Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

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NEW YORK, SATURDAY, OCTOBER 22, 1892.

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No. 877.

For the Week Ending October 22, 1892.

Price 10 cents. For sale by all newsdealers.

ELECTRIC LIGHT AND VEGETABLE GROWTH.

Prof. L. H. Bailey has recently published (Bulletin No. 42, Cornell University Agricultural Experiment Station) a second report on the effects of electric light upon the growth of plants. The first report (Bulletin No. 30), issued last year, gave details of numerous experiments, which are confirmed by the present report. The results are, briefly, as follows:

An arc lamp, 10 ampere, 45 volt, 2,000 nominal candle power Westinghouse alternating current, shaded by a clear glass globe, was hung outside of and in the valley between two greenhouses, about six feet above the nearest glass. It seldom burned after 11 P. M., and on moonlight nights not at all. It exercised a decidedly beneficial effect upon the growth of lettuce, causing the lighted plants to be ready for market from a week to ten days before those grown outside the influence of the lamp. Advantage of this fact has already been taken by a grower near Boston, who finds a gain of five days in a crop by the use of the light. Of other plants experimented on, Prof. Bailey says that endive was injured; radishes were benefited, but not enough to pay for the light; spinach grew from 5 to 15 per cent larger in the light than in the dark; cauliflower seemed to grow better in the dark; violets began to bloom in three weeks after being set out in light, while it was five weeks before those in the dark flowered. The daisy (*Bellis perennis*) bloomed earlier, but did not make as good, stocky plants as those in the dark.

An experiment with spinach seed was of interest as showing that characters of parent plants are not transmitted to the seed. For example, seed from a slender, light-grown plant and from a low, dark-grown plant, together with commercial seed, were planted together in the lighted house. The offspring of the low, dark-grown plant gave the best results, while the commercial seed came next. But in the dark house the best results came from the offspring of the slender, light-grown parent, that from the dark-grown being second and the commercial third. Thus the slender habit of the light-grown plant was not transmitted when grown in the dark, and the low-growing habit of the dark-grown parent was not improved upon the second year, being surpassed by the offspring of slender, light-grown plant.

Upon the whole, Prof. Bailey concludes that the intervention of a pane or two of glass modifies materially the effects of the light, preventing injury, which results at times from the influence of a naked light; that as a rule plants are earlier under the light, and that the light can be used to advantage in the forcing of plants.

Further experiments are in contemplation during the coming winter and spring.

Drinking Water and Other Things in San Francisco.

A large proportion of the buildings in this city (San Francisco) and in some of the towns and villages, also many suburban and farm houses, have the main water supply run into tanks set at a sufficient height to supply the water for use. After a time the water in such tanks becomes covered with a green scum, while decayed organic matter settles at the bottom ready to enter the house supply pipes and be drawn off for household purposes. It needs no argument to show the beneficial result of cleansing these tanks at least once a week. There is a convenience for the cleansing of boilers in the kitchens of many of our residences, viz., a sediment outlet at the lower part of the pipes under the boilers. The sediment should be drawn off every morning through the faucet. Sometimes this faucet is provided with a waste pipe to a hopper outside the house.

One source of danger is to be found in the cities and towns on this coast where the roofs are used by the Chinese for drying clothes and other purposes only known to themselves and to persons having business which gives them knowledge of this state of affairs. The main roofs are nearly flat and in most cases covered with tin or asphaltum; at a short distance above this there is a floor of boards placed upon light framework which serves as a cover for the roof. The space between the roof and boards is, in many cases, reeking with moist filth, which under proper authority could be cleaned up and taken away.

The bake shops may be looked after; the bread, cake and pie pans are in some cases greased with old and rancid fats which permeate the product and may become generative of pestilence.

We have ordinances sufficient, provided the surveillance was more efficient, to abate one of the worst evils extant. The streets are carefully swept and cleaned up during the night time; in the morning the stores or shops are opened and wept out upon the sidewalks and into the streets, so that by noon the streets contain large deposits of dirt and dust to be raised and wafted about by the winds.

While the question of the transfer of dirt into the street is considered, it may be well to mention that in most, if not all, the rooming houses fronting on the streets, the inmates of the front rooms use the streets for the deposit of debris from their rooms, and about midnight the pedestrian will every little while hear and see a package from some window thrown into the street. In some localities, if the person occupying the first story objects to such methods of scavenging for the upper stories, the landlord straightway raises the rent, as the rottenness of the rooms above pays more than the business places below.

There should be an inspection of fruit and vegetables set out for sale in our markets. Decayed and decaying edibles are a prolific source of propagation of infectious diseases. At many of the street corners may be seen peddlers dealing out partially decayed fruit.

The excretions of the dog or cat are considered poisonous, and the animal will try to cover it with earth when the surroundings will admit of it. The dog of the built-up districts will not soil its own home, and we have never seen any good reason why it should be allowed to soil the neighbors' doorways or premises, and we fail to understand why it should be permitted to soil the fruit and vegetables for sale in the shops and on the sidewalks of our greengrocers. This is an evil that should be the subject for a crusade by the people and officials. There should be an ordinance passed that no fruit or vegetables should be deposited less than two feet from the floor or sidewalk where subject to this danger.—*Cal. Architect.*

On an Apparent Relation of Electromotive Force to Gravity.

BY DR. G. GORE, F.R.S.

In a research on "A General Relation of Electromotive Force to Equivalent Volume and Molecular Velocity of Substances" (Proc. Birm. Phil. Soc., 1892, vol. viii., pp. 63–138; "Electrical Review," vol. xxx., pp. 693, 722, 755, 786) I have demonstrated, by means of a large number and variety of experimental measurements, that the *dilution* of the liquid of a voltaic cell by means of water or alcohol, the *solution* of either the positive metal or the negative one by means of mercury, the *dilution* of either of these amalgams by means of mercury, or the *dilution* of one solid metal by means of another in an alloy, is universally attended by an *increase* of *mean* electromotive force of the diluted and diluting substances beyond the calculated amount, and therefore of the *actual* electromotive force of the diluted one (that of the diluent being very little affected), provided that no chemical union of the diluted and diluting substances occurs. If, however, chemical union does occur, this gain of electromotive force is diminished, or converted into a loss which is larger in proportion as the union is more intimate.

In these experiments, by the act of solution or dilution, the molecules of the active or diluted substance are separated farther apart by those of the neutral or diluting one, and acquire greater freedom of motion, while those of the diluent approach only slightly nearer together and do not perceptibly affect the result.

It is generally admitted that the particles of all bodies are in an incessant state of motion, that this motion is the *vis viva* or energy contained in the substance, and that the laws of motion apply equally to the smallest as to the largest bodies. If now we regard each molecule of the active substance as vibrating like a pendulum, its movements must obey the law of falling bodies, and the larger the degree of freedom of motion the greater the arc of vibration, the larger the fall, and the greater the velocity of motion. And as in the above mentioned experiments the volta-electromotive force of substances generally has been proved to vary directly as the degree of molecular freedom, it must also, according to this view, be directly related to, and dependent upon, the velocity of molecular motion and the law of gravity in the above manner.—*Philosophical Magazine.*

The Great Light for the Fair.

At the World's Fair grounds a test of the search light which is to illuminate Jackson Park was lately made. The electric light is perched on the high tower of the Transportation Building. The light is the largest and strongest in the world. It was made by Schuckert & Co., of Nuremberg, Germany, and it has been brought to this country by Prof. Tischendoerfer, a mechanical and electrical expert. The light is what is known as a four foot reflector, that is, the great magnifying glass through which the rays are thrown to such a distance is four feet in diameter. The direct power of the light is 150,000 candles, without any glass whatever. With the big glass, however, the power is magnified to 160,000,000 candle power. The carbons used in the radiator are 12 inches long and 1¼ inches in diameter. They are fastened inside the lamp merely with two upright pieces of steel. The lamp itself is operated on a sort of carriage something after the manner of a Maxim gun. It can be turned in any direction and can be tilted so that the rays will ascend vertically. When the full power of the light was turned on, the city of Chicago could be viewed.

Birds That Eat Acorns.

Dr. Morris Gibbs writes to *Science* from Kalamazoo, Michigan, that in that State there are to his knowledge six species of birds which feed on acorns. Of these, the passenger pigeon and morning dove swallow the acorn entire, with its shell intact, only removing the cup or rough outside covering. The white-bellied nut hatch occasionally hoards the acorns away, and only draws on its store after some months, and when the firm shelly covering readily gives way to its sharp, prying bill. The other three are the well known blue jay, common crow blackbird, and red-headed woodpecker. So far as he has been able to learn, these birds, except in rare instances, do not pick the acorns from the tree, but have to content themselves with the fallen fruit. The red head, deigning to descend to the ground, seizes an acorn, and flying with it in its bill to a spot where there is a small cavity in the dead portion of a trunk, or to a crevice in the bark, immediately begins to hammer it with its sharp-pointed bill. In a couple of strokes, it has removed the outer shell or cup, and at once attacks the still green-colored shell which directly surrounds the meat. The inside, or shell proper, quickly gives way, usually nearly in halves, and the woodpecker enjoys the kernel. The woodpeckers are as nearly strict insect feeders as any birds in Michigan, unless an exception is made of the swifts and swallows, yet here is an instance of a varied diet. However, the red head is quickly satisfied in the acorn line, and soon begins circling the trunk, or more often limbs, for his legitimate food. The blackbird confines himself to the ground in his efforts for acorn meats. Walking up sedately to an acorn, and making no effort to seize or confine it, it strikes savagely and almost aimlessly. Its bill frequently glances, and the splintered shell dances about, until at last a huge piece of the kernel is dragged out, after which the bird leaves for other quarters or begins on another acorn. The jay swoops down with flaunting blue wings, and, seizing the largest acorn on the ground, flies to the nearest convenient limb or to the decayed ridge-board of an adjacent building. There, firmly pressing the nut between his big, black feet, he hammers away with a vengeance, and quickly tears off nearly half of the shell, after which he proceeds to pick out the meat in small bits. The cup is often left nearly perfect, the jay never making an effort to secure the nut entire, which he could easily do. Walking under the oaks, one can readily tell whether the woodpeckers, blackbirds, or jays have been at work among the acorns, by the appearance of the mutilated shell remains lying about.

Storax.

The literature of the aromatic gums and resins is teeming with scientific and historical interest, as so many of them are spoken of in the works of the famous classical authors and in holy writ, thus showing that they have been probably articles of commerce for many hundreds of years. As far as can be shown, however, the botanical source of the products we now use, and, indeed, their physical appearance as well, is not always identical with that of the drugs of the ancients, and in the case of storax this is so.

Our liquid preparation was probably not known before the sixth or seventh century, when it was spoken of by two Greek physicians, Paulus Æquieta and Aetius; they also mentioned storax in the solid form, and the earlier writings of Dioscorides, in the first century, and Pliny and others of later date, show that solid storax, and not liquid storax, was known in their time. The solid storax of the ancients was a product of the tree *Styrax officinale*, Linn., and resembled benzoin in appearance, occurring generally in tears, more or less agglutinated together, which exuded from the trunk either spontaneously or after incision. There are but few samples of this now in existence, even in the museums, but it was probably an article of commerce in comparatively recent years, as shown by the writings of eminent pharmacologists of the last century and by its presence in a few collections of materia medica made within the last 180 years.

It has, however, been growing gradually scarcer, and when mentioned in market reports of that time, it was classed as *amygdaloid*, an exceptionally fine kind, and quoted at a very much higher rate than liquid storax. It is noteworthy that the ancient method of packing it was in reeds (*calami*), a practice which gave to it the name *Styrax calamites*, a name which, though now applied to a commercial article, denotes a very different product, viz., a kind of sawdust-like, sweet-smelling compound, totally unlike the amygdaloid storax known of old. The price of it, according to Pliny, was about 17 denari per pound, corresponding to 16 shillings of English money, and hence its high value and the paucity of the supply rendered it particularly liable to adulteration. Dioscorides and Pliny mentioned that it was sophisticated with the powder of the wood of the tree, honey, dregs of orris, resin of cedar and other gums, and occasionally with bitter almonds; they seemed to rely upon their sense of taste alone for the detection of these fraudulent additions.

The tree, *Styrax officinale*, from which this fine storax was obtained was grown in various parts of the South of Europe, such as Italy, Provence, South France, and also in Asia Minor and Syria. The districts which are especially mentioned by the old writers as the habitat of the tree are Cilicia, Pamphylia and Pisidia, in the southeast of Asia Minor, Casius and Emanus in Turkey, and Sidon, Crete and Cyprus. Though there is now no supply of the gum, it must not be thought that the tree is extinct, for it is undoubtedly well known in many of these districts, though only as a common wild shrub, much degenerated from the original type, which from all accounts seems to have resembled a quince with handsome blossoms.

In the writings of Dr. Landerer, in 1839, some interesting facts about storax are mentioned, though a few of the details of his communications on the subject were refuted by later writers. It seems to be a fact, however, that the tree yielded a most agreeable vanilla-like odor at the time of flowering, and that storax trees were considered of such high value that they were presented to brides as a dowry.

Turning from this storax, which is of historical importance only, to those varieties which are of commercial note in this present day, we are attracted by only two, the preparation official in the British Pharmacopœia, liquid storax, and that which is frequently met with, *storax calamites*, a sort of odoriferous sawdust. Another variety, black storax, a sort of resinous cake used for incense, is occasionally found in Continental warehouses, but it cannot be said to be of any great commercial importance, except in the peculiar district where it is manufactured.

Liquid storax is official in the British Pharmacopœia, and being used in a number of perfumes, etc., merits the greater part of our attention, and it is with increasing interest one turns to the various opinions expressed as to its origin by writers of a few centuries ago. Some, indeed, considered it altogether an artificial product, while others traced its botanical source to *Styrax officinal*, an erroneous idea, and others again to different species of *Liquidambar: L. antinquiana*, *L. styraciflua* and *L. orientale*, the latter of these, however, being now known to be the true one. This was first determined probably by Kinos, in 1841, and corroborated by Koste in 1855 and Danbury in 1857.

The tree *Liquidambar orientale* grows in a number of districts in the Levant, where it forms forests of a very dense nature, though not all particularly extensive. The localities in which it chiefly occurs are those of Sighala, near Mellasso, Moughla, Giova, and Ulla, in the Gulf of Giova, and Isgengak and Marmorizza, opposite Rhodes. The tree itself is handsome and umbrageous, somewhat resembling a plane tree in appearance, averaging from 30 to 40 feet in height, though occasionally reaching an elevation of 60 feet in open and well-watered places, and sometimes being as small as 20 feet in a crowded forest.

The handsome appearance of the tree is marred by the process of stripping the bark to obtain the resin, and though, perhaps, a convenient method of extracting it, it seems likely to lead to the extinction of the species, and is much to be deplored. All authorities agree that when collecting the outer bark is first removed, and that the inner bark is then scraped off and the contents removed by means of hot water, though the details given by them differ slightly. Thus Campbell says that the inner bark is boiled in water over a brisk fire, upon which the resinous part comes to the surface and is skimmed off, the residual bark being put into hair sacks and pressed. Maltass states that the inner bark, when collected, is packed into hair bags and pressed under a wooden lever, the exuding resin being collected.

The contents of the bag are then treated with hot water, and they are then pressed again. McCraith's account agrees more closely with that of Campbell's, and he says that the collectors, a tribe of Yuruks, scrape the tree with a triangular iron scraper, placing the resin and the bits of bark in a leather pouch. These are then boiled in a copper vessel, the liquid resin being run into barrels and the residual bark inclosed in horse hair bags and subjected to pressure, whereby more resin is obtained. Whichever the process be, however, the products are the same, the opaque, semi-fluid viscid resin known as liquid storax, and the exhausted bark known as *Cortex Thymiamatis*, which formerly was common in European pharmacy, but is now rarely used. Liquid storax, as it occurs in the market, is generally more or less adulterated with ashes, sand and other substances, and hence it is that the British Pharmacopœia directs that it shall be purified by solution in spirit, filtration and evaporation. These impurities can also be distinguished by the microscope, as well as by extracting the genuine storax with spirit.

Styrax calamites of commerce, a very degenerate form of the product known to the ancients under that name, is so extremely variable in its nature that its fictitiousness is undoubted, and, indeed, is now known to be manufactured in several places—Trieste, Venice and Marseilles, and others. The better varieties of it are made by mixing *Cortex Thymiamatis* with liquid storax in the proportion of two to three. The bark is first coarsely powdered, and then mixed with the liquid preparation, when it first forms a sticky, clammy mass, which gives off in a few weeks a mass of tiny silky crystals, giving the appearance of moldiness. Inferior qualities of *Styrax calamites* are made with common sawdust, or even red earth, instead of the proper bark.

The other variety mentioned, *black storax*, is made by Greek monks, of the island of Symi chiefly, and is a mixture of olibanum with liquid storax, appearing as dark, resinous cakes that are used for fumigatory purposes and for incense in the Greek churches and mosques. It can be generally obtained in Continental warehouses, but is not found as a rule in English markets.—*Pharm. Record.*

Color Blindness.

In a recently published report issued by the Marine Department of the British Board of Trade some curious and valuable information is given with regard to the proportion of color blindness in the mercantile marine of that country. The number of candidates who presented themselves for examination for certificates as masters and mates during the previous year was 4,688, of whom 31 were rejected because of their inability to distinguish colors. Of this number 21 insisted that red was green, and others asserted that red was some other color than either red or green, usually drab. Candidates to the number of 205 mistook drab for green, 64 mistook drab for pink, and others asserted that it was white or yellow or red. As for pink, 106 persons said it was green, 32 that it was drab, 17 that it was red, and 34 that it was something else. With regard to green, 32 averred that it was white, 42 that it was pink, 33 that it was drab, and 28 that it was red. It appears, however, as before stated, that only 31 were entirely disqualified, as their inability to distinguish colors was so great that it would probably lead to disaster on the high seas, while in the majority of instances the defect was a particular one, and consisted rather in the inability to distinguish one or two colors than in the inability to distinguish all colors, save black and white.

At the same time the figures show how common color blindness is. No exhaustive experiments have ever been carried out with the view of ascertaining the proportion of sufferers from the defect, but it has been asserted on good authority that one individual in thirty is partially and one individual in fifty is wholly unable to distinguish between colors. The defect is believed to be more common among men than among women, one writer on the subject holding that superior color perception on the part of the female has been transmitted and intensified. Another adds: "If the condition is an inherited one, then possibly evolutionists may be able to explain the female superiority in this respect by reference to far-back ages when selection of their partners was, theoretically, a marked duty and privilege of the weaker sex." It may be remarked that savages of both sexes seem to be more favorably endowed than civilized man in regard to the color sense. Their fine perception of color is manifest in their war paint, their crowns of brilliant flowers and still more brilliant birds' feathers, their brightly stained skins and parti-colored dresses, all in marked contrast to the more civilized dwellers in the temperate zones.

Color blindness is an important question, not as bearing on navigation alone, but upon every kind of employment in which the security of life and property depends upon accuracy in distinguishing signals. Defective eyesight has been responsible for many serious accidents, and ability to distinguish at least the primary colors ought to be an indispensable condition for those intrusted with the direction of vessels and employed in the traffic on railways.—*N. Y. Press.*

Essential Oils as Bactericides.

M. Omeltschenko has made experiments which confirm the views previously put forward that the vapors of essential oils exercise a bactericidal action. By using specially contrived culture flasks and passing through them air impregnated with the vapors to be studied, he was able also to establish the quantity necessary per liter of air. Thus the bacillus of typhus was killed by air containing the vapor from oil of cinnamon, 0·0005 gramme per liter, or oil of valerian, 0·0082 gramme per liter, in forty-five minutes. The bacillus of tuberculosis required to be exposed for twenty-three hours to air containing 0·018 gramme per liter of oil of cinnamon before fatal effects were produced. Oil of lavender, 0·0078 gramme per liter, effected the same result in twelve hours, and oil of eucalyptus, 0·0252 gramme per liter, in the same length of time. The degree of saturation must be maintained, or, after the first effects of the vapors pass off, though the growth of the germs is prevented, their vitality is not destroyed. The oils are classified according to their strength as germicides, thus—cinnamon, fennel, lavender, cloves, thyme, mint, anise, eucalyptus, turpentine, lemon and rose, the last two being very weak in disinfecting power.—*Bact. World.*