What is Electricity?

In view of the number of theories advanced in answer to this question, the question might perhaps appear somewhat superfluous when so many satisfactory solutions—all more or less different—are at hand. In his concluding lecture at the Royal Institution, however, Professor Fleming answered it once more as follows:

What (said Professor Fleming) is this mysterious agent which we call electricity, and which seems so ready to adapt itself to our needs? It was the first question people asked; it was the last to be answered. Our knowledge of electricity was comparable to our knowledge of biology, or any other of the sciences. We could see the life processes at work, but were no nearer understanding what life was. We could see electricity at work, but failed to perceive what the thing itself was. However, science was beginning to recognize one thing as the result of its researches, and that was that electricity was probably a wave disturbance of the ether analogous to the wave disturbances which we called light. With light we had waves of the imponderable, ethereal medium which filled all space (equally that filling up space between the stars as that between the smallest atoms of matter) vibrating at the astounding speed of forty-five millions of millions per second, with an amplitude of oscillation as minute as the 37,030th of an inch. The researches of Faraday, Clerk-Maxwell, and Hertz had led to the demonstration by actual experiment that electricity was also a wave motion of the ether of great rapidity, but with waves yards in length instead of mere fractions, like those of light. It was in this direction that the great discoveries of the future would be made.

The Pratt Institute Plumbing Class.

The benefit of trade schools is well illustrated by the observation of a correspondent of the Sanitary Plumber: A few evenings since I called at the Pratt Institute, Brooklyn, and was very kindly shown through the plumbing class departments. The instructors, Messrs. George Heath and John Todd, are thoroughly conversant with both the theory and practice of plumbing and ventilation, and the classes under their charge are making unusually good progress this season. As I glanced down the line of boys, each with his complement of tools, pot, gas furnace, etc., working away under the bright light, I could hardly suppress a wish that I was a boy again simply for the privilege of learning the trade under such favorable conditions. Memories flitted through my mind of the times when, with a few odd wiping tools, a scrap of pipe and a broken-eared pot, I relegated myself to the basement or wood shed to practice wiping joints, so that no one would see my failures or smile at the antics I went through when I burned myself.

As the instructor stooped to direct and encourage one of the students whose solder was dripping from the bottom of the joint he was trying to make, I reflected upon the cold indifference of some journeymen I was obliged to work with when an apprentice. They seemed to take no notice of a boy until he succeeded in making a passable joint, and then, instead of taking the cloth and ladle and showing him how to improve or indicate where he had failed in that particular style of joint, they would invariably wipe another kind, in some difficult position, and while putting the finishing touches on, remark, "When you can do that, you will be a plumber."

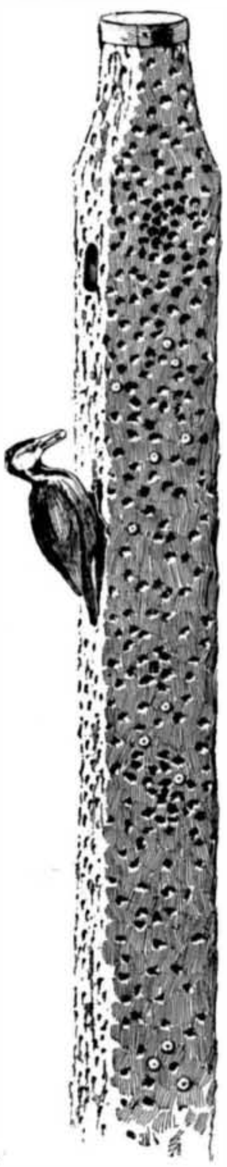
During one hour of the session of Wednesday evening of each week Mr. Todd lectures to the boys on the elementary principles of the trade. The entire class attends this lecture, but it is especially intended for the junior class, while on Friday evening the senior class alone listen to an explanation of the more complex questions, which their better knowledge of the business aids them in appreciating. Both lectures are illustrated by diagrams. After a student has become proficient in a certain branch of work he is allowed to finish an example of it and fasten it to the wall above his bench, as evidence of the progress he is making. This serves to stimulate the boys to greater effort, because none of them is satisfied to see their fellow students get ahead if it can be prevented.

A Collection of Brains.

Dr. Luys has offered to the Paris faculty of medicine, for the Dupuytren Museum, a collection of 220 brains, carefully prepared and catalogued by him during his long service at the Salpetriere and Charite Hospitals. In a letter to M. Brouardel, in which he calls his collection unparalleled in Europe, he describes in detail its scientific interest. "It presents," he says, "manifold samples of lesions of human brains, from the commonest ordinary hemiplegy, the aphasia, up to the most characteristic lesions of madness, and, as a foundation for the studies, hitherto so ill-based, of mental pathology, a series of types of persons suffering from hallucination or monomania, and of those who are chronically delirious with or without consciousness; and it presents also anatomical expressions in harmony with the symptoms observed. Types, of which there are four examples, relate to periodic madness. These are the first examples of the sort ever collected and offered to the examination of the medical public, and they show similar lesions which justly place them in a special nosologic category. Next come brains of general paralytics, with granulated lesions in certain regions and characteristic concomitant atrophy. I have collected also a number of brains relating to idiocy, some relating also to deafness and deaf-mutes. Others have been taken from persons blind of one eye, from the wholly blind, and from the amputated, and they all show special atrophic lesions. There are chosen specimens, to which I intend later on to add others (in particular the brain of a hypnotized subject, the only one at present in existence), and they allow us from the point of view of the morphology of human brains to gain a rapid and accurate idea of the rarity or the frequency of such anatomic dispositions, since it is thus possible to consult immediately from the point of view of verification the cerebral lobes which are present under the eyes." The collection is the result of twenty years' investigation, and Dr. Luys looks upon it as his scientific heritage, "a stone" in the edifice of neurologic studies, which are assuredly in our day a glory of French science.—Paris Correspondence London Times.

THE BORING WOODPECKER.

The drawing shows part of a cedar telegraph pole from near Phœnix, Oregon, which has been bored full of holes by woodpeckers for the purpose of storing away acorns for their winter's supply. The birds generally use large pine trees for this purpose, but they have discovered that occasionally a telegraph pole serves their purpose admirably, as the drawing shows. The woodpecker first digs a hole in the pole about large enough for an acorn to fit in, then he flies off and soon returns with an acorn which he jams into the hole. He hammers away at it with his bill until only the head of the acorn is visible. So tightly are these acorns driven in, that they are with the greatest difficulty extracted. In such numbers do they store them that the bark of a large pine forty or fifty feet high will present the appearance of being studded with brass nails. The birds also store acorns in the hollow stalks of dead plants, notably the century plant, the flowering stalk of which is often found completely filled with the acorns. Sometimes the oak trees are thirty miles away from the birds' place of storage, so that the storing and collecting of each acorn requires a flight of sixty miles.



TELEGRAPH POLE BORED BY THE WOODPECKER.

In times of famine all this good work shows to advantage, for not only birds but many kinds of beasts feed upon the acorns which the woodpeckers have so carefully hoarded. If it were not for the industry of the woodpeckers, they would have to die of starvation.

What People Will Eat a Century Hence.

According to Professor Berthelot, the distinguished French chemist, the time may be approaching when the farmer will go out of business, and bread and beef and milk, or their equivalents, will be produced artificially in the laboratory of the chemist. It is true that we have not yet got beyond the first steps in the process, but, according to Professor Berthelot, who is entitled to speak with authority, these first steps are a guarantee of extended triumphs in the same field.

The professor, as reported by Henry J. W. Dam, in McClure's Magazine, said that "new sources of mechanical energy would largely replace the present use of coal, and that a great proportion of our staple foods which we now obtain by natural growth would be manufactured direct, through the advance of synthetic chemistry, from their constituent elements, carbon, hydrogen, oxygen, and nitrogen." He continued: "I not only believe this, but I am unable to doubt it. The tendency of our present progress is along an easily discerned line, and can lead to only one end. I do not say that we shall give you artificial beefsteaks at once, nor do I say that we shall ever give you the beefsteak as we now obtain and cook it. We shall give you the same identical food, however, chemically, digestively, and nutritively speaking. Its form will differ, because it will probably be a tablet. But it will be a tablet of any color and shape that is desired, and will, I think, entirely satisfy the epicurean senses of the future; for you must remember that the beefsteak of to-day is not the most perfect of pictures either in color or composition. There is a distinction which I would like to make at this point between the laboratory stage and the commercial stage of any given discovery in food making. From the scientific point of view, the laboratory result is the important one. As you and all the world know, the commercial result follows inevitably in time. Once science has declared that a desired end is attainable, the genius of invention fastens upon the problem, and the commercial production of the result slowly attains perfection by gradually improved processes at less and less cost. Take aluminum for instance. Once a very expensive metal, its steadily decreased cost in production is bringing it within the reach of all. The use of sugar is universal. Sugars have recently been made in the laboratory. Commerce has now taken up the question, and I see that an invention has recently been patented by which sugar is to be made upon a commercial scale from two gases, at something like one cent per pound. As to whether or not the gentlemen who own the process can do what the inventor claims, it is neither my province nor my desire to express an opinion."

The professor here cited as an instance of laboratory products, the dye stuff alizarin, the coloring principle of madder, which was formerly a great agricultural industry, but which is now almost wholly supplanted by the artificial product from coal tar. The chemists, he said, have succeeded also in making indigo direct from its elements, and artificial indigo will soon be a commercial product. "Tea and coffee could now be made artificially, if the necessity should arise, or if the commercial opportunity, through the necessary supplementary mechanical inventions, had been reached. The essential principle of both tea and coffee is the same. The difference of name between thein and caffein has arisen from the sources from which they were obtained. They are chemically identical in constitution, and their essence has often been made synthetically. The penultimate stage in the synthesis is theo-bromine, the essential principle of cocoa. Thus, you see, synthetic chemistry is getting ready to furnish from its laboratories the three great non-alcoholic beverages in general use. And what is true of food substances is equally applicable to all other organic substances."

As regards tobacco the professor said: "The essential principle of tobacco is nicotine. We have obtained pure nicotine, whose chemical constitution is perfectly understood, by treating salomin, a natural glucosid, with hydrogen. Synthetic chemistry has not made nicotine directly as yet, but it has very nearly reached it, and the laboratory manufacture of nicotine may be expected at any moment. . . . The tobacco leaf is simply so much dried vegetable matter in which nicotine is naturally stored. . . . Perhaps the greatest importance, and certainly the profoundest charm, in the study of synthetic chemistry is the certain evidence which it offers of the discovery and manufacture of many compounds now entirely unknown, whose effect upon human health, human life, and human happiness no one can possibly conjecture."

As regards the future supply of heat, which is no less important than that of food supply, Professor Berthelot speaks confidently of improved appliances enabling man to make use of the illimitable supply of the earth's central heat. In conclusion, the professor says: "If one chooses to base dreams, prophetic fancies, upon the facts of the present, one may dream of alterations in the present conditions of human life so great as to be beyond our contemporary conception. One can foresee the disappearance of the beasts from our fields, because horses will no longer be used for traction or cattle for food. The countless acres now given over to growing grain and producing vines will be agricultural antiquities, which will have passed out of the memory of men. The equal distribution of natural food materials will have done away with protectionism, with custom houses, with national frontiers kept wet with human blood. Men will have grown too wise for war, and war's necessity will have ceased to be. The air will be filled with aerial motors flying by forces borrowed from chemistry. Distances will diminish, and the distinction between fertile and nonfertile regions, from the causes named, will largely have passed away. It may even transpire that deserts now uninhabited may be made to blossom, and be sought after as great seats of population in preference to the alluvial plains and rich valleys.

THE present 1,500 foot tunnel and turbine wheel pit of the Niagara Falls Power Company will, when it shall work at its full capacity of 100,000 horse power, divert 3·64 per cent of the total volume of water and reduce the depth of the crest along the entire falls to the extent of 1⅞ inches.

The Lion from a Medical Point of View.

The president of the Bristol Medico-chirurgical Society, A. J. Harrison, M.B., delivered before that society, on October 10, a very interesting address founded on his experience in the gardens of the Clifton Zoological Society, with which he has been connected for many years. It appears in full in the current number of the Bristol Medico-chirurgical Journal. The experiences and observations mentioned in the address are not arranged in any formal anatomical, physiological, or pathological order, as the author states, but, fragmentary and disjointed as they are, they are exceedingly interesting. The first case mentioned is that of a lion, considered to be the finest lion in Europe at the time, and one that had always seemed in excellent health until a few months before his death. One morning he was found dead in his cage, and at the post mortem examination it was ascertained that an enormous hemorrhage had taken place into the abdominal cavity, proceeding from the spleen, which organ, it was inferred, had been ruptured by the exertion of coitus. The splenic enlargement, says Dr. Harrison, seemed to have been caused by hyperæmia and increase in the lymphatic and vascular elements, but as to the ætiology, he can only speculate. "Are lions," he asks, "subject to malarious attacks? and had Hannibal been a victim in the days of his youth, in his native wilds—for he was forest bred—before the civilization of captivity had fallen upon him? He had been ill a couple of months or so before his death, when his breathing was affected. Did he have pneumonia then, with carnification of the base of the right lung—or perhaps more probably a hæmorrhage from an embolism—or are lions subject to splenic fever?

Another lion, a fine creature, had become lame by reason of an ingrowing claw. The trouble went on from bad to worse, until something had to be done, and it was decided to extract the claw. The use of chloroform, says Dr. Harrison, was out of the question, for attempts to give these animals anæsthetics have been worse than failures; so it was decided to resort to the "cramp cage." With some difficulty the animal was got into this cage. "He didn't like his quarters," the account goes on to say, "and showed that even within the comparatively small dimensions he could turn round and so evade any efforts to get hold of his claw. Planks of deal, one foot broad by one and a half inches thick, were then put into the cage to limit the space. The animal was fairly furious before; but now came such a display of rage that no one who did not see it could imagine it. He fought for dear life, as he thought. Plank after plank was seized and ripped up like so much match wood, and it seemed as if the iron bars and plates, strong as they were, would not contain the infuriated beast. His mouth bled, and he broke a tooth. Several of the keepers stood on the top of the cage to prevent it from being overturned, and some of the spectators took refuge by quietly withdrawing from the scene. At length, by putting in plank after plank, above and behind, the poor brute was brought to bay, and, to save himself from his very constrained position, pushed out his paws through the bars of the cage. 'Now's your time,' I said. Blunsden immediately seized the offending claw with a pair of strong carpenter's pincers; the grip was good. The animal helped in the operation by trying his best to get his paw free, and the claw came away. It had grown into the flesh at least half an inch, most likely more; and here I can show you the very thing. In half an hour afterward the creature had quite calmed down; he seemed then to have comprehended the rationale of the operation, and he gave me the conviction that if he had had to undergo a repetition, he would have been a mild consenting party. The operation was permanently successful."

The case of another lion is mentioned, one only four months and a half old, that was found dead in its cage. It had been ailing for three or four days; its breathing was very quick and it took no food, but simply lapped a little water. At the post mortem examination the pericardium was found distended with a semi-purulent fluid, of the consistence of gruel, tinged somewhat with blood. Notwithstanding the tradition that in old times, when lions used to be kept in the Tower of London, the lion named Pompey is said to have lived there for seventy years, Dr. Harrison says he cannot believe the story. He looks upon the lion, at least in captivity, as comparatively a short-lived animal, and gives various facts on which he founds this opinion. So decided is he that in the case of a lion that died at the age of sixteen years his conclusion was that the beast's death had been owing to senile decay. The death of a lioness, described as "rather rickety," is recorded as having taken place during parturition, from rupture of the right cornu of the uterus. The animal had been in labor for five days, and one cub had been born and the other was partly extruded into the vagina.

Dr. Harrison's address deals with pathological and physiological observations on various other animals, but the space at our disposal has allowed only of our referring to those of them that relate to lions.—N. Y. Med. Jour.

THE MYSTERIOUS CLEPSYDRA.

The destiny of old clockwork movements, when they are curious, is to figure in museums. Their rusty springs, broken-toothed wheels and out-of-center axes permit them to be no longer anything but the witnesses of a vanished art. This is an irresistible law. So it cannot be denied that a piece running in spite of this law three hundred and fifty years after its construction, without having undergone the least repair, is a remarkable object. Such is the case with a clock that is in operation at Mr. Pottin's, at Ivry-Port, and the age of which has been estimated by Mr. Morie Davy, the lamented superintendent of the Montsouris Observatory. Let us say at once that if it has escaped the sad fate of aged mechanisms, it is because it has no mechanism, since it is, in fact, a sort of clepsydra (Fig. 1).

Externally, we see merely a cylinder about six inches

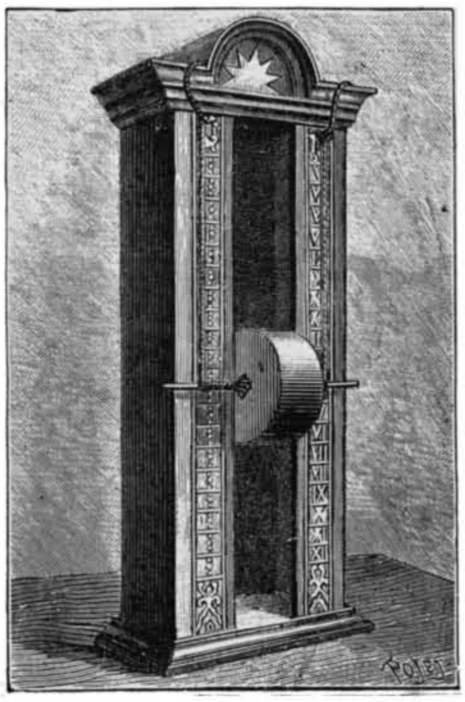


Fig. 1.—THE MYSTERIOUS CLEPSYDRA.

in diameter, suspended by two strings winding round the extremities of a small rod that passes through its axis. If, after having finished the winding of the strings by revolving the cylinder upward, we leave the apparatus to itself, the cylinder, after oscillating for a couple of seconds to find its perpendicular, will begin slowly to descend, and take eighteen hours to travel, with precision, the entire length of the scales to the right and left, whose divisions are of copper set into the walnut of the case. This curious result is obtained as follows: The cylinder (see diagram, Fig. 2) is di-

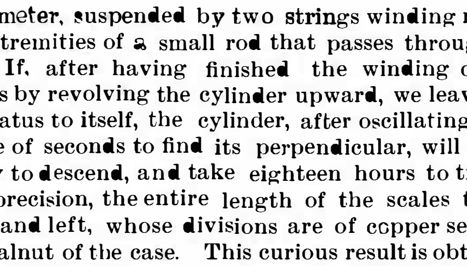


Fig. 2.—EXPLANATORY DIAGRAM.

vided into eight compartments, which are exactly equal and symmetrical with respect to the axis, O. These compartments, G, G_1, etc., communicate with each other through three small apertures, I, I_1, etc. Central channels, R, put them in connection also in pairs. Thus G_7 communicates with G_3, G with G_4, G_1 with G_5, and G_2 with G_6. The cylinder is filled with liquid up to the level, M N. Let us suppose it suspended by the string, F, wound around O, to the right of the vertical, which passes through the center of gravity of the system, C D; evidently, gravity will cause the apparatus to revolve in the direction shown by the arrow, V. But in this motion there is produced a change of level of the liquid to the left and right of C D, in the system of communicating vessels formed by the compartments, G, and the small apertures, I. The liquid rises to the right and descends to the left until the center of gravity passes through the vertical including F. The descent of the cylinder then ceases, and is again resumed in measure as the two levels tend to become equal by the slow communication through the orifices, I. As such equalization can take place only so long as the cylinder is suspended, the slow motion of descent continues indefinitely. It takes place in a perfectly regular way, because all the parts of the cylinder are symmetrical with respect to the central axis. An examination of Fig. 2 will readily show that it is possible for the compartments to communicate during the descent only through the small apertures, I. It will be seen also that the winding up of the apparatus is exceedingly simple. It suffices to revolve the cylinder in the direction shown by the arrow, V'. The string winds around the central axis, and, in measure as the apparatus ascends, the compartments become emptied, through the central channels, R, into their mates, whence it results that, no matter what the height be, the system left to itself will find its perfect equilibrium at the end of two or three oscillations.

Mr. Morie Davy attributes the construction of this clepsydra to an artist of the time of Henry II. It is probable that workmen of less skill have attempted imitations of it, since in the region of Brie, where Mr. Pottin obtained it, at least twenty more have been found, but all incapable of operating. At the Exposition of Retrospective Arts, in 1889, there was to be seen a copper cylinder having much analogy with the one just described and bearing the inscription: Clepsydra of the Time of Charlemagne." Were not a few centuries too many given to this product of ancient art? We cannot say. We have simply desired to make known a very simple and very accurate instrument which certainly very few clockmakers even know of. From this standpoint it merits particular mention.—La Nature.

The Invention of the Bicycle.

A monument has been recently erected at Bar-le Duc to the two Michaux, father and son, who are credited with the invention of the modern bicycle. The Petit Lyonnais tells the story of the invention as follows:

"The Michaux had a small locksmith shop in Paris. One day a bizarre machine was given to them to repair—a small saddle resting upon a snake-like frame and holding together two light wheels. The machine was put in motion by the 'rider' striking the ground with the tips of his toes. The queer thing was painted yellow, and called a draisine, from its inventor, the German forester, K. V. Drais. A 'ride' on this was very tiring, impossible uphill, and, above all, very ungraceful. But the young bloods in the time of the Second Empire managed very well with it, and got lots of fun out of the machine. Young Ernest Michaux conceived the idea of adding pedals to the front wheel, and became thus the inventor of the modern velocipede. His idea found little favor at first; more attention was given to the tricycle. As early as 1863 a Paris hatter named Brunnel visited his customers on a tricycle.

"The International Exhibition of 1867, however, gave an impulse to bicycle riding by drawing the attention of the public to several new improvements added by the Michaux. The Prince Imperial learned to ride, and the aristocracy, with the Prince of Sagan at their head, followed his example. The latter had two high-wheeled machines built to order. One was of aluminum bronze, with wheels of rosewood; the other was built entirely of steel, beautifully engraved with hunting scenes. The bicycle school of the Michaux was now always full. They could no longer fill all orders, and formed a company for the manufacture of their machines. They also built a velodrome, with an asphalted track, on which also a kind of hurdle race could be run. Here was a ditch, which had to be crossed on a narrow plank, and a kind of Irish bank. Lawsuits among the partners broke up the concern, the war of 1870 came, and people had other things to speak about. In the meantime the English and Americans improved the invention, and it was reintroduced into France from across the sea."—Public Opinion.

A Novel Logging Device.

There is a wood pile in Lead City, S. D., widely known throughout the Black Hills mining region. It belongs to the Homestake Gold Mining Company, and is composed of timbers about the size of railroad ties, which are used in supporting the walls and roofs of the drifts and tunnels of the mines. A narrow gauge railroad brings the logs, which have been sawed flat on two sides, to a point on the mountain slope about 600 feet above the valley, and they are then thrown into a wooden chute about 4 feet wide and 2 feet deep. The inside surface is kept smooth and slippery by a small stream of water. If the logs were allowed to run directly to the ground, they would speedily excavate an enormous hole besides damaging themselves, so the lower end of the chute is curved upward, and the logs leave it at an angle of about 60 degrees with the horizontal and rise from 150 to 200 feet in the air, turning over and over, and finally landing on the enormous pile already there. A useful fact in connection with this method is that the logs sort themselves in the pile according to their size: the heavier ones, having a greater momentum, are all found at the side farthest away from the chute.