

accumulators of suitable capacity and tension. For the net of conductors, in consequence of the extended line of streets to be traversed, the five-lead system has been selected. The leads are not cables, as has hitherto been customary, but uncovered rods of copper, resting on insulators of porcelain, and laid in channels of cement. These channels will be mostly carried underneath the flags of the footway. The distribution of the current takes place so that each of the four successive current circuits formed by the five-lead system shows a working tension of 110 volts. The execution of the entire electrical installation, original and in many respects interesting, is intrusted to the firm Naglo Brothers of Berlin, who will use for storing up electric energy "Tudor" accumulators made by the firm Müller & Einbeck of Hagen. The above-mentioned Siemens "five-lead system" has not yet been practically applied in any electrical installation; but the firm Siemens & Halske is executing two extensive installations on this system, — one at Vienna, and the other at Trient. These two installations will be shortly in operation, and as many doubts have been raised concerning the practicability of this system, which is a further development of the three-lead system, and is hence regarded as too complicated, the inauguration of the Siemens installations is awaited in technical circles with no little interest.

**LENS IMAGES MADE VISIBLE BY ELECTRIC CURRENT.** — In the *Photographisches Archiv*, Herr R. E. Liesegang, son of Dr. Liesegang of Dusseldorf, describes an apparatus with which it is possible to render lens images visible at an indefinite distance from the original object by means of the electric current. The instrument is based on the well-known principle that an electric current is produced by light-waves. If light strikes upon one or two platinum, silver, or copper plates, which are arranged in the form of a galvanic element, this gives rise to an electric current. If the exposed plate consists of a large number of insulated metal wires of small diameter, lying very closely together, and if some of these wires are exposed, others not, then, of course, the electric current is produced only in these exposed wires. If the wires are conducted to another analogously constructed plate, which may be placed at any distance from the first one, then the electric current will also here be produced only at the parts correspondent with the exposed wires of the first plate. By coating the second plate with any substance which by galvanic decomposition undergoes a visible change, exposed parts of the second plate can be easily distinguished from the unexposed ones. If, therefore, an image is projected by means of a lens upon the first plate, the same image will be obtained on the second plate.

**AN ELECTRIC RADIATION METER.** — At the meeting of the London Physical Society, Nov. 1, Mr. W. G. Gregory read a paper on "A New Electric Radiation Meter." He stated that the meter consists of a long fine platinum wire attached to a delicate magnifying spring of the Ayrton and Perry type, and stretched within a compound tube of brass and glass. At the junction between the wire and spring a small mirror is fixed. When the tube is placed parallel to a Hertz's oscillator in action, the mirror is turned in a direction indicating an extension of the wire. The arrangement is so sensitive that an elongation of  $\frac{1}{100000}$  of a millimetre can be detected; and, when placed at the distance of a metre from the oscillator, the apparent extension is such as would correspond to a change of temperature of  $0.003^{\circ}$  C. By its aid the author has roughly verified Hertz's statements, that at considerable distances the intensity of radiation varies as the inverse distance; but, before he can proceed further, it is necessary to greatly increase the sensibility of the apparatus, and, with a view of obtaining some suggestions in this direction, he exhibited it before the society. Professor Perry asked if the electro-motive force required to produce the observed results had been calculated; he also believed that the sensibility might be increased by using copper instead of platinum, and replacing the spring by a twisted strip. Mr. Blakesley inquired whether the effect of increasing the capacity of the ends of the wire had been tried. Mr. Boys said, that, if the observed effect was due to rise of temperature, he would like to see it measured thermally. He also thought the effect might be due to extension caused by rapid electric oscillations in some such way as the elongation of an iron bar caused by magnetization. In answer to this, Professor S.

P. Thompson said the matter had been investigated experimentally, but with negative results. Professor Herschel suggested the use of a compound spring such as is used in Breguet's metallic thermometers. In reply Mr. Gregory said that he had estimated the electro-motive force by observing that a Leclanché cell through 50 ohms produced about the same result. No improvement in sensitiveness was obtained by using copper wire or by increasing its capacity, and attempts to measure the rise of temperature by an air thermometer had been given up as hopeless.

**DRIVING TUNING-FORKS ELECTRICALLY.** — Mr. W. G. Gregory, at the meeting above mentioned, also read a paper on "A Method of Driving Tuning-Forks Electrically." In order to give the impulses about the middle of the stroke, the fork is arranged to make and break the primary circuit of a small transformer, the secondary circuit of which is completed through the electro-magnet actuating the fork. The prongs of the fork are magnetized and receive two impulses in each period. Another device was suggested, where the prongs respectively operate contacts which successively charge and discharge a condenser through the coils of the actuating magnet. Professor S. P. Thompson said the methods, if perfect, would be of great service, and suggested that a fork so driven be tested optically by comparison with a freely vibrating one. He regarded the mercury contacts used as objectionable, for their capillarity and adhesion would probably cause the impulses to lag behind the appointed epochs. Professor M'Leod remarked that Lissajou's figures gave a satisfactory method of testing the constancy of period, and could be readily observed without using lenses, and in reference to liquid condensers, suggested by the author for his second device, said that platinum plates in sulphuric acid were found to disintegrate when used for this purpose. He thought lead plates would prove suitable. Professor Jones, who read a paper on a similar subject in March last, said he now used bowed forks, with which to synchronize the speed of the disk there described; and the frequency is determined by causing the disk to complete the circuit of his Morse receiver once each revolution.

**ON ELECTRIFICATIONS DUE TO CONTACT OF GASES AND LIQUIDS.** — A paper on this subject was read by Mr. J. Enright before the Physical Society above alluded to. For some time past the author has been studying the electrical phenomena attending solution by connecting an insulated vessel in which the solution takes place with an electrometer. As a general rule, no effect is observed if nothing leaves the vessel, but, when gases are produced and allowed to escape, the vessel becomes charged with positive or negative electricity, depending on the nature of the liquid from which the gas passes into the air. As an example, when zinc is placed in hydrochloric acid, the deflection of the electrometer is in one direction, while the liquid is chiefly acid, but decreases and reverses as more and more zinc chloride is produced. From such observations the author hopes to obtain some information relating to atomic charges. Owing to the lateness of the hour, the latter portion of the paper and the discussion on it were postponed until the next meeting. For the above reports of the papers read at the meeting of the London Physical Society, we are indebted to *Engineering*.

#### NOTES AND NEWS.

A MR. M. W. DEWEY of Syracuse, N.Y., has patented an electric refrigerator, based on the well-known fact that a current of electricity passed in the proper direction across the junction of two dissimilar metals cools the joint. While Mr. Dewey's apparatus is all right as far as the principle is concerned, we would rather not express any opinion on its practical value just yet.

— Beginning with January 1 next, the Rev. T. De Witt Talmage, D.D., will become one of the editors of *The Ladies' Home Journal* of Philadelphia. The famous preacher will have a regular department each month, written by himself, with the title "Under My Study Lamp." His first contribution will appear in the January number of the journal. Dr. Talmage's salary is said to be one of the largest ever paid for editorial work.

— The regulation of the Danube, a work of much importance to the people of south-eastern Europe, has at length been commenced. The first blasts were fired at the Iron Gate early in September, in the presence of the Hungarian minister of public works.

— M. Herman Fol reports to the Académie des Sciences the result of the researches that he has been making in the depths of the Mediterranean during the summer months, his object having been to certify how far daylight penetrates. His operations have been carried on in water of remarkable clearness between Corsica and the shores of the Alpes-Maritimes, at a distance of eighteen geographical miles from the nearest land. M. Fol used gelatino-bromide plates exposed during ten minutes, whereby he has found the limit of daylight in those waters to be at a depth of 1,518 feet (465 metres). This is 327 feet short of the limit assigned to daylight in the Mediterranean by the Germans, Chun and Petersen, some years ago.

— The official list of awards at the Paris Exposition states that there have been given one grand prize to the Johns Hopkins University; one grand prize and one gold medal to Professor Rowland for his photographic map of the solar spectrum, published by the university; one gold medal and one silver medal to the Publication Agency of the university. The exhibit of the university at Paris consisted of sets of the several journals; etc., issued there. A silver medal was also awarded for the map of the solar spectrum at the photographic exhibition in Berlin this summer.

— At the International Congress of Chemists in Paris this summer, it was decided to appoint a commission to consider the subject of chemical nomenclature. The commission consists of Messrs. Berthelot, Friedel, Gautier, Schützenberger, Grimaux, Jungfleisch, Fauconnier, Combes, Béhal, Bouveault (France); Graebe (Switzerland); Alexeieff, Beilstein (Russia); Baeyer, Noeltting (Germany); Lieben (Austria-Hungary); Franchimont (Holland); Paterno (Italy); Armstrong (England); Istrate (Roumania); Ira Remsen (United States); Calderon (Spain); Bonkowski Bey (Turkey); Cleve (Sweden); Mourgues (Chili).]

— In the new quarterly statement issued on behalf of the Palestine Exploration Fund, it is stated that Dr. Torrance, of the Scottish Mission has undertaken to conduct a series of meteorological observations at Tiberias for the fund. Should Dr. Torrance be able to carry out this undertaking, the observations will, with those made at Sarona (now being published by Mr. Glaisher) and those made by Dr. Chaplin at Jerusalem (and reported in the quarterly statement for 1883), as *Nature* points out, place the society after a few years in the possession of materials for a fairly complete account of the meteorology of Palestine. Tiberias is 682 feet below the level of the Mediterranean; and the society hopes that, as no regular series of meteorological observations has ever been made in such a depressed situation, the results may be exceptionally interesting. As the neighborhood of Jericho is becoming to some extent a place of residence for Europeans, the society trusts that opportunity may before long present itself for meteorological observations there also.

— The Archæological Society of Northern Wisconsin is an organization formed for scientific purposes. Its chief object is to collect, arrange, and disseminate facts and material (abundantly scattered over northern Wisconsin) relating to the peoples and tribes who have successively occupied the territory in past times. Every year new facts are disclosed; implements of iron, copper, stone, and clay are unearthed from mounds and graves that go into private hands, and are lost for any public or practical good to which they ought to be diverted. The great mineralogical resources of this region, and its geological features, afford a vast field for investigation. The co-operation of all persons interested in these and kindred subjects is solicited by the society; and contributions of articles, sent to the president, Rev. George Gibson (Neenah, Wis.), the secretary, Frank Tilton (Green Bay), or to Mr. F. H. Thurston (Oconto), will be duly acknowledged.

— The *Colonies and India* states that a discovery has recently been made on a Fiji plantation which will probably prove extremely valuable in all tropical countries where the cultivation of bananas is

regarded as a settled industry. The banana-disease had for some time been causing much havoc on a plantation on Vanua Levu, and it appears that the discovery of an antidote was due to an accidental occurrence. On a flat near the seashore there was a patch of bananas much diseased, and some time ago the sea swept into it, and remained on it for about an hour. All the plants were killed as far as the standing stems were concerned; but vigorous young shoots came up freely from the roots, and were not only quite free from disease, but soon began to bear much larger bunches of fruit than the parent plants ever did. Upon noting this effect, the planters determined to try the experiment upon a number of badly diseased plants which the sea had not reached. They cut down the diseased plants, and, having stirred the ground about them, poured from one to four buckets of sea-water over each. The result was, that, while the parent stems withered, vigorous young shoots came freely away, without a sign of disease.

— Mr. George F. Kunz, in charge of the Tiffany exhibit at the Paris Exposition, has received from the ministre de l'instruction publique des beaux arts, for his work in connection with the subject of precious stones, the decoration known as l'officier d'Académie, with the right to the purple ribbon known as the "Palm of the Academy." He sailed for New York, Nov. 16.

— The French have long been seeking an expeditious means of communication with the southern provinces of China. *The Chamber of Commerce Journal* of Aug. 5, 1889, reports a discovery which promises to gratify their wishes to some extent. The Marquis de Mores has studied the basin of the Canton River, and in the course of his inquiries he heard that caravans from Yunnan, Sze-Chuen, and other provinces, were in the habit of meeting at Posé, on the Son-ki-kong, a tributary of the Canton River, and a very short distance from the Tong-king frontier. On reaching the Son-ki-kong, accompanied by MM. Thorel and Van Driesche, the Marquis de Mores found that it was a navigable river more than two hundred and seventy yards wide. This river might be placed in direct communication with French territory by a railway about one hundred and twenty-five miles in length. At present the trade of the western provinces of China passes through Canton, and is attended with great difficulty and enormous expense; and the time of transport is sixty to eighty days. It is estimated that this new route would save sixty days on an average, so that Tong-king would have every prospect of becoming the outlet for the trade of the whole of western China. The Red River, which has hitherto been looked upon as the only route into China, has a rapid fall, and ends in a muddy delta which affords no good anchorage. However, according to *Petermann's Mittheilungen* (vol. xxxv. No. 9), a steamer has ascended the river to Laokai on the frontier of Yunnan. The Marquis de Mores found colza, maize, buckwheat, and chestnuts near the river Son-ki-kong. Tobacco, silk, and indigo also are cultivated in small quantities, and their cultivation would probably be much extended if the country were rendered secure from robbers. The exploring party returned to Langson, and thence to Tien-Yen on the coast, a distance of ninety-three miles. The last part of their journey (thirty-seven miles) was performed on the river Son-Tien-Yen, — the only river in Tong-king which yields pure drinking-water, and does not form a muddy estuary. The favorable geographical position of Upper Burmah in regard to Yunnan, however, has not escaped the attention of the British Government; and in this connection it is interesting to note, as pointed out by the *Deutsche Rundschau* (September, 1889), that "by the opening of the Tungu-Mandalay line, the latter town has been brought into railway communication with the port of Rangoon, which has now acquired considerable importance. The railway is to be continued to Bhamo, so that Yunnan and the adjacent provinces of the Chinese Empire will thus be connected with the sea by a much more convenient means of transport than at present exists on their eastern side. Rangoon, and indeed Burmah altogether, will derive much benefit from this line."

— Professor T. H. Lewis, the well-known archæologist of St. Paul, recently obtained a relic of antiquity from Mr. Andrew Wiest of Blakeley, Minn. The relic in question is a small clay cup five inches in diameter and three and one-half inches in depth. The top, or mouth, is four inches in diameter, with a notched rim. The

sides and bottom are ornamented with fine incised lines, and the material of which it is composed is pulverized granite mixed with clay. There is a clay-bed near the village of Blakeley, from which clay is taken for the manufacture of brick. The top of the terrace in which it is situated is about ninety feet above the Minnesota River. At the top there are thirty feet of fine sand, with only a slight covering of loam. Beneath the sand there is a stratum of bowlders, gravel, etc., which is from two to five feet in thickness, below which the clay is found. It was above the bowlders and at the bottom of the sand-bed that the cup, together with some fragments of pottery composed of shell and clay, was found. The distance from the relics to the slope of the terrace in a horizontal line was over one hundred feet, so that their location cannot be attributed to a land-slide, for the strata were unbroken.

— Among recent appointments in the Johns Hopkins University, we note those of Dr. Henry M. Hurd (superintendent of the Johns Hopkins Hospital), professor of psychiatry; Dr. William S. Halsted (surgeon to the Johns Hopkins Hospital), associate professor of surgery; Dr. Howard A. Kelly (gynecologist to the Johns Hopkins Hospital), associate professor of gynecology and obstetrics; Ethan A. Andrews (Ph.D. 1887, late instructor), associate in biology; Dr. Alexander C. Abbott (graduate student 1885-87), assistant in bacteriology and hygiene; William S. Aldrich (U.S.N.), instructor in drawing; Charles A. Borst (fellow 1888-89), assistant in astronomy; Charles H. Chapman (A.B. 1888, fellow 1888-89), instructor in mathematics; George W. Edmond (A.B. 1884), assistant in chemistry; Arthur C. Wightman (Ph.D. 1889), senior demonstrator of physiology; Arthur G. Blachstein (A.B. Cornell 1882, M.D. Leipzig 1887), fellow in pathology.

— The following is a complete list of the papers presented to the National Academy of Sciences during its meetings, Nov. 12-14: "On the Results of the Systematic Study of the Action of Definitely Related Chemical Compounds upon Animals," by W. Gibbs and H. A. Hare; "On the New Prototypes of the Kilogram and the Metre," by B. A. Gould; "Remarks upon the Present State of our Knowledge in Reference to a Revision of the Genera of Brachiopoda for the Paleontology of New York" (Vol. VIII.), by James Hall; "On Zinc Storage-Batteries," by George F. Barker; "On Saturn and its Ring," by A. Hall; "On the Economy of Energy in the Glow-Worm," by S. P. Langley; "On Photometry of Colored Light," by O. N. Rood; "On Certain Pyrophosphates," by W. Gibbs; "On the Vertebrata of the Miocene of the Cypress Hills of Canada," by E. D. Cope; "On the Early Stages of Echinoderms," by W. K. Brooks; "On Relative Wave-Lengths," by A. A. Michelson; "On the Spectrum of Zeta Ursæ Majoris," by E. C. Pickering; "On the Persistence and Meaning of the Bi-concave Centrum of the Vertebræ of Vertebrates," by J. A. Ryder; "On a Peculiar Ordinal Modification as exemplified by Fishes of the Family Halisauridae," by Theodore Gill; "On the Heredity of Acquired Characters," by W. H. Brewer; "On the 'Positive-Negative' Hypothesis in its Application to Organic Chemistry," by Arthur Michael; "On the Results of the Transits of Venus observed in 1761 and 1769" and "On the Theory of Cosmical Temperature," by S. Newcomb; "The Desert Ranges," by J. W. Powell; "On Hypnotic Cases without Suggestion," by H. C. Wood; "On the Laramie Group," by J. S. Newberry; and "On the Skull of the Gigantic Ceratopsidae" and "American Mesozoic Mammals," by O. C. Marsh.

— Sponges are found both on the northern and the southern coast of Cuba, but the chief ports to which they are brought for sale are Batabano on the south coast, and Caibarien on the north. British Consul Little of Havana says, according to the *Journal of the Society of Arts*, that the classes included are sheep wool, velvet, hard-head, yellow, grass, and glova. Very little reef, if any, is found in Cuba. On the south coast sheep wool and velvet are more abundant than on the north coast. Cuban sponges find a market chiefly in England, France, and the United States. The island itself consumes about one-tenth of all the sponges brought in, and these are used especially for the damping of tobacco, and for cleaning centrifugal machines on sugar estates. The sponge fisheries employ about a thousand hands, chosen exclusively from among the *matriculados*, or seamen who have served on Spanish men-of-war,

and are still bound to serve when called upon. On the south coast are employed vessels ranging from about five to twenty tons, carrying from four to eight men, and each vessel is provided with from three to six small boats. On the north coast open boats with one or two men each are used. The annual value of the sponges brought in by these vessels is between \$800,000 and \$900,000.

— It is interesting to read of a part of the world where the buffalo is not dying out, but increasing in numbers. A journal of Perth, in western Australia, says that few Australians are aware that certain parts of northern Australia have vast herds of the wild buffalo (*Bos bubalus*) careering over its plains, and wallowing in its shady pools. *Nature* states that the animals are massive and heavy, with splendid horns, and afford sport of a sufficiently dangerous nature to possess charms for the most daring hunter, a wounded buffalo being one of the most dangerous animals known, his great weight, prominent horns, and splendid courage making him as well respected as sought after. The first buffaloes were landed at Port Essington, North Australia, about the year 1829.

— Hitherto Japanese subjects have not been permitted to charter foreign vessels to sail from any but the five treaty ports. An imperial decree has, according to *The London Times*, now been issued, allowing Japanese subjects to despatch foreign vessels to any one of nine other ports, and there to load them with rice, wheat, barley, flour, coal, or sulphur. These vessels may not be used in the coast trade, and permits must be obtained from the Finance Ministry. The new ports are Yokaitchi, in the province of Ise; Shimonoseki, in Nagato; Hakata, in Tshikuzen; Moji, in Buzen; Kuchinotsu and Karatsu, in Hisen; Misumi, in Higo; Fushigi, in Etchui; and Otaru, in Yezo. Of course, all the ports of the empire will be opened unrestrictedly when the treaties with foreign powers permitting free trade, etc., come into operation.

— The course of lectures at Sibley College by non-resident lecturers in mechanical engineering begins late this year in consequence of the absence of Professor Thurston in Europe until the close of the summer vacation, at the time when it has been customary to arrange the programme, and also in consequence still more of the fact that the lecturers who were expected to open and to appear in the early part of the course have all, for one reason or another, been compelled to ask that their dates be deferred. The course opens on Nov. 22 with a lecture by Professor W. LeConte Stevens on "The History of Aeronautics." This will probably be the introduction to several discussions of this subject, to be given later in the season. The later lectures will probably include one by Professor S. P. Langley, secretary of the Smithsonian Institution, on the results of researches about concluded by him at the Allegheny Observatory, on the laws of aerial flotation and of flight in the atmosphere; and by Mr. O. Chanute, who has been investigating this subject from a theoretical point of view, and who has developed the mathematical side of the theory to a practically applicable degree. Mr. C. E. Emery, the great authority on the subject in this country, will discuss methods of laying-out a steam-boiler plant. Mr. Benjamin F. Isherwood, the engineer-in-chief of the United States Navy during the war, is expected at Cornell in December, when he will give an account of some of those researches which have become famous in the history of the heat-motors. Mr. Alexander Graham Bell will again discuss the curious phenomena discovered by him, which have been given practical interest by his ingenious methods of telephony and telegraphy along a beam of light. At some time during the winter, also, various phases of the engineer's problem of power-development will be discussed by Mr. J. M. Allen, and by Mr. George H. Babcock, the well-known inventor, and ex-president of the American Society of Mechanical Engineers. It is hoped that Mr. Leavit, the great designer of pumping-engines, the consulting engineer of the Calumet & Hecla Mining Company and of numerous other companies, the ex-president also of the Mechanical Engineers, may describe some of his interesting constructions. Mr. Holoway, another past-president of the same society, will talk later of some branch of his work. Professor Anthony, Mr. Weston the electrician, Dr. Dudley the consulting man of science of the Pennsylvania Railway, and Major Michaelis of the Army, are likely to follow later in the season.