

Correspondence.

Chewing the Cud.

To the Editor of the Scientific American:

Your article in No. 25, June 21, "Chewing the Cud," is correct, excepting the first paragraph, which with your permission I will proceed to give a reason for, by making a statement of facts which I trust some of your many readers like myself are cognizant of. It is well known that cows lick themselves, and when in company with other cows will lick them also. I am inclined to think that the licking of themselves and each other may be for the purpose of getting a taste of the saline matter exuded from the surface; at any rate the licking is done, and where cattle frequent for a resting place and to ruminate, there are found balls, principally of hair mixed occasionally with a little food. This ejecta gives rise to the "anxiety and turmoil produced on a farm," etc.

It is a question of grave importance for the combined wisdom of the place to tell which of the cows or steers it is that has lost its cud, if there is more than one; anyway, the custom is to make a cud and proceed to cram it down the throat of the unfortunate animal selected.

Now, this ejection of the cud is as much of a natural consequence as any other of the functions performed by the bovine species; at any rate, ejecta, called cuds, are found occasionally, and so long as this is the case, the same inquiry will continue to be made in the future as it has been in the past.

WM. LYNE.

Fort Wayne, Indiana, June 23, 1884.

Early Oyster Laws.

To the Editor of the Scientific American:

Having occasion to examine the original colonial laws of several of the New England States, I came across the following, which I believe to be the very first enactment ever made for the protection and preservation of oyster beds. The next in order of time was probably the legislation adopted in 1784 in the State of Connecticut, to the effect that each town might exercise its authority to preserve shell fish within its limits. It is quite probable that there was other early legislation that escaped my notice; and if so, it would be gratifying to have it brought to light.

H. C. HOVEY.

OYSTER LAW, PASSED BY THE GENERAL ASSEMBLY OF RHODE ISLAND AND PROVIDENCE PLANTATIONS, THIRD TUESDAY OF FEBRUARY, 1734.

"Whereas, it hath been sufficiently set forth to this Assembly that sundry evil-minded persons in several towns in this government have, for sundry years past and still do practice the catching of great quantities of oysters to burn into lime, whereby the same are greatly destroyed and diminished, to the great disadvantage of sundry of his Majesty's good subjects in this Colony, who are many times greatly benefitted thereby.

"For remedy whereof, Be it enacted by the General Assembly of this Colony, and by the authority of the same it is enacted, that it shall be in the power of the Town Council of each respective Town in this Colony to make such laws, acts and orders as to them shall seem needful and necessary for the preservation of the oysters in their respective Towns in this Government, and for the preventing of the aforesaid evil practice of burning said shellfish into Lime, or otherwise to destroy the same."

Natural Gas.

The committee appointed by the Western Pennsylvania Engineers' Society to investigate the properties of natural gas submitted a report which was read at a meeting of the society on May 20, of which the following is a synopsis:

It set forth that a large number of prominent manufacturing establishments where natural gas is being used had been visited. It is now nearly a quarter of a century since the first wells drilled into the grand old rocks of Venango County gave origin to the great and steadily increasing petroleum industry, but it is only recently it has been realized that with the petroleum is associated an invisible fuel which may yet assume a degree of commercial importance comparable to that of petroleum. Natural gas in Western Pennsylvania is essentially composed of the hydrocarbons of the series known in chemistry as paraffins. Wells drilled for natural gas outside of the oil regions are of recent date, with a few exceptions. The wells at New Cumberland, W. Va., have supplied gas for more than twenty years for the manufacture of bricks. The East Liverpool wells have been burning twenty-five years, and are still productive.

Pittsburg has the advantage of being able to tap three or four very prolific gas belts or fields, viz., the Butler County field, which supplies Spang, Chalfant & Co.; the Bull Creek, which supplies the Pittsburg Plate Glass Company; the Murrys ville or Turtle Creek and Lyons Run field, which supplies the gas for the Acme Gas Company; the belt or field in Washington County in which the celebrated McSwigan well is. No doubt other prolific fields will be found in the near future. It is a common opinion among those versed in the management of gas wells that the outflow is subject to a gradual diminution, tending ultimately to total extinction. In many cases the diminution is owing to a choking up of the pipe by deposits.

The number of companies chartered to supply natural gas

in Pennsylvania up to February 5, 1884, was 150, representing a capital stock of \$2,160,580. Natural gas, next to hydrogen, is the most powerful of the gaseous fuels, and can be used for almost all the purposes to which coal is applied, except for smelting ores in blast furnaces. Being free from deleterious substances, it makes better iron, steel, and glass than coal fuel. For domestic purposes it is also well suited.

The wasteful use of natural gas is deplored by the committee, and they predict that as soon as its superior heating qualities and low price, as compared with coal, are discovered by consumers, more efforts will be made to prevent a reckless waste. The composition of the gas now being brought to Pittsburg renders it improbable that it will compete with coal gas as an illuminant until some specially suitable form of burner has been contrived. Pure marsh gas yields about one-half the light produced by coal gas.

It has been attempted to apply natural gas to the conversion of iron into steel, but thus far the results have been unsatisfactory.

The report goes on to say that the importance of having the high pressure mains as they enter the city suburbs subjected to careful tests, and the mode of laying such pipes under municipal control, cannot be overestimated. The fact that natural gas if mixed with the air will explode on contact with fire is no argument against its general use under due precautions. The odor of natural gas in the mains seems to depend upon the traces of condensable hydrocarbons, for if kept in a closed vessel for a few days the gas becomes absolutely odorless. The odor will therefore in all probability diminish more and more as it is carried away from the wells. It has been found that air containing 10 per cent of Murrys ville gas fresh from the high pressure mains has a decided odor. The velocity of the gas depends largely on the amount of friction it has to overcome, as well as the initial pressure in coming from the well.

Natural gas pipes should be laid without any right-angled elbows or other fittings of the kind. A change of direction in the line should be made by bending the pipes, and no bend should have a radius of less than 48 inches for a 6 inch pipe, or eight times the diameter of the pipe. Gas from a well having a pressure of twenty ounces has a velocity of 23,400 feet per minute. A uhlman ball was driven through three miles of a 5½ casing pipe in 2½ minutes. When gas is flowing freely from the mouth of a well, the pressure has not been found in many cases to exceed two pounds per square inch. The gas as it issues from the wells has a temperature of from 42° to 45° Fah.

In conclusion, the committee made some suggestions to consumers of natural gas. They recommended that the distributing mains for domestic consumption be of ample size, with a pressure not exceeding 5½ inches water pressure; that an automatic cut-off valve be placed on the service pipe; that carefully selected wrought iron should be used in the construction of pipes; that special care should be taken to see that the valve is so boxed as to permit free outlet to the air of any escaping gas from a leaky main. The use of proper appliances for the admittance of air to the gas jets is also recommended. The committee advocate the placing of burners where natural gas is used so far above the floor as to be beyond the reach of children. The report concludes by urging the necessity of having all gas pipes thoroughly tested.

Electric Lighting by Primary Batteries.

At a recent meeting of the Society of Arts, Mr. Isaac Probert delivered a lecture upon primary batteries for electric lighting, in which he gave the history of such means of lighting from 1802, when Sir Humphry Davy first showed the carbon arc. The main object of the lecturer, however, was to show the comparative cost of electric lighting by batteries and by a dynamo. Taking the case of a house requiring 100 ordinary incandescent lamps, it was shown that the expenditure of energy in the working of the lamps would be 10 05 horse power. Allowing for the loss of energy in the dynamo, at least 12 55 actual horse power would be required from a steam-engine; the weight of coal for which would be about 56 lb., costing (say) 6d. Taking a yearly lighting of 1,800 hours, the annual cost of coal on this estimate would be £45; and the cost of lighting would be £147 a year, or £1 9s. 5d. per lamp. With galvanic batteries, using zinc and strong nitric acid at the rate of 1 03 lb. of zinc per hour horse power of energy, the consumption of metal for 12 55 horse power hours would be nearly 13 lb., costing for zinc alone 2s. 8¼d. per hour. Besides this, the cost of the sulphuric acid to oxidize the zinc, at the rate of 1½ lb. of acid per pound of zinc, would run up the expense to 3s. 11d. per hour. Add to this the value of the deoxidized nitric acid, or 4s. 4d., and the cost of materials alone in the galvanic battery is made up to 8s. 3d. per hour, or £742 10s. per annum. Taking capital into consideration, Mr. Probert brings the cost of every incandescent lamp maintained by battery power to £7 11s. 8d. per annum, as against £1 9s. 5d. with the dynamo. As to the supposed value of the residual products of primary batteries, of which so much is said by various inventors, Mr. Probert thinks the less said the better. In the Telegraph Department of the Post Office no residues are deemed worth preserving except the "black mud" from the Daniell cells, which last year, for the 69,323 cells accounted for brought in only £167 14s., or rather more than ¼d. per cell per annum.

The Underground Works at Girard College. Philadelphia.

Underlying the forty-one acres within the inclosure of Girard College walls, Philadelphia, there are 3,500 feet of tunnel, intersecting almost every part of the grounds. The main tunnel is 2,600 feet in length, while the branches run out to the length of 900 feet. The boiler and engine house on the north side of the grounds, opposite Twenty-second Street, are the central point from which the tunnel ramifies. The underground ducts vary in dimensions. A portion of the main tunnel is 8 feet high by 10 feet wide, while in other places it ranges down to 7 by 7. The branches are somewhat smaller, being 5 feet high by 8 feet wide. They are built of stone, with brick arches, at a depth of 14 feet from the surface, and are provided with concrete flooring. At distances of 100 feet apart there are gas jets, which are lighted by electricity. The tunnels are used for the pipes which carry the steam and hot water to the eleven buildings on the grounds. In the various structures there are tanks with a total storage capacity of 34,329 gallons, from which the supply of cold water is obtained. The miles of pipe running through the tunnels contain over 3,000 valves. —N. Y. Evening Post.

The Composition of Glass.

Bohemian glass is made with carbonate of potash, as pure and as rich as possible. Hydrate of potash of 54 to 56 degrees is the best for use. Potash used for glass making is extracted from the residuum of beet root sugar making. In Bohemia a potash extracted from wood ashes comes from Hungary. America also furnishes a good article. All potash used in glass making should especially be free from soda, as it tends to give glass a green color.

Soda has taken the place of potash to a great extent. It is used as a carbonate or sulphate. Carbonate is yet used in the manufacture of table ware, but in the making of plate and window glass, bottles, etc., the sulphate is almost entirely used, owing to its cheapness. By adding a small quantity of charcoal to sulphate of soda it is decomposed much more easily.

In the manufacture of flint glass lead is used in red oxide form, or sometimes a litharge, but the red oxide gives the best results. Red lead furnishes oxygen, which escapes in melting, and serves to refine the glass and burn the organic matters which may be contained in the mixture of materials. Red lead is prepared from the purest of leads coming from England and Spain, which are comparatively free from the oxides of iron, copper, etc. Lead is used in this country for glass making, by those manufacturers who make a superior quality of glass.

In the manufacture of plate, window, or white glass, lime is used as a carbonate or slaked.

It is important that sands should be selected with care, as impure silica has the most detrimental effect upon the color of glass. This is especially important in the manufacture of fine table ware, plate, and window glass. All sands should be free from iron, as this is the fruitful source of the green coloration of all glasses. In Bohemia quartz is used instead of sand. It is first heated, then thrown in water; this breaks into many pieces, which are subsequently reduced to fine powder by mechanical action in wooden mortars with quartz pestles. By this means the introduction of iron is avoided.

France and Belgium, for the manufacture of fine wares, use the Fontainebleau sand, not far from Paris; also the sands of Nemours, Chantilly, and from the province of Champagne. These sands are used for flint, plate, and first quality window glass.

English sands contain a considerable proportion of iron. Silica is sometimes used instead of sand for fine wares. For plate glass making sand from the Isle of Wight is used, but for the best qualities of glass the English manufacturer has to import sand from France and this country. Bottle manufacturers, on the contrary, seek sands containing iron and clay, on account of the elements they contain acting as a flux.

Silica is found in the shape of quartz, rock crystal, sand stone, and quartz sand in the crystalline form; in siliceous or flint stone in the amorphous state. Silica is one of the most abundant natural substances; it is insoluble in water; and resists the action of most chemicals. Among the acids only one, hydrofluoric acid, is capable of decomposing it; this acid decomposes and dissolves glass entirely. Silica, although infusible at the highest temperature of furnaces, has nevertheless been fused by the use of the oxyhydrogen blow pipe. Silica combines with all bases, alkalies, such as potash, soda, and with metals, lead, and bismuth. These give it the property to form vitreous compounds. Lime, magnesia, alumina, form with it infusible compounds; the latter, however, mixed with silicates of potash, soda, or lead, furnishes compounds which are suitable for the work of the glass blower. It is glass proper. If two infusible silicates are mixed together, they nevertheless produce fusible glass. Fine plate glass has been made with a compound of sand, slaked lime, and carbonate of baryta. This glass, as fine as ever made, contains, on being analyzed: Silica 46.5, baryta 39.2, lime 14.3, total 100.

To produce a glass requiring as little fuel as possible, the glass maker should introduce as many bases as possible in his mixture, such as potash, soda, lime, magnesia, alumina, oxide of iron; these, however, more particularly in bottle glass, where color is not so much an object as cheapness. *Per contra*, in making pots the clay should be as free as possible from a mixture of bases; simple silicates, such as silica and alumina, are preferable. —Glassware Reporter.

An Autographic Record of the Vibrations of a Tuning Fork.

The exact determination of the rate of vibration of a tuning fork by means of the siren has heretofore been attended with errors, resulting from imperfections of the recording gear and difficulty of maintaining and counting the beats of the two tones. These errors have been sought to be removed by obtaining autographic records of the rate of the siren and of the difference between this rate and that of the fork. The experimenter, while obtaining these results, being freed from the necessity of even counting the beats, no personal element enters into the observation, and the records, being permanent, can be studied at leisure. The apparatus with which these results are obtained is described in the *Amer. Jour. of Science*, the method employed being the following:

A strip of chemically prepared paper, which rests on a metal wheel, being drawn by clockwork under three platinum pens placed in electric circuits, three simultaneous electro-chemical records are obtained. One of these is a line of dots made at the rate of one a second, by a chronometer placed in the circuit of the same battery with one of the pens. The second is a row of dots made by a closing of the same circuit by a siren once in each revolution, while singing nearly in unison with the fork. The third is a row of dots made by the closing of the circuit of a second battery, once for each beat of the fork and siren.

It thus results that from the same strip of paper can be counted the number of revolutions made by the siren in any number of seconds (which gives the number of impulses produced by the siren) and the number of beats in the same time, which is the difference between the number of shocks imparted to the air by the siren and the number imparted by the fork. The record being made without throwing any work upon the fork, the rate of vibration of the unconstrained fork results.

Roman Remains in London.

The extension of the Metropolitan Railway in London, requiring deep excavation in the very heart of the city, has given occasion for many interesting discoveries. A part of the new line, from the Mansion House Station to the Minories, on the north side of the Thames, and near the shore, is cut through soil which has been accumulating during much more than two thousand years of continuous occupation, and relics, not only of Roman but of British London, have been exhumed in abundance. Just south of the Bank of England the excavation crosses a handsome street known as Walbrook, on each side of which is a little eminence, that to the east have been reputed to be the site of the fortress of the British Prince Cassivelaunus, who fought against Julius Cæsar; while that on the west formed part of the Roman colony subsequently established. In digging under Walbrook, the bed of the ancient brook from which it takes its name was laid bare, and two small landing stages, for boats from the neighboring river, were exposed.

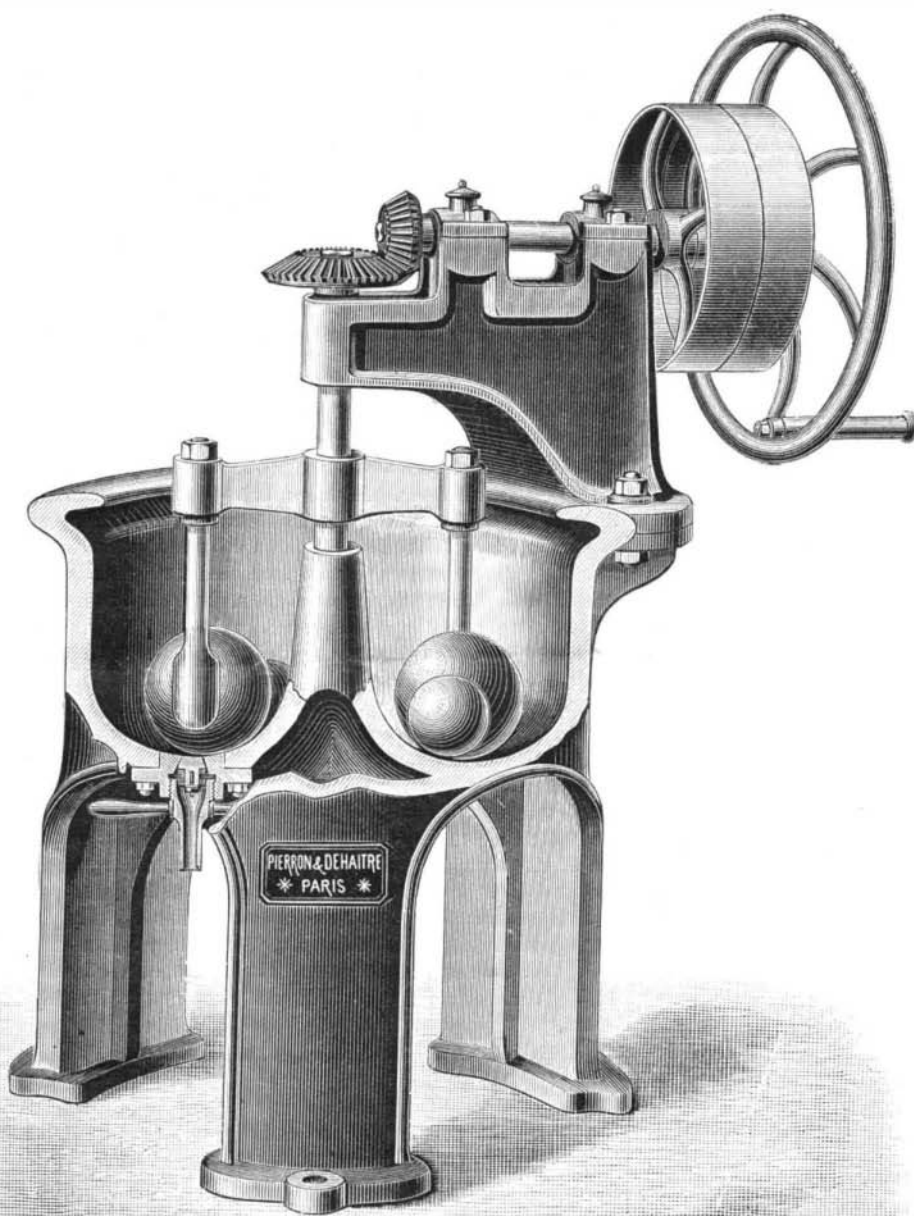
Both of them were built upon oak piles, and one had a quantity of oak tree roots thrown in among the piles, showing that the oak trees used were cut upon the spot, and the roots and useless twigs thrown in among the piles as the readiest way of clearing the ground. Over the piles, in each case, was a bed of concrete, and on this was a pavement of red Roman tiles. It is quite possible that the Roman pavement may have taken the place of a wooden platform, belonging to the original structure, which had fallen into decay, so that two thousand years may have passed since the piers were built. About them were found one or two skulls, of a British type, besides Roman pottery, leaden coffins of a Roman design, and a perfect bronze statue of heroic size. Not far off, at the bottom of a shallow well, was found, with its head downward, the skeleton of some unfortunate Briton, who had either been thrown or had fallen in, and had been left there, disregarded alike by his friends and by those who drank the water of the well.—*Building News*.

MACHINE FOR GRINDING INDIGO AND ULTRAMARINE.

Indigo and ultramarine are, like all colors in general, very delicate materials, that require a lengthy grinding in order to render them perfectly homogeneous. Messrs. Pierron and Dehaitre's machine, which is represented herewith, is designed for performing this operation mechanically. It consists of a circular vessel resting upon three supports cast in a piece with it, and containing in its center a projection which serves as a bush for a vertical shaft that carries a bevel pinion at its upper part.

Upon this shaft there is fixed an iron crosspiece carrying a paddle at each extremity. These two paddles, on being set in motion by manual power or otherwise, revolve continuously around the shaft that carries the crosspiece, and push ahead, each of them, two spheres turned out of cast iron and of different diameters. These spheres, on rolling over the indigo or ultramarine slightly moistened with water, reduce all the granular portions to a very fine paste, and convert them into a very homogeneous material which is then in a state to be delivered to the industries.

The spheres have different diameters and weights, so that, under the action of centrifugal force, the smaller ones shall not have the same rolling circumference as the larger ones,



MACHINE FOR GRINDING INDIGO.

and that the process of grinding shall thus be accelerated. For extracting the ground material from the apparatus when the operation is finished use is made of a cap in the form of a valve. It is only necessary to unscrew by a few turns the threaded rod which carries the conical cap to cause the latter to leave its seat and give sufficient passage for the flow of the ground material.

This machine revolves at the rate of 50 or 60 revolutions per minute. It is capable of grinding 15 kilogrammes of indigo in 10 hours, and costs 580 francs.—*Annales Industrielles*.

The Road to Riches.

One of the richest men in Chicago was asked for a private interview by a *Wall Street News* reporter, who explained: "You are very rich. You have had wonderful luck. Tell me what to speculate in, that I may make money."

"Never speculate at all," was the serious answer.

"But you have made money in railroad stocks, wheat, silver mines, canal stocks, etc."

"Not a dollar, young man! In fact, that's the way I have lost thousands."

"Why, then, how have you made your wealth?"

"By inventing a spring bed, and patenting a bootjack. Let all speculation alone, and turn your attention to the solid wants of the people."

Cedar Shingles.

White cedar shingles are the curiosity of the northwestern lumber trade. They are such for the reason that they are much better than white pine, and yet the majority of consumers do not know it. Men are continually buying pine roof covering, when they could purchase just as handily a better article for less money than pine costs. A special curiosity in connection with cedar shingles is this, that, while a large proportion of the settlers throughout the Northwest originally came from New York, New England, and Canada, and cut their teeth and gloried in their first pair of boots under a white cedar shingle roof, they seem to have forgotten all about this material since they became citizens of the Northwestern States.

The wholesale lumber dealers give as a reason why cedar shingles are not carried in stock more extensively that there is little demand for them. Nearly everybody wants pine. The wholesale dealers, like other merchants, handle the kind of goods there is the more sale for. But a progressive trader will endeavor to educate his customers. This the pine merchants have not attempted to do to any great extent as yet.

The lasting quality of good cedar shingles should insure their dominance over pine, leaving out any other consideration.

It is positively asserted by good authority, that cedar shingles are less liable to warp than pine, stay where they are put better, draw nails less, and consequently make a tighter roof than pine. In places where pine and cedar shingles have been used on contiguous roofs, it has been observed that the pine roofs look old and dilapidated while yet the cedar shingled roofs look as well as when first put on. All who are in any way acquainted with the quality of cedar know that it has great endurance against the effects of moisture and alternate moisture and dryness. Cedar is the favorite wood for posts and pavement on this account. Cedar shingles on roofs have been known to last forty years. There is a shingle in this office to-day that was taken from a roof in the State of Maine, where it had lain forty years. Half of the weather end is worn away, but enough is still there to shed rain. The writer of this was nurtured in his childhood under a cedar roof that tradition said had lasted fifty years; and when it was demolished to make way for a new one, the shingles were still sound, though moss covered and worn. There is no question but that cedar shingles are much more durable than pine.

The quality of lightness in cedar shingles is greatly in their favor as material for shipment. The lumber trade of this city, especially, has a long reach.

In reference to shingles, far away Kansas, Nebraska, Dakota, and Texas are the more important distributing fields. The lighter shingles can be made the more profitable is their shipment. They are very dry pine shingles that are made to weigh but 245. Cedar shingles can be made to weigh but 200 and less pounds per thousand. This results in a great difference on a car load.

Up to the present time cedar shingles have sold considerably cheaper in this market than pine. The current prices by the cargo range from \$1.50 to \$2.00, which includes standard and extra. The range on the same classes of pine shingles is \$1.75 to \$2.20.

In view of the excellence, the durability, and the cheapness of cedar shingles there can be no reason why they should not sell in larger quantity than pine shingles, unless it is that they are not so extensively manufactured. The only possible objection to cedar shingles is that they cannot usually be made as wide as pine shingles. But that is not a serious objection, since cedar shingles do not shrink, warp, nor split as badly as pine, and cedar lays a roof that stays in place better than pine.—*Northwestern Lumberman*.

Last year the German Lifeboat Society saved 277 lives, the rescued persons belonging to 47 German vessels, and to 5 English, 4 Dutch, 4 Swedish, 3 Danish, and 2 Russian ships. The society supports 87 lifeboat stations.