	4	612	25,000	11	3,300	67,000	95,300
South Lubec .....	.....	.....	14,000	.....	.....	.....	4,000
Cutler	1	700	10,000	3	1,000	15,000	26,000
Jonesport	3	470	14,500	4	3,450	60,000	77,950
Millbridge	2	600	23,500	6	2,760	52,500	78,750
East Lamoiné	1	700	6,500	3	500	10,000	17,000
Bass Harbor	1	650	20,000	4	6,000	22,000	48,600
Brooklin	1	1,200	20,000	2	5,200	50,000	75,200
West Deer Isle	1	250	5,000	3	450	5,000	10,450
Green's Landing	3	300	10,500	3	650	34,000	45,150
Total	45	7,814	372,100	125	77,690	845,400	1,305,190

* This includes the value (\$10,500) of two factory buildings operated in 1885 but standing idle in 1886. One of them is located at St. Andrew's, New Brunswick, though both are owned by Eastport firms.
 † This represents the value of a factory operated in 1885 but idle in 1886.

Table of products of the American sardine industry in 1885 and 1886.

Location of canneries.	No. of canneries in 1886.	Herring used in making sardines in 1886.	Quarter oils.		Half oils.		Three-quarter oils.		Quarter mustards.	
			1885.	1886.	1885.	1886.	1885.	1886.	1885.	1886.
Robbinston.....	2	Hhds. 744	Cases. 12,529	Cases. 11,639	Cases. 550					
North Perry.....	1	350		4,000						
Eastport.....	19	17,714	*144,705	205,579	7,728	6,058		500	2,600	9,417
Pembroke.....	2	496	500	6,149						
North Lubec.....	4	693	11,000	6,795						140
Lubec.....	4	3,550	17,193	31,100						100
South Lubec.....			13,000							
Cutler.....	1	700		4,800						
Jonesport.....	3	3,180	6,300	25,737	225	300				3,550
Millbridge.....	2	2,226	3,500	15,691	900	203				
East Lamoline.....	1	1,000	1,165	8,806		403			116	501
Bass Harbor.....	1	1,000	2,800	4,200						
Brooklin.....	1	1,880	9,000	10,580	670	402			883	715
West Deer Isle.....	1	150		575						
Green's Landing.....	3	1,193		7,750						
Total.....	45	34,876	211,692	343,435	10,073	7,366		500	3,599	14,432

Location of canneries.	Half mustards.		Three-quarter mustards.		Three-quarter tomatoes.		Quarter spiced.		Half spiced.	
	1885.	1886.	1885.	1886.	1885.	1886.	1885.	1886.	1885.	1886.
Robbinston.....			Cases 3,200	Cases 980						
North Perry.....				500						
Eastport.....	2,500	2,323	35,363	35,205	1,412	260	150		3,223	
Pembroke.....			500	451						
North Lubec.....			942	713						
Lubec.....			7,176	9,575						
South Lubec.....			400							
Cutler.....				2,350						
Jonesport.....		3,500	1,500	3,327					500	
Millbridge.....			7,200	5,535						
East Lamoline.....			2,401	5,723						
Bass Harbor.....			5,600	8,400						
Brooklin.....			4,500	9,971	401					
West Deer Isle.....				600						
Green's Landing.....				3,160						
Total.....	2,500	5,823	68,782	86,490	1,813	260	150		3,723	

Location of canneries.	Three-quarter spiced.		"Brook trout" (herring).		Russian sardines.		Anchovies.	
	1885.	1886.	1885.	1886.	1885.	1886.	1885.	1886.
Robbinston.....			Cases.	Cases.	Bbls. 204	Bbls. 45		
North Perry.....						15		
Eastport.....	4,400	5,269		162	2,550	3,513		
Pembroke.....					30	97		
North Lubec.....						2		
Lubec.....		800			315	654		
South Lubec.....								
Cutler.....								
Jonesport.....					100	590		
Millbridge.....					100	434		
East Lamoline.....		200	21	93		66		
Bass Harbor.....								
Brooklin.....	737	1,700	860		131	853		
West Deer Isle.....								
Green's Landing.....						370		400
Total.....	5,137	7,087	881	255	3,430	6,639		400

NOTE—A case contains 100 quarter cans, 50 cans of the half and three-quarter sizes, and 24 cans of "Brook trout."

Table of products of the American sardine industry in 1885 and 1886—Continued.

Location of canneries.	Miscellaneous products.		Oil.		Pomace.		Total value of products, 1886.
	1885.	1886.	1885.	1886.	1885.	1886.	
Robbinston	120 case lobsters..	5,500 boxes smoked herring; 400 cases lobsters.	<i>Gals.</i> 4,995	800	<i>Tons.</i> 109	47	\$55,166.50
North Perry Eastport	3,810 cases lobsters, 73,000 boxes smoked herring.	76,950 boxes smoked herring, 1,200 cases lobsters, 2,030 cases mackerel.	29,713	29,066	1,421	2,056	1,123,568.70
Pembroke		4,500 boxes smoked herring.	475	900	10	34	27,550.75
North Lubec	9,000 boxes smoked herring, 1,700 cases lobsters, 17,458 boxes blotters.	19,600 boxes smoked herring, 2,900 boxes blotters.	2,175	955	58	47	33,981.90
Lubec	38,315 boxes smoked herring.	65,000 boxes smoked herring.	4,885	4,145	316	136	175,725.00
South Lubec	8,000 boxes smoked herring.	2,500 boxes smoked herring.	360		15		300.00
Cutler		650 barrels pickled herring, 46,882 boxes smoked herring, 1,141 cases lobster, 143 cases 3-pound cans mackerel, 400 cases 1-pound cans mackerel.		1,000		60	28,000.00
Jonesport		89 cases sardines in spices, odd sizes, 1,363 cases 2-pound cans mackerel, 250 cases 1-pound cans mackerel.		2,900		325	189,008.00
Millbridge	2,000 boxes smoked herring, 4,200 cases 3-pound cans mackerel, 41 cases clams, 57 cases broiled mackerel.	58 cases 2-pound cans mackerel, 231 cases 1-pound cans mackerel.	1,170	900	105	116	96,286.00
East Lamoine	341 cases 1-pound cans fresh mackerel.	47 cases 3-pound cans sardines in mustard, 15 cases 3-pound cans sardines in spices.			35	100	66,690.61
Bass Harbor	4,000 cases 1-pound cans lobsters.	6,000 cases lobsters			40	90	100,000.00
Brooklin	1,100 cases 1-pound cans lobsters, 3,000 cases 1, 2, and 3-pound cans mackerel, 530 cases clams, 95 cases 2-pound cans sardines in tomato sauce, 500 cases 1-pound cans sardines in tomato sauce, 100 cases 2-pound cans sardines in mustard, 1,612 cases 3-pound cans sardines in spices.	366 cases 2-pound cans mackerel, 400 cases 2-pound cans mackerel, 1,588 cases lobsters.	1,880	1,000	75	190	118,481.00
West Deer Isle ..	400 cases lobsters, 75 cases clams.	350 cases mackerel				10	6,748.00
Green's Landing ..	3,000 cases lobsters, 3,000 cases clams, 1,000 cases clam chowder, 1,500 cases mackerel.	450 cases mackerel				100	45,450.00
Total			45,653	42,260	2,184	3,381	2,072,865.40

* The products given for Eastport in 1885 includes those of two factories which were in operation in 1885 but not in 1886. One of these was located at St. Andrews, New Brunswick, but was owned and managed by an Eastport firm.

† The factory at South Lubec was operated in 1885 but not in 1886.

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ERRATA.

Page 162, line 41, for "he," read "the." Page 164, line 1, for "Bightman," read "Brightman." Page 173, line 19, for "work," read "at work." Page 173, line 37, for "sardine-boat," read "market-boat." Page 176, line 3, for "carried," read "carried by sail-boats." Page 176, line 13, for "Canada," read "Canadian." Page 176, line 28, for "Quaddy," read "Quoddy."