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SCIENTIFIC AMERICAN SUPPLEMENT

No. 665.

For the Week Ending September 29, 1888.

Price 10 cents. For sale by all newsdealers.

ELECTRIC LIGHTING INFORMATION.

The National Electric Light Association are establishing a permanent headquarters in New York City; a practical electrician having already been appointed at a handsome salary to give his entire attention to the laudable project it is designed to carry out. Only these who have had to do with electricity and its applications can be fully aware how hard it is to keep up with the times in other departments save your own, and indeed even in that one must needs do a deal of reading and not a little travel. At the last convention one of the best known electrical engineers in the country innocently claimed as his own invention a contrivance that, in some parts, has been in use for nearly three years; there had been so much to read, so many new things to study and ponder over in applied electrics, he had not yet "got round" to what was really an anticipation of his own mechanism. It is now but a few weeks since the electric light men met and discussed some few of the most important matters, and yet he would be a bold man who should to-day attempt to describe the best known means of construction and of operation, of stopping leaks, of locating interferences amid counter-interferences, and the like.

Indeed, so much has been done in each particular department of electrical projection, that it is not possible in the three days sitting of a convention—no! nor in 30 days, or a whole year—to go over all the more or less valuable experiments that have been made and recorded; for, fortunately enough, all the big companies have careful records made of what is done in the way of experimentation in their machine shops and laboratories. Experiments innumerable have been made which, though proving of no value to those making them, are valuable to science and invaluable, perhaps, to those operating in other directions. Nor is there any let-up. Experience, experiment, and discovery are increasing rather than diminishing as time goes on, and it is becoming more and more difficult to keep informed of all that is being or has been done, and, consequently, men undertake great tasks in laboratory and workshop only to learn what was long since known, but hidden away among the musty records of a great workshop.

The permanent headquarters now being established by the National Electric Lighting Association will contain copies of all the records that can be borrowed for the purpose. Information will be asked for in every department, with description of experiments, whatever was their result, and an attempt will be made to index all these, so that whatever is wanted may be readily found. Let us say a subscriber wants to know what has been done in the way of looking for enduring filaments for incandescence lamps, or what experiments have been made with certain kinds of insulating material. He has only to send to or call at the headquarters, and every facility will be given him for finding what he wants to know.

Again, experimental results that are not any use to a man furnishing light might be of great service to one selling power, and *vice versa*. Did you ever make a laboratory experiment with a distinct purpose, and discover that though you had not progressed your own work, you had gained some apparently important information in another direction? One of the duties of the new establishment will be to make known such "finds" to those likely to be benefited—a general exchange being valuable all around—and in many other ways to lighten the labors and inform the minds of working electricians.

POSITION OF THE PLANETS IN OCTOBER.

VENUS

is evening star. She is plainly visible in the southwest soon after sunset, setting on the 1st about an hour after the sun, and on the 31st a little more than a hour and a quarter. She must be looked for about 8° south of the sunset point. She is in conjunction with Beta Scorpii on the 26th, being nearly 2° south of the star. Venus sets on the 1st at 6 h. 26 m. P. M. On the 31st she sets at 6 h. 11 m. P. M. Her diameter on the 1st is 11", and she is in the constellation Virgo.

MERCURY

is evening star. He reaches his greatest eastern elongation on the 8th at 11 h. A. M., being 25° 14' east of the sun. He may then be seen with the naked eye in the west, three-quarters of an hour after sunset, but will be difficult to find on account of his southern declination, as, at that time, he is 11° south of the sunset point. He retraces his steps toward the sun after elongation, and meets Venus on the 9th at 6 h. P. M., passing 3° 9' south. Observers, who can easily find Venus, may pick up Mercury with the aid of an opera glass, knowing his distance and direction from the larger planet. One other incident marks the course of the swiftly moving planet, for he is in inferior conjunction with the sun on the 31st at 7 h. P. M., and becomes morning star. Mercury sets on the 1st at 6 h. 19 m. P. M. On the 31st he rises at 6 h. 27 m. A. M. His diameter on the 1st is 6", and he is in the constellation Virgo.

JUPITER

is evening star. He is in conjunction with Antares on the 24th, being 5° north of the star. He is near Venus at the close of the month, being 1° 30' northeast. Both planets set then about 6 o'clock, an hour and a quarter after sunset. Jupiter sets on the 1st at 8 h. 1 m. P. M. On the 31st he sets at 6 h. 23 m. P. M. His diameter on the 1st is 32".2, and he is in the constellation Scorpio.

MARS

is evening star. He pursues his eastward or retrograde course, diminishing in size and ruddy light, and increasing the distance between Jupiter and himself. Mars sets on the 1st at 8 h. 30 m. P. M. On the 31st he sets at 8 h. 3 m. P. M. His diameter on the 1st is 6".8, and he is in the constellation Scorpio.

URANUS

is evening star until the 10th, and after that time morning star. He is in conjunction with the sun on the 10th at 8 h. A. M. Uranus sets on the 1st at 5 h. 55 m. P. M. On the 31st he rises at 4 h. 47 m. A. M. His diameter on the 1st is 3".4, and he is in the constellation Virgo.

SATURN

is morning star. He may be easily found, in the northeast, in the small hours of the morning, and may be known by his serene light and his position, about 11° northwest of Regulus. Saturn rises on the 1st at 1 h. 28 m. A. M. On the 31st he rises at 11 h. 42 m. P. M. His diameter on the 1st is 16", and he is in the constellation Leo.

NEPTUNE

is morning star. He rises on the 1st at 8 h. 1 m. P. M. On the 31st he rises at 6 h. 1 m. P. M. His diameter on the 1st is 2".6, and he is in the constellation Taurus.

Venus, Jupiter, and Mars are evening stars at the close of the month. Mercury, Uranus, Saturn, and Neptune are morning stars.

A Ruined City in Texas.

The surveys at present being made for the Kansas City, El Paso and Mexican Railroad, at a point north latitude 33 degrees and west longitude 106 degrees, have passed along the lava flow which by the local population is called the Molpais. It consists of a sea of molten black glass, agitated at the moment of cooling in ragged waves of fantastic shapes. These lava waves or ridges are from ten to twelve feet high, with combing crests. This lava flow is about forty miles long from northeast to southwest, and from one to ten miles wide. For miles on all sides the country is the most desolate that can be imagined. It has been literally burnt up. It consists of fine white ashes to any depth which, so far, has been dug down. To the north of the lava flow, and lying in a country equally desolate and arid, the surveyors have come upon the ruins of Gran Guivera, known already to the early Spanish explorers, but which have been visited by white men less often even than the mysterious ruins of Palenque, in Central America. Only a few people at Socorro and White Oaks have been at Gran Guivera, because it is at present forty miles from water. The surveyors found the ruins to be of gigantic stone buildings made in the most substantial manner and of grand proportions. One of them was four acres in extent. All indications around the ruins point to the existence here at one time of a dense population. No legend of any kind exists as to how this great city was destroyed or when it was abandoned. One of the engineers attached to the surveying expedition advances the theory that Gran Guivera was in existence and abundantly supplied with water at the time the terrific volcanic eruption took place.

The Electric Arc Light.

Talking and writing about the discovery of the electric arc light, we rightly ascribe it to Sir Humphry Davy. But we nearly always give the date as 1809. It seems, however, that if Davy did not actually hit the bull's eye in 1800 and 1802, he got at least within the center circle.

Nicholson's Journal for October, 1800, contains a letter signed by Davy, which states that he has discovered that "well burned charcoal possesses the same properties as metallic bodies in producing the shock and spark when made a medium of communication between the ends of the galvanic pile of Signor Volta."

And in the *Journal of the Royal Institution*, vol. i., of 1802, Davy describes some experiments upon the sparks yielded by the voltaic pile, and states: "When, instead of the metals, pieces of well burned charcoal were employed, the spark was still larger and of a vivid whiteness." One is inclined to think that this spark was a true arc as now understood.—*Electrical Engineer*.

Sticky Fly Paper.

Take of—

Resin..............................	14 parts.
Burgundy pitch....................	4 parts.
Molasses...........................	4 parts.
Linseed oil........................	4 parts.

Heavy calendered paper should be used, or in a few days your fly paper will be sticky on both sides.

Electrical Transmission of Power.

The flour mill at Laramie, Wyoming Ty., driven by an electric motor, which has been widely advertised in milling and electrical journals, is a novelty which has excited considerable interest, and prompts an inquiry as to what extent electricity may be made available for transmitting power from inaccessible points or poor locations to sites which offer superior advantages aside from the power required.

In considering the transmission of power either by electricity or otherwise, the items of cost and efficiency are all-important in determining whether it can be made a commercial success. A water power may be of large amount and easily controlled, but if only a fraction of the power can be delivered at a distance of a few miles, and that at a cost per horse power equal to or in excess of the cost per horse power developed by a good steam plant, it will not be utilized. In this connection, the data given in Kapp's "Electrical Transmission of Energy" are of interest. The comparative commercial efficiency of electric, hydraulic, pneumatic, and wire rope transmission is shown in the following table:

Distance.	Electric.	Hydraulic.	Pneumatic.	Wire Rope.
325 feet,	0·69	0·50	0·55	0·96
1,625 "	0·68	0·50	0·55	0·93
3,900 "	0·66	0·50	0·55	0·90
3 miles.	0·60	0·40	0·50	0·60
6 "	0·51	0·35	0·50	0·36
12 "	0·32	0·20	0·40	0·13

For three miles or less wire rope transmission is the most economical, and for longer distances electricity is the most economical, but at a distance of twelve miles only one-third of the power developed can be delivered at the receiving station. The relative cost per horse power at the receiving station, as compared with that of steam power, will, of course, depend upon the capital outlay required, cost of fuel, maintenance, repairs, etc., and would vary widely in different localities. As the efficiency rapidly decreases with increased distance, it would seem that electrical transmission cannot be employed profitably at distances of over ten or fifteen miles, and then only where the power is largely in excess of the requirements at the receiving station. As the commercial efficiency of electrical transmission, even at short distances, will not average a delivery of over sixty per cent of the power developed at the primary station, and as the water powers within short distances of flouring mills are generally limited, it is not likely that the experiment at Laramie will be often repeated. Even at that point, it was made, not because it was economical, but as a curiosity. In this connection it may be added that much is hoped, in the way of electrical transmission, from the Tesla alternating current motor. If it performs all that is promised for it, it will extend the limit of distance and decrease the cost of wires for transmission, but even at the best it does not appear that any great distance can be covered.—*Milling Engineer.*

Bitumen from Sludge Acid.

W. P. Thompson, in the *Journal of the Soc. Chem. Industry*, gives some account of Rave's process for obtaining valuable products from this waste material. The tarry acid is kneaded with iron borings or filings, copper or zinc or other metallic cuttings, the material preferred being iron cuttings or borings. After more or less prolonged contact, depending upon the nature of the metal and its degree of fineness, the sulphuric acid will be found to have combined with the metallic base. The mass is now introduced into heated receptacles and boiling water is added. The metallic sulphate dissolves and separates from the black mass, and the latter melts and rises to the surface. It is withdrawn from the receptacle, and is found to have all the mechanical properties of the best purified soft bitumen. It is well washed with hot water to remove all traces of salts, and the wash water used to dissolve out fresh quantities of salts in a succeeding operation. Any uncombined metal falls to the bottom. The watery solution containing the metallic sulphate and other salts is drawn off into crystallizing reservoirs.

The black mass, or bitumen, being too soft for many purposes, is placed in a still and heated until it assumes the required degree of hardness. The hydrocarbons given off in this operation are collected and used as naphtha. The resulting bitumen is very pure, and can be used for almost all purposes for which the purest native bitumens are used, while at the same time it is so elastic and malleable as to strongly resemble India rubber. Hence it is largely sold by the Societe Oleograisse, who work the Rave process under the name of "mineral caoutchouc-bitumen." One ton of acid tar produces about ten hundredweight of this purified bitumen. If the distillation of the soft bitumen be carried farther, a material soluble in naphtha, but nearly as hard and tough as ebonite, is obtained. This is an extremely good non-conductor of electricity, is unacted upon by acids or alkalies, and is therefore adapted for making galvanic batteries, for coating acid tanks, conducting wires and cables, for insulation plates, and the like. It can be made of all degrees of hardness and moulded by heat, either pure or admixed with fibrous and strengthening materials.

If the mineral caoutchouc-bitumen be mixed with about forty per cent of sawdust and a little lime, heated in an iron vessel and pressed into moulds, it makes an admirable fuel, burning well in a fireplace without melting and with little ash.

The "mineral caoutchouc-bitumen" dissolves readily in petroleum, naphtha, and other light hydrocarbons, and forms an excellent tough black varnish. This varnish is waterproof, and adheres very tightly to metal, not chipping or scratching off so easily as Brunswick black or japan varnish. The bitumen also forms compounds with resin, wax, pitch, and other like materials, with qualities intermediate between those of their constituents.

To sum up, at the expense of the requisite quantity of iron cuttings or oxide the entire sulphuric acid in the material is obtained as green vitriol. One-half the weight of the original acid tar is utilized as soft bitumen, or this is still further differentiated by distillation, and this fifty per cent is converted into seventeen per cent light naphtha and burning oils, eight per cent heavy lubricating oils, and twenty-five per cent metallic carbon.

Obituary.

HENRY CARVILL LEWIS.—Professor Lewis, of Philadelphia, died at Manchester, England, on the 21st of July, in his thirty-fifth year. He was a graduate of the University of Pennsylvania, an active member of the Academy of Sciences of Philadelphia, and in 1883 became Professor of Geology in Haverford College. One of his earliest papers, if not the first, is a notice of the Zodiacal Light, giving the results of five years' observations; it was read before the American Association in 1880, and appeared in vol. xx. (1880) of this *Journal*. He commenced his glacial investigations in 1879, in connection with the Geological Survey of Pennsylvania, worked on the same subject in 1885 and 1886 in Great Britain, and had intended to make observations the present season in Norway. The investigation of the "Terminal Moraine" from the eastern boundary of Pennsylvania (to which point it had been traced across New Jersey, by Professor G. H. Cooke), westward across Pennsylvania, occupied him until the autumn of 1882, when his report, of about 300 pages, was presented for publication. It appeared in 1884, as No. Z of the Geological Series of the Pennsylvania Survey. In 1886 he read his paper on Glaciation in Great Britain before the British Association.

Professor Lewis was also a zealous mineralogist, and until recently had editorial charge of the mineralogical department of the *American Naturalist.* In 1886 he brought out his paper on the "Genesis of the Diamond," tracing it to eruptive rocks, and basing his views principally on the published accounts of the diamond fields of Southern Africa.

Mr. Lewis was an enthusiastic and energetic worker in science, and promised to do much for its progress. He leaves a wife and one child.

JAMES STEVENSON.—Col. Stevenson died on the 25th of July. He was born in 1840, at Maysville, Kentucky. He was an early explorer of the Rocky Mountain region, and accompanied Dr. Hayden in his expedition as executive officer and manager. In 1872 he ascended the highest of the Teton Range, the Great Teton. He has been, since 1879, connected with the U. S. Geological Survey, engaged in making ethnological investigations and collections in New Mexico and Arizona. A very valuable report by him on the collections obtained in 1879 and 1880 is contained in the report of the secretary of the Smithsonian Institution for 1881.

ALBERT D. HAGER.—Mr. Hager was associated with Professor Edward Hitchcock and Mr. C. H. Hitchcock in the Geological Survey of Vermont. Since 1872 he has lived in Chicago, where he died, on the 29th of July. He was born at Chester, Vermont, in 1817.—*Amer. Jour. Science.*

Why Does the Shell of the Lobster Become Red on Being Boiled?

The answer to this question in general terms is that the salts which go to make the color in the shell undergo a chemical change by being subjected to the action of hot water. This answer can hardly be a satisfactory one to a person seeking specific information on the subject. It is, however, the only answer that can be given at present. The matter is one which has apparently excited more popular than scientific curiosity, for whereas the question has often been asked, it has not as yet received a satisfactory—that is, a specific—answer. It is a question for the chemist rather than for the naturalist, and that, probably, is the reason why it has not received more attention.

It is not only the lobster, but all crustaceans that undergo this change of color on being boiled. Salt water crustaceans become redder in the process than fresh water crustaceans. The addition of common table salt to the water in which the creature is boiled will conduce to greater redness. Whether it is the sodium or the chlorine in the salt that helps to this result I do not know. The creature itself has nothing to do with the change in its shell, for if the shell be taken from the living crustacean and then boiled, the result will be exactly the same. It has been suggested that red may be the basic color of the shell, and that the chemical change which takes place is merely the elimination of the other colors. The objection is that there is no evidence of removal of color shown in the water. The objection is not vital, however.

Dampness in Foundations.*

A wall constructed of brick or stone of any quality whatever will be subject to the damp which exists in the soil, and which will enter in all directions and in all parts where the wall is in immediate contact with the ground. The extent to which this damp will penetrate cannot be determined, and it may rise to a very great height above the level of the soil; and if it be arrested more or less, that will be caused by the influence of the neutralizing power of the temperature of the atmosphere; so that a wall which may be very damp at the beginning of summer will be much less so at the end of the dry season, and particularly so if immediately exposed to the sun, but the following winter the damp will return, unless the original causes of humidity be subdued.

It is desirable in all and every class of soil to have a substratum of concrete under the footings. For the purposes of damp this need not be very deep, perhaps not exceeding a foot high. As soon as the footings and lower part of the wall are carried as high as the level of the ground inside, it will be well to introduce a thin sheet of lead the whole thickness of the wall, or a layer of bituminous substance as thin as possible, so as to penetrate the brick and stone and fill the pores, or a double course of thick slate set in cement. The purpose of the sheet of lead and of the bituminous substance, and the slating, is to prevent the wet from rising up from the footings. But other precautions are necessary to prevent the access of damp from the surface of the ground next the outside face of the wall. A facing of stone is the best remedy. It need not be very thick, but it is well for it to be at least two or three feet high; and if a small interval between this facing slab and outside surface of the wall, so much the better, provided a circulation of air be kept up in the space. By this provision neither the rain beating against this part of the wall, nor the water returning from the pavement or ground, will be able to reach the main substance of the wall; for although the facing slabs may be temporarily damped, they will soon be dried without communicating the damp to the body of the wall.

The inside of external walls should never have the plastering applied immediately on the face. They should be battened by means of long narrow slips of wood attached by holdfasts to the inside face of the wall. These slips or battens receive the laths upon which the plastering is applied. The space formed by the battens between the wall and the lathing effectually keeps out the humidity. No impervious covering should be laid on wooden floors in the lowermost story, such as oil cloth for instance; a certain moist air always rises from the ground and escapes through the joints of the boards, but if this be intercepted by an oil cloth the air will rot the boards and oil cloth in a very few months. But it is important to keep the damp from the floors which come upon the ground, that is, the floors of the lowermost story.

It is evident that the timber of stone slabs should not be in immediate contact with the soil. For this purpose let a stratum of concrete be laid over the whole surface of the house, six or nine inches thick at the least. Upon this form sleeper walls or piers up to the necessary height, and on them lay the plates or paving slabs. As an additional precaution, a thin sheet of lead might be laid under each pier on the bed of the sleeper walls. In palaces, as a greater precaution, and in buildings where expense is a secondary object, a thickness of asphalt might be laid on the concrete. In the dwellings of the poor it is expedient at all events to have the sleeper walls or piers, which need be only half brick wide and one course high, without the cement, and generally that will be a sufficient precaution. Where stone paving forms the floor, bricks must be laid under all the joints. Thus will the humidity be more or less prevented from reaching the floors. But of all precautions to prevent damp entering by the face of the wall, the best remedy is to have an area, which, by keeping the soil at a distance, precludes its fatal effects on the wall. These areas may be three or more feet wide, and may serve as a passage all round the building, and afford access to cellars outside, as in the London houses; or if this, from want of space or the expense, be impracticable, it will be sufficient to have what are called blind areas, with convex walls against the earth, the points of contact with the outer wall of the house being as small as possible, to diminish the possibility of the communication of damp.

* Vandoyer, in *The Architect*, London.