

word or name even in our own language is frequently mispronounced, — how much more with words of languages utterly unknown to the reader. The same necessity does not arise in most continental languages. In them a definite combination of letters indicates a definite sound, and each nation consequently has spelt foreign words in accordance with the orthographic rules of its own language. It was therefore not anticipated that foreign nations would effect any change in the form of orthography used in their maps, and the needs of the English-speaking communities were alone considered.

The object aimed at was to provide a system which would be simple enough for any educated person to master with the minimum of trouble, and which at the same time would afford an approximation to the sound of a place name such as a native might recognize. No attempt was made to represent the numberless delicate inflections of sound and tone which belong to every language, often to different dialects of the same language. For it was felt not only that such a task would be impossible, but that an attempt to provide for such niceties would defeat the object.

The adoption by others of the system thus settled has been more general than the council ventured to hope. The charts and maps issued by the Admiralty and War Office have been, since 1885, compiled and extensively revised in accordance with it. The Foreign and Colonial Offices have accepted it, and the latter has communicated with the colonies requesting them to carry it out in respect to names of native origin. Even more important, however, than these adhesions is the recent action of the Government of the United States of America, which, after an exhaustive inquiry, has adopted a system in close conformity with that of the Royal Geographical Society, and has directed that the spelling of all names in their vast territories should, in cases where the orthography is at present doubtful, be settled authoritatively by a committee appointed for the purpose. The two great English-speaking nations are thus working in harmony. Contrary to expectation, but highly satisfactory, is the news that France and Germany have both formulated systems of orthography for foreign words, which in many details agree with the English system. The Council of the Royal Geographical Society, by printing the rules in "Hints to Travellers," and by other means, have endeavored to ensure that all travellers connected with the society should be made aware of them; but as it is possible that some bodies and persons interested in the question may still be in ignorance of their existence and general acceptance, they feel that the time has come again to publish them as widely as possible, and to take every means in their power to aid the progress of the reform. To this end, and with a view to still closer uniformity in geographical nomenclature in revisions of editions of published maps, a gigantic task requiring many years to carry out, the council have decided to take steps to commence tentatively indexes of a few regions, in which the place-names will be recorded in the accepted form.

The rules referred to are as follows: —

1. No change is made in the orthography of foreign names in countries which use Roman letters: thus Spanish, Portuguese, Dutch, etc., names will be spelt as by the respective nations.

2. Neither is change made in the spelling of such names in languages which are not written in Roman characters as have become by long usage familiar to English readers: thus Calcutta, Cutch, Celebes, Mecca, etc., will be retained in their present form.

3. The true sound of the word as locally pronounced will be taken as the basis of the spelling.

4. An approximation, however, to the sound is alone aimed at. A system which would attempt to represent the more delicate inflections of sound and accent would be so complicated as only to defeat itself. Those who desire a more accurate pronunciation of the written name must learn it on the spot by a study of local accent and peculiarities.

5. The broad features of the system are: (a) That vowels are pronounced as in Italian and consonants as in English. (b) Every letter is pronounced, and no redundant letters are introduced. When two vowels come together each one is sounded, though the result, when spoken quickly, is sometimes scarcely to be distinguished from a single sound, as in *ai, au, ei*. (c) One accent only is used, the acute, to denote the syllable on which stress is laid. This is very important, as the sounds of many names are entirely altered by the misplacement of this "stress."

6. Indian names are accepted as spelt in Hunter's "Gazetteer of India," 1881.

ELECTRICITY IN AGRICULTURE.¹

FROM the time electricity became a science much research has been made to determine its effect, if any, upon plant growth. The earlier investigations gave, in many cases, contradictory results. Whether this was due to a lack of knowledge of the science on the part of the one performing the experiments, or some defect in the technical applications, we are not prepared to say; but this we do know, that such men as Jolabert, Nollet, Mainbray, and other eminent physicists affirmed that electricity favored the germination of seeds and accelerated the growth of plants, while on the other hand Ingenhouse, Sylvestre, and other savants denied the existence of this electric influence. The heated controversies and animated discussions attending the opposing theories stimulated more careful and thorough investigations, which established beyond a doubt that electricity had a beneficial effect on vegetation. Sir Humphrey Davy, Humboldt, Wollaston, and Becquerel occupied themselves with the theoretical side of the question; but it was not till after 1845 that practical electro-culture was undertaken. Williamson suggested the use of gigantic electro-static machines, but the attempts were fruitless. The methods most generally adopted in experiments consisted of two metallic plates — one of copper and one of zinc — placed in the soil and connected by a wire. Sheppard employed the method in England in 1846, and Foster used the same in Scotland. In the year 1847 Hubeck in Germany surrounded a field with a network of wires. Sheppard's experiments showed that electricity increased the return from root crops, while grass perished near the electrodes, and plants developed without the use of electricity were inferior to those grown under its influence. Hubeck came to the conclusion that seeds germinated more rapidly and buckwheat gave larger returns; in all other cases the electric current produced no result. Professor Fife in England and Otto von Ende in Germany carried on experiments at the same time, but with negative results, and these scientists advised the complete abandonment of applying electricity to agriculture. After some years had elapsed Fichtner began a series of experiments in the same direction. He employed a battery, the two wires of which were placed in the soil parallel to each other. Between the wires were planted peas, grass, and barley, and in every case the crop showed an increase of from thirteen to twenty-seven per cent when compared with ordinary methods of cultivation.

Fischer of Waldheim, believing atmospheric electricity to aid much in the growth and development of plants, made the following tests: —

He placed metallic supports to the number of about sixty around each hectare (2.47 acres) of loam; these supports were provided

¹ Abstract of the January Bulletin of the Hatch Experiment Station, Amherst, Mass., written by Clarence D. Warner.

at their summit with electrical accumulators in the form of crowns surmounted with teeth; these collectors were united by metallic connection. The result of this culture applied to cereals was to increase the crop by half.

The following experiment was also tried: Metallic plates sixty-five centimetres by forty centimeters were placed in the soil. These plates were alternately of zinc and copper and placed about thirty metres apart, connected two and two, by a wire. The result was to increase from twofold to fourfold the production of certain garden plants. Mr. Fischer says, that it is evidently proved that electricity aids in the more complete breaking up of the soil constituents. Finally, he says that plants thus treated mature more quickly, are almost always perfectly healthy, and not affected with fungoid growth.

Later, N. Specnew, inspired by the results arrived at by his predecessors, was led to investigate the influence of electricity on plants in every stage of their development; the results of his experiments were most satisfactory and of practical interest. He began by submitting different seeds to the action of an electric current and found that their development was rendered more rapid and complete. He experimented with the seeds of haricot beans, sunflowers, winter and spring rye. Two lots of twelve groups, of one hundred and twenty seeds each, were plunged into water until they swelled, and while wet the seeds were introduced into long glass cylinders, open at both ends. Copper discs were pressed against the seeds, the discs were connected with the poles of an induction coil, the current was kept on for one or two minutes, and immediately afterwards the seeds were sown. The temperature was kept from 45° to 50° Fahrenheit, and the experiments repeated four times. The following table shows the results:—

	Peas. Days.	Beans. Days.	Barley. Days.	Sunflowers. Days.
Electrified seeds developed in.....	2.5	3	2	8.5
Non-electrified seeds developed in.....	4	6	5	15

It was also observed that the plants coming from electrified seeds were better developed, their leaves were much larger and their color much brighter than in those plants growing from non-electrified seeds. The current did not affect the yield.

At the Botanical Gardens at Kew, the following experiment was tried:—

Large plates of zinc and copper (.445 of a meter and .712 of a meter) were placed in the soil and connected by wires, so arranged that the current passed through the ground; the arrangement was really a battery of (zinc | earth | copper). This method was applied to pot herbs and flowering plants and also to the growing of garden produce; in the latter case the result was a large crop and the vegetables grown were of enormous size.

Extensive experiments in electro-culture were also made at Pskov, Russia. Plots of earth were sown to rye, corn, oats, barley, peas, clover, and flax; around these respective plots were placed insulating rods, on the top of which were crown shaped collectors—the latter connected by means of wires. Atmospheric electricity was thus collected above the seeds and the latter matured in a highly electrified atmosphere; the plots were submitted to identical conditions, and the experiments were carried on for five years. The results showed a considerable increase in the yield of seed and straw, the ripening was more rapid, and the barley ripened nearly two weeks earlier with electro-culture. Potatoes grown by the latter method were seldom diseased, only 0 to 5 per cent against 10 to 40 per cent by ordinary culture.

Grandeau, at the School of Forestry at Nancy, found by experiment that the electrical tension always existing between the upper air and soil stimulated growth. He found plants protected from the influence were less vigorous than those subject to it.

Macagno, also believing that the passage of electricity from air through the vine to earth would stimulate growth, selected a certain number of vines, all of the same variety and all in the same condition of health and development. Sixteen vines were submitted to experiment and sixteen were left to natural influences. In the ends of the vines under treatment, pointed platinum wires were inserted, to which were attached copper wires, leading to the tops of tall poles near the vines; at the base of these same

vines other platinum wires were inserted and connected by copper wires with the soil. At the close of the experiment, which began April 15, and lasted till September 16, the wood, leaves, and fruit of both sets of vines were submitted to careful analysis, with the the following results:

	Without conductor.	With conductor.
Molsture per cent.....	78.21	79.84
Sugar.....	16.86	18.41
Tartaric acid.....	0.880	0.791
Bitartrate of potash.....	0.180	0.186

Thus we see that the percentage of moisture and sugar is greater and the undesirable acid lower in those vines subject to electrical influence than in those left to natural conditions. There are also experiments which prove the beneficial effects of electricity on vines attacked by Phylloxera.

The following experiments were made at this station: Several plots were prepared in the greenhouse, all of which had the same kind of soil and were subjected to like influences and conditions. Frames in the form of a parallelogram, about three feet by two feet, were put together; across the narrow way were run copper wires in series of from four to nine strands, each series separated by a space about four inches wide, and the strands by a space of one-half an inch. These frames were buried in the soil of the plot at a little depth, so that the roots of the garden plants set would come in contact with the wires, the supposition being that the currents of electricity passing along the wires would decompose into its constituents the plant food in the vicinity of the roots and more readily prepare it for the plants. The electric gardens were thus prepared and each furnished with two common battery cells, so arranged as to allow continuous currents to pass through each series of wires. Near each electric garden was a plot prepared in the same manner, save the electrical apparatus. We will call the two gardens A. and B.

The place chosen for the experiments was in a part of the greenhouse which is given up largely to the raising of lettuce, and the gardens were located where much trouble from mildew had been experienced. The reason for this choice of location was to notice, if any, the effect of electricity upon mildew, this disease being, as is well known, a source of much trouble to those who desire to grow early lettuce. The soil was carefully prepared, the material taken from a pile of loam commonly used in the plant house.

Garden A was located where mildew had been the most detrimental; the experiments began the first of January and closed the first of April. For the garden, fifteen lettuce plants of the head variety were selected, all of the same size and of the same degree of vitality, as nearly as could be determined; the plants were set directly over the wires, so that the roots were in contact with the latter; the plants were well watered and cared for as in ordinary culture, and the fluid in the battery cells was renewed from time to time, that the current of electricity might not become too feeble. At the close of the experiments the following results were noted.

Five plants died from mildew, the others were well developed and the heads large. The largest heads were over the greatest number of wires and nearest the electrodes. It was further noticed that the healthiest and largest plants, as soon as the current became feeble or ceased altogether, began to be affected with mildew. On examining the roots of the plants it was found that they had grown about the wires, as if there they found the greatest amount of nourishment; the roots were healthy and in no way appeared to have been injured by the current, but, rather, much benefited by the electrical influences.

Beside garden A was prepared another plot of the same dimensions, having the same kind of soil and treated in like manner as the first, but the electrical apparatus and wires were wanting. At the close of the experiments only three plants had partially developed, and two of these were nearly destroyed by mildew—one only was free from the disease. The results, therefore, show that the healthiest and largest plants grew in the electric plot.

In the second experiment, which we called B, twenty plants of the same variety of lettuce and of equal size were taken. The treatment given was the same as the plants in plot A received. Five plants only remained unaffected with mildew; seven died

from the disease when they were half grown; the rest were quite well developed, but at the last part of the experiment began to be affected. Several heads were large, the largest being over the greatest number of wires and nearest the electrodes. Examination of the roots disclosed the same phenomena as in A.

Near plot B were also set twenty other plants, subjected to like conditions as the first, but without electricity; all but one died from mildew before they were half grown, the solitary plant that survived being only partly developed at the close of the experiment, and even this was badly affected with the disease.

Everything considered, the results were in favor of electricity. Those plants subjected to the greatest electrical influence were hardier, healthier, larger, had a better color and were much less affected by mildew than the others. Experiments were made with various grasses, but no marked results were obtained.

The question would naturally arise whether there may not be a limit reached where electricity would completely overcome the attack of mildew and stimulate the plant to a healthy and vigorous condition throughout its entire growth. From the fact that the hardiest, healthiest, and largest heads of lettuce grew over the greatest number of currents and nearest the electrodes, it would seem that electricity is one of the agents employed by nature to aid in supplying the plant with nourishment and to stimulate its growth. To what extent plants may be submitted to electrical influence, or what strength of current is best suited to them and what currents prove detrimental to their development, have not been determined as yet, but it is desirable to continue this research until some definite information shall be gained on these points. Probably different varieties of plants differ greatly in their capacity for enduring the action of electric currents without injury — experiment alone must determine this.

It has been proved that the slow discharge of static electricity facilitates the assimilation of nitrogen by plants. Faraday showed that plants grown in metallic cages, around which circulated electric currents, contained fifty per cent less organic matter than plants grown in the open air. It would seem from the researches of the latter physicist, that those plants requiring a large percentage of nitrogen for their development would be remarkably benefited if grown under electric influence.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

The First Locomotive Run in America.

It was in 1829, the same year in which Stephenson, with his "Rocket," demonstrated the practicability of rapid steam traction on railways. The engine was named the Stonebridge Lion. It was made in England and imported by the Delaware and Hudson Canal Company, and designed to draw coal from their mines in Carbondale to the head of their canal in Honesdale, Penn. On its arrival, it was placed on the railway and run from Honesdale to Seeleyville, a little over a mile. It was found to be too tall to go under a highway bridge over the track at that place, and was reversed and run back to Honesdale. All parts of the railway above the surface of the ground were built on trestles, and the heavy engine racked them so much as to endanger safety. For these reasons the locomotive was set off by the side of the track, and a board shed built over it. The railway was planked, and horses employed to draw the cars. The engine stood there safe for several years.

The writer was personally acquainted with these facts. Two men who rode on that trip are living at this time.

In 1840 and 1841, while I was a student in the Honesdale Academy, I found the boards on one side of the shed torn off and the engine exposed to view. I spent many hours in trying to study out its mechanism and movement. No published description of a steam engine was then within my reach. The Stonebridge Lion had four wheels, three or three and a half feet in diameter, and

the boiler rested directly on the axles. The cylinders were vertical, one on each side of the boiler near the hind wheels. There were two heavy iron walking-beams a few feet above the boiler, and to one end of each a piston-rod was attached by Watt's parallelogram. The other ends of the beams were joined by swinging-rods to cranks at right angles to each other on the forward wheels. There was no whistle or bell, I think. The engineer stood on a small open platform behind the boiler.

Soon after 1841 the engine began to be carried off piece by piece, mostly by blacksmiths and machinists; and I am told that only one small piece of the iron is now in existence in its primitive form. If the engine had been kept intact, it would be worth almost its weight in silver for exhibition in Chicago in 1893.

M. H.

The Historical American Exhibition at Madrid.¹

ONE of the most interesting and instructive celebrations proposed for the year 1892 is the Spanish celebration, the chief feature of which will be an exhibition at Madrid, termed the Historical American Exhibition, the special object of which is to illustrate primitive American life and the history of the period of discovery and conquest. In selecting the prehistoric and early historic eras for illustration, the Spaniards will make their own exhibition complete in itself, without in the least competing with the Chicago exhibition.

The plan of the exhibition is, within its limits, a very broad one, comprising five general divisions, viz., prehistoric America, the historic period, Indian industrial arts, cartography, nautical instruments, etc., and the fine arts and kindred subjects. Under the head of prehistoric America, plans, models, reproductions, drawings, etc., are solicited of ancient caves and caverns, and anything that may help to show the use of these primitive places as human dwellings. Similar models, drawings, or photographs are desired of American menhirs, dolmens, and mounds, as well as lacustrine dwellings. All sorts of implements and objects relating to this period are desired, such as stone weapons, articles of bone and horn, pottery, ornaments, utensils of bone, wood, stone, and other materials, with fossil or animal bones throwing light on the archæology of this time. Examples of all the ages and periods of primitive life as they can be traced on the American continent are wanted.

In the historic period the objects desired include models of ancient American buildings, architectural remains, plans, models, and drawings of restored monuments. Examples of sculpture, bas-reliefs, architectural paintings, and other forms of painted decoration form another class. Under industrial art is included clothing and adornment of the aborigines and uncivilized Indians, with implements of war, offensive and defensive. Jewels of gold, silver, bone and ivory, pottery, household utensils, and articles used in transportation by water and land, constitute another division of this branch, while written documents in native tongues, pictures, and photographs of Indians and effigies showing native costumes, models of Indian dwellings, and Indian crania, form a third division.

The department of cartography includes maps, plans, charts, and drawings, and all that concerns ancient cartography, with models of vessels anterior to the voyage of Columbus, as well as those he himself used. A section is devoted to nautical instruments, with the idea of illustrating the instruments, charts, and maps in use at the period of discovery, while objects in personal use by Columbus and pictures of the same are also desired. The fine arts department includes ancient architectural monuments, sculpture, paintings, industrial and artistic work following the discovery, American coins, literary and scientific publications, manuscripts, charts, and plans of all kinds, from the discovery to the middle of the eighteenth century.

Most liberal inducements are offered to intending exhibitors from America. The exhibition will be held in the new library and national museum building in the park at Madrid, which will be used for the first time for this purpose, the exhibition serving as a sort of inauguration of the structure, which has been a num-

¹ This letter appeared also in The Nation.