

self. With this inductor and the coils on the pole tips, it was finally possible to obtain a R. M. S. current of 0.1 ampere at frequencies up to 120,000 periods per second. The maximum P. D. at 100,000 periods per second with 0.1 ampere flowing was 2 volts, and on open circuit 3.6 volts. As this output, though small, was ample for the purposes of the research, no attempt was made to further increase it.

THE ECONOMIC VALUE OF NEW GAME FOR ISLANDS.

By JUDGE D. W. PROWSE, LL.D., St. Johns, N. F.

IN the great natural history of our day, the "Voyage of the Beagle," Darwin describes in a most interesting way how Nature has provided the islands of the Pacific with their fauna and flora. Modern man is not contented with those slow old methods of Mother Nature; he designs to play the part of special Providence himself, and to provide by artificial means new birds, beasts, and plants, especially for islands.

The most remarkable of all these various experiments was the introduction of English trout into New Zealand. To carry alive 16,000 miles through the tropics such delicate things as trout eggs seemed impossible, but Frank Buckland and his fellow enthusiasts were not daunted by their first failures. They persevered, and finally succeeded. This small box of eggs has done more to make the beautiful island of the Antipodes attractive to tourists than even her famous hot springs, her labor laws, or her socialistic experiments. The trout are specially lusty, and have turned the island's barren streams into a veritable angler's paradise.

Another venture of this kind which had a similarly wonderful effect was the introduction, some thirty years ago, of the varying hare into Newfoundland. The Hon. Stephen Rendell procured about half a dozen of those animals from Nova Scotia, and to-day they are in prodigious numbers all over the island. Darwin says that in a general way insular types are inferior to the continental ones. In this colony the rule is quite the reverse. This poor little hare, which furnishes scanty food for the wandering Indians and the Hudson Bay Company's trappers all over the sub-Arctic region and the barren grounds, has become in our island large and plump.

Its introduction has been of enormous advantage to the Newfoundland fishermen, giving them abundance of splendid food and lucrative employment in the winter, catching them for market.

This varying hare (the blue hare of Scotland) is so prodigiously plentiful that it is often a drug in the local markets at twenty cents a pair. A story is told of an economical major of engineers (a bachelor). He used to declare that a hare roast was splendid, next day it could be jugged, and the remains made a splendid soup.

Many English naturalists have made the mistake of confusing this hare with *Lepus glacialis*, the Arctic or polar hare. They are quite distinct. The Arctic hare is much larger and different, both in color and in its habits. It is indigenous to Newfoundland. In summer it has a beautiful coat of silvery gray, turning into a dead chalk white in winter, with black spots on each ear. While the varying hare seldom weighs more than seven or nine pounds, his Arctic congener tips the scales at twelve and sometimes fifteen pounds. Two most interesting experiments are now being carried out in Newfoundland. One, the introduction of the elk, known all over America as the "moose," is actually in operation. Many years ago a pair were introduced. Unfortunately, the bull moose was either killed or died from an accident; the cow survived and was seen alive not long ago. There were rumors that she had mated with the native caribou, and that some extraordinary progeny of this union had been produced. Naturalists will view these stories with suspicion, and there is really no foundation for the rumor. Last year three more moose were procured and let loose. J. G. Millais, author of "The Mammalia of Great Britain and Ireland," suggested that they should be placed in the wooded region of the Gander River. Curiously enough it was in those extensive woodlands that they were found a few weeks ago. They were strong and fat and the bull had grown immensely. This success has encouraged the Newfoundland government to proceed with the experiment on a larger scale, until a herd of twenty is procured, fifteen cows and five bulls. They will be protected by law for at least ten years. The vast interior of Newfoundland (larger than Ireland) and wholly uninhabited, will form an ideal home for these splendid animals. As moose meat is the finest of venison, and the animal in its full growth stands higher than a horse and is as large as a bullock, besides being an attraction for sportsmen it will furnish abundant food for the people.

One more project which is warmly supported by our governor, Sir William MacGregor, and the premier, Sir R. Bond, is the introduction of the tame Lapland reindeer into Labrador and northeastern Newfoundland. This will be watched by the naturalists of the world with the keenest interest.

Sir William, who is a very able man, distinguished for the leading part he has taken in the study of tropical medicine, goes thoroughly into this subject in his report on Labrador.

At present in both Labrador and northeastern Newfoundland numbers of savage dogs are kept for winter sledge driving. Those beasts are so voracious that they have been known to kill and eat poor women and children. No domestic animals can be kept where they exist. They prevent the Newfoundlanders from rearing sheep. If their place could be taken by the tame

Lapland reindeer the whole condition of the poor Eskimos and settlers on Labrador would be materially changed. Instead of fierce canines they would possess a domestic animal, good for food and warm clothing, and the best possible means of communication during winter, in those desolate Arctic regions.

All European and American naturalists are agreed that the wild caribou of Labrador, Newfoundland, Alaska, and the American Arctic regions is precisely the same animal as the Lapland reindeer, and feeds on the same food. Where the wild animal can live the domesticated reindeer can also exist.

As an illustration of the absolute practicability of this project, Sir William MacGregor gives the experience of the Americans in introducing the Lapland reindeer into Alaska. One point is of great importance—they stand the voyage well, and as they are in herds of thousands their first cost is very reasonable.

The Lapland reindeer, after centuries of training, is as tame and obedient to man as the horse or dog. It has been suggested that they might be crossed by the wild caribou, a larger and stronger animal. We think, however, that it would be wiser to keep to the domesticated; the wild strain would be sure to break out in the cross breeds.

In 1891 the question of the introduction of reindeer into Alaska was raised by Dr. Sheldon Jackson. The Eskimos were threatened with extinction from want of food. White men had driven away the game, or destroyed it, and had depleted the salmon fishery by netting the rivers. It was found that the residents of eastern Siberia derived their subsistence chiefly from the reindeer, even to a greater extent than do the Laps. It was therefore deemed desirable that the reindeer should be introduced for the use of the Alaskan Eskimos. Congress having refused to grant an appropriation for that purpose in 1891, \$2,146 was raised by private subscription for the purchase of reindeer. With this sum 187 deer were brought from Siberia, with regular herdsmen, to whom a certain number of Alaskan Eskimos were apprenticed as herdsmen and teamsters. From 1892 to 1904, 1,280 deer were imported from eastern Siberia to Alaska, and in 1904 the total number of fawns surviving was 10,267. In the official report of the commissioner for education, published 1905, it is stated: "It is perfectly safe to predict, from the inspection of the annual per cent of increase, the doubling of the herd every three years." All the female deer are preserved. The males are used as food, or trained to harness. Allotments of fifty deer are made to those natives that underwent apprenticeship. Seven Lap families, on account of being more civilized than Siberians, were in 1894 employed to take charge of the Siberian deer in Alaska, and to teach the Eskimos. Between December 1, 1899, and May 31, 1900, the United States ran a mail by reindeer, under contract, three round trips from St. Michael, at about 63 deg. 30 min. N., across the Seward Peninsula to Kotzebue, which is inside of the Arctic Circle, about 66 deg. 50 min. N. Each round trip of 1,240 miles was successfully accomplished through an unbroken wilderness without a road or trail. Several relief expeditions to the far north have been successfully carried out by United States officers in Alaska by means of reindeer, when such expeditions would have been impossible by any other means. A contract has lately been entered into to carry a regular winter mail over the 650 miles from Kotzebue to Barrow, the most northerly point of Alaska, about 71 deg. 20 min. N. It is said that on these journeys, "when used in relays fifty miles apart, reindeer can transport the mails at the rate of two hundred miles a day."

That both Newfoundland and Labrador are well adapted for the reindeer is shown by the fact that the wild caribou thrive in both countries. Millais, the great naturalist, declares that the very superior quality of the Newfoundland caribou is owing to the splendid food he obtains in the insular moors and marshes.

In this matter we have the experience of the United States for our guide and can profit by their experience.

In 1898 the United States government imported from Lapland 538 head of choice reindeer trained to harness, 418 sleds, and 411 sets of harness, a few herding dogs, and 50 drivers, some of whom had families, making in all 113 emigrants. These Lapland deer were not for breeding purposes, but only for harness. More than half of them died of starvation after reaching Alaska, as moss had not been provided for them. From 1894 to 1903, Congress has appropriated no less than \$158,000 for the introduction into Alaska of domestic reindeer from Siberia. It has been found that "with careful training the Eskimos make excellent herders." It is thought that in thirty-five years there may be 35,000,000 reindeer in Alaska, with an export of 500,000 carcasses a year. The deer purchased in Siberia from the Chunchus cost \$4, from the Tunguse \$7.50 a head. It is stated by Mr. Gilbert H. Grosvenor that "the tame reindeer of Siberia was practically the same animal as the wild caribou of Alaska, changed by being domesticated for centuries." This corresponds with the general view of English zoologists, that there is but a single species of reindeer, but presenting local peculiarities. It appears that the Alaskan deer is not equal to the Lapland deer in strength or speed. A pair of the latter can pull a load of 500 or 700 pounds at the rate of thirty-five miles a day, and keep that up for weeks at a time. Mr. Armstrong states that a single deer can draw 600 pounds on a sled thirty, fifty, and even ninety miles a day. It is said the Lapland deer can in point of speed do 150 to 200 miles a day, and sometimes twenty to twenty-five miles down hill an hour. The Alaskan reindeer express has been driven at the rate of ninety-five miles a day. Reindeer can travel as well at night

as in daylight. In Siberia a caravan of 160 sleds is managed by ten men. In summer a reindeer can carry as a fair load a pack of 150 pounds. A good deer can easily carry a fair-sized man.

The experiment of transporting the Lapland reindeer to Labrador will be watched with great interest all over the world.

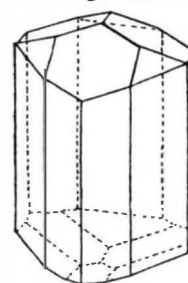
If successful (and there is no reason why it should not be so), it will help to solve one of the problems of Arctic exploration. As the wild caribou at the present time extends as high as 80 deg. north latitude, where the wild animal finds food, the Lapland deer can also live. In every respect they are vastly superior to dogs for Arctic traveling.

The introduction of new game is a very interesting subject, and presents all kinds of possibilities, such, for instance, as the crossing of the Scotch grouse with the hardier and stronger Newfoundland willow grouse, as a preventive of grouse disease. The colonial government, encouraged by the successful introduction of the varying hare and the moose, are now proposing to introduce the spruce partridge, indigenous in Canada and Labrador, and also naturalize the American woodcock. Snipe of all kinds are already numerous, but woodcock have only been found occasionally on the west coast of the island, as rare visitors.

PYRO- AND PIEZO-ELECTRICITY.

THOUGH the phenomena of pyro- and piezo-electricity have been known for a long time, this knowledge has hitherto been confined to a very small circle. The results of recent investigations have, however, placed

Antilogous End.



Analogous End.

FIG. 1.—HEMIMORPHIC CRYSTAL OF TOURMALINE.

our knowledge of this department of electrical science on a solid basis, and some information on the subject may therefore be of interest to our readers.

Even in ancient times frequent mention was made, among others by Theophrastus and Diocles, of a certain very hard stone, which was used for seals and which possessed the property of attracting straw and other substances. And during the middle ages and up to the commencement of the modern era, the attention of Dutch travelers in India and Ceylon was directed to a stone possessing the same property and called "tournamal" or "trip" by the natives. As the crystal, when heated, attracted ashes, it was called "Aschen-trecker" in Holland. It is now known under the French name "tourmaline."

The electrical nature of the observed power of attraction was first discovered by Æpinus in 1756. This remarkable property was then studied by a number of investigators, and many other crystals were gradually

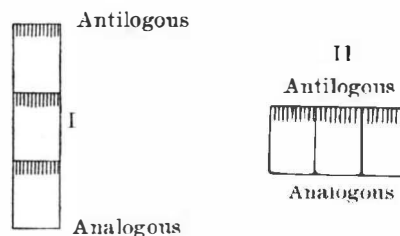


FIG. 2.

discovered which exhibited the phenomenon of electrical polarization when subjected to variations of temperature or, as was afterward observed, of pressure. Most of the investigations were qualitative only. But during the last decade exact quantitative experiments have been successfully made which, though confined for the most part to tourmaline and quartz, have yet permitted the formulation of laws, the calculation of constants, and the establishment of a very serviceable theory. The work done in this field by Hankel, Hallwachs, Thomson, I. and P. Curie, Gauguin, and Röntgen among many others should be mentioned, and special credit is due to Riecke and Voigt, who have obtained results of the greatest value both in measurements, and in the development of the theory.

Having briefly glanced at the history of pyro-electricity, we will now turn our attention to the phenomena.

Tourmaline, on which most of the experiments have been made, is a hemi-morphic crystal, i. e., a crystal having the two ends modified with unlike planes, as may easily be seen on reference to Diagram 1.

If one of these crystals is heated at a constant temperature for some time and then allowed to cool, the so-called "antilogous" end being positively, and the "analogous" end negatively electrified. This phenomenon is well shown in Kundt's experiment, which consists in blowing a mixture of powdered red lead and sulphur on the