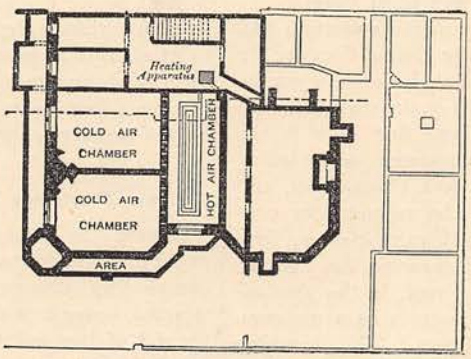
THE GATHERER.

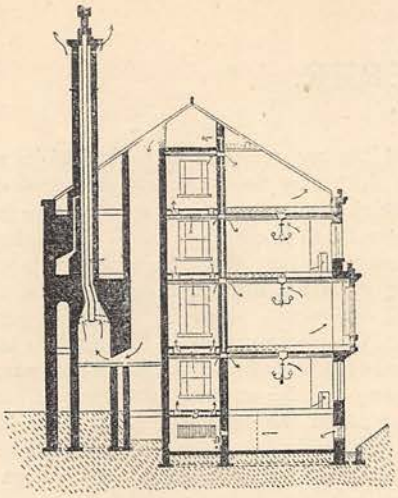
Ventilation without Draughts.

Although many of our villas are exceedingly pretty to look at, yet when we come to examine their plan of construction we see that they are not so airy, comfortable, and free from pernicious draughts as they might be. As a rule, the crannies of doors and windows are the only provision made in these buildings for supplying pure air to the rooms, and the chimney is the only vent available for the foul air, while every time the outer door is opened a cold blast enters the lobby and sends disagreeable draughts into the rooms which open from it. Architects are, however, beginning to turn their attention to hygiene, and medical men to the designing of houses, so that we may hope to see the residences of the future built in stricter accordance with scientific principles than has been the custom hitherto. Some excellent advice on the subject is to be found in a small book by Drs. Drysdale and Haywood; and it is satisfactory to learn that houses actually built upon the plans therein set forth, at Brighton and elsewhere, have successfully put the system to a practical test.



For a house to be healthy it should have a good supply of fresh air throughout all its chambers and passages. To insure this it is necessary to have an inlet for the pure air, and an outlet for the foul; but the inlet should not open directly into the outer air, because the incoming air should first be tempered before it is admitted into the rooms. All perforated bricks, gratings, &c., communicating with the external air are therefore to be avoided, so also are front doors opening into lobbies. Even second or inner doors do not overcome the evil, for they are often left ajar by servants while the outer door is open. The remedy recommended by Dr. Richardson is to have the entrance-hall and staircase separated from all the rooms by inner lobbies, which are thus kept free from draughts, and Drs. Drysdale and Haywood have adopted this suggestion in the form of a central hall, into which no outer door opens. There should be a general plan of ventilation for the whole house, else we shall have an uncomfortable inequality of atmosphere in different parts, and insidious draughts will be set up between room and room, or at the windows, chimneys, doors, and perhaps even out of the drains or cellars. The incoming air should be heated to about 65° Fahrenheit before being admitted into warm rooms; and the best way of doing this is by passing it over or through coils of hot-water pipes, for by this method it is not scorched or robbed of its moisture. These pipes may be situated in a special chamber, from which the tempered air can discharge itself into the central hall or corridor; but if this be large, or if the passages be long, it will be necessary to make the heating pipes run through them, otherwise the fresh air will cool again below 65° before it gets to the rooms. The primary inlet for this air into the house may be in the basement, at a place where pure air can be drawn; and the warming arrangement had better be situated on the basement also. The fresh air should preferably be allowed to enter the rooms from the central hall by apertures at the cornices. Being heavier than the foul air within the room it immediately begins to sink towards the floor, displacing the vitiated air, which rises by an aperture in the ceiling. Of course all other means of ingress for the outer air must be prevented by such means as valves in the chimney-throats, close-fitting windows, &c. The outlets for the tainted air of a room may be located in the central ornament of the ceiling, and from each room a flue should carry the current to a special foul-air chamber or holder, all the flues emptying into the chamber, if possible, on the same level, and in the direction of the general discharging shaft. This shaft leads to the kitchen chimney, the heat of which is utilised as the suction power by the heat of the fire. The up-cast foul-air flue runs up behind the fireplace, and then surrounds the smoke-flue, which should be of iron, until it terminates in several external openings below the coping, which are protected by a suitable wind-guard. An up-cast shaft of this kind has a considerable amount of efficiency even when the kitchen fire is not burning at all.

The central corridor, if not absolutely essential, is very desirable, and in country houses, or in town houses at the corners of streets, it is readily obtainable by making the front door at the side, and arranging all the working and service department on one side, and the living rooms on the other. In labourers' dwellings and in small houses the corridor may be dispensed with by having the warming chamber entirely in the basement, and carrying the warmed air directly into the rooms by flues within the walls; and if the stairs lobby be also supplied with warmed air the room doors may open out of it. The corridor is, however, advantageous in all good houses, both as a distributor of the fresh air, and as allowing the rooms to be built *en suite*.



The figures illustrate a model house built upon this plan of Drs. Drysdale and Haywood. It is situated in Grove Street, Liverpool, and consists of basement, ground-floor, and first, second, and third floors. The basement is devoted principally to the collection and warming of the fresh air. On the ground-floor are the cellars, a ball-room, two professional rooms, a gentleman's cloak-room, &c., and the main entrance, with vestibule and stairs lobby. The first floor is the living-floor, comprising drawing-room with ladies' dressing-room, a dining-room with china-closet, and a kitchen with pantries, &c. The second floor consists of the family bed-rooms, breakfast-room, &c.; and the third of the servants' bed-rooms, &c. Above all, beneath the ridge of the roof, is the *foul-air chamber*. The central corridor serves as a museum, picture-gallery, and bagatelle-room. The incoming air, after being warmed, passes into the corridor on every floor, and from the corridor into every room, by means of the cornice apertures, and the foul air is drawn off from each room by zinc flues at an orifice in the centre of the ceiling. These flues lead to the foul-air chamber at the house-top, and thence a brick shaft leads the whole down to behind the kitchen fireplace, where the shaft is caused to enclose the smoke-flue, as shown in the section.

A Glass Mountain.

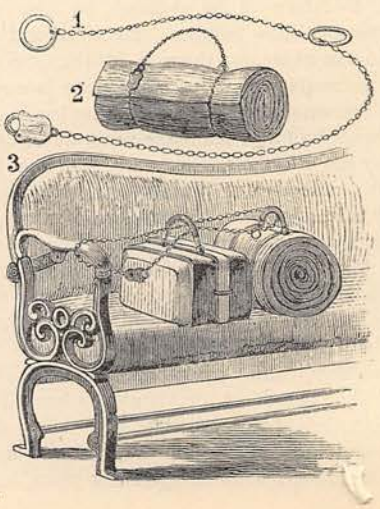
Another marvel recently brought to light in the Yellowstone Park of North America, is nothing less than a mountain of obsidian or volcanic glass. Near the foot of the Beaver Lake, a band of explorers came upon this remarkable mountain, which rises at that place in columnar cliffs and rounded bosses to many hundreds of feet in altitude, from hissing hot springs at the margin of the lake. As it was desirable to pass that way, the party had to cut a road through the steep glassy barricade. This they effected by making huge fires on the glass to thoroughly heat and expand it, and then dashing the cold water of the lake against the heated surface so as to suddenly cool and break it up by shrinkage. Large fragments were in this way detached from the solid side of the mountain, then broken up small by sledge-hammers and picks, not however without severe lacerations of the hands and faces of the men from flying splinters. In the Grand Cemon of the Gibbon River, the explorers also found precipices of yellow, black, and banded obsidian, hundreds of feet high. The natural glass of these localities has from time immemorial been dressed by the Indians to tip their spears and arrows.

A New Remedy for Whooping-Cough.

Dr. Garth, of Vienna, proposes a singular treatment for this distressing ailment, which will doubtless receive careful consideration from the medical profession. He states that by placing twenty drops of the oil of turpentine on a handkerchief, holding it before the face, and taking about forty deep inspirations, to be repeated thrice daily, marked relief, succeeded in cases of laryngeal catarrh by speedy cure, is the result. Being called in to attend an infant of fifteen months in the convulsive stage, he instructed the child's mother to hold a cloth, moistened as already described, before it when awake, and to drop the oil upon its pillow when it slept. In this instance the remedy in its effect was most beneficial. The frequency and severity of the attacks sensibly decreased in the course of twenty-four hours, and by proper support by the help of stimulants improvement was rapid.

How Travellers may Secure their Luggage.

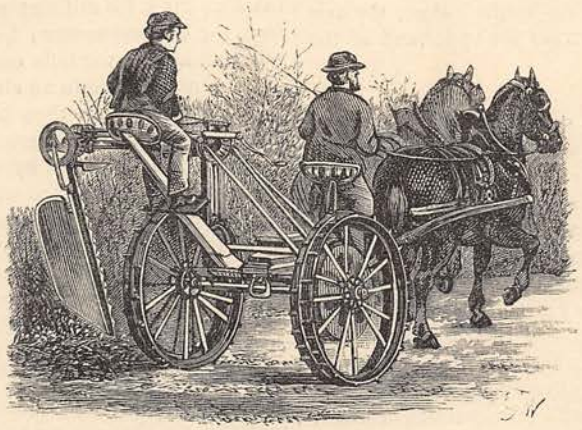
Among the inconveniences of travelling may be noted the mysterious way in which a trunk or parcel occasionally disappears, sometimes theftuously abstracted, sometimes carelessly left behind. To prevent the risk of loss and the trouble of carrying baggage, Mr. G. M. Young has patented the fastener represented in the woodcut. It consists of a chain carrying a loose link, and having at one end a large ring and at the other a padlock. The ring and the lock at the ends of the chain are big enough to prevent the loose link from sliding off, as a reference to Fig. 1 will show. In



using the appliance for carrying a shawl or other portable parcel, a loop is made in one end of the chain to receive the article, by passing the portion of the chain near the end through the end ring. The loose ring and lock compose another loop, and the intervening portion between these loops serves as the handle. Fig. 2 explains this arrangement. By passing either end of the chain through the handle of a portmanteau, or basket, or whatever it may be necessary to secure, and then passing it round the arm of a stationary seat or other immovable object, and finally engaging the lock with either or both of the rings, travellers may rest assured that their personal baggage is safe, and may leave the carriage for a "snack" with the comfortable hope that their parcel will not have been stolen—for brute force is out of the question—or their seat occupied by some intruder. In Fig. 3 it will be seen how this may be managed. The invention is obviously simple and cheap, and ought to be very useful to travellers.

A Hedge-Cutting Machine.

Farmers and estate-owners who like to see their property presenting a trim and orderly appearance will be glad to hear of a new hedge-cutting machine, that is capable of speedy and good work. Our illustration affords a true idea of the machine and its working. Between the two travelling-wheels are two fixed seats for the driver and cutter, and the gearing for communicating motion to the cutting apparatus. A standard is reared from one side of the main frame, supporting a tubular arm (which may be lengthened or shortened by a lever action), the handle of which is within easy reach of the machine-man. The cutting apparatus, which consists of one fixed and one reciprocating knife, hangs from the end of this arm. Both knives are composed of a number of sections, similar, although much larger, to knives used on mowing and reaping machines. The bar carrying these two knives is loosely pivoted to the end of the extensible arm, so that it may be set by the cutter at any angle. A worm and wheel with spindle run along the arm, and terminating in a handle conveniently near the hand of the machine-man, provide for the setting to the necessary angle; so that, from his seat, the man may easily vary at will the slope of the hedge, and withdraw the cutting apparatus the instant he comes upon a tree or gate. The height of the cutting gear is regulated by a wheel or pinion. When everything is ready for the machine to begin its work, the projecting arm is raised to the necessary height, the correct inclination is given to the knife, the driver starts his horse at a slow trot (which can afterwards be increased to five miles an hour), and at the proper distance from the hedge. The management of the machine is left to the machine-man seated at the back. This man grasps the lever connected with the extensible arm and guides the cutters, drawing them in or pressing them out as occasion requires. In this way, in spite of any deviation of the horses, he is able to preserve a regular cut. If it is required to cut a hedge with a ditch running immediately beneath it, so that the machine cannot travel in it, the arms of the cutter can be lengthened and brought into action from the other side of the hedge.



Improved Reflecting Telescopes.

There is no doubt that, theoretically, the reflecting telescope is superior to the refracting instrument because of its more perfect achromatism. But, in practice, the superiority of the optical powers of the refractors is acknowledged. This want of distinctness in the former instrument has lately been the subject of much careful study and inquiry by MM. Henry, and they have come to the conclusion that the instability of the images seen is caused by the whirling motion of the "air masses" in the tube, which are of unequal density. Consequently the image is confused when it reaches the observer's eye. Other defects are observable in the reflecting telescopes, and all these evils have now been remedied by the MM. Henry, to a very great extent at least.

These gentlemen proposed to close the tube hermetically with a glass lens, so cut as not to affect the optical powers of the telescope, and they actually fixed a slightly concave but thin lens of crown glass, the same size as the mirror, in the mouth of a Newtonian telescope, 0·10 m. diameter and 0·60 focal length.

By this form of instrument they manage, with but little loss of light, to get rid of the double image from a plane glass, and to destroy the aberration of the refrangibility of the microscopic eye-piece. The result of their experiment has been remarkably successful, and they can perceive that the image of a star is much steadier than in an ordinary reflecting telescope. These gentlemen are so pleased with the result, that they are constructing a very large Cassegrainian telescope on the same principle.

The Spiral Slide-Rule.

A very convenient slide-rule, which is calculated to facilitate arithmetical computation much more than any other kind, has been invented by Professor George Fuller, C.E., of Queen's College, Belfast. The main feature of the rule is a cylinder, marked *d* in the figure, which is engraved with a logarithmic scale wound spirally round it. This cylinder can be moved up and down, and also round about, the axis of a tube *f* within it. An index *b* is fixed to the handle of the rule *e*. Two other indices *c* and *a*, whose distance apart is just equal to the axial length of the spiral cylinder, are fixed to a second inner cylinder *g*. This cylinder slides inside the tube *f* after the manner of a telescope, and thus enables the operator to place these indices in any required position relatively to the spiral cylinder *d*. The two scales required are shown at *m* and *n*, one being vertical along the axis and the other horizontal across the upper end of the spiral cylinder *d*.

The Air-Jets of Niagara.

Those of our readers who have witnessed the Niagara Falls will doubtless have observed, on carefully looking down through the mist which invariably surrounds the lower parts of the Falls, cone-shaped jets of water suddenly shooting upwards from the bottom to the level, and sometimes even above the level, of the upper part of the Falls. These remarkable jets rise from 150 to 160 feet and then disperse. Mr. W. H. Barlow informs us that they are not simply compact masses of water, as most people suppose, but are jets of air, so to speak, with thin coatings of water. And this is how he explains this extraordinary phenomenon:—A considerable amount of air rushes under the broken sheets of water during its hasty descent and becomes entirely encased. As it falls the compressed air suddenly strikes the rocks below, rebounds as described, and an explosion ensues which is heard and felt at a distance of over half a mile.

Phosphorescent Powder.

Attention was recently called to the use of mineral powders which emit light in darkness as a means of illumination; and a patent has now been taken out in England for a powerful phosphorescent substance of this kind. The object of the invention is to utilise by night the daylight which has been stored up in the powder by virtue of its phosphorescence; and the composition of the special powder is described as follows:— 100 parts by weight of carbonate and phosphate of lime, produced by calcination of sea-shells, especially the shells of the genus *Tridacna*, and cuttle-fish bones, are to be intimately mixed with 100 parts by weight of calcined lime. To this are to be added 25 parts by weight of calcined sea-salt; and finally the resulting mixture is to be impregnated with 25 to 50 per cent. of sulphur, by the process of sublimation. Phosphorescent colouring matter, such as mono-sulphine of calcium, barium, strontium, may also be united with the powder, which can be painted on objects, such as dial-faces, barometers, buoys, street-door plates, signs, pictures, and flowers, which it is desired to render self-luminous. Curiously enough the brightness of the powder is largely intensified by passing an electric current through it.

Ploughing by Electricity.

By means of a dynamo-electric machine, like that of Gramme or Siemens, mechanical power is transmuted into electricity, for the electric light or other purposes; but the reverse process is equally available by any of these machines, and mechanical power can be obtained from electricity. Thus, if a current of electricity be sent into the armature or coil of a Gramme machine, the latter will revolve and thereby become a source of motive-power. This property of the dynamo-electric machine fits it for utilising power at a great distance from the original source; for example, the power of a waterfall among the hills can be transformed by one of these machines into an electric current on the spot, and this current can then be transmitted by wires to a distant town, and there transformed back again into mechanical power by a second machine. It is expected that this method will be greatly employed in the future, when coal is dearer, for the purpose of using up what are now waste sources of energy, such as waves, waterfalls, and winds. Meanwhile an attempt has been made by M. Tresca, at Lermaize (Marne) in France, to plough a field on this plan, by the help of three Gramme machines. The first machine, which was stationary, was driven by a steam-engine of 6 horse-power at a speed of 1,200 turns per minute. This machine was then caused to actuate two other portable Gramme machines, one 400 metres and the other 600 metres from the fixed machine, at 1,200 and 980 turns per minute respectively. These two portable machines drove the plough through very stiff soil with a force of about 3 horse-power by means of a double cable. The loss of available power by this experiment on transmission to a distance was therefore about fifty per cent.

Black Mildew.

The remark made respecting the black appearance of St. Paul's Cathedral, by Professor Paley, has drawn some observations from a brother professor in Philadelphia (Professor Leidz) to the effect that this black mildew is of a vegetable nature. Some years ago the American gentleman noticed a black appearance, very similar to the sombre hue of St. Paul's, on a block of houses near the Delaware River; and, in consequence of an escape of watery vapour, the professor suspected that the black substance was of vegetable origin. He examined it and found that it was an *alga*, very similar to the vegetable growth which gives the green tint to the trunks of trees, and which is also found upon walls and fences. It is supposed to be the same plant in a different state, but

as yet his investigations have not led him to proclaim this as a fact. The alga consists of very minute round or oval cells in groups. Although to the naked eye the alga appears to be quite black, by transmitted light it assumes a brownish hue. Professor Leidz proposes to distinguish it as the *Protococcus lugubris*, in contradistinction to the *Protococcus viridis* which grows on the trees.

A New Stone-Planer.

America has produced a wonderful machine for planing granite and other stone. It is made on the same principle as the ordinary wood-planer. Every one knows how difficult it is to plane stone, yet this machine will do its work well and with astonishing rapidity. The inventor tested the powers of his invention on the hardest of granite, and the witnesses of the experiment saw the flinty roughness on the surface of the stone disappear like magic, leaving a smooth face on the huge block as simply and as easily as an English carpenter would plane a piece of pine. Nothing but a little fine powder remained to show how well the strange work had been accomplished by the ingenious application of steel. Hitherto the tools employed in such rough work would dull very quickly and seriously impede progress, but this machine is wonderfully superior in this respect. The machine is simple in construction, and the tools can be changed in a few minutes.

A Novel Mode of Staining Glass.

Some samples of glass ware stained by a new process were recently exhibited before the French Academy, and called forth much admiration. The process in question is the invention of M. Monot, a French manufacturer, and it consists in subjecting the articles of glass at a red heat to the action of coal-gas. The glass contains certain metallic oxides, which are decomposed by the gas, and the metals separate in the vitreous mass into beautiful veins and shining films. In this way some excellent imitations of precious minerals, such as aventurine, have been obtained.

A New Mineral.

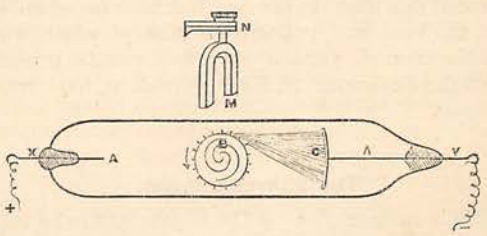
In ridding iron from phosphorous by the Bessemer process of steel-making, it is necessary to employ an extremely high temperature in the furnace which converts the iron into steel; and hence it is advantageous to get a fire-brick to line the furnace which will stand an intense heat. Such a brick has been discovered by Professor Osborn Reynolds, and Mr. V. Ball. These gentlemen placed a number of bricks made of aluminous limestone in a pile on the floor of the converter, which was lined with ordinary siliceous fire-bricks, and after raising the whole to an intense white heat they found that the aluminous bricks had sunk into the fused surface of the ordinary brick, while they themselves had undergone a crystalline change, grey and green prisms of a new mineral, which proved to be a true pyroxene, appearing in their mass. This accidental discovery is an interesting case of the artificial production of a member of the volcanic family of minerals.

Planting Potatoes.

Bagshot Park, the new residence of the Duke of Connaught, was the other day the scene of a useful experiment: the merits of a new potato-planting machine were tested, and found to be highly satisfactory. The mechanism is of an extremely simple nature. There is a round hopper placed upon two wheels, from the axle of which an endless chain, formed of a series of cups, passes up through the hopper—each cup taking a potato as it passes through. The form of the cup holding the potato is very clever, and in a great measure accounts for the success of the machine. There were at the trial a very few blanks detected, the seed being dropped with satisfactory regularity and precision. These machines are made in several sizes—to plant one, two, or three drills at a time.

A Molecular Mill-Wheel.

In a recent article of the "Gatherer" we described the chief results of Mr. W. Crooke's researches into the condition of matter in very perfect vacuo. That accomplished physicist is continuing his experiments, and recently exhibited at the *soirée* of the Royal Society several novel and beautiful effects. One of these was the molecular mill-wheel represented in the figure, where A A is a glass vacuum tube, into which are soldered platinum wires X and Y. These wires are connected to the poles of a powerful source of electricity, such as an induction coil, the negative pole being connected to the wire Y, so that there is a discharge of negative electricity from the curved metal plate or surface C at the extremity of that wire. A light and delicate wheel, or mimic turbine, fitted with mica vanes projecting from its rim, is mounted in the centre of the tube, in the path of the discharge. Now, when the stream of electrified molecules of residual gas in the tube, which constitute the discharge, impinges on the middle of the wheel, there is no motion of the latter; but if the stream be diverted upwards by a magnet M N, as shown in the figure, the wheel



begins to turn, by the impact of the stream on the projecting vanes. On presenting the opposite pole of the magnet to the discharge, the latter is driven to the

under side of the wheel, and the rotation first stopped, then reversed. In this way the wheel can be made either "overshot" or "undershot."

An Inland Sea in California.

Not content with cutting through the Isthmus of Darien, the American people have applied for a commission of engineers to report upon a plan advanced by General Fremont. This project is to convert the useless sandy plain between Arizona and Southern California into an inland sea. General Fremont affirms that by the removal of a ridge he can admit the waters of the gulf by a canal into a lake already existing about ten miles inland. From this lake, which is twenty miles in length, another canal would admit the water to the basin of the proposed sea, which is estimated to extend for 200 miles to a depth of 300 feet, with a width of fifty miles. Evidence exists that at some former period this salt tract was filled with water. The expense is estimated at only one million dollars, but estimates are generally delusive. At any rate, a great commercial highway would be formed, and the value of the whole territory much enhanced, by the completion of the work.

Vanilla from Oats.

Many people have remarked the pungent and musky odour emitted by pine-needles when bruised between the fingers; and a few years ago two chemists—MM. Ziemann and Harmann—succeeded in extracting the odoriferous principle of the well-known scent vanilla from the sap of pines, an achievement which gave rise to a new industry, and rendered the chocolate-makers and other consumers of vanilla independent of the natural bean, which is imported from the West Indies and Cochin China. Another, and a still homelier source of this fragrant essence, has been found in field oats, the bran and pericarp or husk of which, when suitably treated, yield a very fine vanilla perfume, which the discoverer, M. Eugène Pérullat, has termed *aveneine*.

The Sphygmophone.

This is an invention by Dr. Richardson, who seeks to make our pulses talk by telephone, and the inventor stated at the meeting of the Royal Society that the human pulse expresses itself telephonically by sounds like the words, "bother it." What the pulse may eventually beat out we cannot say, but the fact is undeniable. The needle of the sphygmograph is made to move upon a metal plate, which is connected with the zinc pole of the Leclanche cell. The metal stem of the sphygmograph is then united to one terminal of a telephone, and the other terminal is connected with the other pole of the battery. The needle is permitted to traverse the plate with every pulsation, and the result is to give three distinct sounds from the telephone—one long and two short utterances—which correspond with the first, second, and third events of the sphygmographic reading. By these means the pulse can be heard by several hundred persons, and if the wires were extended the patient's beats could be heard a long way off. It will now not even be necessary for the doctor to visit a patient to ascertain the condition of the heart, or arterial pulse, and thus much trouble and many visits may be saved to doctor and patient.

A Sponge Plantation.

For many years the sponge-fishers of the Mediterranean have carried on their avocation so recklessly, that there is reason to fear that the supplies from the Great Sea (which yields the best article) will practically cease, unless means are taken at once to prevent the men from destroying—as they do at present in countless numbers—the young animals while securing the full-grown victims. Meanwhile Dr. Brehm, the illustrious naturalist, has suggested a plan for raising sponges artificially. Selecting a few hundred specimens, he divided them into several thousand small pieces, fastened separately into perforated cases, which were then towed out to the Bay of Socolizza. He next attached the pieces to a wooden framework, which was then lowered in a shady spot to a proper depth. In a few months the sponges had grown to the size of good natural ones, exhibiting their distinctive black colour. The authorities regarded his scheme with favour, but the fishers, with that ignorant prejudice which so often has delayed sound reform in almost every industry, attacked the plantation by night, destroyed the frames, and made off with 2,000 sponges. By substituting copper-wire for woodwork, Dr. Brehm immediately checkmated the *teredo*, whose ravages in wood are notorious; and, by fastening the sponges to stones, it was observed that they speedily attached themselves firmly.