THE COD FISHERIES OF NEWFOUNDLAND.*

By Day Allen Willey.

The signing of the famous Bond-Blaine treaty, by which the market of the United States is partly thrown open to Newfoundland, will allow Americans to become acquainted with the famous codfish upon which the people of the great island depend so extensively for a livelihood. Up to this time, the greater proportion of the catch has gone to Great Britain, the West Indies, and South America; and it may be said that a very large population in the tropics depends upon the Newfoundland cod as a staple article of food, while cargoes have been sent across the Atlantic for centuries. It is an interesting fact that religious ceremonies have had much to do with the development of this industry, the demand for fish in Queen Elizabeth's time being such in both England and in northern Europe that nearly every sea became a fishing ground. In 1563 laws were passed in Great Britain providing that fish must be used in place of flesh or fowl at least 153 days in a year.

A large quantity of the product which was sent to England from Newfoundland in this century was caught by French, Portuguese, and Spaniards, who, as is well known, were the pioneers in the Newfoundland waters. The year 1600, however, found a fleet of about 200 vessels crossing the Atlantic, principally from Devon and other ports of the English west country. Quite a number of these decided to locate upon the island, and the colony owes much of its progress and prosperity to-day to these sturdy fishers.

When it is stated that over half of the population of 220,000 people in Newfoundland gain a livelihood almost entirely from the cod-fishing industry, an idea can be gained of its importance. It is small wonder that the courts of the island have legally applied the term "fish" to cod, owing to its importance; and when one speaks of fish, he is understood to mean the codfish, which, in the northern and southern coast settlements, is so often used as an equivalent of money as to be called Newfoundland "currency." It is measured by the quintal of 112 pounds, and in this form pays for food, clothing, and medicines, as well as fees for physician, the clergyman, and the lawyer. The fish "flakes" are so numerous in all of the towns, and even St. Johns itself, that it would be impossible to guard their contents; so stringent laws have been passed to prevent thieving, and the culprit who is convicted is frequently sentenced to several years in confinement, though he may take but a single fish.

While Newfoundland craft are to be seen in numbers upon the Grand Banks, during the last few years the crews have confined their operations largely to the waters in the vicinity of the island. Although the cod are somewhat smaller, they are fully as numerous and of excellent quality, while, in a good season, fish weighing ten and twelve pounds are frequently caught. The vessels range in size from the schooner, 125 feet in length and over 100 tons burden, to the sailboat manned by two men, who cast their lines or set their nets under the lee of the rocky shores perhaps not more than 500 feet from land, for schools of fish are to be found in proximity to the coast as well as a hundred miles away from it, depending largely upon the course of the Labrador current, which forms their principal food supply. The larger vessels are schooner rigged, and usually carry two jibs, a mainsail, foresail, and main topsail, with sometimes a small jigger extending over the stern, and staysail rigged between the two masts. In addition, they carry a triangular riding sail to assist in steadying them when they are at anchor. The larger ones are manned by from 15 to 30 men, provided with lines for deck fishing as well as set lines and trap nets. Each carries its complement of boats, and, on arriving at a fishing ground, a part of the crew throw their lines over from the deck, while others bait and put out the set lines and the trap nets from the smaller boats, visiting them at regular intervals to gather in the fish, which are taken to the schooner to be hastily cleaned, salted, and packed in the hold until the "fare" is completed. The captain usually keeps his boat anchored as long as the school which has been "struck" remains. The fish may stay on one feeding ground four or five days, or perhaps disappear in four or five hours after the vessel has cast anchor. Then the set lines and nets are taken up, the vessel weighs anchor, and search for another school begins.

In offshore fishing, the trap net is also used in addition to set lines, and the larger boats occasionally use hand lines as well, if the fish bite freely. A very large catch is made, however, with the set lines and nets, and the boatmen go out every morning to take out the fish and bait the hooks, perhaps paying another visit in the evening. Upon the return of the men to the home settlement with their boatload of fish, the women and children join them in cleaning the "fare," salting it and spreading it on the "flakes" to dry. At times the fishing is so good that the men make three and four trips daily to the nets and lines, carrying home a good load on each trip. Then the women and children prepare the fish in order to save time.

The time required to "cure" the codfish varies from four to ten days according to the weather. With a succession of sunny days, the "fare" will be thoroughly cured in less than a week, but the fish must be protected against rainy weather, in spite of the salt with which they are rubbed after being cleaned.

The "flakes" are composed of platforms of tree boughs, elevated from six to ten feet above the ground upon scaffolding; and the fish are laid upon the boughs so closely together, that at a distance the "flakes" look as if they were covered with pieces of white canvas. Each fish is turned over at least once every twenty-four hours, in order to cure both sides thoroughly; and when the process is completed, the fish is as stiff as a piece of board. No other ingredient except salt is required for the ordinary curing, although some of the cod prepared at the larger settlements are ground into fine particles, after being dried, and mixed with a jam made of small berries. This is placed in jars and sold as a preventive for scurvy. The "fares" secured by the larger vessels remain in their holds until the cargo is completed. On arrival at St. Johns, or the home port, the cargoes are sold, in a partly cured condition, to the merchants, who finish the preserving process. In buying the fish from the large vessels, as well as from the fishermen in the settlements about the coast, the cod are valued according to their weight, and generally sorted in three different sizes, the largest bringing a proportionately greater price. The merchant, as he is known in Newfoundland, is the large dealer who exports the fish to the tropics and Europe. He buys both from the fishermen and planters. The latter are a sort of middlemen, and usually have "stations" located at different points along the coast. These stations include general stores containing everything required by the average fisherman. The people in the vicinity can go to the station and exchange their harvest for what they need at home and the outfit required for fishing, and if anything is left to their credit, can obtain its equivalent in money. Many of them, however, are usually in debt to the planter, and, in a good year, the surplus remaining after obtaining their necessities, goes in payment of the debt of a previous season. The planters also buy schooner loads, and many of them own steamers and sailing vessels which make regular trips around the island, carrying the fish purchased by the planter to the general market at St. Johns, or one of the other large towns.

While the number of fish caught varies considerably according to the season, the average catch of this species is from 1,250,000 to 1,500,000 quintals, the value of course depending upon the price. Within the last two or three years the revenue from this source has aggregated about $5,000,000, not counting $300,000 for codfish oil, and a small sum for the oil made from the livers of the codfish to use for medicine. The number of crews engaged in codfishing can only be estimated, owing to the variety of craft and the wide field of their operations. Authorities on the subject, however, estimate that fully 60,000 men are engaged in the fishery each year, and that a fleet of fully 1,000 two-masted vessels hailing from the island alone, ply upon the nearby waters and on the Banks. Practically all of these vessels are home-made, the wood for both hulls and spars being secured from forests in the interior, while the sails and rigging are imported chiefly from England.

* Specially prepared for the Scientific American Supplement.

STRANGE FACTS ABOUT THE EUCALYPTUS.

Mr. D. E. Hutchins, of Cape Colony, who in 1882 in conjunction with Sir A. Brandis discovered the remarkable sun power storage capacity of the eucalyptus, has again been drawing attention in Nature to this extraordinary feature of the tree. According to Mr. Hutchins, a eucalypt plantation in tropical mountains, such as in South Africa, under favorable circumstances, stores up about one per cent of the solar energy received on the unit of area, and it is considered much cheaper in some parts of Cape Colony to plow up the land and plant a forest of quick-growing trees than to import coal.

In 1882 Mr. Hutchins and Sir A. Brandis, as the result of their experiments, discovered that eucalypts planted on tropical mountains produce fuel at the rate of 20 tons—dry weight at 60 pounds per cubic foot—per acre per year in perpetuity. The eucalypt plantation reproduces itself when cut without further expense, and its dry timber, heavier than coal, has an equal or a higher thermal power, bulk for bulk, than coal. This result was obtained as a measurement of the maximum yield of Eucalyptus globulus on the Nilgiris, Southern India. If a chance tree on a chance mountain in a chance soil can produce the equivalent of 20 tons of coal per acre per year, it seems not unreasonable to suppose, Mr. Hutchins suggests, that by selection double this, or 40 tons, can be produced. A powerful sun, a heavy rainfall, and a very rapid forced growth are the essentials of such a production of wood fuel. A glance over the rainfall map of the world shows these conditions are fulfilled over about 8,000,000,000 acres of its surface, which is between one-fourth and one-fifth of the total land surface of 35,200,000,000 acres. One-half of this area under forest might thus yield the equivalent of 160,000,000,000 tons of coal yearly, which is more than 288 times the world's present consumption of coal, assuming that coal and eucalypt timber are of approximately equal heating power. On the basis of the actual forest yield of the present day, we have half of this, or the equivalent of 80,500,000,000 tons. In Germany, one-fourth of the total area is under forest, and taking the German standard of one-fourth forest, on the basis of the present maximum yield we should obtain 40,250,000,000 tons; while if the maximum forest yield be converted to an average forest yield there would still remain a yearly product of 20,175,000,000 tons, which is rather more than thirty times the world's present consumption of coal. Thus it is seen that the yield of firewood from the world's tropical and extra-tropical forests, wherever they are fully stocked and scientifically worked, will yield the equivalent of from 30 to 122 times the present consumption of coal, or even up to 243 times the present consumption, if by cultivation the present timber yield be doubled, as it might be without difficulty.

THE ANCIENT RUINS OF RHODESIA.

The remarkable ruins in South Africa, which by many are boldly declared to be the remains of King Solomon's mines, are fully described and illustrated in a recent work by R. N. Hall and W. G. Neal. No theories are offered for the presence of the ruins in savage lands. The authors, however, seem to incline to the opinion of Prof. Keane, which is, in brief, that "the 'gold of Ophir' came from Havilah (Rhodesia), and was worked and brought thence first by the Himyarites (Sabæans and Minæans), later by the Phœnicians. . . . The numerous objects of Semitic worship and the fragments of Himyaritic script found at Zimbaye and elsewhere south of the Zambesi leave no reasonable doubt that the old gold-workings and associated monuments of this region are to be ascribed to the ancient Sabæans of South Arabia and their Phœnician successors."

Correspondence.

APPARENT CHANGE OF POSITION OF A TARGET'S BULL'S EYE.

To the Editor of the Scientific American:

Having read with much interest the communication in your Supplement, No. 1419, by Dr. Friedrich W. F. Riehl, treating of the apparent change in position of a target's bull's eye under different conditions of light, it occurred to me to question several old members of the rifle club (*skyttegille*) of this town whether they, all of them good marksmen, had had experiences similar to those of Mr. R. I found that all and every one of them were perfectly cognizant of the fact that with differing lights they had to change their aiming, just according to the calculation put forth by Dr. Riehl. They, however, ascribe it to some disturbing influence of the light on the peepsight, not to any apparent change in position of the bull's eye.

Axel Danielson.

Wisby, Island of Gotland, Baltic Sea, March 27, 1903.

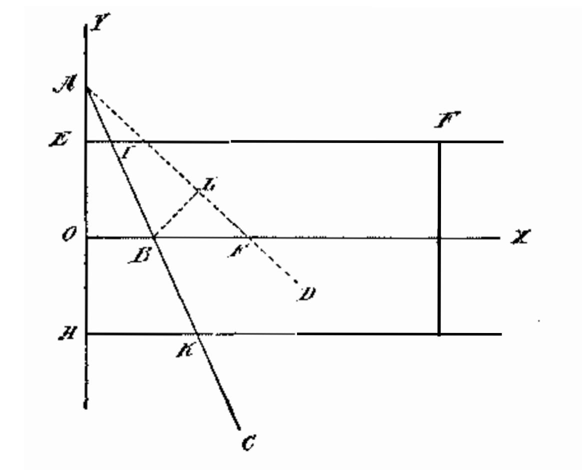
AN EXPLANATION.

To the Editor of the Scientific American:

The reason for the construction given on page 22537 of the Scientific American Supplement for December 13, 1902, may not be obvious to many, and the argument is here given.

In the accompanying drawing, we fold any trapezoid *EIKH* so that the edge *EH* may pass through the fixed point *F*. The question is to find the envelope of such lines as *IK*.

Produce the edge *EH* indefinitely, as also the perpendicular *FO* upon *EH*, taking *O* for origin of rectangular co-ordinates with axes *OX* and *OY*.



Let $FO = 2p$, $OB = a$, $OA = b$; then

$$\frac{x}{a} + \frac{y}{b} = 1 \ldots. 1 \qquad \frac{x}{2p} + \frac{y}{b} = 1 \ldots. 2$$

are the equations of the lines *AC* and *AFD* respectively.

From *B* draw the perpendicular *BL* to *AFD*. Then $BL = BO = a$.

But also from 2,

$$BL = \frac{2bp - ab}{\sqrt{b^2 - 4p^2}}$$

(for it is the perpendicular distance from the point a, o to the straight line 2).

Hence, clearing of fractions and rationalizing:

$$a^2 p = (p - a) b^2 \ldots\ldots\ldots 3$$

From 1 $$b = \frac{ay}{a - x} \ldots\ldots\ldots 4$$

Substituting 4 in 3, and simplifying:

$$p a^2 - (2px - y^2) a + p(x^2 - y^2) = 0 \ldots\ldots 5$$

But the condition for the envelope of 1 is that 5 have equal roots, or

$$(2px - y^2)^2 = 4p^2(x^2 - y^2) \ldots\ldots\ldots 6$$

Expanding 6 and arranging,

$$y^2 = 4p(x - p) \ldots\ldots\ldots 7$$

Transferring the origin to the middle of *OF*, 7 becomes $y^2 = 4px \ldots 8$, the common parabola, as was assumed.

William Hoover.

Ohio University, Athens, Ohio.

Dielectric Constants of Crystals.—W. Schmidt has worked out the method of determining dielectric constants originally described by Drude. It consists in immersing small crystals in liquids of various dielectric constants ranging from 2.3 to 80, and consisting of more or less dilute solutions of benzol in acetone or of acetone in water. The bath is placed between the armatures of a condenser at the end of a Lecher wire system, and when the liquid has the same dielectric constant as the solid, the immersion of the latter causes no alteration in the position of maximum resonance. The author has made this method available for crystals of a high dielectric constant by making the secondary circuit resound to the primary circuit underneath it, thus practically employing the method used by Drude for the determination of inductances. Maxwell's rule $k = n^2$ is only fulfilled in sulphur. In the other crystals examined there is no numerical agreement whatever, and mostly no qualitative agreement either. In some crystals, like pyromorphite, rutile and aragonite, the "electric double refraction" or difference of dielectric constant in different directions may be as high as 50 per cent. Rutile and pyromorphite also show a surprisingly high dielectric constant considering their low conductivity. In beryllium and tourmaline the dielectric constant is much greater at low frequencies than it is at high frequencies.—W. Schmidt, Ann. der Physik, No. 12, 1902.

SCIENTIFIC AMERICAN SUPPLEMENT. No. 1430

Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyright, 1903, by Munn & Co.

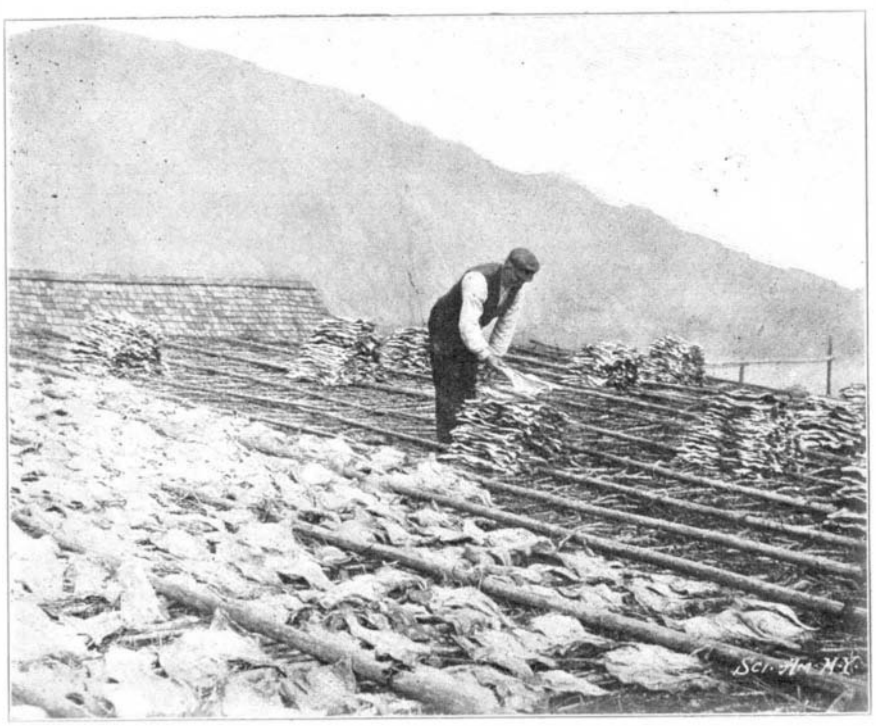
Scientific American, established 1845.
Scientific American Supplement, Vol. LV. No. 1430.

NEW YORK, MAY 30, 1903.

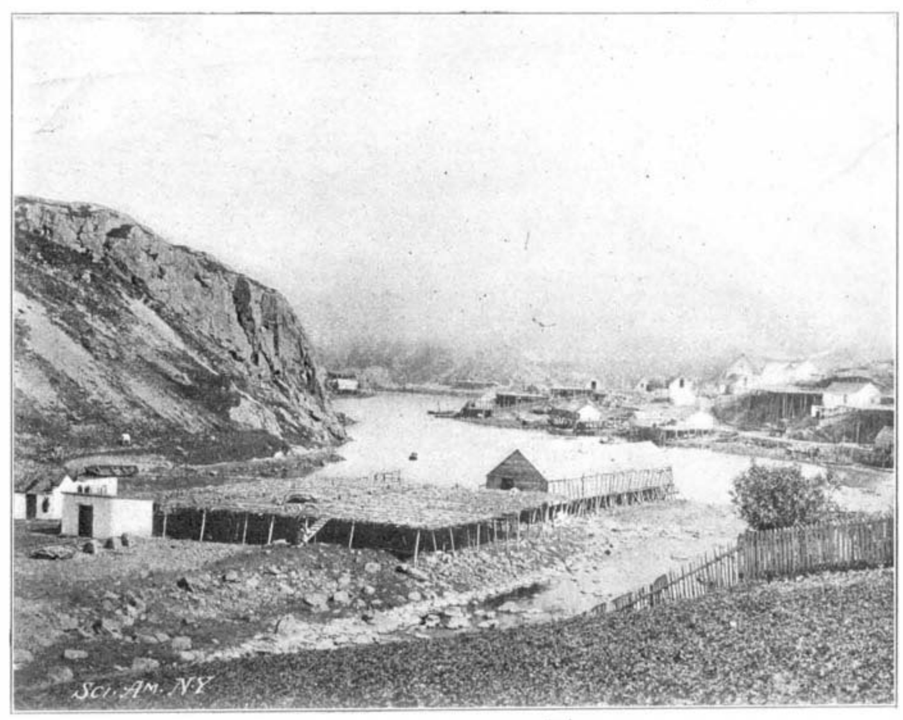
Scientific American Supplement, $5 a year.
Scientific American and Supplement, $7 a year.

ON THE WAY TO SET COD-NETS.

NEWFOUNDLAND SMACK IN AN ICE FIELD.



DRYING FISH ON A "FLAKE."



ONE OF THE ISLAND FISHERY SETTLEMENTS, SHOWING THE "FLAKES" CONNECTED WITH EACH HOUSE. FOG IS RISING IN THE DISTANCE.

A PILE OF NEWFOUNDLAND CODFISH.

UNLOADING FISH AT ST. JOHNS.

THE NEWFOUNDLAND FISHERIES.