

XXX.—THE SALTING OF HERRING.*

Just as there are sick people, who, after it has taken years to destroy their health, want the physician to cure them in a few days, so there are persons who demand of a guide for preparing fish, that it shall give rules how to obtain a good product in spite of a poor raw material and careless treatment. To such persons we can simply say that the only secret known consists in exercising the greatest care during the entire treatment. This is absolutely necessary, and neglect in one point can easily counterbalance all the care exercised in other directions. It is impossible to lay down binding rules for preparing fish, nor would it under all circumstances be possible to follow these rules. All that can be done is to lay down some fundamental principles as regards the best method to be followed during the different stages of the process of preparation. Only by following these principles in every respect can one expect to obtain a first-class article. In the good old times the authorities took care of such matters in a fatherly way by issuing orders and decrees.† It is true that we find in these decrees the principles whose correctness is recognized even at this day, and which are followed in their main outlines; but, although these rules laid down by law had their advantage, by contributing towards a careful method of preparing fish, and by guaranteeing proper care, they were, by the obligations which they imposed on people, in other respects, impediments in the way of a proper development of this industry, and often exercised an injurious influence. These decrees have therefore been abrogated, but their leading ideas have been retained in the present laws, for instance, in those requirements which in several countries are necessary for obtaining the Government stamp. Compulsory stamping has been abolished‡ by our more liberal laws, and it is left to the manufacturer to make the most, and we may also say, the least, of the raw material. Optional stamping, however, still prevails in many places,

* "*Salting of Sild.*" From *Norsk Fiskeritidende*, Vol. III, Bergen, January, 1884.

Translated from the Danish by HERMAN JACOBSON.

† The oldest of these which are known are the Ostend decrees of 1177; those of Amsterdam, of 1511, 1527, and 1579; and the Scotch decrees of 1142.

‡ In Sweden in 1774, except for herring caught outside the coast waters, for which it was not abolished till 1853; in Norway in 1852; in Holland in 1857. In the last-mentioned country all official stamping was abolished in 1878. In Scotland stamping was only compulsory for those herring for which the Government, with a view to encourage the fisheries, paid a premium; and compulsory stamping and the system of premiums ceased in 1829. Stamping at present is optional, but about two-thirds of all the herring exported are stamped at the request of the manufacturers.

so that there is some inducement for the manufacturer to have goods, which have been prepared according to standard principles, recognized by an official stamp. In the following we shall give a brief review of these principles. We do not claim to give anything new, but only repeat what, in part at least, has been known for centuries.

THE RAW MATERIAL.—The first condition for obtaining a first-class article is to have good raw material. It is well known that the herring which are caught vary greatly as to size, age, fatness, and development of the sexual organs. The influence which these differences have on the value of the goods will be spoken of later under the head of *Sorting*. The point to which here we desire to call attention is that the herring, from the moment it is taken into the boat until it is delivered to the manufacturer, must be treated with the greatest care, and that the manner in which the raw material is treated has a great influence on the value of the manufactured article. Whenever a net has been hauled in, the herring should at once be shaken out of it, for nothing is more injurious for them than to lie packed in the net, whereby they become soft, more or less spotted, and are apt to lose some of their scales. The board of fisheries lays great stress on this, and speaks in strong terms against the injurious habit of letting the herring stick in the nets after they have been hauled.* The herring should be protected against the influence of the weather by being covered with tarpaulin, especially when the sun is hot, so as to prevent their becoming sunburnt.† Care should also be taken that the herring are not trodden upon. The boat should always be kept free from water, for which purpose each boat should be supplied with a pump, whereby the work is very much facilitated. We must finally call attention to the circumstance that tarred boats should not be used until they are thoroughly dry, and that the vessels used for fishing and for carrying the fish must constantly be kept clean.

When fresh herring are transported, not too many should be crowded together; and special care should be taken in this respect with fat summer herring. The decree dated June 29, 1775, relative to the better management of the Bergen herring fisheries, prohibited the carrying of more than 24,000 in one load, which number, by provisional decree of November 24, 1821, was increased to 60,000. This decree was abrogated by the law on the herring fisheries of April 25, 1863, so that now every one can put as many in one load as he pleases. The vessels used for carrying the herring should, however, be divided into compartments by boards running lengthwise, and by some running cross-

* Attention was already called to this matter by circular of June 22, 1816, but, as it seems, with very little result.

† By the decree of June 29, 1775, it was prohibited to take summer herring from the nets till one or two hours after sundown, or before 10 p. m. and after 5 a. m. All the fish taken outside of those hours could be prepared only for the use of farmers as an inferior article.

wise, so as to prevent the herring from pressing too heavily against each other.

If we compare the conditions under which the raw material is obtained in the Norwegian, Scotch, and Dutch fisheries, we find that they are most favorable in the Dutch fisheries, as the salting is done exclusively on board the vessels by which the herring have been caught, the herring being put in the salt direct from the nets. Where the salting is done on shore the length of time which will elapse before its effect can be felt will depend on the distance between the place where the fish are caught and the salting place, either a salt-house or a vessel. In this respect the Norwegians are more favorably situated than the Scotch, partly because the fisheries are carried on nearer the land, partly because the majority of the herring are caught with nets from which they can be taken alive and conveyed direct to the salt-houses. As regards freshness, the Norwegian net-herring stand higher than the Dutch seine-herring, whose salting place is near to the place where they were caught, and we have here, provided the herring are of good quality, the first condition for obtaining a first-class article. If it becomes necessary to convey the herring some distance, they lose their freshness and therefore their value. In Scotland herring which are put in salt later than 24 hours after they have been caught cannot get the official stamp. Similar distinctions are made in the Netherlands, and occasionally a distinction is made even between the fish taken from the net first and those taken last. The preparation or curing of fish, therefore, begins, if circumstances permit, during the fisheries. In Norway, after the rules relative to the preparing of herring had been abolished, the proper distinction has not always been made between the herring prepared in the place where they had been caught, and those which had to be conveyed by vessels to more or less distant salt-houses, unless they were absolutely spoiled. Some people have even gone so far as to prefer old herring in which the process of decay had already begun. What stress was laid, even in former times, on putting the herring, when quite fresh, in salt, may be inferred from the circumstance that in the times of Queen Margaret [1353-1412] and Eric of Pomerania [1389-1459] it was a capital crime to salt spoiled herring. There are, however, such differences in the raw material, that in a national herring trade some regard should be had to them. By ignoring these differences one runs the risk of having the foreign buyer judge the whole lot of goods by the worst specimens, whereby the difference in value which really exists is lost to the manufacturer or the shipper.

SALT SPRINKLING.—The next condition for obtaining a good article is that the herring should be put in salt as soon as possible. In olden times it was customary to throw them into strong brine before they were salted down in the kegs, which, however, cannot be recommended, as thereby they lose too many scales and become soft. At present salt is sprinkled on the fish. The Scotch sprinkle the herring freely with

salt in special vessels, as soon as they have been brought on shore, a second time after the fish have been cleaned, and again prior to their being put into the kegs. The Dutch roll the herring in salt, in dishes specially made for the purpose, as soon as they have been cleaned, and only a few hundreds at a time, so the work can be done carefully. For sprinkling, the Scotch use Lisbon or coarse Liverpool salt, or a mixture of both, while the Dutch use fine Lisbon or St. Ives salt, one ton of salt to every eleven tons of herring. In Norway no salt touches the herring until they are put in the kegs. For this purpose we use, it is true, more salt than either the Scotch or the Dutch, but a great portion of it had better be used for sprinkling.

CLEANING.—Cleaning was first introduced in Holland towards the end of the fourteenth century, and its introduction is generally ascribed to an extensive herring dealer, Wilhelm Beuckels, who died in 1397. This process must be considered as one of the greatest improvements in preparing herring. Although the visit which the Emperor Charles V paid to Beuckels's grave at Biervliet, in 1556, in order to honor his memory, was more calculated to flatter the national vanity of the Dutch than to thank Beuckels, even in his grave, for the great pleasure and enjoyment (as an old author naively relates) which he had given his Imperial Majesty by his method of preparing herring, Beuckels, nevertheless, deserves the gratitude of later generations.

Every herring which is to be smoked should be cleaned before it is salted. The object of the cleaning is:

1. To get the blood out of the herring, which is done by removing the gills, the throat, and the heart;
2. To remove those parts which, before the salt penetrates them, are most liable to decomposition, or which contain matter which is already in a state of decomposition (the stomach and entrails); and finally,
3. To give the brine as free an access as possible.

The Scotch remove the gills, the throat, the pectoral fins, the liver, heart, stomach, and sometimes the cæcum, if the herring are to be exported to the West Indies or to other countries outside of Europe. The Dutch do not remove the cæcum, partly for the sake of appearance, partly because many people think that it imparts a particularly pleasant flavor to the herring. In Labrador and Canada the entire belly of the large herring in summer is cut open, and is cleaned before they are salted. With our summer herring we generally remove only the throat, the pectoral fins, and the heart, and with our spring herring in former times also the gills. By our method we reach only the first of the above mentioned objects, namely, to let the blood flow out, and this only partly. The parts which are most liable to decomposition are left in the fish. Many people do not clean the herring, but salt them as they are, or clean them only after they have lain in salt for some time, more for the sake of appearance than for any practical use. A common way of ascertaining how far the herring has become a prey to corruption is to

tear it open at the back and smell the backbone. That this is the place where the unpleasant odor will be noticed soonest is owing to the fact that the corruption spreads more rapidly through the veins filled with blood which extend along the backbone than through the fiber of the muscles. By taking the stomach out in time the greatest injury is prevented.

With a view of practically proving the importance of thorough cleaning Mr. Buch made the following experiments with herring, taken in seines outside the Jæder, towards the end of June, 1880. All the herring used in these experiments were salted with the same quality and quantity of salt, and kept in the same place, viz., a cool cellar. All in all, four quarter-kegs of herring were salted. Of these those which had been salted whole were spoiled after 8 days, those which were only cut were spoiled after 14 days, those cleaned in the old Norwegian fashion were spoiled after 14 days, while those cleaned in the Scotch manner were entirely fresh and good after a month, and could, as to their flavor, be placed by the side of the finest Dutch herring. Mr. Buch has made similar experiments during the present year, and with the same result.

If many people in Norway have thought that the thorough cleaning could be dispensed with, the reason for this, as far as the spring herring are concerned, is that these fisheries are carried on during the spawning season, when the fish as a rule take little or no food. There are, however, many exceptions in this respect, partly caused by the different stages of development of the sexual organs, and partly by the more or less easy access which the fish have to their food. It is therefore no uncommon occurrence to find herring which are ready to spawn with a stomach full of food. In the Scotch, Dutch, and other North Sea fisheries it is customary to remove the stomach from the herring, unless they are intended for smoking, when they are salted whole. If we followed the same method of cleaning the herring, the products of our fisheries would rise in value. The gills, which are full of blood, should at all events be removed. As regards the summer herring, those which are caught in nets should certainly be cleaned according to the Dutch or Scotch method; those which have been caught in seines will, as a rule, not have any food in their stomachs after they have been in the seine for 4 or 5 days. There may, however, be circumstances when the fish have not been in the seine for that length of time, and in that case the stomach should be taken out, if the fish are to be kept. The principal reason why we do not clean the herring more thoroughly relates to the fat. In herring taken before the middle of August the fatty matter, as a general rule, is soon eliminated, and the fat turns out train-oil. In that case it should under all circumstances be taken out before the herring are salted, as it will not go away of its own accord, and as the train-oil, which easily hardens, is apt to injure the abdomen in which the process of separation is going on, as well as the brine. If

the fat is taken out before the herring are salted, a well-flavored article is obtained which will keep well, while the fat, which should be kept in separate vessels, will yield a considerable quantity of train-oil. From herring caught in autumn, however, the fat should, if possible, not be removed. It is true that it also often separates, but the cause of this is generally that the fish have not been put in salt soon enough, or have been pressed too hard, on account of having been packed too tightly when fresh. In former times fat herring have been thoroughly cleaned in Norway, for an order dated 1753 prohibited "to take out the fat, unless in some places it should be needed for special purposes." It is very desirable that this custom should again be generally introduced. As it always takes a certain time till the natural brine begins to form, Norwegian manufacturers generally fill the keg with 6 to 8 liters [about 7 quarts] of brine (one-fourth ton St. Ives salt to 1 ton of sea-water) as soon as the herring have been salted, and thereupon close the keg, in which the fish are packed loosely. By this method the entrails are soon brought in contact with the salt, and the contents of the stomach will in that case not tend to spoil the article. The Dutch, who are also in the habit of pouring brine into the keg before it is closed, prepare this brine by pouring sea-water over the parts which have been removed from the fish, but do not mix any salt with it. The pouring in of artificial brine should be recommended when it is so cold that the herring are exposed to the danger of freezing before the brine has properly penetrated them.

THE KEGS.—The quality of the kegs is of great importance. They must be strong, firm, clean, of even size, of a suitable shape, and made of good wood. Their strength will mostly depend on the thickness of the staves and on the number of hoops. The staves should be at least 15 millimeters [$\frac{5}{8}$ of an inch] thick. In this respect we have kept pace with the times, as we now generally use kegs the thickness of whose staves is 16 millimeters. Kegs of that strength should be made by machines, as the stave is too thick to be bent with the hand. In hand-made kegs the staves are therefore generally made a little thinner in the middle. As split staves are better than cut staves, they may be somewhat thinner. In our opinion the paring should be confined to the sharp edges, partly because it somewhat diminishes the thickness of the staves, and partly because a rough surface is better calculated to keep the hoops firmly in their position. As regards the number of hoops, the Dutch use 18 to 20 (10 to 12 + 4 + 4); the Scotch, 16 to 18 (9 to 11 + 3 + 4); and the Canadians, 20 (10 + 10); while we generally use 12 to 16, arranged by threes or fours, when they are of wood, and by sixes when they are of iron. These latter have proved very serviceable, as they will hold better than the wooden ones; but they have, as we think, this disadvantage, that the keg rests exclusively on the side, while in those having wooden hoops it also rests on the middle hoop. Kegs bound with iron hoops should therefore have thicker staves. As

iron expands when exposed to heat, the iron hoops are moreover apt to become loose, and as they easily become rust-eaten their disadvantages are greater than their advantages. Hoops made of hazel wood are stronger than those made of willow. To prevent the hoops from sliding, the outer main hoop should be nailed fast, and small pieces of wood should be placed between the outer and inner row of hoops, so as to keep them in position.

The firmness of the keg depends on the thickness of the staves, on the material employed, and on the manner in which it is worked. The thickness of the staves has already been referred to above. As regards the material, it should be of some kind of wood which will not let the brine ooze through. The poplar and the pine, whose wood absorbs water easier than the fir, are not considered suitable for making staves. The wood of trees grown on marshy soil is not good for this purpose, and wood which has been in water for some time should not be used under any circumstances. Even if by drying it quickly one should succeed in giving it a white appearance the brine will easily soak through. Pine wood can least of all stand moisture, while clean, fresh-cut pine staves are equal to fir staves. The kinds of wood usually employed are, oak (Holland), beech and birch (Scotland), pine and fir (Norway). Beech wood has the disadvantage that it is brittle and warps easily, for which reason the staves should not be too broad.* Oak wood, or resinous pine, or fir wood† will, more than other woods, give a peculiar flavor to the herring. Whether this is an advantage or a disadvantage will depend on the taste of the customers. In former times the preference which was given to our herring in the Polish and Russian markets was ascribed to the resinous flavor which the fir kegs gave to the herring, so that it even became necessary to repeal the order given by the Danish Government (under whose authority Norway was at the time) prohibiting the use of fir kegs. The customers of the Dutch, on the other hand, preferred the flavor imparted to the herring by oak kegs. In our opinion no wood should be employed which imparts a peculiar flavor to the herring, except for markets where a preference is shown for fish having such a flavor. The summer herring especially are apt to take the flavor of the wood. From the experiments made last year by the Society for the Promotion of the Norwegian Fisheries, it appears that spring herring do not so quickly take flavor from the wood.

As kegs, when stored away, are apt to fall to pieces, or at least to have their staves loosened, they are filled with water, but not longer than twenty-four hours before being used. It is not advisable to let them lie by the side of the vessel, as only part of the keg gets in the water. It is said that putting in every keg $1\frac{1}{2}$ liters [3 pints] of salt

* In Scotland the breadth of the staves generally does not exceed 152.4 millimeters [6 inches], except oaken staves, which may be 177.8 millimeters broad.

† Till the year 1874 it was forbidden in Scotland to salt herring in fir kegs.

brine while stored away will prevent the staves from becoming loose. After the keg has been filled with brine and closed, its firmness is tested by pressing the end of the keg which has been closed with a heavy piece of wood. Hidden leaks will show themselves after twenty-four hours, for which reason kegs should not be stowed away until that time has elapsed, and even then only after having been carefully examined. Kegs which have been used once should not be used again, except for inferior kinds of fish, and not till they have been thoroughly cleaned.

With regard to the capacity of the kegs it is, according to the law of July 28, 1824, the duty of the police and the customs officers to see to it that fish, roe, train-oil, &c., are not imported or exported at any place unless the kegs or barrels have the prescribed dimensions, viz., 118 to 124 pots [about 93 to 99 quarts], laws of April 11, 1863. Any person violating this law is liable to a fine of 4 crowns [about \$1] and to have his keg (but not the contents) confiscated. Kegs of less capacity, should be eliminated wherever found, or if they are used at all should be specially mentioned on invoices, bills of lading, &c. If the price of Norwegian herring is lower than that of some other nations, the reason for this must, in part at least, be found in the size of the kegs. The standard capacity should be:

	Liters.
For a Norwegian herring keg [102 quarts]	116
For a Scotch herring keg (minimum)	121.2
For a Dutch herring keg (minimum).....	125
For a Swedish herring keg* (minimum)	125.6
For a French herring keg† (minimum)	135.6
For a Canadian herring keg (minimum)	114

As regards the shape of the kegs, the curve should be sufficiently large to let the hoops catch hold firmly, but not larger than to be on a level with the upper edge of the nearest (wooden) hoop. For loading and unloading ropes are used, and not hooks. The kegs should be protected against the sun (and also against frost) and when on board a steamer they should be as far as possible from the engine.

SORTING.—Before the salting commences, the herring should be sorted, which is done while the fish are being cleaned, the person cleaning them throwing the different kinds into different baskets or tubs. Not much time is lost thereby, although this is often made an excuse for the careless sorting which is so much in vogue in Norway. All the damaged herring should, first of all, be picked out and salted by themselves. As regards the further sorting, it may possibly offer peculiar difficulties with us, as our fisheries are principally carried on with seines, into which herring of different kinds are more apt to enter than into the nets, but this should be no reason why the sorting should not be done more carefully than is generally the case.

* Since 1843 the Norwegian herring keg is generally employed.

† "Tonne" of a net capacity of 125 kilograms; the new measure, the "baril," is to have a net capacity of 112 kilograms.

The leading principle in sorting should be to follow the division of the herring adopted by the Scotch and Dutch, and to some extent, also, by us.

1. Fat herring, including herring containing fat, or from which the fat has been removed, and with sexual organs little or not at all developed.

2. Full herring, which should be subdivided into milters and spawners.

3. Empty herring, having neither fat, roe, nor milt.

As each of the above-mentioned kinds are generally caught separately, the sorting will be easy; and as a rule it will not be necessary to sort the fish. Each of the above-mentioned kinds of herring should then be sorted according to their size, as is now done with the summer herring, using, however, a different nomenclature.

It is well-known that at present the summer herring are, in Norway, divided into "merchant's herring," "medium herring," "large Christiania herring," "small Christiania herring," "small herring," &c., names which do not indicate the same size under all circumstances. The size of each of these kinds not only varies in the different years, but depends a good deal on the individual taste of the manufacturer or buyer, and even sometimes, in one and the same year, on the different localities where the herring have been caught. The most rational method of sorting would be the one proposed by a contributor to our journal,* viz., to sort the fish according to their length, so that 0 stroke would indicate herring measuring more than 30 centimeters† [12 inches]; 1 stroke, from 30 to 27.1 centimeters; 2 strokes, from 27 to 24.1 centimeters; 3 strokes, from 24 to 21.1 centimeters; 4 strokes, from 21 to 18.1 centimeters; 5 strokes, from 18 centimeters [7.1 inches] and less; and to use the same system for indicating the different subdivisions of the three principal classes or sorts referred to above. As a margin is left of 3 centimeters, the greater or less fleshiness of the herring, to which some regard should be had in sorting, will also be taken into account. We pass by the fraudulent method of sorting, which consists in placing good herring at both ends of the keg and poor ones in the middle, and which will sooner or later meet with its deserved punishment, although this will probably not be so severe as the one given in the old Skauor and Falsterbo law, whose article 48 says: "Any person who, in salting herring, puts other than good herring in his kegs, shall, if found out, lose his life."

In conclusion, we would observe that by careless sorting, the good fish will, as a general rule, not bring the price which ought to be paid for them, and being found in bad company they will be judged accordingly. It is the same with herring as with human beings, they are judged by the company which they keep.

* July number, 1882, p. 14.

† Under this category would come most of the spring herring, great herring, and Iceland herring.

SALTING.—No special rule can be laid down as regards the quantity of salt to be used, as this depends on the strength, purity, and solubility of the salt, on the length of time the herring are to be kept, on their fatness, freshness, and the place for which they are destined. A fat herring requires more salt than a lean one; a fresh herring, or one which has been cleaned, less than an old one, or one which is to be salted whole. Herring which are to be exported to tropical countries require more salt than those destined for countries that have a cold or temperate climate, when the salt should be coarse and not easily dissoluble. Herring which are intended to be eaten soon get less salt than those which are to be kept for any length of time, as the preparing is, to some extent, done at the expense of the flavor. The Dutch are, or rather were, the nation which used least salt, as the small quantity, 16,000 tons, which they annually brought into the market was sold immediately. They used the following quantities of Lisbon salt: In summer, 1 ton of salt to 5 tons of herring,* and in winter, 1 ton of salt to 6 tons of herring. As a general rule 4 tons of salt were counted to 14 full tons of herring, which would make 1 ton of salt to 3.5 tons of herring. The Scotch count 1 ton of fine Liverpool salt to about $4\frac{1}{2}$ tons of herring, while in Norway 1 ton of St. Ives salt is counted to 4 tons of herring, when just put up, and to 3.2 when ready for shipping.

It is difficult to say to which kind of salt the preference should be given, as one and the same place produces different kinds of salt, and as the quality depends, to a great extent, on the salt harvest. The Scotch use Liverpool salt; the Dutch, medium coarse Lisbon salt; and we in Norway, St. Ives salt. Each one of these three nations seems to be satisfied with the kind of salt it uses, even if it should not meet with all the requirements. The Scotch Board of Fisheries says regarding the Liverpool salt, "It should be remembered that Spanish or Portuguese salt makes a better cured article than Liverpool salt." The main point is that the salt should be pure, and that a suitable quantity should be used. It should be borne in mind that fine salt melts easier than coarse salt, but that the salt which holds water makes a weaker brine. Wherever there is need of it, salt which easily dissolves should be used in cases where it is important that brine should form quickly, while coarse salt is excellent for filling the kegs, or for salting fish which are to be kept in store for a long time.

PACKING THE HERRING.—In this respect there is considerable difference between the Scotch and the Norwegian methods, as the Scotch lay the herring on the back, while we lay them on the side. In so far as the method employed influences only the looks of the fish, the difference is of very little importance, as the taste of the customers varies in this respect. As regards those herring whose stomachs have been taken out, it is of importance that they should be laid on the back, as in that case the brine can more easily penetrate the abdominal cavity.

* Counting in what was used for sprinkling.

FILLING THE KEGS.—The further treatment of the herring after they have been cured differs, according to whether they have been cured on shore or on board the vessels. We shall, therefore, briefly describe the methods used by the two model countries in this respect, Scotland and Holland.

*Scotland.**—While the fish are being put up, which is done under shelter, the keg is filled so that several layers of fish protrude over the edge, and a lid specially made for the purpose is put on the top. After two or three days the fish have settled down, when more herring of the same kind are put in, care being taken not to pack them too tightly. The keg is thereupon closed and laid on the side. Every second or third day it is turned, until the final filling takes place. During all this time a constant lookout is kept for leaks. If the leak is small it is stopped up, and if this is impossible the herring are transferred to other kegs. To obtain the official stamp the herring must have lain in salt at least ten days, not counting in the salting day and the day of the final filling. If, after this period has elapsed, the herring are to be got ready for shipping, the brine is allowed to run off through the bung-hole, which is then closed; one end of the keg is then opened, and, while being pressed, herring of the same kind, which have been salted on the same day, are put in the keg. For pressing, either the hands or a common press is used. The object is partly to avoid the filling in of more fish at the place of destination, and partly to prevent the air from entering. At one time it was thought the superior quality of the Dutch herring was owing to the circumstance that they were put up by men, and were therefore pressed more firmly than those put up by women. When a keg has received its full quota of fish it is closed, the hoops are hammered down, and the firmness of the keg is subjected to another test by blowing through a blow-pipe, which is inserted in a hole specially made for this purpose in the bottom. This hole is finally closed by a tight-fitting wooden peg. The keg is now laid on its side and some of the original bloody brine is filled in until it begins to flow over.

If the fish are to be transferred to another keg, they are emptied out, washed in fresh water, and after the water has flowed off they are put in other kegs, with coarse Liverpool salt, and new brine, made of clean salt, is filled in. To get the official stamp the cæcum must have been removed, and the kegs must have the full number of hoops at both ends. Besides the hoops, an iron band one inch broad is put round the keg at each end.

Holland.—Salting is done on board the fishing vessels in the morning, partly during and partly after the hauling in of the nets. The kegs, into each of which is poured a bucketful of the bloody brine, are not closed until all the fish have been salted, when they are let down into the hold of the vessel. After five to ten days the first filling in

* Principally according to Dr. Axel Vilhelm Ljungman's *Anteckningar rörande sillsaltning*, &c., Udevalla, 1882.

takes place, when, as in Scotland, the brine is first allowed to flow off entirely. Three tons are generally used to fill in fourteen. As regards the time for filling, it is customary not to do it too soon, as the herring are apt to shrink, but not too late either, as by lying in the brine too long they lose some of their scales and become flabby. As in Scotland, the brine is filtered before it is again put into the kegs. On returning to shore, the kegs are again filled. Fourteen kegs "filled at sea" will make thirteen to thirteen and a half kegs for exportation. This shows that the fish are packed firmly at sea.

In Norway, whenever fish are salted on board the fishing vessels, the kegs are left from one-half to one day, when they are filled, closed, and let down into the hold of the vessel, where they remain until they reach their destination. Many kegs, therefore, arrive at destination with hardly any brine. When being prepared for exportation many persons confine themselves to brushing off the topmost part of the brine, which is often full of train-oil and loose scales, to sprinkling salt all round the sides, and pouring in some more brine at both ends. Loose packing is the rule, and the brine which is poured in has never been filtered. It is quite right that all herring should be packed loosely during the salting process. After they have lain in salt ten to twelve days it is generally supposed that close packing will do no harm; and there is, therefore, no reason for the loose packing which is so common in Norway just prior to getting the herring ready for transportation. It must be considered injurious to let the herring lie in the brine while being shipped from the salting place, and the kegs should, therefore, be filled completely after ten or twelve days. It is said that our summer herring cannot stand close packing, as the fat is apt to be pressed out. Whenever the fat becomes loosened the formation of train-oil cannot be prevented, no matter how loosely the herring are packed; and it is, therefore, immaterial whether the fish are packed loosely or not. To draw off the brine, as is done in Scotland and Holland, when the kegs are to be filled, would be a great mistake, at least as regards those herring which emit train-oil, as the greater portion of this would remain in the keg. The method commonly employed is, therefore, the best, all things being considered. But, as has been stated before, the fat should be removed before the fish are salted, whenever it is loose, for the emission of train oil will continue, no matter how often the brine is changed or how often it is skimmed off, as is done sometimes. Whenever herring which do not emit fat are put in the kegs, the brine should be drawn off and filtered before it is again poured into the kegs.

From the above it will be seen that the defects in our method are principally the following:

1. That we are not particular enough as regards the freshness of the raw material.
2. That the herring are not thoroughly cleaned.
3. That the sorting is not done systematically.

4. That no salt is put on the herring until they are put in the kegs.
5. That the packing is done too late and too loosely.
6. That no proper regard is had to the purity of the brine during the final packing.

The reason why in Scotland and Holland greater care is exercised in the curing of herring, and that in those countries the herring trade is carried on in a rational manner, must be sought in the fact that the fish are, as a general rule, cured for the merchant or dealer, who, therefore, is at the same time a producer. When a merchant is nothing but a merchant, his principal interest centers in the difference between the price at which he buys his goods and that at which he sells them, or on the quantity of money which he can raise on his goods, their quality being of less importance to him. His main object is to get goods which will have a ready sale, that is to say, which will fetch a higher price than they are really worth. Unless the shipper is at the same time a producer, our Norwegian herring do not enjoy, as a rule, the reputation which they might and should have. There is no doubt, however, that their value could be increased, and that they could find a readier sale, if they were cured more carefully. This would prove an advantage both to the dealer and to the producer. It was to be expected that, as they have their interests in common, they would work together to reach the desired end. But as in Norway, as a general rule, both the curing and the selling of herring is done in small quantities, reforms could hardly be introduced unless the value of the product was recognized by a strict system of official stamping in which perfect reliance could be placed.