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Contents.

(Illustrated articles are marked with an asterisk.)

THE GULF STREAM AS A HEAT CARRIER.

The Gulf Stream finds a sturdy champion in the author of "Climate and Time," Mr. Croll, of the Scottish Geological Survey. Dr. Carpenter, who has a theory of his own, goes out of his way to belittle the influence of the Gulf Stream as a modifier of climate, calling the stream a mere rivulet compared with the (theoretically) grand surface drift of tropical water into the North Atlantic: whereupon Mr. Croll resorts to the logic of fact and figures, and demonstrates the enormous influence which the body of warm water, entering the Atlantic through the Straits of Florida, must have in mitigating the climate along its subsequent path. Mr. Croll's argument is presented at great length, proving beyond a doubt that, so far from being currently overestimated, the thermal effect of the Gulf Stream is vastly greater than has ever been suspected hitherto.

The observations of the United States Coast Survey, in regard to the breadth, depth, and temperature of the streame were many and careful. Unfortunately, however, no observations were made to determine precisely the velocity of the current at all depths along any particular section; consequently, while the mean temperature of the stream may be determined with considerable precision, it is impossible to make an accurate estimate of the volume of the current. From the limited data afforded by the records of the survey, Maury considered the volume of the stream to be equal to that of a stream 32 miles wide and 1,200 feet deep, flowing at the rate of five knots an hour. That would give a flow of 6,165,700,000,000 cubic feet an hour. In his "Physical Geography," Sir John Herschel estimates it as equal to a stream 30 miles wide and 2,200 feet deep, flowing at the rate of four miles an hour, that is, having a volume of 7,359,900,000,000 cubic feet an hour. More recently Dr. Colding estimated its volume at 5,760,000,000,000 cubic feet an hour. From the same data, Mr. Croll, some years ago, determined its volume to be equal to that of a stream 50 miles wide and 1,000 feet deep, flowing at the rate of four miles an hour, or considerably less than the lowest of the foregoing estimates. To obviate any possible objection on the ground of overestimating the volume of the stream, Mr. Croll calculates its heating capacity on the basis of a velocity of only two miles an hour, according to which the flow would be 2,787,840,000,000 cubic feet an hour, a little over one third of Herschel's estimate.

The average temperature of the surface water in the Florida Channel, for the whole year, is 80°. The bottom temperature, according to Dr. Carpenter, is 60°, which would make the mean temperature about 75°. Mr. Croll thinks this estimate much too high, an error arising from an underestimate of the sectional area of the stream. Believing that the current extends to a depth where the temperature is below 60°, he calculates that the mean temperature of the stream is not over 65°. In its passage to the arctic regions, the water is cooled down to about 30°. Assuming that part of the return current, by the way of the Azores, is fed from the water of the Gulf Stream proper (not entirely from the larger current further east, discovered by the Challenger expedition, and considered by Captain Nares to be an offshoot of the Gulf Stream), a considerable portion of the stream is not cooled below 45°. Altogether, however, Mr. Croll thinks he cannot be overestimating the cooling of the water in fixing the average minimum temperature at 40°, thus allowing for the loss of 25° of heat while the water is making its northern journey. At this rate each cubic foot of the water must transport from the tropics to more northern latitudes upwards of 1,158,000 foot pounds of heat. Consequently the total quantity of heat transferred daily by the entire stream amounts to 77,479,650,000,000,000,000 foot pounds.

The effect which this vast amount of heat must have in mitigating the climate of the regions to which it is carried can best be estimated by comparing it with the amount of heat received from the sun by the same areas.

According to the observations of Sir John Herschel and M. Pouillet, the sun pours down upon every square foot of the earth's surfaces at right angles to its rays about 83 foot pounds of heat a second: this allowing for no absorption of heat by the atmosphere. M. Pouillet estimated the loss of heat by atmospheric absorption to be 24 per cent of the amount received from the sun. Mr. Meech (*Smithsonian Contributions*, Vol. IX) estimates the loss at 22 per cent. At the latter rate of absorption there would remain 64·75 foot pounds of heat a second to fall on each square foot of the earth's surface when the sun is directly overhead. On the equator at the time of the equinoxes, the sun shines daily for twelve hours. Were it to remain at the zenith all this time, its heating effect per square foot would be 2,796,768 foot pounds. Not so remaining, its effect is less in the ratio of 1 to 1·5708; so that each square foot of the earth's surface at the equator, under the most favorable conditions, receives 1,780,474 foot pounds of heat during the twelve hours from sunrise to sunset. A square mile receives 49,636,750,000,000 foot pounds. As we have seen, the Gulf Stream carries from the tropics daily 77,479,650,000,000,000,000 foot pounds, or as much as falls upon 1,560,936 square miles at the equator.

Mr. Meech estimates the quantity of heat received from the sun annually, by each square mile of the frigid zone, taking the mean of the whole zone, at 0·454 of that received at the equator: consequently the heat conveyed by the Gulf Stream is equal to that which falls on an average of 3,436,900 square miles of the frigid zone, or nearly $\frac{2}{5}$ of its entire area: this, assuming that the percentage of heat absorbed by the atmosphere in polar regions is no greater than at the equator. If the obliquity of the sun's rays is allowed for, it appears that the Gulf Stream conveys not far from half as much heat as the sun furnishes to the entire area within the arctic circle.

The mean annual quantity of heat received from the sun in temperate regions, per unit of surface, is to that received by the equator as 9·08 to 12. Consequently the Gulf Stream furnishes as much heat as the sun gives to an area of 2,062,960 square miles in temperate regions. Since the area of the Atlantic from the latitude of the Straits of Florida to the arctic circle is only about 8,500,000 square miles, it follows that the quantity of heat conveyed to that region by the Gulf Stream is to that received from the sun by the same area, as 1 to 4·12: in other words, very nearly one fifth of all the heat possessed by the water of the Atlantic within those limits, even supposing that every sun ray is absorbed thereby, comes from the Gulf Stream.

To assert that this enormous reinforcement of the normal heat supply of the North Atlantic is without sensible effect upon its climate is simply absurd. To Mr. Findlay's assertions that the inability of the Gulf Stream to affect the climate of England is self-evident and needs no calculations, Mr. Croll retorts with calculations from Mr. Findlay's own data, most effectually disproving his rash assertions. Mr. Findlay says, for instance, that all the water passing through the Florida channel will not make a layer of water more than six inches thick a day over the space which the stream is supposed to cover off the coast of England. Mr. Croll replies that a layer of water six inches thick, cooling 25°, will give out 579,000 foot pounds of heat per square foot. The amount of heat received from the sun in the mean latitude of Great Britain, 55°, taking the mean of the sun's heat for the entire year, is 1,047,730 foot pounds per square foot a day. Consequently Mr. Findlay's layer of water must give out an amount of heat equal to more than one half of all that is received from the sun. But assuming that the stream should leave the half of its heat on the American shores, and carry to the shores of Britain only 12½° of heat, there would still remain a heating power of 289,500 foot pounds per square foot, or more than a fourth as much as the sun supplies in that latitude.

THE PATENT DRIVE WELL.

This consists of a small tube driven into the ground by means of a hammer, until water is reached. A pump is then applied to the tube, and the well is complete. It is the invention of Colonel Nelson W. Green, of Courtlandt, N. Y., patented by him May 9, 1871, but discovered and put into use by him in 1861 while he was serving in the United States army. It has been brought into use all over the world, and is one of the most valuable of inventions. Nearly all the dwellings at the famous watering place of Oak Bluffs, Martha's Vineyard, are supplied by this means with water, including the Sea View Hotel. At the latter establishment a six inch pipe is driven down 22 feet into the ground; and such is the abundance of the supply that a steam pump of equal bore, running constantly for eighteen hours out of twenty-four, never lacks water, which is pure and excellent. There appears to be a fresh water lake or stratum under the whole island, at about the above depth. When the drive well tube is sunk to 27 feet, it strikes salt water. If the well tube is sunk in the salt-water-covered bottom, a few rods out from the shore, the result is the same; fresh water is found at about 22 feet, and salt water at about 27 feet. The drive well patent has been a subject of litigation for several years. The owners are at present conducting an important litigation against W. & B. Douglas, of Middletown, Conn., who are alleged to be infringers. Nearly a year has been occupied in taking testimony, which reaches three thousand pages of foolscap, while the costs so far are estimated at upwards of a hundred thousand dollars. The case is before the United States Circuit Court, Brooklyn, Judge Benedict presiding.

CEREALS AND THEIR CHEMICAL VALUE.

Wheat, oats, rye, barley, and Indian corn are cereals which yield to men all the principles which build up the human frame. Some other plants make fat-forming matter; some merely afford acids, which assist the digestion of food. Among the latter are the various fruits, particularly the grape, so much recommended to the invalid, the acid of the grape being the active agent. But in wheat and its companions of the field, namely, oats, barley, and rye, we meet with every substance necessary for the staff of human life. We will first glance briefly at the constituents of the cereals, and ascertain something of their properties.

If we take a grain of wheat or other cereal, and burn it in a gas flame, we find that only a portion of it is consumable. The unconsumable portion that remains is termed the ash, which is the mineral or inorganic portion. The consumable portion is the organic or combustible compound of vegetable matter, the proportion being 94 per cent of principally vegetable matter, and from 1 to 6 per cent of mineral matter. The organic constituents of wheat, oats, etc., are: The woody fiber, next comes the starch, then the sugar, gum, and oil, and after these the two nitrogenous substances, the albumen and the gluten, which contain large quantities of nitrogen, these latter being the flesh-forming substances in wheat; the others are the fat-forming substances; and the mineral ash contains the constituents which are necessary for building up the structure of man. Let us examine these bodies in their proper order.

If we take a piece of paper or wood, or almost any organic substance, we find that it contains a very large quantity of woody fiber. Hemp and flax also contain large quantities of this fiber, which is the back bone of the plant. Starch is a white, glistening substance which will not dissolve in water, although it will mix with it in small quantities. Potatoes, wheat flour, and oatmeal are chiefly composed of starch. Sago and tapioca are pure starch. To detect the presence of starch, put a little iodine into the substance to be tested; if it turns blue, chemistry will at once tell you that starch is present. To detect the presence of iodine, you have only to get a similar reaction, by applying starch; and although there are many different forms of starch, which may be distinguished by the microscope, it may always be detected by iodine. Gum and sugar are also present, as we have already stated, but the quantities are so small as to call for no special remark. Albumen exists not only in the vegetable, but also in the animal kingdom. The white of an egg, for instance, is entirely pure albumen. It is met with in flesh, and is the commencement of the formation of muscle. One of the chief characteristics of albumen is its coagulation by heat. The coagulation may be easily effected by chemicals. For instance, nitric acid will do it; and although albumen and gluten are both nitrogenous substances, gluten cannot thus be coagulated. Both are found in wheat. Gluten is of a very tenacious character, and makes good birdlime. Oil is chiefly found in many seeds of plants, generally in the outer portion of them. In making wheat flour, we ordinarily throw away that which we ought to retain, that which is the source of the development of the bony structure, namely, the woody fiber, and keep the starch.

Of the mineral or inorganic matter of cereals, water is 14 per cent, while the principal constituent of wheat, phosphoric acid, is present to the extent of 40·91 per cent, potash being 31·30, and silica only 9·71. The silica of wheat is identical with the widely diffused silica of sand and flints, and is combined in cereal products with alkali, in which it is soluble. Silica, taken alone into the system, would pass right through; and to secure its assimilation to the human body, it must be connected with potash or soda. But it can be recovered from its solutions by putting nitric acid in the mixture; it at once separates in the form of solid flint. The ash of wheat contains nearly 10 per cent of this substance. It may be seen in the glaze on straw, and some plants are almost entirely composed of silica. Phosphorus and lime are the chief bone-making elements in cereals, bones being nearly one half composed of phosphate of lime; and artificial phosphates of lime are largely used as manure for wheat. There are two kinds of phosphate, soluble and insoluble. The insoluble phosphate takes years to decompose; therefore, in order to grow wheat by it, it must be converted into soluble phosphate, such as the superphosphate, familiar to our agricultural readers.

Plants require two kinds of food, vegetable and mineral, or rather organic and inorganic, as the former constituents are also to be obtained from animal matter; and the inorganic matter is found in the soil and in the air. But altogether, growing cereals must be supplied with nitrogen, carbon, silica, and phosphoric acid; and without these, no profitable crops can be obtained.

WHEN IS WATER UNFIT TO DRINK?

BY PROFESSOR ALBERT R. LEEDS.

There is perhaps no question more important to the inhabitants of many cities, nor one which more severely taxes the resources of applied science, than the determination of the fitness or unfitness of a water supply. The difficulty arises from the fact that, in some cases, a water may have taste, smell, color, and a considerable amount of foreign matter, and at the same time be drunk with little or no injury: while another water, which is agreeable to the taste, limpid, colorless, and with little foreign matter, may yet contain abundant sources of disease.

The literature of the subject shows that there are two classes of thinkers, one of which puts great faith in the efficacy of natural agencies to bring about the purification of polluted streams, the other which contends that the only safe plan is to reject water which has ever been contaminated by sewage, etc. The evidence elicited by the Royal Commission on the water supply of London is that principally quoted by both classes, and cannot be regarded as conclusive. The rapid extension of our knowledge in this branch of sanitary chemistry is such, however, that we may anticipate greater certainty in these matters, and imparts great interest to some recently published methods of investigation. Anyone who refers to analyses, made a few years back, will find that it was deemed sufficient to give the character and amount of the mineral substances contained in the water, while the organic and volatile substances were expressed in a sum total, no attempt being made to determine their precise character. But, except in cases where the mineral substances were positively deterious or excessive in quantity, this did not settle the question. Of late, the greatest attention has been paid to the organic constituents, and the analyses state what amount of putrefiable matter is present. A careful determination is also made of the amount of ammonia, and of nitrous and nitric acids. These are regarded as the forms which the organic matter in large part assumes after it has passed through the putrefiable stage, and indicate therefore the degree of previous contamination.

But it is said, and with truth, that all these things may be known to a wonderful degree of nicety, and yet there may be substances present capable of rendering the water altogether unsafe for drinking. It is urged that the living organism is exceedingly sensitive to substances whose capacity for injury is fatal, even when present in amount so small as to render their weighing, and even detection, impossible. But of late, the fauna and flora of water courses have been studied, with a view of learning what assistance they could be in the matter, and the results are highly encouraging.

It has long been known that dissolved oxygen played a great part in the purification of streams, and was the principal agent by which putrefiable substances were broken up and converted into harmless inorganic compounds. A recent essay by M. Gerardin, to which the prize was awarded by the Paris Academy of Sciences, contains some striking results obtained by the abovementioned methods of investigation. To summarize, these methods were:

1. A determination of the amount of oxygen held in solution. 2. An observation of green plants and aquatic mollusks. 3. A microscopic examination of algæ and infusoria. It is claimed that the results obtained by these three methods were identical, and that, where the water was clear, with abundance of fish, watercress, etc., the water contained a correspondingly large amount of oxygen; while in places where the dissolved oxygen was small, fish and the higher types of aquatic plants were wanting, and certain low forms of vegetable growth had taken their place. The river Vesle in France from Rheims to Braisne was taken as the field of observation. It was studied over a distance of 37½ miles, during which it received the sewage of one large town (that of Rheims, the daily flow of which amounts 4,180,000 gallons) and other impurities. Above Rheims, the water (which was clear, wholesome, and with abundance of fish, charas, watercress, iris, etc.) contained 0·66 cubic inch in 61 cubic inches of water. In passing through a suburb above Rheims, the Vesle received the refuse of some dye works, which colored the water: and in place of the fish and watercress, *sparganium simplex* makes its appearance. At a point where the water had received the contents of the five principal sewers of Rheims, the water was thoroughly polluted and contained but 0·03 cubic inch of oxygen in 61 cubic inches. Two species of *algæ*, the *biggiatoa alba* and the *oscillaria natans*, were developed largely, the latter to such an extent that the whole surface of the sluggish water was covered with a thick blackish coat.

This coat was seemingly so solid that animals and even men have rushed on it, mistaking it for *terra firma*. Above the mill at Macan, where the oxygen had increased to 0·45 cubic inches, the two varieties of *algæ* mentioned above had disappeared, and the bed of the Vesle was covered with a long whitish *alga*, called *hypheothrix*.

At Compensé mill, the oxygen had increased to 0·5 cubic inch, the *hypheothrix* had almost completely disappeared, and the *sparganium simplex* was again abundant. Below this point the amount of oxygen increased, and with it a corresponding change took place in the vegetation until, at Braisne, the water contained 0·66 cubic inches of oxygen per litre, all traces of pollution had disappeared, and fish and watercress flourished.

From this it would appear that a properly aerated and pure water showed, when polluted, the amount of pollution by a corresponding diminution of oxygen, by the appearance of *sparganium simplex, spirogyra, hypheothrix, biggiatoa* and *ossilaria*, and a progressive improvement by a corresponding increase of oxygen, and the appearance of these plants in reverse order. It remains for us to apply and extend this knowledge to our own streams. Fortunately, the means are not wanting, since the great monograph on the fresh water *algæ*, magnificently illustrated with plates, by Dr. H. C. Flood, which was not published by the American Philosophical Society, has been recently printed by the Smithsonian Institution.

THE FAIR OF THE AMERICAN INSTITUTE.

After a successful exhibition, the fair has closed. The display, remarkably good in the early weeks, improved as tardy exhibitors gradually added their contributions, until, during the closing days, every available foot of space was filled with a variety of articles certainly exceeding in interest, if not in numbers, those presented at the fairs of several preceding years. The venerable Institute, we think, needed the new life which evidently has been infused into it, to rescue it from the state of respectable fossilism into which it was rapidly lapsing. Its fairs, herefore, have been conducted more on the principle of advertising a few steady exhibitors, and furnishing a chronic yearly grievance for a very large number of others, than as an instructive and attractive exhibition for the general public. The energy which has characterized the management of the fair just over has worked a great change for the better; and since the favor of the public has been courted by means well calculated to win the same, it is to be hoped that the substantial rewards thus fairly merited have been received.

During our last stroll through the building, we noted a few novelties which have recently been added. Of these, we give brief descriptions below: Captain J. B. Stoner, of life-preserving-suit fame, exhibits three huge models of

FLOATING LIGHTHOUSES

or telegraph stations. These are large floats made in different ways, some being tanks, others being stages supported on buoys. It is proposed to moor these in deep water, and to connect them with the submarine cable, so that ships reaching them during their voyages may be able to transmit intelligence to their owners or consignees. A superstructure of light and strong construction is raised on the floats, and is suitably built either for a lighthouse tower, fog whistle, or any other purposes desired. Whether these peculiar craft can be moored at sea so as to withstand heavy weather is questionable; but it seems that the system of large floats with houses built on them might serve better for hospital purposes than the old hulks which have been devoted to that end in the Quarantine Station near this city.

A NEW PIN

is exhibited, which will become quite popular, we think, for many purposes, on account of the impossibility of its working out of the fabric in which it is placed. It is made of a piece of ordinary wire sharpened at both ends. One extremity is then turned down and wound spirally for a couple of turns about the shank. When the pin is inserted, a slight twist given to the bent end causes the sharp point on the spiral to catch and enter in the cloth. The inventor has not only devised the pin, but some very ingenious machinery for its manufacture. One apparatus cuts off the wire, sharpens the ends, and throws the piece into a hopper, whence it passes into another machine which produces the spiral. The rate of production of the pins is about 200 per minute. Mr. R. W. Huston, of Brooklyn, N. Y.. is the inventor.

We mentioned, last week, the

MINERAL WOOL

made of blast furnace slag, which a mistaken foreign contemporary announced as a new German invention. Specimens of this material have been exhibited at the fair, manufactured under the Player patent, granted in this country in 1870. The wool weighs about 30 pounds per cubic foot, and is sold at 2 cents per pound. It costs about 5 cents per square foot of surface, 1 inch in thickness. It closely resembles genuine wool, but is of much shorter fiber, and is somewhat gritty. From a report of tests made by a committee of the Franklin Institute, we learn that, when used as felting, the mineral wool retains heat somewhat more than one tenth longer than common felting. The material is entirely indifferent to dampness and fire, and does not decay.

A NEW CESSPOOL

is exhibited, in which the novel feature is a stirrer, shaped like a propeller blade, and placed horizontally near the bottom. It is mounted on a vertical shaft, which terminates in a crank handle above. During a rainfal, when water is escaping rapidly through the sewer pipe leading out of the cesspool, the crank is turned first one way and then the other, until currents are established in the mass, when the latter is carried into the sewer. It is stated that, by this means, cesspools can be rapidly and effectually cleansed, without manual labor.

A CAPPING MACHINE,

for affixing the metallic caps to jars, is a useful invention for druggists, grocers, and others who put up large quantities of bottled goods. The cap is placed in position over the cork, and the top pressed against a die, which, being supported by a spring, yields, allowing swiftly revolving smoothers to act upon the cap, behind the rim of the bottle mouth, and press it neatly in place. Various sizes of dies are used for different bottles. A gross of caps are easily attached in about fifteen minutes.

ARTIFICIAL HONEYCOMB FOUNDATIONS,

prepared by Mr. John Long, a well known apiculturist of this city, are a novelty, and one which, it seems, may be productive of considerable economy in the cost of securing honey for the markets. It has been estimated that the actual cost of a pound of comb is equivalent, at least, to that of twenty-five pounds of honey; and beekeepers cannot, without considerable loss, afford to melt down any combs that can be used to advantage. Mr. Long makes comb foundations of pure bleached wax, and from these the bees raise their cells on an amount of feed which ordinarily would not induce them to build comb at all. The foundations, it is said, make white delicate guides. They are very easily fastened in the boxes, and honey stored in them has been shipped long distances without damage either through leakage or fracture, and the bees seem to like the improvement. Thus even the honey bee has become the patron of a patented invention.

SCIENTIFIC AND PRACTICAL INFORMATION.

FERMENTATION FROM INORGANIC SUBSTANCES.

M. Mairet communicates to the French Academy of Sciences a curious experiment which, from the extraordinary result, leads to the belief that either the author has failed to take into account some circumstances not noticed, or else that a discovery of importance, worthy of further and careful investigation, has been made. He says that he mixed acetate of potash, nitrate of potash, and phosphate of soda together, all being in aqueous solution. At the end of a few days, the acetic acid appeared to be destroyed, nitrogen was disengaged, and the liquid contained only carbonate of potash and phosphate of soda. The action may be compared to a sort of fermentation in the case of the acetate, and more especially since it was accompanied by the development in the liquid of a glassy substance, similar to that which sometimes accompanies the fermentation of sugar.

GAS FROM DEAD ANIMALS AND SEWAGE.

A process of making gas from dead animals, sewage, and other refuse, which recently received a very favorable report from a commission appointed by the authorities of Breslau, Germany, has been subjected to extended practical tests and proved a failure. The material produces less than half the gas than is evolved by an equal quantity of coal; it costs twice as much, and requires a special combustible; and the gas is so full of impurities as to render its purification both difficult and very expensive.

DISCOVERY OF TELLURIUM IN CHILI.

For a long time tellurium was found only in Transylvania but of late years deposits of it have been discovered in Turkey, and in Colorado and Nevada. Recently the element has been found in Chili in the shape of tellurate of silver or tellurate of lead.

THE ENGLISH 81-TUN GUN ECLIPSED.

According to the *Kölnische Zeitung*, Krupp is making preparations for the construction of a 124-tun cannon. This enormous gun will throw steel bolts weighing more than 2,200 lbs. each, and will require a load of powder weighing 400 lbs. It is estimated that the projectile will pierce at a distance of 3,200 feet the heaviest plates, of 23·8 inches thickness, now used on the English ironclads, and that its extreme range will exceed seven miles and a half.

A NEW ADULTERATION OF PORT WINE.

This new adulterant, unlike many others, is easily detected by non-chemists, and is in some cases dangerous, especially when partaken of by the feeble, delicate, and convalescent. It is an artificial coloring, which, Shuttleworth says, consists of a mixture of azalin and magenta red. The aniline colors, objectionable in themselves, are the more dangerous because they not unfrequently contain arsenic. The adulteration is detected by shaking the suspected wine (and all cheap wines are to be suspected) with an equal volume of amylic alcohol (fusel oil). If the wine is genuine port, the amylic alcohol remains colorless; but if adulterated, it dissolves out the coloring matter, and itself appears of a purple red color.

THE coarse long hair from the neck of an old chamois, if drawn between the finger and thumb from the root to the point, becomes positively electrified, but if drawn in the reverse direction it becomes negatively electrified.

A PIECE of wood cut from a tree is a good conductor; let it be heated and dried, it becomes an insulator; let it be baked to charcoal, it becomes a good conductor again; burn it to ashes, and it becomes an insulator once more.

R. H. H. send us the following recipe for staining light wood in walnut color: Take asphaltum varnish 1 part, turpentine 3 or 4 parts, linseed oil 1 part, and Venetian red ground fine in oil to suit. This will impart to light wood a good imitation of walnut, so that it can hardly be detected.