The First Electric Telegraph.

The idea of the practical application of the electric telegraph to the transmission of messages was first suggested by an anonymous correspondent of the *Scots Magazine* in a letter dated Renfrew, February 1, 1753, signed C. M., and entitled "An Expeditious Method of Conveying Intelligence." After very considerable trouble Sir David Brewster identified the writer as Charles Morrison, a native of Greenock, who was bred a surgeon, and experimented so largely in science that he was regarded in Renfrew as a wizard, and eventually found it convenient to leave that town and settle in Virginia, where he died. Mr. Morrison sent an account of his experiments to Sir Hans Sloane, the President of the Royal Society, in addition to publishing them anonymously, as stated above. The letter set forth a scheme by which a number of wires, equal to the letters of the alphabet, should be extended horizontally, parallel to one another, and about 1 inch apart, between two places. At every twenty yards they were to be carried on glass supports, and at each end they were to project 6 inches beyond the last support, and have sufficient strength and elasticity to recover their situation after having been brought into contact with an electric gun barrel placed at right angles to their length about an inch below them. Close by the last supporting glass a ball was to be suspended from each wire, and at about a sixth or an eighth of an inch below the balls the letters of the alphabet were to be placed on bits of paper, or any substance light enough to rise to the electrified ball, and so contrived that each might reassume its proper place when dropped. With an apparatus thus constructed the conversation with the distant end of the wires was carried on by depressing successively the ends of the wires corresponding to the letters of the words, until they made contact with the electric gun barrel, when immediately the same characters would rise to the electrified balls at the far station. Another method consisted in the substitution of bells in place of the letters; these were sounded by the electric spark breaking against them. According to another plan, the wires could be kept constantly charged, and the signal sent by discharging them. Mr. Morrison's experiments did not extend over circuits longer than forty yards, but he had every confidence that the range of action could be greatly lengthened if due care were given to the insulation of the wires.

A JARDINIERE, BIRD CAGE, AND AQUARIUM COMBINED.

A correspondent of *La Nature* communicates to that journal a description of a cheap and easily constructed ornamental object that possesses the novelty of being an aquarium, a bird cage, and a jardiniere all in one.

It consists of a large bell glass mounted upon a wooden or iron base, and into the interior of which is introduced a cylindrical glass vessel that has first been loaded with bits of lead or cast iron painted green and other colors, so as to imitate the bed of a spring or clear brook. Upon the bottom of this inner vessel rests a movable perch made of iron rods of small diameter and provided with a foot. The orifice of the cylindrical vessel, as well as that of the bell glass, is covered with wire work having meshes sufficiently wide to admit plenty of air to the birds, while preventing their escape, and sufficiently strong to bear the weight of a row of flower pots.

After the apparatus has thus been constructed birds are introduced into the cylindrical vessel, and gold fish into the water surrounding the latter, while pots of flowers are placed upon the wire work that covers the orifice of the bell glass.

The effect produced upon the spectator by this arrangement is said to be very curious, as the birds seem to be living in the water along with the fish.

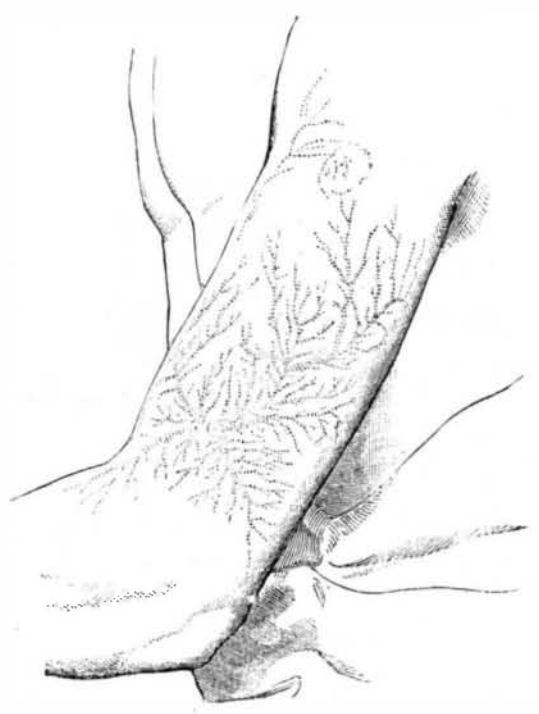
Imported Cattle Disease.

A report of the U. S. Treasury Cattle Commission, under date of August 4, 1883, says that the charges recently made in the British Parliament that American cattle were being received in British ports which were infected with the foot and mouth disease are not true; that the first invasion of the disease into this country was from two English cows brought by way of Montreal, and that "two years ago the steamship France, of the National Line, landed in New York a herd of Channel Island cattle suffering from foot and mouth disease. These were quarantined by the State authorities, and the infection stamped out. The France, however, after an attempted disinfection, shipped a cargo of American beeves for the return voyage, and these, on arrival in England, were condemned as being infected with foot and mouth disease. This was undoubtedly contracted on board ship. The second case is that of the steamship Nessmore, which, in March, 1883, landed in Baltimore a herd of Channel Island cattle suffering from foot and mouth disease. These again were secluded, as soon as detected, by the Pennsylvania authorities, and no evil consequences to our home herds can be traced. But the steamship Nessmore, after an attempted disinfection by the agents, shipped a cargo of American fat cattle, and these, on arrival in England, were found to be suffering from foot and mouth disease. This infection, unquestionably contracted on board ship, appears to have been the main if not the sole occasion of the recent questions and resolution in the British Parliament."

IN Virginia they are making flour of peanuts. In Georgia the nuts are pounded for a pastry.

LIGHTNING PRINTS ON THE HUMAN BODY.

A photograph by Mr. G. Boner, of Duns, N. B., the first of the kind with which we are acquainted, has been shown to us, in which the impression found on the arm of a boy who was recently struck by lightning is most vividly reproduced. An interesting note on the subject will be found in the *Photographic News* of the 6th July. The objections to the popular idea that the delicately traced figures, so very



LIGHTNING PRINTS ON THE HUMAN BODY.

like fern fronds or branches of trees, are caused by the imprint of a near object on the surface of the body are very well put forward. The writer arrives at the conclusion that the markings are caused by the direct action of the electric fluid in paralyzing the nervous system, by causing congestion and redness in the capillary vessels, and the experimental explanation of the tree-like form is clear and satisfactory.—*Lancet.*

[The discharge of static electricity over a very poor conductor, or over a non-conductor when the latter is covered with a film of moisture or dust, assumes an arborescent form, generally spreading in all directions. Discharges of this character from a large inductorium or Holtz machine over a slightly conductive surface are readily produced, and without doubt the lightning picture shown on the arm in the engraving could be readily duplicated by artificial means could a subject be found who would be willing to become a martyr—to that extent—to the cause of science.—ED. S. A.]

BIRDS IN AN AQUARIUM.

Synthesis of Salicine.

Natural salicine occurs in the bark of the willow tree, and is called a *glucoside* because it is easily broken up by the action of dilute acids into glucose (dextrose) and a resinous substance. There are a large number of natural glucosides, but this is the first one that has been produced artificially by synthetical methods. Although, as in all such cases, some of the preliminary steps had been taken by different chemists, the final successful synthesis was accomplished by Prof. Arthur Michael, of Tufts College, Mass.

The substances employed were not those in common use, and we beg our readers not to be frightened by their names, for the substances themselves are perfectly innocent. Helicine, which had previously been prepared by the author from acetchlorhydrose and sodium salicylaldehyde, was dissolved in water and reduced with sodium amalgam. After filtering from mercury the solution was neutralized with carbonic acid and evaporated to dryness, and the residue extracted with alcohol. After several crystallizations the product was found to possess the chemical composition and other properties of natural salicine.

CINNAMIC ACID.

Prof. Michael has also recently produced cinnamic acid by a new synthesis, viz., by heating benzoic aldehyde and malonic acid for several hours in a closed tube at 130°.

Luminosity of Flames.

Sir W. Siemens, in the *Ann. Phys. Chim.*, says that the luminosity of burning gases is a secondary phenomenon dependent on the separation and incandescence of solid particles suspended in the flame. Gases from which no such particles are separated, burn with a feebly luminous flame, and this luminosity is assigned to the incandescence of the gases themselves. No experiments have hitherto been made to ascertain whether pure gases heated to a high temperature really emit light. In order to examine this point the author's brother made a series of observations with a Siemens regenerative oven of the form used in the hard glass manufacture, whereby a temperature of the melting point of steel, 1,500° to 2,000° C., could easily be attained. By a suitable contrivance the interior of the oven could be examined, and it was found that, provided the experimental room was kept perfectly still, the heated air in the oven emitted no light. The introduction of a luminous flame into the oven caused its interior to be only feebly illuminated. As a result of the experiments, it follows that the supposition that the luminosity of the flame is due to the incandescence of the gas is incorrect.

In order to determine the temperature at which luminous waves become non-luminous, the author suggests a repetition of the above experiments with a more refined apparatus. The author further demonstrates that the heat rays emitted from hot gases are very small in number as compared with those emitted from equally hot solid bodies. Observations on the behavior of flames themselves prove equally that the luminosity of flames is not due to the incandescence of the products of combustion. If the gases to be burnt are more quickly mixed the flame becomes shorter, since the process of combustion is accelerated and hotter, since less cold air is mixed with the burning gas. The same phenomenon occurs if the gases are strongly heated before they are burnt; but since the ascending products of combustion are maintained for a short time only at the temperature of the flame, the above phenomenon would be reversed were the gas self-luminous. The luminous part of the flame is separated by a line of demarkation for the products of combustion, and is coincident with the termination of chemical action, which is probably the cause of the emitted light.

If it be assumed that the gas molecules are surrounded with an envelope of ether, then a chemical combination between two or more of the molecules will cause a vibration of the ether particles, which becomes the starting point of the light and heat waves. The luminosity of gases when an electric current is passed through them can be explained in a similar manner, and the author has already observed that all gases are conductors of electricity when their point of so-called polarization maximum has been reached.

New York Stock Quotations Received via Boston.

Much inconvenience was experienced by business men in New York city and in other portions of the country, August 14, by the cutting of the wires that connect the Stock and Gold Exchanges with the offices of business men. But the value of private wires, which were uninjured by the vandals who tried to disable those of the Western Union, was shown by the fact that the private wires of a firm in New York reaching to Boston were the principal means of communication between the two cities for commercial business. The *Sun* says: The firm of H. L. Horton & Co. obtained their quotations very promptly by way of Boston. The gold and stock wires to that city were not cut, and as fast as the figures came out in the Boston branch office of the house they were telegraphed back to the New York offices over the firm's private wire.

THE statistics of Paris lately published establish the claim of the city to be the most cosmopolitan in Europe. Whether it be a thing to be proud of or not, Paris is chiefly inhabited by a population who are not Parisians. Out of 100 residents only 30 are born within the limits of the city; the remaining 70 are provincials and foreigners.

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The Discovery of Luray.

Some time ago there appeared in the SCIENTIFIC AMERICAN an interesting account of the Luray Cave, which an attache of this office graphically described, after visiting it. Since our description of the wonderful cave many thousands of persons have visited it, and it has now become a place of popular resort. A correspondent of the Atlanta *Constitution* tells its readers how the cave was discovered, and how the party making the discovery were deprived of their gain:

A wandering photographer who chanced to be near Luray (then Loraine) was impressed with the belief that there was a cavernous formation in some of the hills that throng about the village. Why he thought so only those who know how thoroughly such a man must study nature and acquaint himself with woodcraft can understand. At any rate, he persuaded to his views a local hunter named Campbell, and the two started out on a systematic and persistent search for a hole in the ground.

For a long time they were unrewarded. One morning, however, they came upon a bowl-like depression in the side of a mountain, from which they thought a vague current of air was issuing. They began picking through the loose stone and sand that made the bottom of the sink, and, after going about ten feet, dropped through an open cavity of indeterminate dimension. A rope was tied around Campbell's body, and he went far enough to discover that the new-found cavern was vast and measureless. The hole was then carefully covered over, and the discoverers, keeping their secret, sought the owner of the land. On a short bargain they bought the land for $100, and took the deeds.

They then disclosed their secret, secured help, and made a thorough exploration of the cave. This exploration opened up the weirdest, most picturesque and marvelous range of underground scenery, in my opinion, in the world. I do not see how anything can surpass it. For more than five miles winding passages lead through vaulted and fluted chambers large enough to quarter a regiment, past pools of crystal water caught m glistening basins, through corridors of enchanting beauty into vast and silent cathedrals and beyond archways, to pass under which a child must bow its head—all filled with stalactites, knolls, and columns, fashioned through the patient and ceaseless work of centuries upon centuries into the most singular resemblances and similitudes that are startling. Nowhere is there a sign of life, except that in one huge chamber a solitary bat flutters in uncertain circles amid the lofty tops of fluted columns. No other bat was seen there—and this one was so wizened and wrinkled that he might have been distilled from the darkness and dungeon like vapors of the cavern—the one blind, and pinched, and chilled evolution of a cycle of gloom and silence. There is one other sign of life—the skeleton of a human being half embedded in the bottom of a gorge. Ages ago this man, of perhaps a race the memory of which does not survive, was doubtless lost in the cavern. Falling into this chasm, struggling against its clammy sides in the utter darkness, and filling the awful stillness with his dying cries, he died alone. And now holiday crowds of a race as strange to him as the phantoms with which his last terrors peopled the blackness of the cave pause with laughing speculation over his bones, and the feet of children run trippingly over the ways where he perished so helplessly.

As soon as the railroad people became satisfied of the extent and beauty of the newly discovered cave, they organized a company with a capital of $100,000, and bought the cave from Mr. Campbell and the photographer. The price given was $40,000; but before it was paid over the former owner of the land, who in his ignorance of the cave had sold it for $400, moved to set his sale aside on the ground of fraud. He contended that he had sold simply the top of the ground, and not what was under. The courts decided he was right, and ordered the $40,000 paid to him instead of the discoverers. These latter got nothing, and Campbell is now a guide for the company on a salary. After paying $40,000 for the cave, the company built the Luray Inn, a perfect model of a Swiss hotel, at a cost of $50,000. A charge of $1 is made for entrance to the cave, and last year 25,000 persons paid this fee. Excursions are run twice a week, and bring from 300 to 600 people on a train.

Special Forms of Gelatine.

Mr. F. Dawidowsky writes that gelatines prepared for special purposes can be designated as specialties. There are two kinds of sufficient importance to be mentioned, one called bouillon stock, and the other chrom-gelatine; the former finds use in the culinary arts, the latter in various other arts (including photography).

Before accurate physiological investigations had proved that gelatine possessed very slight nutritive value, it was supposed that there was no more strengthening food than meat which had been boiled until it formed a soft mass like jelly. As this contained all the constituents of the meat and was quite soluble in water, it was thought that a strengthening broth could be prepared by dissolving it in hot water. As this extract was first made in France, it was called bouillon.

A solution of this jelly in water is by no means the same thing as a freshly prepared meat broth, or bouillon, for the latter contains only those constituents of meat which are soluble in hot water, a meat extract, while the bouillon stock contains, in addition to these substances, part of which have already begun to change, the whole quantity of muscular tissue originally present as such, but now converted into glue.

The preparation of this bouillon stock is as follows:

Perfectly fresh ox beef is chopped fine, all the sinews and bits of bone carefully removed, and then put in *cold* water containing 4 or 5 per cent of salt, and heated to boiling.

It may be boiled in an open vessel, but then it is absolutely necessary to stir the mass continually to prevent its burning fast to the bottom of the kettle. When working on a large scale, it is far better to boil it with steam.

At first a considerable quantity of brownish scum rises to the surface of the liquid. This should not be skimmed off, but stirred in. The boiling is continued until the muscle fibers of the meat are completely dissolved and a sample of liquor, when cooled, solidifies to a very stiff jelly, which does not yield to the pressure of the finger end.

To give it a convenient shape for use it is poured into small tin moulds, where it solidifies in tablets of the size and shape of cakes of chocolate. When these cakes are dried in heated chambers, they become hard like horn.

When one of these cakes is put in hot water, it dissolves to a light brown liquid in which float little delicate flakes of coagulated albumen. In its chemical nature this broth consists of a gelatine solution containing the soluble constituents of meat so far as they are unchanged by boiling.

Since the slight nutritive value of gelatine has been recognized, bouillon stock has nearly gone out of use, and the more so since Liebig's meat extract offers a substance which contains, in reality, all the easily soluble and, therefore, strongly nutritive constituents of the meat, and only needs to be dissolved in warm water, with the addition of some salt, to produce a liquid of the same nutritive value as good beef broth.

CHROM-GELATINE.

If a solution of gelatine is mixed in the dark with a solution of some soluble chromate, *e. g.*, bichromate of potash or ammonia, or with a salt of chromic oxide, as a solution of chrom alum, no other change takes place except in color, the chromates coloring the gelatine an orange red, the chromic salts purple or violet.

If, however, thin layers of chrom-gelatine are exposed to the action of the sun's light, the gelatine will become insoluble in water without losing the property of swelling up in water. Although the chemical change which the gelatine suffers in this case has not yet been explained, a very important use is made of the property in the arts for reproducing pictures.

If a solution of very pure gelatine is mixed in the dark, or in a room illuminated only by chemically inactive light, such as orange yellow, with any chromate, and the solution be then poured on plates of glass, it will form, when dry, a thin film of gelatine on the plates. When one of these plates is covered with an ordinary photographic negative and then exposed to sun light, the gelatine will become insoluble in places where the light has unobstructed access, while it remains soluble elsewhere.

After a plate has been sufficiently exposed to light it is placed in warm water, where the insoluble gelatine merely swells up, while the soluble portion dissolves. When the plate is dry it exhibits the picture of the photograph that was copied on it in relief and of insoluble chrom-gelatine. The gelatine plates can be immediately rolled with printing ink and printed in a printing press, or they may be electroplated and copper printing plates prepared from them. *Wiener Gewerbe Zeitung.*

Heating Railroad Cars.

There is still a demand for a first-class heater for railway cars. In a lengthy article on the above subject the *Railroad Gazette* recommends, as preferable to the present style of stoves now quite generally used, the substitution of cylindrical stoves made of boiler iron, the longitudinal seam welded instead of being riveted, and the top and bottom heads welded in like the reservoirs of the Westinghouse brake. The inside could be lined with fire brick, or it could have a cast iron fire pot. It should then be bolted down, not with a few lag screws, but with strong three-quarters or seven-eighths inch rods passing over the top of the stove and down through the floor, with proper nuts and washers underneath the sills. In order to protect the sides of the car from the heat of the stove it could be inclosed with a cylindrical casing made of tank iron, with a liberal space, say six or eight inches, between it and the stove. This might be open at the top and bottom, and the lower edge should be raised and have an open space between it and the floor of about six inches. The effect of this would be that the air between the stove and the casing would be heated and would rise and thus draw in the cold air next the floor, which in turn would be heated and would also ascend. Above the stove, and in the end of the car, above the end window, a suitable ventilator could be placed, with slats which incline upward, so that the current of cold air as it enters would be directed upward and would mingle with the ascending current of hot air from the stove, and would then be distributed through the car.

This arrangement, it is believed, would heat the car very effectually, and with a reasonable degree of uniformity; it would give good ventilation, and it would be much less liable to set the car on fire in case of accident than the ordinary heaters are, and lastly it would be cheap and simple. It is not claimed that the plan has all the advantages which some of the other systems possess, but it is believed that cars could be heated very satisfactorily with such an apparatus.

Limit of Hearing.

This subject has recently been studied by M. E. Panchon, and his results have been communicated to the French Academy of Sciences. The notes were produced by a powerful siren of the kind invented by Cagniard-Latour, and actuated by steam. The highest audible notes produced in this way had 72,000 vibrations per minute. M. Panchon has also vibrated metal stems fixed at one end, and rubbed with cloth powdered with colophane. In diminishing the length of the stem the sharpness of the note is increased. Curiously enough he finds that the length of stem giving the limiting sound is independent of its diameter; and for steel, copper, and silver the lengths are in ratio to the respective velocities of sound in these metals—that is to say, as 1,000 for copper, 1,002 for steel, and 0·995 for silver. Colophane appears to be the best rubbing substance. When the acute sound ceases to be heard, the sensitive flame of a gas jet is still affected by it.

While upon the subject, we may mention that Mr. Francis Galton has recently invented a "hydrogen whistle," which enables him to obtain notes far above the upper limit of human hearing, his object being to test the hearing powers of insects, which, as is well known, have very acute ears. The number of vibrations produced by a gas in a whistle is universally proportional to the density of the gas, and as hydrogen is thirteen times lighter than air the sounds produced by it in a given whistle are thirteen times shriller—that is to say, the pitch is thirteen times higher. Mr. Galton has made a whistle 0·14 inch long and 0·04 inch in diameter, which with hydrogen gas gives a sound of 312,000 vibrations per second. The whistle is fitted with a piston at its base to regulate its length, and it is probable that still higher notes can be obtained with a shorter length.

Oil of Birch.

(BETULA LENTA, *Lin.*)

A thorough chemical investigation of the composition of the volatile oil of birch has never been made, although in 1844 Proctor first found it to contain salicylic acid, and from the similarity of the properties of this oil with those of oil of gaultheria he suggested the idea of an analogous chemical composition of the two oils.

Nothing more was written upon the subject until 1882, when Mr. G. W. Kennedy, of Pottsville, made some experiments with it, by which results were obtained indicating the presence of salicylic acid, and by which the identity of the oil with that of gaultheria was presumed.

In 1843, Proctor made a series of experiments with oil of gaultheria, and in the following year M. Cahours made a careful analysis of it, and found it to consist of salicylate of methyl, together with 10 per cent of a terpene.

The oil used in this analysis was obtained through the kindness of Mr. Kennedy, and, being distilled by a friend of his, an oil of absolute purity was thus guaranteed.

The oil of birch when freshly distilled is a bright and colorless liquid, of considerable refractive power; it possesses a very agreeable and fragrant odor, closely resembling that of gaultheria, although a difference can be perceived when the two oils are compared. With age, the oil acquires a reddish color, of which, however, it is deprived by distillation. It has a specific gravity of 1·180 at 15°C. (59° F.), and its boiling point is constant at 218°C. (424·4° F.).

A portion of the oil when shaken with a concentrated solution of sodium bisulphite afforded no crystalline compound, thus proving the absence of an aldehyde.

H. P. PETTIGREW.

The Cholera.

Dr. John Roche, an English physician who has had remarkable experiences, gives as his conclusion that cholera is purely and simply a specific fever, only inferior in its ravages to yellow fever, and closely allied to it. Cholera has a period of incubation varying from two to fourteen days: prone to attack the enervated and those subject to depression from any cause. It is contagious, and liable to occur periodically about every ten years in some parts of India. It seems to have visited the British Isles about every sixteen years, and as the period has elapsed since the last outbreak, it is more than likely to occur this year. Those persons who indulge in no enervating habits, and take nothing internally which would arrest the secretions nor too drastically stimulate them, and partake of nothing which is highly fermentable, may safely feel that they are cholera-proof during an epidemic.

Progress of the Telephone.

Professor Bell, the electrician, is reported as saying in a recent conversation that there are more than 500,000 telephones in use in the United States, and the manufacturers are unable to supply the demand so as to keep abreast of orders. He said that the progress of the telephone would have been greater but for the opposition of the telegraph companies, who regarded it as, in part, a competitor instead of an ally. In other countries the telegraph companies had very generally adopted the telephone as an auxiliary, especially at city branch offices and at small offices in the country. Professor Bell said that the science of electricity was still in its infancy. He was constantly engaged in further investigations. Incidentally he was preparing a catalogue of books, pamphlets, and even short articles on the subject, with a view to facilitate his own investigation and those of others. He had the titles of 40,000 such productions already.

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