THE TWELVE THREAD PLUME BIRD.

This beautiful bird (*Epimachus albus*) was first brought into notice through the investigations of Rosenberg. It greatly resembles a bird of paradise, and might easily be mistaken for one. Its length is thirty-two centimeters, the wings sixteen, and the tail eight centimeters in length.

Around the neck is a collar, and there is a long cluster of feathers on the breast. The velvet-like feathers of the head, neck, and breast are black, changing into green and violet; the elongated feathers on the side of the breast are emerald green. The wings and tail are a beautiful violet color. The most remarkable feathers are the long, silken plumes at the side, the longest of which reach over the tail; six of the lower ones on each side are furnished with long, thread-like prolongations, about as large as a horse hair, which are golden yellow at the root, and the remainder brown. The eye is scarlet, the bill black, and the foot yellow.

In the female the under part of the neck, upper part of the back, and velvet-like feathers of the head are bright purple, the under part of the back, the wings, and the tail rusty brown. The whole under side is grayish white, or bright yellow brown ground, with small black diagonal stripes. The young birds resemble the female; as they grow older the neck becomes gray, at the next moulting they become yellow on the under side, and the clusters of feathers at the sides make their appearance; after the third moulting the elongated threads, which were straight, are curved outward.

Rosenberg says that a large number of mutilated skins of these birds are carried every year to Mangkassar and Tennate, but not a single collection in Europe has a perfect specimen. Until now all descriptions and pictures have been incomplete and incorrect.

During Rosenberg's stay on the island of Salwati, in the month of August, 1860, he was so fortunate as to obtain six of these incomparably beautiful birds.

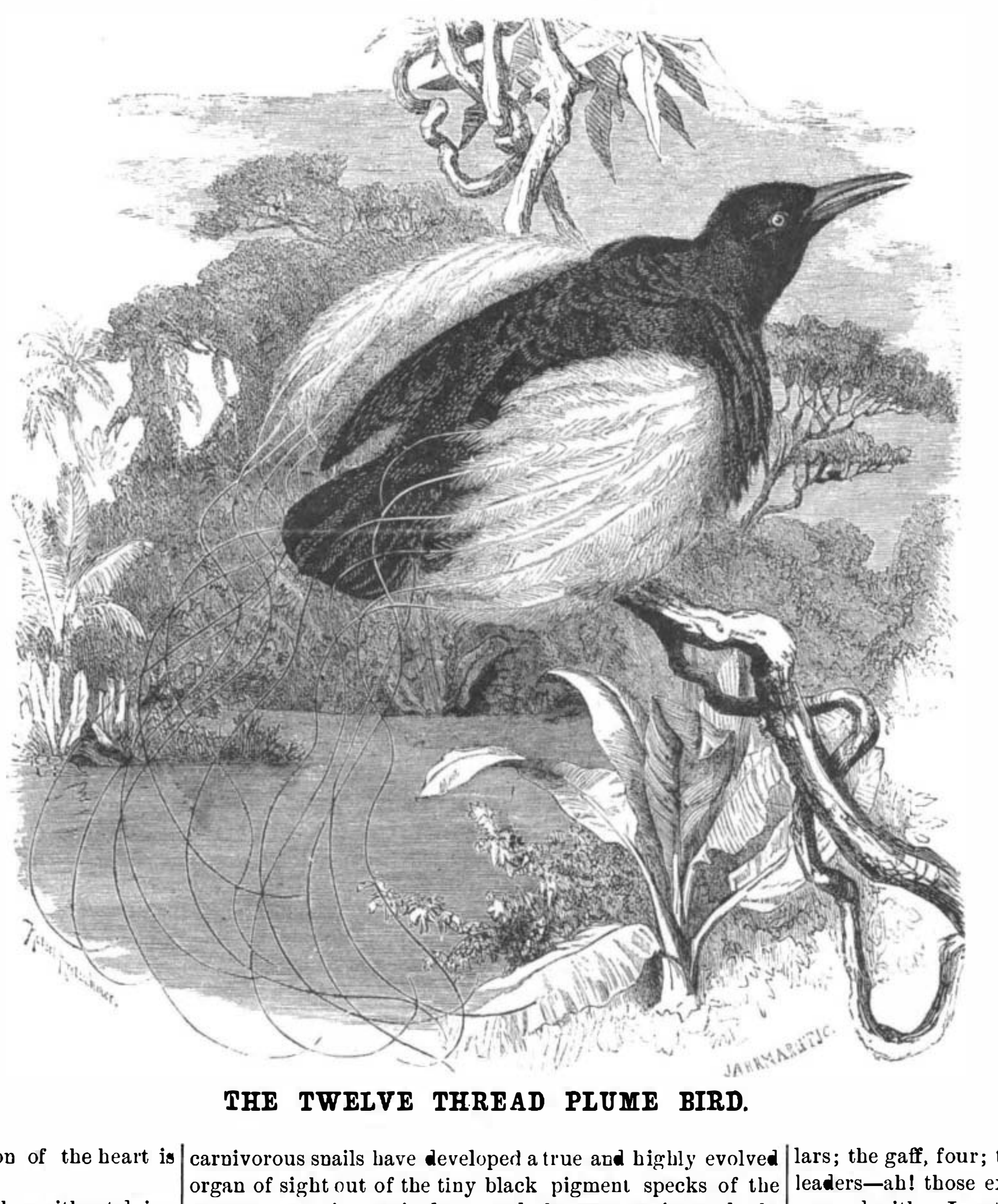
They live in small troops or families. They are natives of New Guinea and the island of Salwati. They prefer mountainous regions. In the crops of the dead birds Rosenberg found fruit mixed with the remains of insects.

At the brooding time the bird erects the feathers forming the collar, and opens the elongated side feathers into a beautiful fan shape.

According to Wallace, these birds visit trees in bloom, especially the sago palm and plantain, in order to suck the nectar from the flowers. They rarely stay but a moment upon one tree; their large feet enable them to climb quickly around among the blossoms; then they fly with great rapidity to another tree.

Wallace asserts that the dead birds that he examined had a brown juice in their crops, resembling the nectar of flowers. An imprisoned bird of this kind ate eagerly moths and melons.

Nothing is known about their nest or eggs.—*From Brehm's Animal Life.*



THE TWELVE THREAD PLUME BIRD.

Curious Facts about Snails.

In a native state, snails generally live about two years, though they often go on living for much longer periods. Every autumn, as the cold weather comes on, they grow torpid, and retire to a hole in the ground or in the rocks, where they hibernate just like bears or dormice. In the hibernating condition they sleep very profoundly, only breathing to a very slight extent, while the action of the heart is all but entirely suspended.

Snails will sleep away whole years together without dying when in their torpid condition. A writer in the *Gentleman's Magazine* mentions a case in which two garden snails remained alive, fastened by their own mucus to a wall, with no food or drink for thirty-two months at a stretch; and an instance has been recorded where a desert snail from Egypt passed four years under similar circumstances, gummed to a card in the British Museum. Even during their most wakeful periods snails breathe in a very slow and leisurely fashion. If you watch a garden snail for a few minutes, as he walks deliberately along the top of a brick wall, you will see him every now and then lazily open and shut a sort of hole or gap on his right side, which gives him a queer, yawning appearance.

This hole is really the mouth of his lung or pulmonary chamber—about as simple a form of breathing apparatus as any to be found in the whole circuit of the animal kingdom. It consists merely of a sac or hollow in his body, with a mouth that can be irregularly opened and closed at pleasure, but without any mechanism for respiration, that is to say, for inhaling fresh air and expelling the superfluous carbonic acid. The veins are merely disposed around the walls of the pulmonary chamber, and whenever the animal opens the little gaping mouth a fresh stock of the pure outer atmosphere is taken in, exactly in the same way as when we air a room by opening a window. The snail then keeps this air inclosed in his simple lung till his blood has absorbed all the available oxygen and replaced it by carbonic acid, after which he once more opens the mouth and allows the air a second time to renew itself by mere atmospheric diffusion. The effect is just the same as if we ourselves were merely to open our mouths every three minutes or so, and let the air get in of itself, without breathing in any way. Of course such a rudimentary type of respiration is only possible in a very inactive and sluggish animal. Active creatures require much more oxygen to keep the internal fires burning brightly, and the engine working up to full vital speed. Garden snails crawl by means of successive expansions and contractions in the broad muscular under surface of the body, technically described as the foot.

As the snail walks, he keeps pushing out in front of him four curious retractile feelers or tentacles, commonly called his horns. Two of these horns are long, and two short, the longer pair being the upper ones. Both can be withdrawn by being turned inside out, like the finger of a glove that is pulled off backward. At the end of the long pair of tentacles are two small black spots, the eyes, which are very rudimentary in the garden snail, and apparently only possess the power of distinguishing light from darkness, without any distinct vision for shapes or colors. This is a very interesting fact from the evolutionary point of view, as the highest marine shell fish belonging to the same group, such as the strombs or wing whelks, have in the same position well developed eyes, as perfect as those of many fishes, with a full complement of retina, crystalline lens, aqueous humor, and vitreous humor, exactly as in the human eye. The regular gradation and similarity of position show that these marine carnivorous snails have developed a true and highly evolved organ of sight out of the tiny black pigment specks of the common creeping univalves, and the process is no doubt largely connected with their extremely active habits, and their singular power of jumping through the water by successive bounds or leaps.

It has long been noticed that the eye is always most highly developed in the most locomotive animals, and almost or completely wanting in the most sedentary. The converse side of this principle is well exemplified in the oyster, the young fry of which, during their early locomotive stage, have a pair of distinct black eyes to guide them in choosing their future home; but as soon as they settle down for life on some ledge or bank in complete laziness, the eyes die away, and the animal passes the rest of its existence in complete and contented blindness. The eye stalks and eyes of snails possess the faculty of reproduction, after accidental injury, so common among the lower animals. If the tentacles are cut off with a pair of scissors, they will grow again in about a fortnight. This habit of reproduction seems to depend, as Mr. Herbert Spencer has pointed out, on the same principle as that which governs growth and development. The entire animal shape is the one which satisfies the natural polarities of the units which compose it; like a broken crystal, the animal tends to restore its own original and normal form by the inherent physical attributes of the parts which go to make it up. As the snail walks about he keeps pushing forward and withdrawing his horns, in proportion as he finds his way clear before him or otherwise. The manner in which he does so shows at once that he depends almost as much on touch as on sight to guide his slow and tentative movements. He can, however, hear a little, for he has a sort of rude ear, with a tiny calcareous pebble or otolith, suspended in it, near the base of the tentacles. He can smell, too, and there is no doubt that by smell mainly he is attracted toward the particular food-stuffs that please his vegetarian palate.

All snails are hermaphrodite, that is to say, each individual is at once male and female, but they pair together like ordinary sexual animals. One tropical Brazilian snail lays an egg as big as a pigeon's, covered externally with a hard calcareous shell. The garden snail, in his younger days, is mostly devoured by thrushes and blackbirds. He has comparatively few other enemies, except toads, who eat him freely, and hedgehogs, who are not averse to him while his shell is still soft and easily crushed by the small teeth of his nocturnal aggressor. The smaller kind of snails are less protected, and are much more largely eaten both by birds and by the lesser quadrupeds. Even the glow worm is a great snail eater, living as a rule off this kind of food alone. The big Roman snail, on the other hand, has too stout a shell in his adult state for almost any ordinary bird or mammal to masticate readily, still he falls a victim, in Southern Europe at least, to the culinary tastes of man himself; for the *escargot* is a favorite dish with French *chefs*, and in the market place at Toulouse large basketfuls are exposed for sale every day. They are dressed with melted butter in the Paris restaurants, and should be tasted by every amateur of novelties in cookery. The Roman snail has even, in Southern Europe, a medicinal value. French doctors prescribe *sirop d'escargots* largely for pulmonary complaints, and the mucus is supposed to be an excellent substitute for cod liver oil.

An Outfit for Salmon Fishing.

"Old Izaak," of the *American Angler*, having received an invitation to join a party salmon fishing next summer, and not being able to buy a whole outfit, commenced by making his own flies. He had been out of practice for a year or two, but after completely spoiling a dozen got his hand in and succeeded tolerably well: though the flies he made were not as beautifully and artistically tied as those offered for sale, they were made sufficiently strong, and could not be pulled or snapped off. This part of the outfit was therefore the least expensive. Our old angler wanted to be provided with first-class tools to work with, and could not afford to buy what was needed.

He had a Newport split bamboo bass rod, which it was thought might answer as a foundation for a salmon rod. This rod he had put together himself, having procured the ferrules, mountings, and the bamboo strips from a dealer; he also had an extra long and stout bamboo tip, and sent the rod with the tip to the dealer, requesting him to make an extra joint same length as the tip. It came back, *not* a perfect salmon rod, but such as he could cast a long line with, and handling it feel a confidence of killing any fish he might be fortunate enough to hook.

Being well fixed for rods and reels, he went on completing the outfit. "And now," he says, "comes the expensive part. The line cost ten dollars; the gaff, four; the wading pantaloons, fifteen; the gut leaders—ah! those expensive little traps I have only commenced with. I got samples from several dealers, costing from seventy-five cents (worthless affairs) to the nine foot single gut, for which I paid two dollars each. They are warranted to stand a test of seven pounds strain. One hank of salmon gut cost four dollars; one dozen of sample flies, six varieties, cost seven dollars; head net and mosquito bar, three dollars; rubber blanket, four dollars; and heavy blue blanket, six dollars.

"Now, there are a number of knickknacks yet to be secured; but this will suffice to give the angler some idea of the cost of a salmon outfit of very moderate and economical proportions. But if you wish to dance a hornpipe in a rapid river with a long, heavy rod held aloft, with the butt resting against your stomach, and a fifteen or twenty pound salmon dancing Juba and jumping Jim Crow at the end of your line, while the perspiration rolls down your face in streams, and mosquitoes and black flies are playing their distresses to you, and you think it fine fun and glorious sport, just do it like a man, and never mind the cost, provided you bring the fish to gaff. Truly, getting your tackle and traps ready, and the anticipations, are not the least enjoyments of the angler, and the great consolation is given, even to the grumbler, that once outfitted, you have never again (provided you know how to care for tackle) such an expense to undergo. Life is short, and we have but one life; the angler is the true philosopher, and gets all the good out of life he can; because he more than any other knows how to do it."

Sulphuric Acid.

As we all know, this acid is one of the most commonly used for technical purposes; it also forms an important part in the chemical department as used in dye houses, print works, and the manufacture of dyes. The large and constantly increasing consumption renders it necessary that, at least for many purposes, it should be of a comparatively pure nature. Ingredients which happen to be found in sulphuric acid, during the process of manufacturing, may not be of any consequence for some purposes, but will for others. In the dye house and color-mixing room it is required that the acid used should be of some degree of purity. It should not contain any arsenic, sub-nitric or sulphurous acid, nor any chlorine; which ingredients may, more or less, act injuriously on the colors.

For the preparation of indigo paste we require, without doubt, a product which should be entirely free from the above ingredients; and although manufacturers may wish to deal fairly with the consumer in every way, it may sometimes happen that one or more of the above impurities are found in it. Without special test they cannot be detected, and it is only found when color and dye are injured by it; that is, when it is too late. It is, therefore, advisable to always test purchases of sulphuric acid for their purity, and get convinced that it is in such a condition that it will not injure the product to be made. A simple test is for this purpose of great advantage, and the following method will be of some use in places where no chemist in employed:

A small portion of the sulphuric acid is evaporated on a platinum sheet, which is subsequently brought to a red heat. Good sulphuric acid should not leave any residue; if there is any, it is generally sulphate of potash, or soda, or even lead. These are derived from the manufacture, and cannot be classed among adulterations. We may say here that on account of the cheapness of the sulphuric acid it never is willfully adulterated, but *may* contain many foreign ingredients.

A little sulphuric acid is diluted with water and a few drops of concentrated muriatic acid added; if the solution, which was clear before, becomes milky, it indicates the presence of lead, which can be more safely identified by letting a current of sulphureted hydrogen gas pass through the liquor. If lead is found in sulphuric acid, it will be a means of trouble in darkening and injuring delicate shades of any color.

Another ingredient which is often found in sulphuric acid, particularly such products as are made from pyrites, is arsenic. For the manufacture of indigo paste, which requires much sulphuric acid, it is especially required that the acid be entirely free from arsenic, and also nitrous acid and sub-nitric acid. Arsenic is detected by the so-called Marsh test. If mixed with water and granulated zinc, hydrogen gas is liberated, which should not contain any trace of arsenic. The hydrogen gas is ignited, and the flame allowed to strike a cool porcelain plate, on which, if arsenic is present, metallic arsenic is deposited.

Sub-nitric or nitric acid may be detected by throwing a small piece of copperas in the questionable acid; if it shows a brown coloration where it touches the liquid, the presence of the above impurities is indicated.

Chlorine or muriatic acid, also injurious for many purposes, is detected by adding a few drops of nitrate of silver into the diluted sulphuric acid; a precipitate or a milky appearance of the mixture shows the presence of chlorine or muriatic acid.

Sub-nitric acid, derived from the manufacture, is shown by adding iodide of potash and starch mixture to the sulphuric acid; a blue coloration shows sub-nitric acid.—*Oil and Colorman's Journal.*

Red Sunsets and Precipitation.

The readers of the scientific journals have no doubt observed that the prevailing explanation for the red sunsets and colored sky, during the past few months, is that of chromatic diffusion of light by volcanic ash particles. There are some apparent incongruities as pointed out by Prof. Proctor and others, but we believe that the established physical laws will permit a satisfactory solution to the phenomena, assuming volcanic matter as the cause.

The object of this article is to notice what seems to the writer as a probable connection between the conspicuous sunset colors and the excessive cloudiness and precipitation during the last month or six weeks. Let us amplify the "ash theory" somewhat, and briefly mention the more important points to serve as a basis for our secondary considerations. Matter ejected from volcanoes of such proportions as the recent eruption assumed must become finely divided, in much the same manner as water is reduced to spray in being discharged with great force from a nozzle. When thus discharged into the atmosphere it will obey, approximately at least, the laws of detritus in water; it will be transported proportionately to sixth power of the velocity of air currents, and it will tend to become stratified, the larger particles forming the lower, and the finer particles the higher, strata.

With this distribution of particles varying in fineness from those capable of taking up and diffusing the red rays to those capable of diffusing the other respective parts of the spectrum, it is easily seen that the observed phenomena would result. Thus, during the middle of a clear day on looking toward the sun we see a white or yellowish diffused light, resulting from the nearly equal intensity of the different parts of the spectrum; but at sunrise or sunset, as the sunlight comes more obliquely to the observer, the red and orange colors predominate. On looking into the higher strata we observe the green, and near the meridian, or to the part of the heavens opposite the rising or setting sun, even the rich violet.

With regard to precipitation, we must recognize M— Aitkin's discovery and theory, viz.: that clouds and oth forms of precipitation occur by virtue of the solid particl of matter suspended in the atmosphere serving as nuclei upo which the aqueous vapor is condensed. The supply of th solid matter in the aggregate is nearly uniform, but if a excess occurs from any cause we should expect a larger pre cipitation for the same hygroscopic state of the atmosphere This conclusion, we believe, has been verified during the pas two months in meteorological observations. It might be argued that the cloudiness and rain have not been evenly distributed, as would be expected if caused by the settling of the ash particles. But in what has been said no regard is taken of the various causes for an unequal distribution of the matter and the common conditions governing storms. We should expect weather records to show the greater precipitation in regions where the sky colors have been most conspicuous. The writer has no data for verifying this, however.

The above is advanced rather as a suggestion than as an exposition, with a hope that it may stimulate a more exhaustive study of this connection, if such connection there is. W. H. HOWARD.

Fresh Paint.

The current belief among householders that the smell of fresh lead paint is noxious is founded on pretty general experience, but is opposed by the belief, equally current among chemists, that lead compounds are not volatile. A fact recently brought to our notice seems to support the domestic theory. The basis of the useful and popular luminous paint is known to be sulphide of calcium. Now, this compound, when unprotected by varnish, glass, or some other impervious substance, is slowly acted on by the acids of the air and sulphureted hydrogen is evolved, which blackens lead paint. This is well known, and can easily be avoided by proper protection of the paint. But the curious thing is that unprotected luminous paint is found to be perceptibly blackened by the fumes from fresh lead paint. There seems to be only one possible explanation of this—namely, that a surface freshly covered with lead paint does actually emit some volatile compound of lead. We believe that many physicians could confirm this view from their own observations in regard to newly painted houses.—*Lancet.*

Preparing Liquid Carbon Dioxide.

The usual Amherst experiment, as an illustration in the lectures in chemical physics, of condensing carbonic dioxide, by the Thiloreir apparatus, was this year "written up" by an enterprising reporter, in a style which Professor Pond says is in the main correct as to the facts, although it is decidedly sensational. The experiment has been regularly conducted at Amherst for twenty years, and although laborious and troublesome, is not considered dangerous, but the reporter says:

"So difficult and dangerous is the undertaking by this process that it is forbidden by law in all countries except the United States, and probably Amherst is the only college where it is undertaken. Two iron cylinders are used, one the generator, the other the receiver. They resemble howitzers fitted with strong iron bands and peculiar valves. Bicarbonate of soda and sulphuric acid are placed in the generator in such a way as not to mingle until the cylinder is securely closed. The union of the substances generates carbonic acid gas with terrific pressure (being about a ton to every four square inches), and this passes into the receiver, which is packed in ice and salt. The process is repeated twelve times, until the gas in the receiver is forced by pressure and cold into liquid form. When this is allowed to flow out it evaporates so rapidly that it forms a solid, snow-like mass, having the surprising temperature of 140 degrees below zero. Mercury poured upon it freezes instantly, and the effect of touching it is about the same as handling a red hot coal. The great danger in the experiment arises from the tremendous pressure—and thus the liability of a bursting cylinder."

Solid carbon dioxide evaporates without melting, for its melting point is —85° Fah., and its own evaporation keeps it at —125° Fah. So cold is it that, with prompt handling, even mercury in a red hot platinum dish may be frozen solid by solid carbon dioxide in ether.

Metallization of Wood.

Rubennick's process steeps the wood in a bath of caustic alkali, for two or three days, according to its degree of permeability, at a temperature between 164° and 197° F. The wood is then placed in a second bath of hydrosulphate of calcium, to which is added, after 24 or 36 hours, a concentrated solution of sulphur. After 48 hours the wood is immersed in a third bath of acetate of lead, at a temperature between 95° and 122° Fah., where it remains from 30 to 50 hours. After a complete drying, the wood thus treated is susceptible of a very fine polish, especially if its surface is rubbed with a piece of lead, tin, or zinc, and finally finished with a burnisher of glass or porcelain. It then looks like a metallic mirror, and is completely sheltered from all the deteriorating effects of moisture.—*Les Mondes.*

Illuminated Bodies in Dusty Air.

In 1870 Dr. John Tyndall described the remarkable dark plane or dust-free space which rises from a hot body in illuminated and dusty air, and gave two explanations of it. Other explanations were given by Dr. Frankland, Lord
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layer is found to increase with the temperature of the body, becoming very thick at a temperature of, say, 100° Cent., but is very narrow for temperatures only a few degrees above the air. The authors have found the coat on bodies of various sorts and sizes, such as mica plates, pieces of copper, zinc, carbon, selenite, potash, silver, chalk, and paper. These bodies were examined by inclosing them in a box filled with smoke of tobacco or ammonic chloride, the latter when a decidedly volatile smoke was desired. Magnesic oxide smoke was used when a non-volatile and incombustible smoke was required. The beam of an electric lantern was projected on the body. Professor Lodge also succeeded in obtaining the dark layer from the surface of an iron wire in water tinged with rouge. Glass gives a clear but thin coat; rock salt a wide one. The cause suggested by the experimenters is that molecular bombardment and gravitation both assist in producing the plane; the dust particles being driven away from the hotter surface of the body. It is interesting to remark in this connection that Mr. Aiken, who will be remembered for his researches into the cause of fogs, recently read a paper to the Royal Society of Edinburgh on similar phenomena, and he shows that a room heated by a stove will get smokier and dustier on the walls than one heated by a fire, because the air is hotter than the walls in the stove heated apartment, and the walls are hotter than the air in a fire heated room.

Shifting of the Mississippi Channel.

Capt. Marshall, of the U. S. Engineers, on the Mississippi River Commission, in charge of its improvement a short distance below the Arkansas line, reports that at Mayersville chute there has been a surprising change within the past year. He says: "A pile five feet longer than the rest, marked to indicate the front of the dike at high water, still remains standing upright and firm, but it has traveled 62 feet down stream erect and firmly embedded in the sand. Such cases have been reported heretofore, but not credited by me. This case I observed myself. It can only be accounted for on the supposition of a bodily movement of the sand foundation."

The many and great changes known to have taken place in the channel of the Mississippi within a comparatively recent period may, in connection with such records from authentic surveys, give us better means of carrying out the further improvements contemplated in the river channel, or, at least, give a clearer apprehension of the difficulties in the way. "It would seem," says Major Harold, one of the officers of the Commission, "as if all the material in the trough or bed of the river was in motion like an Alpine glacier, which, although a solid river of ice winding through the rocky ravines of the mountains, has an actual progressive motion. We may suppose the mud and sand which make up the deposit is undergoing bodily translation, like a glacier. In no other way, as it appears, can this pile, maintaining its solid hold in the mud and sand and its perpendicular position, be accounted for."

Mortality among Fishes.

A correspondent says the quotation from "Mr. Charles Hallock, a fisherman of repute" in relation to this subject in the SCIENTIFIC AMERICAN of February 23, 1884, appears to convey the idea that air is absolutely necessary to fish to enable them to live. He cites pickerel as "more subject to mortality from this cause (absence of air) than others." It is to be demonstrated that pickerel require more atmospheric air than hibernating fish—or rather, that they require air in winter any more than other fresh water fish. Their voracity impels them to seek food at all times, and the attraction of a live bait through the fisherman's hole in the ice probably has more to do with the pickerel's approach to this hole than has his desire for air.

When I was a boy I carried home a block of ice cut from the lily pads in an adjacent pond in which was frozen a half grown pickerel. The ice was put in my mother's wash tub in the kitchen and gradually thawed. When it thawed the pickerel was as lively as he ever was, and was apparently waiting for breakfast.

I bought three frozen pickerel at a market a few years ago. Either one would probably have broken in two, like a glass fish, by pressure or a blow. Placed in cold water that night, in the morning one of them was as frisky as though just out of his sunny or shady resort. Evidently in each of these instances the fish did not languish for atmospheric air.

Phylloxera in Portugal.

Accounts from the Oporto wine growing districts state that the phylloxera is causing such devastation there as to threaten the very existance of the vineyard.

The Trade Schools of New York.

A reporter of the *Evening Post* lately paid a visit to the New York Trade Schools, an institution of which comparatively nothing is known, considering the importance of the work accomplished and its interest to every intelligent person in the community. Walking down Sixty-eighth Street from Third Avenue toward the East River, one sees, blocks away, the bright lights from a row of neat one-story buildings, which, after dark, give a cheerful appearance to a rather desolate neighborhood. These are the shops of the Trade Schools. The whole frontage on the east side of First Avenue between Sixty-seventh and Sixty-eighth Streets is occupied by the shops, unpretentious but well built one-story structures, with large windows on every side, from which at night the brilliant light within streams forth. From the street the buzz of many men at work can be heard. These trades schools of New York, not yet four years old, are the first serious and successful attempt to remedy an evil due directly to the selfish and mistaken policy of the trades-unions of this city. In order to limit the production of good mechanics, the trades-unions, almost without exception, have made rules prohibiting employers from having more than a certain number of apprentices irrespective of the number of workmen they may employ. Thus a "boss" carpenter or builder may not have more than two apprentices at a time, whether he employs one man in his shops or one hundred. A plasterer may have two, a stone cutter may have three, a bricklayer may have two, and so on through the whole list. In some trades boys are a necessity, as in plumbers' shops, each man requiring a helper, who in course of time becomes a full fledged workman. The tailors put no limit to the number of apprentices an employer may have, but very few American boys want to learn that trade. In consequence of these arbitrary rules, thousands of New York boys grow up without the knowledge of a trade, and the places which they ought to take are filled by foreign workmen. The number of apprentices allowed to the bosses by the unions, even if all apprentices become good workmen, would be wholly insufficient to supply the demand for good mechanics. Protests against these rules have been found useless, and violations of them have been followed by strikes. To mention but one instance in illustration, John J. Tucker, one of New York's oldest and best builders, employing more than one hundred men, dared, two years ago, to take into his employ a third apprentice. The boy was a bright young fellow, and pleaded so hard for a place in the shop that Mr. Tucker took him in. The next day one of the walking inspectors of the union informed him that the boy must be discharged, as there were already two apprentices in his shops. Protests proved unavailing, and rather than submit, Mr. Tucker allowed his union men to take their tools and go. Since that time he has gone on in defiance of the union. Where one employer has determination enough to break with the unions, scores are either unwilling or unable to do so. Contracts are frequently made by which the contractor is subject to penalties in case of delay; strikes are therefore so costly and dangerous that almost any rule of the union, no matter how unjust, will be obeyed. The result has led to idleness among young men, scarcity of good workmen, and the necessity of importing foreigners who already know their business.

The trade schools were founded to supply what the unions refused. To do passably good work as a bricklayer, or a plasterer, or plumber requires usually an apprenticeship of several years. Much of the time, however, is taken up in labor which pays the employer, but teaches the boy nothing. He is not allowed to handle the tools of the trade, or do any actual work except at odd moments: if he is bright, and watches the workers carefully, he may become a journeyman in two or three years, but the dull boy has no opportunity whatever, and the hod carrier remains a hod carrier as a rule and does not become a mason, simply because he lacks ambition to pick up the knack of handling a trowel in spite of the opposition of the masons to whom he brings bricks and mortar. The same rule applies, in a modified aspect, in all other trades. A systematic attempt is made to keep boys from learning to become competent workmen.

It occurred four years ago to a New Yorker who had the good of the community at heart, and abundant wealth to carry out a far-reaching scheme, that bright boys and young men could, under competent instructors, obtain the knowledge and knack of trades which the unions denied them or which they had no opportunity of obtaining, by devoting a few hours every week to the actual practice of the trade they wished to learn. A few hours a week may be more actual instruction than a young apprentice can get in the shop where he is employed. The expectation is not, and never was, to turn out first class mechanics as the result of three evenings' work a week for five months of the winter; but in that time a young man who is industrious can learn enough of whatever trade he chooses to handle the tools intelligently and to do work which will compare favorably with that of other young journeymen. He will do good enough work to get at least living wages, and thus obtain a chance to perfect himself in the trade by daily practice.

The first building entered by the reporter was the bricklayers' school, a long, brightly lighted shop in which more than twenty young fellows were at work, each building his particular piece of wall or arch for that evening. Each had his own tools, his mortar board, and his pile of bricks. A first class mason employed by the school went from one worker to another, giving a direction here, a hint there, or showing how the work ought to be done. The men, most of them about twenty years of age, worked quickly and handled their tools with a thoroughly workmanlike knack, tossing the bricks, knocking off pieces to make them fit, laying the mortar and pointing the points with neatness and without the slightest awkwardness which might be expected in beginners, the truth being that these young fellows in their few months of practice three evenings a week had had more actual bricklayer's work to do than a regular apprentice at the trade gets in a year. These lads were as fine a lot of young workmen as could be wished for—bright, quick, and eager to make the most of their time; and the same may be said of the men in all the shops of the schools—167 in number this night. In the bricklaying shop the men work on Monday, Wednesday, and Friday evenings, from 7 to 9:30 o'clock, beginning on November 4 and ending on April 4. The instruction given covers all the ordinary work of a competent bricklayer—building piers, arches, flues, fire-places, setting sills, lintels, etc. The terms are $3 a month or $12 a year, and the pupil must not be younger than seventeen years or more than twenty-five. Exceptions as to age are made, however, in particular cases. Every one of the young men at work on Wednesday night had his living to make during the day, and came there at night to pay money for the privilege of learning a trade.

The plastering shop was next visited. A word should be said as to the admirable lighting of the shops. Gas is used unstintingly, and every shop is as bright and cheerful a place as can be imagined. The plastering shop was begun last autumn at the request of some of the men who had learned bricklaying in the schools, and having secured daily work as bricklayers, were eager to learn plastering in order to have employment in winter. Fourteen men were at work in this shop hard finishing the walls of small rooms built on purpose. Each man had his own room to finish complete, from the scratch coat to the hard finishing and running the cornices. The men pay $5 a month.

In the stone cutting shop, half a dozen young men, who paid $3 a month for the privilege, were hammering away at brown stone, and a creditable piece of stone frieze with elaborate carving and mouldings was nearly done at one side of the room. In the pattern making room the parts of a steam engine were under way, the men working from drawings set before them. Adjoining this is the carving shop, where the work is pretty enough to attract any one, and in fact one of the workers was a clerk who was learning the art as a recreation for the evening after a day's work over his ledgers. A comment as to the neatness and beauty of the carving tools called forth the remark from the gentleman to whose energy and thoughtfulness the whole enterprise is due, that in the three years of the schools' existence, there has not been a bit of wanton injury done to the building or its tools—not even a pencil mark on the walls—and no profane language ever heard. Next to the carving room is the fresco-painting department, where a dozen young men were found at work upon designs for ceilings, from the straight lines of the beginner to the most elaborate color designs. The instructor is a painter recommended by the Messrs. Marcotte, and has done excellent work.

The plumbing shop was the last one visited, and proved to be one of the most interesting. More than thirty young fellows were at work at what is technically known as "wiping joints," that is, joining two pipes with melted lead. The instruction in the plumbing shop is practical on two evenings of the week, and scientific on the third. The practical instruction includes dressing pipe, making lead joints, wipe joints, sand bends, lead safes, fitting up baths, basins, boilers, sinks, wash tubs, water closets, etc. The scientific instruction is upon the proper arrangement of service and water pipes, and upon drainage and ventilation. Many of the pupils of this class are helpers during the day in city shops, and thus get a chance in the evening of doing the work themselves which they see others do during the day. Each man has practical work to do: he has his plumber's furnace and lead pot in front of him, the heat being furnished by Bunsen gas-burners. Upon the charts and blackboards are cuts showing the arrangement of different systems of pipes for boilers, water-closets, ventilation of traps, etc.

A boiler and sink fitted up with elaborate arrangements for hot and cold water, all done by the young men of the schools, took a prize for workmanship at the last American Institute Fair, and it ought to have been mentioned that the building occupied by the bricklayers was put up by the pupils last autumn, and is an excellent specimen of brick-work.

In the pleasant office of the schools some details as to the history and working of the institution were learned. The trade schools were opened in 1881 with an attendance of thirty-three. In 1882 the season began with eighty, and this year with 207. About one-third each year find the night work too hard, or that the occupation they fancied is uncongenial, and drop off. Three of the classes this winter, the bricklaying, plumbing, and plastering, are full, and bonuses have been offered of $15 and $20 for the privilege of joining. This spring additions will be made to the buildings, which will give room for 350 young men in the different workshops. The schools were not intended to serve the masters or to oppose the unions; they simply give young men a chance to make a fair start in the world. Union men have brought their sons to the schools and paid their fees. Although some manifestations of hostility were shown at first, there have been signs of a friendly feeling from the unions this winter, and some of the teachers are union men. In reality, these and similar schools would bring up mechanics and relieve journeymen from the competition of cheap unskilled labor. It would seem better to teach young men at home how to work than to send to Europe for skilled labor.

As an example, last spring seventeen young bricklayers, between eighteen and twenty-five years of age (their portraits hang in the office of the schools, and they are as creditable looking a lot of young men as any city could turn out), left the schools. Fourteen have been heard from, one of whom died. Of the thirteen, eight found work in different country towns at wages varying from $1.25 to $2 per day, and four got work from a non-union builder in New York. All of these young men received wages varying from $3 to $4 per day in the autumn. One went directly to Chicago, where he knew no one and had never been before. He asked the foreman on a building if he wanted a bricklayer, and was set to work at $4.50 per day. He joined the union, and received those wages until winter. He has now begun business in Chicago as a contractor on the money he saved. This, of course, is an exceptional case. Still, what one can do others can do.

The 167 young men now at the schools come from all parts of this city. Quite a large delegation comes from Brooklyn, four come from Hoboken, one from Orange, N. J., one from Bergen Point, and one from Stapleton. They work at their different callings all day, and use their evenings in learning how to improve their condition in life. Giving up the evening to work after a busy day's labor, and paying from their wages for the privilege, and getting home late at night (for those who live beyond the city limits have from an hour to an hour and a half of travel, with its expense, before them). This means an amount of self-sacrifice and perseverance which promises well for their future.

The tuition fees received during the year about pay for the instructors' services and for the material used. The other expenses are met by the founder of the schools.

How to Tell Pure Loaf Sugar.

A correspondent asks the New York *Sun* the difference between the sugar which is sold in apparently smoothly cut lumps and other white sugar, the lumps of which are somewhat rough on their surfaces. "The difference is considerable, and the latter, which is pure loaf sugar cut into lumps, always commands a higher price in the wholesale market, and cannot be adulterated. It is called in the market 'cut loaf.' The former quality of sugar is what is known as 'cubes.' The cut loaf sugar is made in lumps of fifty pounds out of cane sugar, then sawed into slabs, and these slabs are partly cut through and partly broken. It is easy to distinguish the marks of cutting and breaking on each lump.

"The cube sugar is made of soft sugar and pressed in moulds, which gives the smooth appearance. The cut loaf sugar will keep its shape in any climate, and is suitable for shipment. The cube sugar will sometimes on a sea voyage resume the consistency of the soft sugar, and the change of form is due to adulteration.

"The safest sugar for any one to buy is pure loaf sugar, and it is much sweeter than any other. The principal substance used in adulterating sugar is glucose, which is sugar made from various vegetable substances, chiefly grain. While glucose is sweet, it is easily detected by the expert because it is not so sweet as cane sugar. It is, nevertheless, very extensively used to adulterate cane sugar and produce the cheap sugars which are sold in the market. Reputable dealers sell it as glucose, but there many dealers who sell glucose for sugar. The nature of the glucose is to make a close, sticky sugar; it does not produce grains, like cane.

"The polariscope readily exposes any adulteration of sugar, but there is need of some ready household test, by which housekeepers, who cannot afford a polariscope, can tell whether they are buying cane sugar or glucose. The glucose is not harmful as food, but its sweetening properties are limited. The official test of cut loaf sugar is 100 per cent. Other refined sugars in lumps do not always reach that test. At present the precise form of the genuine cut loaf sugar has not been counterfeited."

Invisible Wire.

Platinum wire has been drawn down so fine by Mr. H. F. Read, of Brooklyn, as to be invisible to the naked eye, although its presence upon a perfectly white card could be detected by the touch and could be seen with the aid a small magnifying glass when the card was h ld in such a position that the wire cast a shadow.

A small platinum wire, about No. 18, was inclosed in a close fitting tube of silver. The tube was made by taking a long and narrow sheet of silver, about one-twentieth of an inch thick, folding it over into a cylinder, and drawing down until the wire would just fit in it. This was then drawn down until the tube containing the wire was only as large as the original wire. A short length of this was cut off and incased in a second tube of silver, which was drawn down in the same way. This operation was repeated until the platinum wire had been reduced sufficiently in diameter. The last wire was drawn as fine as the dies would permit, when the silver coating was removed by an acid. During the work it was necessary occasionally to anneal the wire.

The resulting wire was in short lengths and had no strength. It was designed to be used for the cross wires in telescopes, its perfect opaqueness and fineness rendering it particularly applicable, but its extreme weakness made its handling almost an impossibility.