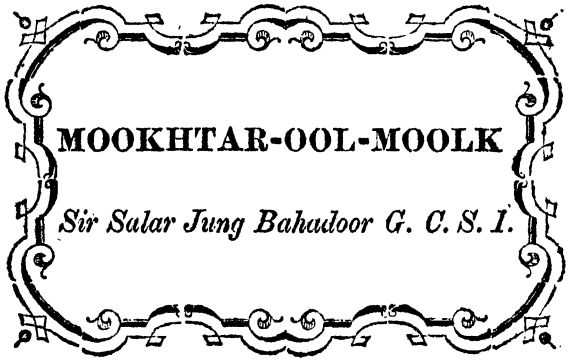
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Sir Salar Jung Bahadoor G. C. S. I.

BY THE AUTHOR OF "THE YEAR-BOOK OF FACTS."

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Editor of "Laconics," "Year-book of Facts," &c.
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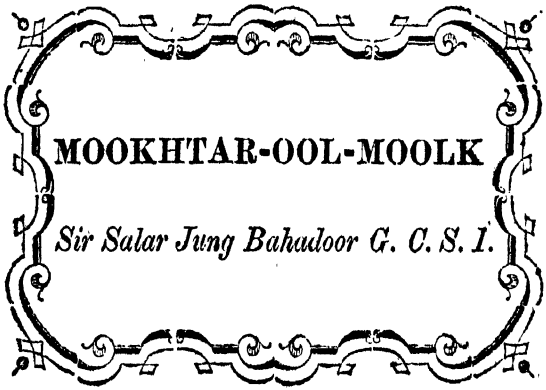
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IN

Science and Art:

EXHIBITING

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IN MECHANICS AND THE USEFUL ARTS; NATURAL PHILOSOPHY; ELECTRICITY; CHEMISTRY; ZOOLOGY AND BOTANY; GEOLOGY AND GEOGRAPHY; METEOROLOGY AND ASTRONOMY.

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"We do not attempt to range through the loftier regions, but to catch the drops as they fall, and apply them to the common purposes of life. Thus, Science becomes not merely a luxury to the rich, but bread to the poor."—SIR C. LEMON'S ADDRESS TO THE CORNISH POLYTECHNIC SOCIETY, 1

Spinous Lizard of Western Australia.—See p. vi

LONDON:

TILT AND BOGUE, FLEET STREET.

MDCCCXLII.

Wilson and Ogilvy, 57, Skinner Street Snowhill, London

PREFACE.

ALTHOUGH the Discoveries in the several fields of Science, during the past year, have been more characterized by their utility than by their brilliancy, it is presumed that on such account, the present volume—attempting to record these Discoveries—will be not less acceptable to the public than its precursors.

It has been appositely observed of the late Anniversary Meeting of the British Association, (in one of the first journals to chronicle its Proceedings,) that

"We have this year no great scientific novelty, theory, or discovery, brought upon the tapis, and claiming the attention of absent philosophers. There is no voyage to the South Pole to be promoted,—there is no hypothesis of glaciers to astonish the world,—there is no observation of the nature of storms to throw a light upon these terrible visitations,—there is no doctrine and measurement of the waves, or on the form of vessels, (which are now nearly wrought out),—there is no new feature in the grand research into the mysteries of magnetism,— in short, except the idea of following up the investigation of meteorological phenomena by means of balloons, we have heard of nothing very particular in any of the Sections. Let it be understood, however, that in all the branches of science which engage the mind of the Association, steady progress has been made and recorded. Data of high consequence are collected, both to check future mistakes and advance future information. Induction, the true basis of all truth, will flourish upon these; and therefore, though there is nothing extraordinary in this stage of the onward journey, the distances and milestones are fairly marked so far, and the prospects in the distance are rendered much more clear and distinct. The way to the field is beaten, and its ample survey defined. There is nothing needed but to march on, take time, and labour to a useful end*."

Such has ever been the aim of the Editor of *the Year-book of Facts*; and, in his humble labour, he cheerfully acknowledges that he has been largely assisted by the judicious scientific reports in the Journal, wherein he recognises the above coincident object and purpose.

In carrying out this principle will be found noticed in the following pages the construction of the most important Steam-ships during the

* Literary Gazette.

year; and the Railway Improvements; Calculating Machines; Novelties in Navigation; the details of several new Lighthouses; the progress of great Public Works; improved processes for Lighting and Heating; Economy of Materials, &c.

Terrestrial Magnetism, the Tides and Waves, and some remarkable organisms, are prominent in the department of "Natural Philosophy."

The "Electrical Science" is, probably, more copious in this volume than in previous Year-books; a proportion only in accordance with the increased applications of Electricity, hastening to rival those of Steam itself. The details of the Electro-metallurgic processes are likewise numerous.

The "Chemical Science" is rife with New Processes; the Photographic details being alike distinguished by number and novelty.

The "Zoology" and "Botany" include many welcome contributions of facts and data for the Naturalist and lover of Nature.

In "Geology and Physical Geography," the most important investigations of the year are glanced at, or reported entire; and, in popular interest, this division challenges comparison with any other portion of the volume. The Records of Fossils are especially striking.

To the "Astronomical and Meteorological Phenomena," Dr. ARMSTRONG has again obligingly communicated his valuable "Summary of the Year."

The Portrait of the lamented Dr. BIRKBECK has been chosen as a Frontispiece to this volume, in memorial of the unremitted exertions of this philosopher and philanthropist in popularizing Science; for the happiness as well as the enlightenment of the people ever lay next to the heart of this truly excellent man. I. T.

Gray's Inn, January, 1842.

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[This Lizard, *Moloch horridus* (Gray) is figured and described in Capt. Grey's *Journal of Two Expeditions of Discovery in North-west and Western Australia.* Its external appearance is very ferocious, the horns of the head and the numerous spines on the body giving it a most formidable appearance, on which account it is named after "*Moloch*, horrid king." The length of the body is four inches and a half; colour, pale yellow, marked with dark regular spots; sides and beneath with black-edged dark similar spots. It is covered with granular plates, scales, and spines; the larger spines consisting of a horny sheath placed on a fleshy process. Discovered by the Hon. Capt. Grey, and John Gould, Esq.]

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THE

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Mechanical and Useful Arts.

THE THAMES TUNNEL.

THE completion of this stupendous work is close at hand. The Tunnel being completed to the entire breadth of the river, Mr. (now Sir Isambard) Brunel was the first to pass from shore to shore, by means of a drift-way connecting the Tunnel with the shaft on the Wapping bank of the river. This shaft, in which is to be constructed the circular staircase for foot passengers, is 75 feet deep, and is in course of completion. The total outlay for the work, including the Government loans, is estimated at 400,000*l.* The receipts from visitors during the year ending March, 1841, were 1,705*l.* Fortunately, the work was not damaged by the flood of the Thames in October last, although the top of the shaft at Wapping was only 3 feet above the level of the surrounding ground.

TRANSATLANTIC STEAM NAVIGATION.

THE *British Queen* and *President* steam-ships are stated to have cost the British and American Steam Navigation Company 90,715*l.* each, instead of 50,000*l.* each, the original estimate. The total receipts of the *British Queen* for 9 voyages, amounted to 82,001*l.* 2*s.* 6*d.*, and the total expense to 70,691*l.*; showing an average profit for each voyage of 1,256*l.* 13*s*, 6*d.* The *President* received for the 9 voyages 25,234*l.* 6*s.* 7*d.*, and the expenses were 21,833*l.* 3*s.* 7*d.*; showing an average profit per voyage of 1,350*l.* 7*s.* 8*d.* The *British Queen* has been sold to the Belgian Government; but, the fate of the *President*, which sailed from New York in March, 1841, remains to this day a melancholy mystery.

AMERICAN STEAMERS.

MR. S. SEAWARD believes the building of the river Steamers of America to be very peculiar: some of them have engines of 600 horse power on board, yet they draw only 4 feet of water; whereas, a sea-going steamer with that power will draw, at least, 16 feet. As far as Mr. Seaward can ascertain, the actually authenticated speed does not exceed 14½ geographical miles per hour, through still water. The fuel consumed cannot be ascertained, as it is chiefly wood, taken on board at the places of stoppage; there is a great consumption of steam at a very high pressure. Their machinery is not heavy, and is especially adapted

to the vessels. Daily improvements are making in the form of vessels in England; and when high-pressure steam and light engines are applied to vessels of a different form from those at present constructed, the speed must be increased. Some vessels lately built on the Thames are of an extremely light construction, with tubular boilers, the weight of the machinery being only 11 cwt. per horse power.—*Transactions of the Institution of Civil Engineers.*

SAILING AND STEAMING VESSELS.

MR. S. SEAWARD has reported to the Institution of Civil Engineers a "Supplementary Account of the use of auxiliary Steam Power, on board the *Earl of Hardwicke* and *Vernon*, Indiamen"; the original description of which will be found in the *Year-book of Facts*, 1841, p. 18. The former vessel, of 1,000 tons burthen, with one engine of thirty-horse power, effected the voyage from Portsmouth to Calcutta in 110 days, a much longer time than usual; but still with an advantage of 29 days over the *Scotia*, a fine vessel of 800 tons, which sailed one week before the *Hardwicke*, and arrived 22 days after her. During the voyage, the *Hardwicke* used her engine 364 hours, and was propelled by it 946 knots; an average of nearly three knots per hour; while in a calm, with the ship steady, she made five knots per hour. The total consumption of fuel was 90 tons. The *Vernon*, which sailed one month after the *Hardwicke*, made her passage to Calcutta in 97 days; passed the *Scotia*, and arrived 7 days before her, gaining 42 days upon her during the voyage. The *Vernon's* consumption of fuel was also 90 tons; but the copy of her log not being arrived, the number of hours during which steam was used could not be ascertained. The *India* steam-ship, of 800 tons burthen, with engines of 300-horse power, had not arrived at Calcutta, although she had been out 109 days; so that the *Vernon*, with only auxiliary steam power, had already gained twelve days upon her. The comparison between the advantages of these two vessels, in point of expense, is then fully entered into; and shows a saving of 3,733*l.* in favour of the *Vernon*, on a single voyage, while she gained at least twelve days upon the *India* in point of time.

NEW STEAM-VESSELS.

AMONG the Steam-Vessels completed during the past year, those which are most remarkable for their peculiarity of construction are as follow:—

The Geyser, H.M. steam-frigate, 1060 guns, launched Oct. 26, was built at Sheerness, from the designs of Sir William Symonds, and fitted by Messrs. Seaward and Capel. This fine vessel, (300-horse power,) is the fifth of her class with engines upon *the Gorgon* principle,* first introduced into the service by Messrs. Seaward. By this peculiar construction of the machinery, a

* That is, upon the same principle as the engines of *the Gorgon*, fitted by Messrs. Seaward in 1838; the most important improvement in which is, that by dispensing with the sway-beams, side-ribs, cross-heads, &c., the energy of the piston is at once carried to the paddle-shafts, and the whole force of action and reaction confined within the base of the cylinder upon which the engine stands.—See description of *the Gorgon*, in the Year-book of Facts, 1839, p. 11.

saving in weight of one-fourth, and more than one-third in space, has been effected over the ordinary steam-engine. The engine-room is only 50 feet long, within which, besides her machinery, she can stow 300 tons of fuel, sufficient for 15 days' steaming at full power, and enough almost to carry her to any sea-capital of the civilized world. Upon her troop-deck, there is accommodation for 300 soldiers, with their officers, baggage, and equipments; besides the usual space allotted to her own officers and crew. Her force is two 10-inch guns, carrying hollow shot of 98lb. weight; and four 8-inch guns, carrying 68lb. shot. The exquisite beauty of the model, the general arrangements and entire construction of the vessel, do great credit to the scientific and practical skill of the Surveyor General of the Navy; the superior style, the economical adaptations, the harmonious, smooth, yet powerful action of the machinery, also entitle Messrs. Seaward to the highest praise. In an experimental trip on the day of the launch, the *Geyser* performed the distance to below Gravesend and back at the rate of 11½ miles an hour; and so complete was the absence of all noise or vibratory motion, most disagreeably felt in other steamers, that a person standing over the engine-room, or at either extremity of the deck, would scarcely have known that the vessel was under weigh.—*Abridged from the Times, Oct.* 27.

The Precursor, a large vessel, built for the Eastern Steam Navigation Company, launched October 20, is the first of a line of mail and passenger steamers, intended to ply between Calcutta, Bombay, and the Red Sea, in connexion with the route by the Isthmus of Suez, and the steamers which complete the journey, by the Mediterranean, from India to England. She is the largest steamer ever built out of dock and launched from ways—the *British Queen*, *President*, &c. having been built in dock, and simply floated out. Her length is 260 feet; breadth on deck, 41 ft. 6 in.; depth of hold, 25 ft.; and tonnage, including engine-pits, 1780 tons.

The *Clyde*, built by Duncan and Co., of Greenock, is the first completed of 14 steam-frigates, in progress of construction for the Royal Mail Steam Packet Company. They are all designed to perform, in time of peace, the service of mail-packets, to and among the West India Islands; and are fully armed with the heaviest ordnance, to act as war-frigates, when required by Government for that purpose. These vessels are all of similar dimensions, having a capacity of about 1500 tons each, with steam-engines of about 500-horse power. The aggregate fleet will thus consist of 21,000 tons, and 7000-horse power. These vessels are almost exactly of the proportions of the *Great Western*, and of the shape and construction of the Halifax ships; with this difference only, that they are larger than the *Great Western* or Halifax vessels, and have a greater proportional breadth of beam, to enable them to carry their armament of heavy guns on deck, while they have also a roomy spar deck for giving the air and accommodation so desirable in a warm climate. The engines are the old plain lever, with ordinary boilers, as constructed by the most experienced engineers.

The *Driver*, of 1100 tons burthen, and 280-horse power, and the *Ardent*, of 800 tons, and 200-horse power, have been built from the designs of Sir W. Symonds, and fitted by the Seawards with engines on the plan of those of the *Gorgon*. The *Driver* will stow in her engine-room 300 tons of fuel, or 16 days' [illegible] and power. In these can be applie[illegible] almost instantaneously disconnecting the paddle wheels of steamers from the engines, whenever it is desired to suspend for a time the use of steam-power; and of reconnecting them with the like celerity, when required to be brought again into action.

The *Cairo* has been built by Ditchburn and Mare, for the navigation of the Nile. She is a remarkably elegant vessel, flat-bottomed, to adapt her for the shallow waters of the Nile, her draught being only two feet. She is propelled by two engines of 16-horse power each, by Penn and Son. The cylinders are oscillating. The *Cairo* is an iron vessel, and divided into five compartments with water-tight bulkheads, separating each, which adds much to the safety of the vessel. The engines and machinery occupy such a small space that 100 persons can be accommodated in the cabins; and there are two spacious

stow-rooms for luggage only, between the engine-room and the fore-cabin, and the engine-room and after-cabin. The builders and engineers have guaranteed the average speed of the *Cairo* at 15 miles an hour; but, for the Nile, a light draught of water is her greatest recommendation.

The *Devastation* steam-frigate, 1000 tons burden, launched from Woolwich Dock-yard, has been fitted with double cylinder engines, of 400-horse power, by Maudslay and Field; and also with the paddle-wheel connecting and disconnecting apparatus, lately patented by J. Maudslay. The engines of this vessel, as compared with those of other vessels previously fitted by this eminent firm, are stated to occupy one-fifth less room, to be one-fifth less in weight, and to consume one-fifth less fuel. The armament of the vessel consists of two 10-inch, and four 32-pounder, guns, placed on circular turn-plates, so that they may be moved round and fired in every direction.

The *Fire-fly*, of about 2-horse power, and fitted with a locomotive boiler, vibrating engines, and Ericsson's screw-propeller, has attained a speed of 9 miles an hour, on the Thames at Oxford; her motion being extremely smooth, and the propeller fixed in her stern. The engines were planned by Mr. H. Warriner, a pupil of Braithwaite and Milner; and the boat was built by Roberts, at Banbury.

Lilliputian Steamer.—Mr. G. Blaxland, of Greenwich, has constructed a handsome little steamer, *the Jane*, the propelling power of which possesses many advantages over the Archimedean screw. There are two small paddles at the stern, and the machinery is worked by straps and friction pullies, so arranged as to avoid the wear and tear of gears. This steamer is only 26 feet long, with five feet beam; her burden is less than three tons, and her steam power less than one horse: in calm water, she attains a speed of seven miles an hour; and, which is an immense recommendation for the navigation of narrow rivers and canals, she makes scarcely any perceptible swell.

Armament of British Steamers.—Our first-class steamers are armed with two 10-inch guns (one at each end, but capable of being fired on either side) of 85 cwt.; and four long 32-pounders of 41 cwt. The second-class have two 10-inch guns, and two 32-pounders, 25 cwt.; some have only one 10-inch and one 8-inch gun; others, again, two 8-inch and two 32-pounders. The steam-packets are variously armed, some with 32, and others with 9-pounders, according to the line employed on: but all are capable of full armament, if required.

ICE-CUTTING STEAM-BOAT.

M. C. HIORTH has resolved a problem, which, for upwards of ten years, has vainly exercised the sagacity of naval engineers. He has invented a Steam-boat, capable of cutting its way through the thickest ice, with a speed nearly equal to that of its unimpeded navigation. The General Administration of Posts at Copenhagen have received a most favourable report from a committee of ship-builders and machinists, to whom they had submitted the model; and have applied for authority to construct a vessel upon M. Hiorth's plan for the transport of the mail-bags in winter.

PATENT FUEL FOR STEAM-BOATS.

MR. GRANT has made several successful trials of the fuel prepared by him in Her Majesty's steam-boats. It is made of coal-dust, and other ingredients, in the shape of common bricks. In generating steam, 200 tons of this fuel will perform the same work as 300 tons of coal; it occupies less space than coals, creates no dust, produces a very small proportion of clinkers, and is thus far less liable to choke and destroy the furnace, bars, and boilers, than coal is; whilst the ignition is so complete, that comparatively little smoke and ashes are produced by

it; and the cost is much less than that of coal.—*Abridged from the Hampshire Telegraph.*

ON THE PROPULSION OF VESSELS BY THE TRAPEZIUM PADDLE-WHEEL AND SCREW.

At the Plymouth meeting of the British Association, Mr. G. Rennie gave an account of the various experiments to which he had been led, on the Propulsion of Vessels by various forms of paddle-floats, and by the screw. It was generally admitted that the paddle-wheel was the best means of propulsion with which engineers were at present acquainted; and various attempts had been made for its improvement. There are several objections to the square or rectangular floats, particularly the shock on entering the water, and the drag against the motion of the wheel on the float quitting the water; both of which give rise to considerable vibrations. He had been led, in considering the improvement of the paddle-wheel, to have recourse to nature, and the form of the foot of the duck had particularly attracted his attention. The web of the duck's foot is shaped so that each part has a relation to the space through which it has to move, that is, to the distance from the centre of motion of the animal's leg. Hence he was led to cut off the angles of the rectangular floats; and he found that the resistance to the wheel through the water was not diminished. Pursuing these observations and experiments, he was led to adopt a float of a trapezium or diamond shape, with its most pointed end downwards. These floats enter the water with their points downwards, and quit it with their points upwards, and then arrive gradually at their full horizontal action, without shocks or vibrations: and after their full horizontal action, quit the water without lifting it, or producing any sensible commotion behind. After a great variety of experiments, he found that a paddle-wheel of one-half the width and weight, and with the trapezium floats, was as effective in propelling a vessel as a wheel of double the width and weight with the ordinary rectangular floats. The Admiralty had permitted him to fit her Majesty's steam-ship, *African*, with these wheels, and he had perfect confidence in the success of the experiment.

Another means of propulsion was the screw, which had been applied with success by Mr. Smith, in the *Archimedes*. In examining the wings of birds and the tails of swift fish, he had been particularly struck with the adaptation of shape to the speed of the animals. The contrast between the shape of the tail of the cod-fish, a slow-moving fish, and the tail of the mackerel, a rapid fish, was very remarkable, the latter going off much more rapidly to a point than the former. From these observations he was led to try a screw with four wings, of a shape somewhat similar to these, but bent into a conical surface, the outline being a logarithmic spiral. He found also that certain portions of these might be cut off without diminishing the effect. With respect to ascertaining the friction of the screw on the water, great difficulty existed; but he would refer to his experiments, published some years ago in the *Philosophical Transactions*, in which he measured the friction of the

water against a body revolving in it, by the time which a given weight took to descend; this body consisted of rings, and he found that the friction or resistance through the water did not increase in proportion to the number of rings.

ARTIFICIAL ICE.

MR. KIRK has patented a composition laid down in the same manner as the asphalt pavement, for skating, in the spite of warm winters and the absence of frost. The invention has been tested by the several members of the Skating Club, who consider it so perfect an imitation of natural ice, that all figures and evolutions performed on real ice might be equally well accomplished by them on the artificial substitute. A piece laid down at the Baker-street Bazaar was about $\frac{7}{8}$ of an inch in thickness; but stood great friction, and was but little damaged by the cutting of the skates in several months' continuous wear and tear. Indeed, no real ice could have supported the same perpetual friction unless renewed by successive frost. The patentee proposes to lay down an area of 30,000 square feet of this artificial ice, to be called the *Glaciarum*, a model of which may be seen at Jenkins's nursery-ground, New Road.—*Times, Dec.* 21 ; *abridged.*

RAILWAY CONSTANTS.

MR. E. S. RUSSELL has read to the British Association* a Report from the Committee appointed to inquire into the mean value of Railway Constants. These experiments, which were principally made on the Liverpool and Manchester Railway, were very numerous and varied, and amongst the most important results were the following:— That a very large proportion of the resistance encountered by trains in motion is as the square of the velocity; that the resistance is in a simple ratio with the load, and that the resistance of the load is much greater than is supposed, in luggage loads being twice, and in light trains three times as much. The Report, which was not, however, considered conclusive, as another was to be read during the meeting, gave rise to an interesting discussion. With respect to the high resistance of the air, contrary to the opinion given in the Report, Mr. Rendel stated that this was very considerable, as on the Southampton Railway it had been known to delay the arrival of the trains for half an hour. One important result which the Report arrived at was, that it would, if correct, be found advantageous to the introduction of railways into hilly countries. He was sure that the velocity which would pay the best and serve the public would be a rate of twenty-five miles per hour; and upon that ratio they had only to determine what gradients were safe, and curves could be safely passed. According to the Report, it appeared that a level, to obtain which many difficulties had to be encountered, was no advantage over a gradient of 16, 20, or even 25 feet per mile. The subject, it was resolved, should be reserved for future inquiry and discussion.

* The Association held their Meeting at Plymouth, in the week commencing Thursday, July 29.

RAILWAYS COMPLETED IN 1841.

EXCEPTING the main line of the London and Brighton Railway, no complete line of railroad has been entirely opened to the public since November, 1840; but several, which were then partially opened, have since been rendered available for their whole length, and considerable progress has been made towards the completion of some others. Altogether, there have been about 247 miles of railway brought into use for the conveyance of passengers within the year; but some other lines are on the eve of completion.

Lines completed, most of which were partially opened in 1840 :—

	Total length. Miles.	Opened since Nov. 1840. Miles.
Manchester and Leeds (main line)	50¼	10
Taff Vale (main line)	24¼	8
Glasgow, Paisley, and Greenock	22¾	15¼
Great Western	117½	42½
London and Blackwall	3¾	0¾
Birmingham and Gloucester	56	16
London and Brighton (main line)	41½	41½
		134

Lines partially opened before, and further so during 1841 :—

	Total length. Miles.	Open. Miles.	Opened 1841. Miles.
Maryport and Carlisle	28	8¼	1
Northern and Eastern	30	23	7
			8

Lines first partially opened in 1841 :—

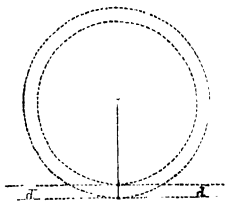
	Total length. Miles.	Opened 1841. Miles.
Great North of England (with branches)	78	44½
Bolton and Preston	14½	9¼
Cheltenham and Great Western Union (with branch)	48	18
Bristol and Exeter (main line)	75½	32½
		104¼

Companion to the Almanac for 1842.

GALLOWAY'S IMPROVED RAILWAY.

A WORKING model of this novel and ingenious mode of propelling Railway Carriages may be seen at the Adelaide Gallery.

The principle of the invention consists in propelling detached carriages by means of a third continuous rail, (which is moveable), extending midway between the present rails and supporters in rollers. This rail is composed of wood and iron of sufficient strength, and is to be moved by stationary engines, about a mile and a half apart; and the results and peculiarity of the arrangement are, that by giving a very small velocity to this propelling rail, a very considerable velocity of the carriages is obtained. This effect is produced by the application of the principle of the lever, and may be thus explained :—



(Galloway's Improved Railway.)

Let *a b c* be a lever of the third order, of which *a* is the fulcrum, *b* the power, and *c* the resistance. Now, if *b* be moved, the points *b* and *c* will describe arcs in the proportion of their respective radii, *a b* and *a c*. Now, let the two dotted circles be drawn from the point *c*, and conceive the outer circle to be capable of rolling along a horizontal line, *d d*, and that power be applied horizontally to the point *b*, then the outer circle will, for a short distance, roll along *d d*, at a velocity as many times greater than the point *b*, as the whole radius *c a* is to the part thereof *b a*. But if the two circles be supposed to represent two wheels fixed upon one axis, and to roll upon separate planes, *e e* and *d d*, and we suppose the respective planes touch the respective wheels so closely as not to slip, then if *e e* be moveable, and *d d* stationary, the motion given to *e e* will, as in the case of the lever *a b c*, cause *c* (which has now become the axis) to move many times faster than *e e*.

This principle is carried out by having six wheels to each carriage, there being a double-flanged wheel between each pair of the ordinary wheels. Instead, however, of the axis extending right across, as usual, it is divided into two parts, and coupled by a sort of universal joint, at or near the middle wheel, so as to adjust the wheels to the accidental sinking of any of the rails. There are six springs, capable of adjustment so as to give a proportionate adhesion to each and all of the wheels. The middle wheels are of one-seventh less diameter than the four side wheels, and bear upon the propelling rail as already described. These wheels are double flanged, as stated, so that to get off the rail is scarcely possible, as, even if a rail were displaced, the flanges of the centre wheels would guide the carriage until over the defective part. If, therefore, the middle rail be moved by a stationary engine, a carriage so constructed must travel along the line at seven times the velocity of the propelling rail. The patentee proposes to work these moveable rails by chains or or wire ropes winding round drums worked by stationary engines. It will be apparent that these moveable rails may be as much shorter than the distance from station to station, as they require to move to propel the carriages over them. They are to be so constructed as to overlap each other, so as to cause no interruption to the carriages when passing from one length to another, and the time of starting each engine is announced by electric signal.

In the curved portions of the line, the propelling rail would be of such dimensions in its depth and width as to bend easily round the greatest curves; and a little consideration will show that a very small effort will be sufficient to effect this.

In this system of railway, every carriage is *self-propelled*, and, therefore, all the weight is *rolled* along the line. Thus a very considerable acclivity can be ascended, and we were informed by the patentee that his carriage can ascend an inclination of one in thirty, being three times greater than is practicable for locomotive engines.

A collision is almost impossible, since the power, when in action, must propel everything in the same direction and at the same velocity. If, however, the conductor perceives an obstruction, he can (by, moving a lever,) slightly raise the middle wheels, which instantly destroys the adhesion by which the carriage is propelled, and the brake is applied to overcome the impetus. By letting down the middle wheels the carriage moves on as before.—*Literary Gazette*, No. 1269.

IMPROVED RAILWAY CARRIAGE.

Mr. Houldsworth, of Manchester, has patented two improvements in Railway Carriages: first, by covering the carriage, either wholly or in part, with metallic wire-gauze-cloth, or net, of texture sufficiently close to break the force of the wind, and destroy the vio-

lence of the currents produced by rapid motion through it; and also to impede the entrance of the particles of coke-dust emitted by the locomotive engine chimney, and yet not materially to obstruct the view of external objects: secondly, by seats constructed so as to fold up of themselves when not in use, by the action of springs or weights. For the details of this patent, see *Mechanics' Magazine*, No. 919.

NEW RAILWAY SIGNALS.

A NEW system of Signals for Railroads has been invented by Mr. Hall, the managing director of the Eastern Counties Railroad; intended to supersede the red and white flags now carried and exhibited by policemen at certain distances, and which have been sometimes found inadequate to the purpose. The new signal, which Mr. Hall calls the "Panel or Fan signal," has, when put in operation, the appearance of an upright post of about 12 feet high, surmounted by a piece of woodwork resembling in shape that of a closed fan. Where they both join is a strong iron framework. In the upper woodwork, three panels are encased, which are worked by machinery, and when brought down to the iron framework before described, assume the appearance of a crimson quadrant of a span sufficient to be visible in a straight line for two miles. When a train is due to start, the three panels are lowered. As soon as it has started and reached the signal, the man in charge of it sets in motion a piece of machinery, which gradually works up the three panels in 15 minutes; and the signal, at the end of that time, presents its original appearance. By this arrangement, engine-drivers will be able accurately to calculate the time which has elapsed since a train has passed; one panel indicating five minutes, two ten, and three a quarter of an hour.—*Times*, *Oct.* 13.

Mr. C. B. Curtis has patented a Self-acting Apparatus to be used on railways, for obviating collisions between successive trains. The distinguishing character of this invention is, that every time a train passes by the apparatus, the same will immediately exhibit a signal, and continue to do so until sufficient time has elapsed for the train to have advanced far enough along the line to permit any succeeding train to follow; and the signal will give information to the driver of the succeeding train, that he is to stop and not proceed; and this apparatus, after having exhibited its signal, in due time withdraws the same by wheel-work, during which the signal so changes its appearance, as to give information to the driver of any train within sight of the apparatus, that the train may proceed slowly. Then the apparatus wholly withdraws the signal, or into a resting position, which it continues until another train passes, the driver of which it informs that he may proceed at full speed without risk of collision with the preceding train. The action is by a piece of wood affixed to the locomotive engine striking the trigger of the apparatus, which communicates, by a lever, rod, &c., with wheelwork, and thus exhibits the glass field signals, or sections, or fans. This apparatus may be seen in operation at the London terminus of the Great Western and Birmingham Railways; and the details are illustrated in a pamphlet published by Messrs. Smith, Elder, and Co., Cornhill.

RAILWAY FILTERS.

UPON the roof of the terminus of the Greenwich Railway have been constructed Filters for supplying the engines with pure water, it having been ascertained that the machinery has been considerably injured by hitherto employing unfiltered water. Similar filters have been erected at the New Cross station, on the Croydon line.

WEIGHT OF RAILS.

WE find compiled in an able paper on Railways, in the *Athenæum*, No. 713, the following Table, showing the Weights of Rails on different railways, and the dates at which they were in use :—

	lb. per yard.	lb.
Liverpool and Manchester	in 1830, 35, in 1840,	60—75
London and Birmingham	1836, 50, .. 1840,	75
Stockton and Darlington	1823, 28, .. 1840,	64
Great Western	1838, 44, .. 1840,	62
Garnkirk and Glasgow	1830, 28, .. 1840,	50
Ardrossan and Johnston	1827, 28, .. 1840,	56
Ballochney	1826, 20, .. 1840,	54
Eastern Counties	1840, 75	
Edinburgh and Glasgow	1840, 75	
Edinburgh and Dalkeith	1831, 28	
Glasgow and Ayr and Greenock	1840, 75	
Grand Junction	1836, 75	
London and Brighton	1840, 76	
South Western	1840, 63—73	
Midland Counties	1840, 77	
Newcastle and Carlisle	1836, 42	
Manchester and Bolton	1835, 55	
Dublin and Kingstown	1835, 45	

TAAFFE'S PATENT SLATING AND ROOFING.

THIS patent has been granted for an improved method of Roofing and Slating buildings, whereby much of the overlapping of the slates will be avoided, and roofs will be more advantageously constructed with a much smaller quantity of timber and slates than at present used. The rafters are formed—First, with a groove ploughed, or otherwise made in their upper surface, which is to be lined with lead, zinc, or other metal, to form channels or courses;—second, by nailing a projecting slip of wood on each side of the rafter, which forms the sides of the channel; this method is used for the old roofs;—third, by dividing the rafters and placing slips between, to form the channel. Other methods are adopted, cutting the rafters diagonally, and then reversing them, which forms the channels. The rafters being furnished with proper water channels in some of these ways, slates are taken of such a width as to reach exactly from the centre of one water-course to the centre of the next, so that the side joinings of each series of slates fall exactly over the centre of the water channels; by which means any water that may pass through between them, will be carried off into proper gutters. The first or eave course of slates is fastened by one or two copper screws or nails at the bottom of each slate to the wall plate, or by plates screwed to the rafters, and ⌶ cramps; and the upper corners of the slates of that course *and all the others*, require two nails only to be used, viz: one in each to the rafter.

AIR-ENGINE.

MESSRS. STIRLING have constructed and patented an Air-Engine at the Dundee Foundry, which has the advantage over a steam-engine in consuming much less fuel, and is contained in less space; important properties for the purposes of navigation.

The principle of this air-engine consists in alternately heating and cooling two bodies of air in separate vessels: these are so arranged, that, by the stroke of two plungers worked by the engine, while the whole of the air contained in one of the vessels is at the lower end immediately over the furnace, and is, consequently, quite hot; the whole of the air contained in the other vessel is at that time disposed at the other end, cut off from any communication with the furnace, and therefore, comparatively cold. The expansion caused by the heat renders the air in one vessel much more elastic than that in the other; and the two ends of the working cylinder, (which is fitted with a piston,) being respectively connected with the two air-vessels, a preponderating pressure is produced on one side of the piston, and is therefore, pushed to the opposite end of the cylinder. By the alternate action of the plungers in the two air-vessels, this end of the cylinder comes in its turn to be subjected to the pressure, and the piston is thereby pushed back again to its former position; and thus it continues a reciprocating motion, and is applied to turn a crank, similarly to a steam-engine.

The great saving of fuel is by only a very small portion of heat being entirely thrown away by the alternate heating and cooling of the air. The size of the engine is kept under by using the air pretty highly compressed by means of a small air-pump; but very little power is expended on this, for the same body of air is used over and over again, with a trifling loss from leakage. In the first month of working this air-engine, its consumption of fuel was only about one-fifth part of that required for a steam-engine. The whole machine stands in about the same space that a steam-engine of equal power would occupy, without its furnaces and boiler. It will reduce the expense of the power employed in drawing machinery at Dundee alone, by, at least, 25,000*l.* or 30,000*l.* a year; but, for purposes of navigation, the advantages of this invention will be still more important.—*Abridged from the Dundee Advertiser.*

SMOKE NUISANCE IN LARGE TOWNS.

THE Committee appointed by the Court of Common Council of London, appointed to inquire into the Nuisance arising from Smoke of Manufactories, Steam-engines, &c. and the best means of obviating the same, have received communications from upwards of 41 parties, suggesting a variety of modes for the above purpose. These suggestions are, in the Report of the Committee, classed as follows: 1. Parties tendering general advice. 2. Methods for the combustion of coal and the prevention of smoke, by the introduction of fresh or undecomposed air into the furnaces. 3. Methods of coking or charring the coal in furnaces of steam-boilers, coppers, &c. 4. By the introduction of a jet of steam, in conjunction with a jet of air, into the furnace of steam-

boilers. 5. By the use of Anthracite, Welsh coal, or coke. 6. By compressed fuel. 7. Parties possessing plans, at present unexplained. 8. General complaints, but no remedy proposed. For the List of the respective Plans, names of Parties, &c., see *Civil Engineer and Architect's Journal, No.*50. One of the correspondents in Class 7 refers to an article in the 7th volume of Chambers's popular *Edinburgh Journal*, vol. 7, as calculated to effect the object required.

CONSUMPTION OF SMOKE.

Mr. S. Hall has completed, at the manufactory of Messrs. Boden and Morley, Derby, his patent Apparatus for the Consumption of Smoke from Steam-engine Chimneys. The furnace is supplied by a current of air heated by the furnace itself, which, when in full operation, completely consumes the volume of dense smoke which is frequently sent forth from the engine chimney.

CALCULATING PLANISPHERE.

This machine, the invention of Mr. J. M'Farlane, of Glasgow, consists of three metal plates, which revolve round a screw, or central axis. On these plates are printed tables, on which are several series of figures so constructed as to give the result sought for, by moving the revolving tables according to the printed directions given with the machine. Some portions have the merit of originality, and the whole is well adapted for obtaining with celerity the results which, by the common arithmetical methods, require time and labour; particularly interest and mensuration.—*Times, Oct.* 21; *abridged.*

BABBAGE'S CALCULATING MACHINE.

In the year 1821, Mr. Babbage, of London, undertook to construct a machine for Government, which should, by mechanical means, form tables of progression for the use of surveyors. A portion of this machine, forming a progression up to five figures, was complete—17,000*l.* had been expended on it already, and to perfect the entire work would have required twice as much more; consequently, in 1833, the project was abandoned, and it is not probable that the costly machine will be brought to a perfect state.

The fragment or member alluded to may be seen at the inventor's. Mr. Babbage is at present occupied with the plan of a machine which is to perform mechanically all the operations of algebra. Already he has 30 plans extant; and every friend of science must heartily wish that the inventor may be more successful with his new project than he was with the previous one.—*Times, Oct.* 13.

FOWLER'S CALCULATING MACHINE.

Mr. Fowler has exhibited to the British Association, his Calculating Machine, and worked some simple questions by its aid, to

exemplify its principle and action*. The machine itself is on the principle of the old abacus, or calculating rods. At the first glance, it has somewhat the appearance of a pianoforte, or organ, with all its keys laid bare. It would be impossible by mere description to make clear the details of the instrument, or the method of working it. The property of numbers which Mr. Fowler takes advantage of in his arithmetic is, that any number whatever may be expressed by a proper combination of the powers of the number 3. The powers of 3 are in succession thus: the 0 power is 1; 1st, 3; 2nd, 9; 3rd, 27; 4th, 81; 5th, 243; &c., &c. Thus, then, suppose the number 14 is had by subtracting from 27, or the 3rd power, the sum of 9, 3, and 1, the 2nd, 1st, and 0 powers, and similarly for all other numbers; the combination for some being more simple, for others more complicated. Instead of using the nine common characters, with 0, nought, or zero, as in our common mode of numbering, Mr. Fowler only uses three marks, + when the power of 3 is to be added, − when it is to be subtracted; and the power itself is expressed by the place in which the mark stands: thus the number 14 would be + − − −, where the − most to the right means that the 0 power of zero, or 1, is to be subtracted; the next − to the left means, that the 1st power of 3 is also to be subtracted; the next, that the 2nd power of 3 is to be subtracted, and the + in the 4th place of figures means, that the 4th power of 3 is to be added. When any power belonging to any rank or place is not required in expressing any particular number, a 0 occupies the place of either + or − in that place of the combination of characters for the number: thus + 0 − 0 − + would express 243 + 1, diminished by 3 and 27, or 214, to express which, the 3rd power of three, or 9, is not required; the 0 then in the third place expresses this, and yet gives the proper value to the −, 0, and +, in the 4th, 5th, and 6th places. Arithmetical operations are then performed by the aid of these simple marks with all the rapidity and security of the simplest algebraic processes, and pretty much in accordance with the well-known algebraic rules: thus to add 214 and 14 the process would be thus:

214	or	+ 0 − 0 − +
14	or	+ − − −
sum 228	or	+ 0 − + + 0

here the + and − in the place of the 0 power of 3 destroy one another; if the two −'s in the next place had a third with them, they would go on as one − to the third place; that − is then supposed to be introduced, but to balance it a + is also introduced and set down below: we then have two −'s in the 3rd place, which similarly give + below, and one − goes on to the 4th place, where the + and − already existing, balance one another or mutually destroy the −; that which has been brought on appears below, and so do the 0 of the 5th place, and the +

* See also a notice of this Machine, by Prof. Airy, at the Meeting of the Association in 1840, Year-book of Facts, 1841, p. 31.

of the 6th, there being nothing to alter them. One other simple example must suffice: multiplication of 214 by 14 will stand thus:

$$
\begin{array}{r}
+\ 0\ -\ 0\ -\ + \\
\\
-\ 0\ +\ 0\ +\ - \\
-\ 0\ -\ 0\ +\ - \\
-\ 0\ +\ 0\ +\ - \\
+\ 0\ -\ 0\ -\ + \\
\hline
0\ +\ +\ 0\ +\ 0\ 0\ 0\ - \\
\text{or } 2187+81-1=2996.
\end{array}
$$

Other processes are equally rapid, equally simple in principle, and uniform in method, and therefore we conceive that, independent of the calculating machine altogether, the method may be made useful in calculation. The great defect of it at present is, that the translation of a given number into the ternary combination of signs suited to express it, requires the aid of very voluminous tables. We can conceive, however, that some simple method of translation may be devised, and to this we beg to direct the attention of its ingenious author. In the machine, the successive rods have the power of the number that would be expressed by a +, or −, or 0, in the place in which the brass nail appears. The range of the machine is greatly extended by the use of the lines parallel to the zero line, for thus 3 + 's or 4 − 's suppose, are in succession placed by the rod being carried down 3 lines or up 3 lines, and thus additions and subtractions are performed by the very motions which work the rods in the process of multiplication and division. The extent of power of the machine will be conceived if we consider that 7 + 's followed by 480 can be set on the machine, and would represent the number

871049558399447807707902 12,

While 55 + 's would be, if all the rods were set one line only below the zero,

87224605504560089535585253, or

87 quadrillions 224605 trillions 504560 billions 89535 millions 585253 thousands.—*Athenæum*, *No.* 723.

A Correspondent of the *Athenæum* proposes "a very compendious Table," and a few Rules, to remedy the defect above complained of; for which see *Athenæum*, *No.* 725.

NEW CALCULATING MACHINES.

For the last two years, Dr. Roth, of Paris, has been engaged in the construction of arithmetical machines; and the success that has attended his efforts hitherto proves he has accomplished his scheme for performing automatically all the operations of arithmetic, from simple addition, subtraction, multiplication, and division, to vulgar and decimal fractions, involution and evolution, arithmetical and geometrical progression, and the construction of logarithms, with ten places of decimals. The machine, in its present state, works addition, subtraction, multiplication, and both kinds of progression, quite mecha-

nically. In division alone, the attention is required to avoid passing over the cipher. The arithmetical progression is of vast importance, as it operates from one farthing to millions of pounds sterling; and the instrument is small, not more than a foot wide, and of comparatively insignificant price. Mr. Wertheimer, the proprietor and patentee of this invention, has two descriptions of these machines—a larger one which performs sums in addition, subtraction, multiplication, and division; and a smaller, which performs addition and subtraction only. These machines have been submitted to the inspection of several gentlemen eminent for their scientific attainments, all of whom, particularly Mr. Babbage, have expressed the most unqualified admiration at their unparalleled ingenuity of construction. Mr. Wertheimer had the honour of an introduction to the Royal presence, at Windsor Castle, on Oct. 6, when both Her Majesty and Prince Albert were graciously pleased to express their approbation of the machines, and to order two of each sort to be supplied for their use.

Dr. Roth's Calculating Machines have since been exhibited at *the Polytechnic Institution*, and are thus described by the Editor of *the Mechanics' Magazine:*

"We use the word *machine*, as the whole of Dr. Roth's calculating contrivances may, we understand, be combined in one frame or case; but what we saw were *two* separate machines or instruments—one for performing the operations of addition and subtraction, which is of a rectangular form, about 6 inches long by 3 in breadth; and the other for doing sums in multiplication and division, which is of a circular form, about 12 inches in diameter, and 3 inches in thickness. On the face of each machine, there is a series of revolving circles or zones, each bearing the integral numbers 1, 2, 3, 4, 5, 6, 7, 8, 9; and each representing either units, or tens, or hundreds, or thousands, &c. Beneath each figure, there is an orifice, by inserting a small hand-style or pricker, in which the circle to which it belongs can be turned round, so as to present that figure to any point of the circle desired. All these circles are connected with and act upon a system of wheel-work concealed from view beneath the face of the machine, (like the machinery of a watch;) but in what manner or on what principle is not explained, and will, probably, remain a secret till the specification of the patentee, (Mr. Wertheimer,) is enrolled. As the numbers to be added, subtracted, multiplied, or divided, are given to the operator, he transfers them to the machine by means of the style; and when the whole are told off, you see almost at the same instant the product or answer to the question, exhibited to view through a series of open circular spaces left in the face of the machine, immediately above the revolving circles. We saw a great many questions solved by these machines, in each of the first four rules of arithmetic, as fast as they could be enunciated, and in every instance without the slightest error. Whether the system of the inventor can be made applicable to the solution of questions in the higher branches of the science of numbers, remains yet to be seen; but we have no doubt of its complete mastery over all the more ordinary computations required in the current busi-

ness of life. Dr. Roth's machines have the defect, which is probably inseparable from all machines of this class, that you cannot retrace the steps of any computation made by them; so that if any error is made in the delivery of a series of numbers to the machine, and which of necessity will produce an erroneous product, it is impossible to detect where that error lies, and your only remedy is to perform the whole computation over again. But it is to be observed, on the other hand, that so rapid is the operation of these machines, that you may make any computation by them, (within the range of common arithmetic,) half a dozen times over, in the same time that it would take most persons to make the same computation by pen or pencil. If used as tests merely, by which to check calculations on paper, they must be of immense service in all public offices, banking and commercial establishments, schools, &c. If the numbers are but given to them correctly, the answers furnished by them are *certain to be correct.* One great recommendation which Dr. Roth's machines possess over all others of the sort which we have seen or heard of, is their conveniently portable size, and, (should the demand for them be extensive,) consequent cheapness. The price now asked for an adding and subtracting machine, of the dimensions before given, is 2*l.* 2*s.*, and for the multiplying and dividing one, 26*l.* 5*s.*; but unless there is something of a more nice and complex character in the concealed machinery than we have reason to suppose, both machines might be supplied, *in large numbers*, for a fourth of the money, and yield a handsome profit."—*Mechanics' Magazine, No.* 951, *Oct.* 30.

Prof. Moseley has also described to the British Association, "A Machine for Calculating the numerical value of Definite Integrals;" a principle first suggested by M. Poncelet for the registration of dynamometrical admeasurements, which have been applied by M. Morin to an instrument called the Compteur, for registering the traction of loaded carriages upon common roads; and, during 1840, by a Committee of the British Association, to a permanent registration of the work of the steam upon the piston of a steam-engine. Prof. Moseley's machine has some mechanical expedients in common with the last mentioned machine; it has nothing in common with the Compteur of M. Morin, except the admirable principle of M. Poncelet. An engraved figure of Prof. Moseley's machine, with explanatory details, will be found in the Report of the Proceedings of the British Association, *Athenæum, No.* 722, p. 671.

PRINTERS' COMPOSING MACHINE.

A NOVEL and ingenious machine has been constructed by Messrs. Young and Delcambre, for placing the moveable types used in printing in the same position with regard to the spelling of words as they are now placed by the compositor. To give some notion of the invention, it may be said that the machine consists of as many grooves as there are letters in the alphabet, including the capitals, small capitals, &c. These are conveyed by means of keys, on which each letter is marked, to what may be called the receiving groove, which is about a foot and

a half in length. The type is then taken out of the groove, and the compositor has to divide or subdivide it, according to the required width of the column or pages, and this the inventors calculate will take about seven-eighths of the time less than the composition of the matter; and they reckon that from 12,000 to 15,000 letters, about the number contained in a column of *the Times* newspaper, may be put together by their machine in one hour and ten minutes; and, adding to this one hour for justifying the lines according to their required width, would make the time of preparing a column of matter for *the Times* two hours and ten minutes—a process which, under the hands of an ordinary compositor, would take about eight hours; thus effecting a considerable *apparent* saving in point of time: we say apparent saving, for it does not seem to have entered the minds of the inventors of this machine, that one man or boy must be employed to convey the type contained in the receiving groove to the compositor; nor do they seem to have considered how much more may be accomplished in the same time by the division of manual labour, particularly as applied to newspaper printing. The placing of the types in the grooves when they are emptied, must again occupy a considerable time, and cause a great drawback from the time gained by the rapidity of the machine. Another objection is, that the distribution of the type must be performed in the ordinary way, and each separate letter must be again collected to be replaced in the receiving groove.—*Times, August* 21.

NEW PRINTING PROCESS.

Mr. Morison has invented and patented a peculiar method of printing, by means of cylinders, which he terms the *Ophine Process*. The principle is that, if two cylinders be made to communicate motion one to the other, by means independent of the contact of their surfaces, they will give off on each other, or on any intervening surface, exactly the same quantity of ink as may have been received, by one or more of them, from another cylinder moved by the same influence as the first. By the application of this principle, Mr. Morison is enabled to supply a surface of types with a constant and equal coating of ink; and whether the types, or other surface to be printed from, be placed on a cylinder and moved circularly, or a vibratory movement, backwards and forwards, be imparted to a plane surface, as the supply of ink keeps pace with the movement of the surface, impressions may be taken as rapidly as two men can supply and take out paper. The inventor has further applied this principle to cylinder printing in colours, which is effected by fixing round a drum a number of cylinders, each supplied with colouring matter from a separate inking apparatus, and so arranged that their several impressions upon the paper supplied by the drum combine and form an entire figure. The motion of the whole apparatus proceeds from that of the drum, from which all the cylinders receive their movement by means of cogs. One of the most valuable results of the process thus briefly described is, that, as the degree of pressure exercised by the rollers, one on the other, is com-

pletely under command, it becomes possible to take impressions from the slightest conceivable elevations, or from the most flexible substances, without wearing or depressing them. The specimen designs are printed partly from cork, partly from leather and soft wood, and others from relief drawings, executed by scratching on the reverse side of a thin plate of metal—a method which admits of producing designs with the greatest rapidity.—*Mechanics' Magazine, No.* 922; *abridged.*

NEW PLANE-SURFACE PRINTING MACHINE.

THIS machine is the invention of Count Rosen, and is adapted for all kinds of book-work, and may be worked either by hand or steam power. It is capable of doing the work of two common presses, requiring a superintendent, and two boys to lay on and take off the sheets, and lower and raise the tympan. The simplicity of its construction cannot fail to recommend this machine to the favour of the trade, as it may be managed by a common pressman—the making ready not differing much from his usual method. The inking apparatus is very cleverly arranged, the distributing rollers having three or four different motions; the table, on which the type is placed, though remaining stationary when in work, has the elasticity of the wooden press; and the use of tympans enables the workman to dispense with blankets, so as to produce the finest impressions from wood-engravings. When in action, it makes very little noise, and may be stopped at any moment required. The space occupied by the machine, exclusive of the turning-wheel, is not greater than a press of the same capacity, (double crown), requires, but the cost is nearly fourfold. Of course, this machine is chiefly available where a large number of impressions are required, or greater dispatch than ordinary; as, for small numbers, too much time would be occupied in making ready, to render it equally economical.—*Athenæum, No.* 713.

TURKISH MINT.

MESSRS. MAUDSLAYS have executed for the Turkish Government, Mint Machinery, on a large scale, which has been much commended for the completeness of its design, and the beauty of its execution. It consists of two 16-horse power high-pressure engines, two pair of large rollers and two pair of smaller rollers, six cutting-out presses, two double draw benches, four coining presses, with pneumatic apparatus; and a die-sinking press, with two double-acting milling machines, ingot-moulds, &c.; uniting all the recent improvements which have been adopted in the British Mint.

IMPROVED CLOCKS.

MR. E. J. DENT, of the Strand, has patented the following Improvements in Clocks and other time-keepers:—

1. Giving the impulse to the pendulum of a clock at the centre of percussion, or as near as practicable to that centre.

2. Producing a compensation for the expansion and contraction of

the length of the pendulum, arising from changes of temperature, by causing the arcs of oscillation to vary in an inverse ratio to the vibrations of the length of the pendulum.

3. Combining three or more main springs to act simultaneously, without the medium of a fusee, upon the train of wheels of a chronometer or other time-keeper.

4. Placing two intermediate wheels between the three or more barrel wheels, and the centre pinion, in order to make a chronometer or other time-keeper go eight or more days at one winding up.

5. Connecting three or more arbors of the main springs with a common arbor, whereby all the barrel-arbors may be wound up at the same time by one application of the key.

6. Placing a chronometer or other time-keeper in an atmosphere of dry non-corrosive gas, contained in an air-tight case, through a stuffing-box, in which case the winding-up arbor passes, and in which it revolves, whereby all communication between the contained gas and the external air is prevented.

7. The application of the well-known voltaic or electro-metallurgic process to the deposition of a thin film of gold or other metal incorrodible by the atmosphere, upon the steel balance-spring and compensation balance, whereby rust is prevented, and consequently one cause of variation in the rate of chronometers is avoided.

TRINITY CHURCH-CLOCK, HULL.

THIS Clock, constructed by Mr. Harrison, on his new plan of propelling the pointers, is believed to be the largest in the world with four dials of equal magnitude; each upwards of thirteen feet in diameter, and each pair of pointers weighing above 56lbs. The rate of this clock is admirable.

STEPHENSON'S THEATRE MACHINERY.

A POPULAR notice of this new system of Machinery will be found in the *Year-Book of Facts*, 1839, p. 52. The following more detailed description of the general arrangement has lately been read to the Institution of Civil Engineers:—

The interior of the house between the basement and the roof, is divided into four compartments, viz.:—1. A raised platform, on which the gearing for working the stage-traps is placed. The trap-frames are mounted upon rollers; they traverse on the lower platform in every direction; and, when brought under the apertures of the stage, allow the traps to sink or rise at any required speed. 2. The stage, with its traps of various dimensions, including a considerable portion formed to rise or fall by suitable machinery, and called the sinking stage. 3. The lower flies, or corridor, between which and the stage are placed the wings or side-scenes, and the border-frames are suspended. 4. The upper flies, upon which is placed the machinery to communicate motion to the whole, from the upper horizontal shaft, by means of level gear, provided with double clutches to reverse the motion and shafts, on the lower ends of which are the slow-motion

wheels and drums, an endless chain is driven horizontally in either direction; to this are attached the borders representing foliage, clouds, arches, &c. The side-scenes, or wing-frames, the number of which is determined by the depth of the stage, may either be flat, circular, or triangular; and they receive a rotary motion, combined with or apart from a forward or backward movement, at pleasure, and can be placed at any desired angle to the audience. At every change of the scene they revolve through 120° or $\frac{1}{3}$d of a circle; and the scenes, when removed from sight, are replaced by those which are to succeed them. The traversing frames revolve on a centre, and are suspended from the border-frames, or from the upper part of the theatre, for crossing the stage in any direction, or at any given inclination.—*Athenæum*, No. 731.

IMPROVED PLANK-SAWING-FRAME.

Mr. B. Hick has communicated to the Institution of Civil Engineers a novel kind of gearing for producing what is usually termed the "taking-up," or "traversing" motion of the plank during the operation of sawing.

A revolving motion is given to two pair of coupled vertical fluted rollers, by means of worms and wheels, which are worked by a ratchet-wheel and catch, from the crank-shaft of the machine. When a plank is introduced between the moving rollers and the fixed guides in the centre of the machine, the tendency of the motion is to draw the plank forward at each stroke, with a force exactly corresponding to the degree of resistance opposed by the teeth of the saw. By this means, the necessity of any other support or side roller to the plank, during its progress through the machine, is avoided; and any number of planks of different length, depth, and thickness, can be put through the machine after each other, without any alteration, or stoppage of the work.

Several minor improvements are introduced in the general arrangement of the machine, particularly in the position of the crank-shaft, and connecting rod, which latter is placed in the centre of the moveable frame, occupying a space which has not hitherto been made use of in machines for cutting two planks simultaneously; and by carrying the crank-shaft upon the framing, instead of having it fixed upon a separate foundation, the construction is simplified, as well as rendered less expensive.

STEAM COOPERAGE.

Capt. W. H. Taylor has patented a new process of manufacturing staves, shingles, laths, and wood-cutting in general; which is so simple, and effectual, that it must cause an entire revolution in the trades affected by the invention.

The wood, having been cut from the solid timber, by means of circular saws, into blocks of the requisite length and breadth, is first steamed for the purpose of softening and seasoning. The waste steam of the engine is used for this purpose. It is then cut into leaves of

the required thickness, with extraordinary rapidity by one or other of two sets of machines adapted for this purpose; the one being a species of iron plane working in a vertical direction, the other a large disc, containing two cutters, and performing from 100 to 150 revolutions per minute. Mr. Robinson (late Bramah,) has completed a giant machine of this kind, being a disc of thirteen feet in diameter, intended for cutting hogshead staves. Such is the dynamical excellence of the mechanical arrangements, that at the expense of but two or three horse steam power, the wood is cut like cheese, without offering any apparent resistance to the knife, and without the slightest waste in saw-dust, shavings, or chips. The leaves thus cut are passed through another machine, which at the same moment bends them into the curved form required for the shape of the cask for which they are intended; gives them the requisite taper, and bevels the edges so as to make them fit each other with a water-tight joint. Each of these machines, attended only by a boy of from eight to ten years old, is capable of turning out as many finished staves in a minute, as the most experienced cooper could rend and finish in an hour.—*Patriot Newspaper.*

WHEELS MADE BY STEAM.

Messrs. Russell, mill-wrights, of Loanhead, near Denny, have invented a machine, worked by a steam-engine of six-horse power, by which the naves, spokes, and felloes of wheels, are not only turned and perfectly formed out of rough wood in an incredibly short space, but each part is, at the same time, so ingeniously fitted for being joined to the other parts, as to form a whole; each part being perfectly fitted and finished for that purpose. The naves are neatly perforated and mortised to the requisite size, and fine openings formed for "bushing," and for the spokes which are "tenoned" on both the nave and folloe ends, and at once made exactly to fill the mortisings, while the felloes in their formation have the "dool" or rather dule holes, and the mortising for the "tenoned" or upper end of the spokes perfectly finished, all by the machine; so that manual labour is superseded, except for the mere purpose of cleaning and putting the parts together. —*Abridged from the Stirling Journal.*

IMPELLING MACHINERY.

Mr. Pinkus, of Maddox-street, has patented certain improved methods of Impelling Machinery, applicable to carriages on roads, and vessels on canals. The first improvement is "A Differential Railway,"—a double line, on which, at certain distances, is fixed a gas-explosive apparatus, provided with two large horizontal wheels, one above the other, round each of which passes an endless metal band; and between each apparatus thus described, is an intermediate apparatus placed in one direction, whilst the band from the other horizontal wheels passes round one of the wheels of an intermediate apparatus placed in the opposite direction. The bands pass over wheels placed in the centre of each line of rails, and put those wheels in motion; which motion is communicated to the train of carriages by means of

bars extending from the bottom of the same, and which are kept in contact with the wheels.

The patentee's second improvement is for propelling boats on canals by a gaso-pneumatic explosive engine, along suspension rails on one or both banks of the canal: or a steam-engine may be used instead of the gaso-pneumatic engine.

The roads or ways in this specification are systems of mains or pipes, in which are laid metallic wires, which, at each station, are brought into contact with the positive and negative poles of an electric battery, and thus constitute metallic circuits.

The electric power is also used to prevent the collision of trains on railways, by causing it to put the breaks of the carriages into action. The electric power is likewise employed for lighting railways, tunnels, roads, &c. by effecting "a glow, or brush," to be placed in the focus of reflectors.

Further details of this elaborate specification may be seen in *the Inventor's Advocate;* or *the Civil Engineer and Architect's Journal, No.* 44.

TRACTION ON ROADS.

M. MORIN concludes from experiments, that for all kinds of surfaces of which roads and streets are ordinarily composed, the force required for the Traction of Heavy Vehicles is in the inverse ratio of the diameters of the wheels.—*Literary Gazette*, No. 1255.

IMPROVEMENTS IN PLOUGHS.

MR. WILLIAM HENSMAN, of Woburn, Bedfordshire, machinist, has obtained a patent for an improved mode of applying coulters to Ploughs, in order that they may be adjusted more easily. On one side of the plough-beam, a projection is formed, serving as the fulcrum on which the coulter moves, and on the other side is a plate which partly embraces the beam. Through this plate, the ends of two eye-bolts pass, and are secured by nuts; and through the eyes of these bolts the coulter passes, resting against the projection as a fulcrum. By screwing the nut of the upper eye-bolt tighter than the lower one, or the nut of the lower tighter than the upper one, the end of the coulter will be either made to advance to or recede from the land side of the furrow. The patentee shows a modification of the above, in which the projection, instead of being on the beam, is on a plate applied to one side of the beam through which the eye-bolts pass; and the lower bolt, likewise passing through the beam, serves as an axis to the plate. To the end of the plate an adjusting screw is attached by a pin-joint; and the upper end of it, passing through a projection on the beam, has a nut screwed on it. In this arrangement, the coulter can be adjusted two ways, viz. it can be made to advance to or recede from the land side of the furrow, by means of the eye-bolts and screw-nuts; and it can be made to advance to or recede from the fore part of the plough by raising the end of the plate, which is effected by turning the screw-nut on the adjusting screw.

IMPROVED DRAIN PLOUGH.

Mr. E. Alexander, of Taylorton, near Stirling, has invented an improved Drain Plough, the distinguishing features of which consist in the form given to the sock, and the prolongation of the mould or reast. The sock has attached to it, upon the right hand side, a feather, which is a piece of iron somewhat in the shape of a short coulter. This inclines backward at an angle of fully 45 degrees, and when it is fixed to the sock it measures $4\frac{1}{2}$ inches from the body of the plough, while at the top it measures $7\frac{1}{2}$, both inside measure, and it cuts to the depth of thirteen inches. The drain, when cut, measures fully five inches at the bottom, and eight at the top. The labourers now follow, laying in the tiles, after which the drain is filled up, and the work is completed in a very expeditious manner. The elongation of the mould or reast serves the purpose of throwing the unproductive subsoil quite clear of the productive upper soil, so that it can be easily cast back into the drain in its proper place. The elongation is about two feet. The mode of working this plough is by twice going over the field; for it is so constructed, that by fixing different socks, which Mr. A. has, it will work either shallow or deep; so that if it were required, he may even go over the field a third time, deepening the cut at each turn. When it goes the first time, it is generally drawn by four and sometimes six horses. As proof of the facility with which it does its work, we may mention, that the draining of four Scotch acres, at the rate of a drain in each alternate furrow, was fully completed in about four hours. The great object Mr. Alexander has in view is not so much the saving of expense as of time, besides giving certainty to his operation; and these objects we think he has accomplished in a very satisfactory manner.—*Stirling Observer.*

IMPROVEMENT IN THE PIANO-FORTE.

M. Isoard has submitted to the Academy of Sciences, at Paris, an instrument of the Piano-forte kind. Its ingenious inventor has long devoted his attention to a kind of combination of the effects which would result from the hammer of the piano-forte and the bow of the violin, in producing sharply, and then in prolonging, any given note made by the vibration of strings. The principle of the invention is this—that the sound is first produced by a hammer, as in the piano-forte, striking a string; and then the vibrations of the string are continued with the same intensity for any interval of time by the admission of a current of air, which produces a similar effect to what the drawing of a violin bow over the string would occasion. The introduction of a bow was first tried, but was found too difficult of application; and the action of air, by an ingenious mechanical contrivance, was then substituted. The effect of the instrument was quite commensurate with the skill of the inventor, the sounds being prolonged *ad libitum*, and giving to notes all the swell and compass of the organ.—*Galignani's Messenger.*

MOVEABLE OBSERVATORY AND SCAFFOLD.

Mr. A. H. Simpson, of Westminster, has invented a machine, or apparatus, to be used as a Moveable Observatory, Telegraph, or Platform, in erecting or repairing buildings, and also as a fire-escape. It consists of a shaft or spar, with a gallery or platform suspended or detached, which is raised or lowered by a sliding frame in the shaft, filled with a pinion. There is also a horizontal suspension rail, supported by shafts or spars, with a platform or gallery suspended therefrom, capable of receiving motion from within the gallery. For further details see *Mechanics' Magazine*.

WHITELAW AND STIRRATT'S PATENT WATER-MILL.

This machine, invented by Mr. Whitelaw, of Glasgow, and noticed in the *Year-Book of Facts*, 1840, p. 84, is one of the most remarkable improvements of the day in the application of water as a moving power. A large engine, upon this principle, has been erected at the Culcreuch Cotton Works, Stirlingshire, which are six stories in height, nearly 200 feet long, and 38 feet wide: they contain above 20,000 mule spindles—several hundred throstle spindles—with other machinery requisite for such works. Hitherto, and for many years, the works were propelled by two huge water-wheels, upwards of 30 feet each in diameter, one 5 feet in breadth, the other 12 feet in breadth. These wheels made about four revolutions per minute; they were supposed equal to about 60-horse power, and were fitted up at an expense, perhaps, of not less than 2,000*l.*; whereas the Patent Machine now in their place is only about 9 feet in diameter, yet it is equal to 95-horse power, and gives sixty revolutions per minute, and the entire expense of fitting it up is only about 600*l.* The machine itself resembles a large-bodied sea-snake coiled up, and making its gyrations in a boiling surf.

IMPROVED JACQUARD APPARATUS.

This improvement, by a resident of Manchester, when appended to looms, is capable of producing, either on light or heavy fabrics, not only a greater variety, but also a wider and more extensive range of patterns, than any other kind of loom: it makes a top and bottom shed of any required depth, without the aid of weights and springs attached to the healds. The design is formed, and may be varied at any moment, by the application of paper cards, or wooden logs or pegs. It will weave with any number of shafts, from 2 to 30; and any length of pattern, up to 5,000 picks, may be produced by it. The invention is, altogether, a very important one to manufacturers.—*Manchester Guardian.*

HOP-BINE HEMP.

The Bine of Hops boiled in lye till the rind separates freely, may be stripped, and when cool, worked like Hemp. This is best done by cording, which makes it like cotton.—*Mechanics' Magazine*, No. 921.

NEW ZEALAND FLAX.

MR. AIKIN, in a series of illustrations of "Vegetable Fibre," before the Society of Arts, on Feb 10, observed that the fibre of the *Phormium tenax*, or New Zealand Flax, appears to be very generally employed for cordage of all kinds in our colonial possessions in New Holland, and considerable importations have been made of it into this country. On its tenacity compared with that of Russian hemp, there are various opinions; but, judging from experiments, made with great care by Capt. Huddart, it seems to be decidedly inferior. According to these, if the tenacity of the best Russian hemp be estimated at 10, the Hungarian and Italian hemps are of equal strength with it. Bombay hemp is 8; New Zealand flax and Manilla hemp are 6; and the Bengal 5·5. New Zealand flax refuses to unite with tar; and the recent attempts to supply the place of tar with a composition in which caoutchouc enters, have not been found sufficiently cheap for the purpose.

SILK AND GLASS PICTURE.

AT the first anniversary of the Spitalfields School of Design, on August 31, there was exhibited a very striking design for a Picture to be executed in silk, or silk and glass, by Bailey, of Her Majesty and Prince Albert. The picture will be four feet in width, and five feet six inches in depth, and it will take machinery to the amount of 8,400 cords to make it. The number of cards requisite will be from 80,000 to 100,000; the rule-paper will measure seventy-two feet in width, and ninety feet in length, and when completed will be of greater magnitude than has ever been accomplished in this or any other country. The design is to be executed by a young artist named Voyer.—*Times, Sept* 1; *abridged.*

CHINA GRASS-CLOTH.

THE linen called China Grass-Cloth is fabricated of the fleshy part of the leaf of the aloe, which abundantly grows wild in China. The flax, which constitutes the fishing-lines known under the name of Indian twist, is also manufactured from aloe fibre.

BOSTON ROPE MANUFACTORY.

MR. BUCKINGHAM, in his account of the United States, describes the Rope-walk of the Navy, at Boston, as nearly half a mile in length, two stories high, built of fine granite, and roofed with iron and slate; the window-shutters are cased with iron, and the whole is fire-proof. A steam-engine at one end of the building is made to furnish the power for performing all the operations for rope-making, with very little aid from manual labour; from the first combining of hemp, and spinning it into threads, to the tarring and twisting of the yarn, and the winding of the whole into the hawser, or the cable required. Mr. Buckingham believes that in England we have no rival to the Rope-walk at Boston, either in the beauty and perfection of the building and machinery, or

the uniformity and strain in every strand and every fibre in the rope produced; or the finished roundness, smoothness, and flexibility of the hawsers and cables.

WIRE ROPE.

Mr. D. Laing has read to the British Association, a paper on the capabilities of Mr. Smith's Wire Rope, and pointed out its admirable adaptation for the standing rigging of ships. He stated, according to the report of Mr. Symonds, of her Majesty's Dockyard, Woolwich, that in the Falmouth, rigged with wire, only one-half of the surface was exposed to the wind that would have been, had she been rigged with hemp; the weight was diminished, and in the prime cost, taking weight, size, and strength into account, there was a saving of 30 per cent.; whilst the durability of wire-rope is at least three times greater than hempen cordage. It has been successfully used in mines, and in the Blackwall Railway. The details of the invention of the Patent Metallic Ropes will be found in the *Year-Book of Facts*, 1841, p. 54.

FLEXURE OF BARS.

On Feb. 8, Mr. Sang drew the attention of the Society of Arts for Scotland to an erroneous deduction drawn by the late Capt. H. Kater, from his experiments on the Flexure of Bars. Capt. Kater has observed that the elongation of the distance between two marks on the surface of a bar, when the bar is supported at the middle, is hardly half of the contraction caused by supporting the same bar at the two ends, the mere reduction on account of curvature having been allowed for in both cases. And he has thence considered that the neutral plane is not, as is usually supposed, in the middle of the thickness of the bar, but only at one-third of that thickness from the convex side. Mr. Sang showed that this result would imply that bodies resist distension with eight times the energy with which they resist compression; and he pointed out that the disparity observed by Capt. Kater is due to the difference of curvature in the two states of the bar, and that such disparity agrees with the deduction of the ordinary force of flexure. He also pointed out some errors in Capt. Kater's methods of computation and experimenting, which seemed to him, (Mr. S.) to destroy all confidence in any of that philosopher's experimental results.

STRENGTH OF CAST AND WROUGHT IRON AND WOOD.

Mr. Colthurst has detailed to the Institution of Civil Engineers, his "Experiments for determining the position of the neutral axis of rectangular beams of Cast and Wrought Iron and Wood; and also for ascertaining the relative amount of compression and extension at their upper and under surfaces, when subjected to transverse strain." The result, in every case, showed that the *neutral axis* of extension and compression in cast iron girders was certainly situated within two-tenths of an inch of the centre. Similar experiments were then made on wrought iron, with precisely the same results; showing that the neutral axis, if not actually situated at the centre, was nearly identical

with it. A similar series of experiments, made upon wood beams, gave exactly the same results, as regarded the position of the neutral axis. From all the foregoing experiments, the author concludes that the neutral axis of extension and compression in rectangular beams of cast and wrought iron and wood, is situated at the centre of their depth, when those beams are subjected to transverse strains. Experiments were also instituted to ascertain the amount of extension and compression of cast and wrought iron and wood. With cast iron, until rather more than two-thirds of the breaking weight was put on, the amounts of extension and compression did not sensibly differ, but between that point and the breaking weight, extension yielded in a higher ratio than compression. With wrought iron, the amounts of extension and compression continue to be equal up to the complete destruction of the elasticity of the beam. With fir battens, the amounts of extension and compression up to three-fourths of the breaking weight, do not sensibly differ, but as the ultimate strength of the beam is approached, compression yields in a much higher ratio than extension, and may be actually seen to give way first. Mr. Colthurst states also, that the amounts of extension and compression are in direct proportion to the strain, within the limits of elasticity, and that even after those limits are greatly exceeded, and up to three-fourths of the strength of a beam, they do not sensibly differ.

STRENGTH OF BRICK AND TILE ARCHES.

Mr. T. Cubitt caused to be built two Arches, each with a span of 15 feet 9 inches and a rise of 2 feet. The Brick arch was 2 feet 4 inches wide, and composed of half a brick in thickness, with cement. The Tile arch was two feet four inches wide, and built of four tiles set in cement, forming a thickness of 4¼ inches. The spandrels of the arches were filled up level to the crown with rubble-work and cement. A load of dry bricks was placed along the centre of both arches, and gradually increased, at stated periods, from 12 cwt. 3 qrs. up to 160 cwt., at the end of seventy-five days, when the abutments of the arch gave way; and the tile arch broke down while loading.—*Proc. Institution of Civil Engineers.*

STRENGTH OF GRANITE.

The following important practical discussion at the recent meeting of the British Association, arose on the reading of a paper on the Granite of Dartmoor.

Mr. Eaton Hodgkinson had made a great number of experiments with various materials, to ascertain the strength of each. He had adopted the only mode by which he believed a correct result could be obtained. The surfaces had been made perfectly square, and rendered completely smooth, to make them perfectly prismatical; the process of pushing was then effected; and with respect to granite, the result had been that they split in the direction of the laminæ. He mentioned

this, to show that the practice of placing these stones in buildings without any reference to strata was exceedingly injudicious, when they were required to bear any weight. Mr. Enys knew that the strength of granite was altogether unlimited, with regard to the proportions of other stones usually made use of in buildings. He had found in the Cornwall granite a difference in the strength; and he had no doubt the same difference existed in the Dartmoor and all other granite. Mr. Rendel believed the granite stone was usually placed the bed way, because it converted better. Workmen called it the grain of the stone; it was very well known that unless it was placed in the way of the grain, it would, in effect, be weaker. Professor Moseley complimented Mr. Hodgkinson on the accuracy of the experiments he had made. Nothing had so much tended to the injury of practical science as inaccuracy of experiments; and whoever by any means published inaccurate results was a traitor to the cause of practical science. The results of experiments which had been made with respect to crushing stones had been generally inaccurate. He could not tell why they had always adopted the cubical form: certainly the best was the rectangular form.—*Literary Gazette, No.* 1284.

WEAR OF GRANITE PAVEMENT.

DURING 17 months, the following was the relative wear of Pavement made of the Granites named, laid down on the Commercial Road, London; Guernsey, 1·0; Herm, (near Guernsey,) 1·19; Budle, (a Northumberland whinstone,) 1·316; blue Peterhead, 2·08; Haytor, 2·238; red Aberdeen, 2·524; Dartmoor, 3·285; blue Aberdeen, 3·571. These considerable differences are mostly to be attributed to the mineralogical structure of the stone; granite being composed of, at least, the red species, mica, feldspar, and quartz, of which quartz is the hardest, and mica the softest. Permeability to wet is also a cause of rapid disintegration, especially in conjunction with frost.—*Rail-road Journal.*

NEW WOOD PAVEMENT.

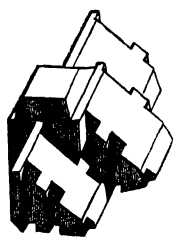
THIS Pavement is the invention of Mr. Rankin, and is manufactured by Messrs. Esdailes and Margrave, at the City Saw-Mills, as follows. A square-sided piece of timber, of a proper length, is provided, each side being 4 inches across; along the entire length of which piece two equilateral grooves are cut by steam machinery. The piece is then turned over, and on the side opposite to that grooved, two corresponding tongues are cut, along the whole length. The timber thus prepared, will have two sides opposite each other with plain surfaces, one of the remaining sides *grooved*, and the other *tongued*; and in this state it is ready to be cut into blocks, to be laid down as pavement.

This grooving and tonguing constitutes the principal merit of the invention; and their construction is geometrically correct. The tongues of one piece of timber fit into the grooves of another; and

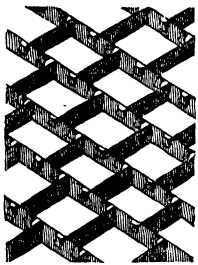
when two pieces are thus united, they are not *flush* with each other; but the side of the second piece projects beyond the side of the first to which it is fastened, exactly half its own width. If a third length were attached to the second, in the same way that the second was to the first, the edge of this third length would again project beyond that of the second, half its width, and the same effect would be produced with any number of pieces.

The lengths thus prepared are next sawn into wedge-like blocks, in two sets, upper and lower, the individual parts of every block of each set being geometrically alike. In the pavement, half the number of blocks are laid upon the ground with their bases downward, and the other half form the surface of the pavement in a reversed position, their bases being placed upward. The lower blocks are called base-blocks, and these support the others; the upper blocks are called key-blocks, and these firmly interlock the under blocks, and themselves together.

Unchangeableness of position, a most important quality of this pavement, is thus secured. The annexed cut represents five blocks locked together: four base-blocks, and one surface-block; the key of the latter being supported by the others, and by all equally: no surface pressure can separate them laterally, or drive them asunder; so that any weight applied at the surface is distributed over a base nearly four times its area; but these four base-blocks likewise respectively lock in with four other different series of the same kind, and so on continuously from side to side of the street, where they rest on the kerbs, and longitudinally from end to end of the pavement; and thus the weight applied to an individual surface-block is not confined to the four base-blocks, its immediate supporters, but is transmitted throughout the whole structure, and no part can yield to the superincumbent pressure without causing a deflection from kerb to kerb, which is only possible to a very small amount: no inequality of surface, from the sinking of individual blocks, can consequently arise, until the surface-blocks themselves are fairly worn out; assuredly, a result much more remote than is yet commonly believed. The construction of this pavement, therefore, as regards uniform stability of base, places it beyond all comparison with any stone paving now in use; because it includes the principle of the arch, the kerbs representing the abutting piers, and the upper or surface-blocks the key-stones, with their grooves and tongues.



Another advantage of this pavement is that it provides an effectual *remedy against slipperiness*, by offering a firm foot-hold for the horse in all states of weather, as the foot of the horse cannot slide over its surface. At the same time, it offers no resistance to the progress of the wheel; wherefore, this prevention of slipperiness is not obtained



by any sacrifice of facility of traction. The annexed engraving conveys the general character of the pavement. It remedies the hitherto insurmountable evil attending the use of wood, the insecurity of the horse's foot-hold; and offers a facility of removal equal to the present stone paving, and an evenness of surface, and combination of construction, together with an absence of noise and increase of cleanliness, which wood alone can give.—*Abridged from the Polytechnic Journal.*

FORCE OF ATMOSPHERIC PRESSURE.

MR. PARKES, in an elaborate paper On Steam Boiler Explosions, read to the Institution of Civil Engineers, on March 30, related the two following cases which he considers to have arisen chiefly from inequality of Atmospheric Pressure. The first occurred at the Plymouth Breakwater, during the great storm, in February, 1838, when several of the largest granite blocks, weighing from 3 to 8 tons each, composing the surface of the Breakwater, were torn from their positions and projected over the pavement into the Sound; although they had been squared and dovetailed into the structure, and embedded in excellent cement to the extent of their whole depth, thus forming a solid mass. Mr. Parkes attributes this to the hydrostatic pressure exerted beneath the stones, at the moment when the atmospheric pressure above had been disturbed by the masses of water suddenly and rapidly thrown upon the surface of the breakwater. Blocks of stone are thus often carried to a great distance; not so much by the waves lifting them, as by the vacuum created above them by the motion of the water, which exerts at the same time its full pressure from below.

The other case occurred during a storm in the year 1840, when the sea-door of the Eddystone Lighthouse was forced outward, and its strong iron bolts and hinges broken by the atmospheric pressure from within. In this instance, Mr. Parkes conceives that the sweep of the vast body of water in motion around the Lighthouse had created a partial, and momentary, though effectual, vacuum, and thus enabled the atmospheric pressure within the building to act upon the only yielding part of the structure.

IMPROVED SIGHT FOR FIRE-ARMS.

MR. C. T. COATHUPE, of Wraxhall, has read to the British Association the following paper "On an Improved Sight for Rifles and other Fire-arms."

The usual mode of constructing the regulating sight of a rifle is, to adapt a piece of steel to a dove-tailed groove filed transversely across the lower end of the barrel; and to furnish this piece of steel with two, three, or four separately moveable leaves of steel, of various

heights, each having a notch filed in the centre of its upper edge. These leaves, being attached by means of a hinged joint, can be raised at pleasure; and their heights are generally regulated for certain definite ranges, the lowest being for 100 yards, the next for 150 yards, the third for 200 yards, and the fourth and highest for 250 yards.

Between these stated intervals an imaginary allowance for the correct elevation is all that can be effected.

As a substitute for this description of sight, Mr. Coathupe recommended another, upon a different principle, equally simple, and by which any elevation may be readily obtained with accuracy, commencing with the lowest, or point-blank range, and ascending by the least possible increments to the extreme range for all useful purposes.

It should be constructed by first forging a piece of iron, which, when filed up flat, and square at the edges, shall furnish a wedge, or inclined plane, from six to eight inches in length, and from three-eighths to half-an-inch in width, having its thicker extremity about three-eighths of an inch, and its thinner end about one-sixteenth of an inch in thickness.

Upon this inclined plane, a piece of steel, of similar length and width to that of the inclined plane, but of uniform thickness throughout, and having its edges filed so as to exhibit a dove-tail section, must be fixed, the wider surface being uppermost. Upon this dove-tail plate a steel sight, with a small notch filed in the centre of its upper edge, must be fitted so as to traverse steadily from end to end. The dove-tail plate may be attached to the inclined plane by means of gunsmiths' solder; and when thus fixed, a narrow groove must be filed longitudinally through its substance, commencing in a median line upon its upper surface, the bottom of the groove being parallel to the base of the inclined plane. The whole must then be affixed to the rifle barrel, in a line corresponding with the axis of the bore, by means of three steel screws, whose heads must be countersunk.

It is evident that if the upper edge of this traversing sight, when at the commencement of the inclined plane, be so adjusted to the perpendicular heights of the inclined plane, and of the sight near the muzzle, that a line passing through a central point in each shall be parallel to the axis of the bore, this will be the position for the point-blank range of the rifle. Also, that if the lower sight be pushed farther along the inclined plane, the angle of elevation, and consequently the range, will be proportionally and gradually increased, until it has traversed to the extent of its limit: and as, during its passage, it will be gradually approximating the upper sight, there will be an increasing ratio of range as the distance between the two points of sight diminishes.

The plate upon which the lower sight traverses should be graduated throughout its length for every ten yards of distance within the range of the barrel, (the charge and quality of the powder being uniform.) By means of the thumb, the sight may be instantly adjusted to accord with the estimated distance of the object from the observer.—C. T. C.

GUNPOWDER MACHINE.

M. LAURENT has exhibited to the Academy of Sciences, at Paris, the drawings and description of a Machine, for the improved fabrication of Gunpowder; by means of which the employment of manual labour, except for superintending the working of the apparatus, is entirely superseded. Most of the common causes of accident in this dangerous manufacture are avoided by the new machine, which also makes the powder more rapidly, and with less waste of material, than by the ordinary methods.—*Literary Gazette, No.* 1283.

PERCUSSION SHELL.

CAPT. J. NORTON thus describes his invention, the Percussion Shell to explode at the bottom of the Sea. An iron tube, like the barrel of a musket, is screwed into a shell of any size, water-tight. A rod of iron, about half a pound in weight, and one foot in length, is suspended within the tube, by means of a split quill passing through a hole in the upper end of the rod, the other end being armed with a percussion cap. The mouth of the tube is closed with a screw-lid almost water-tight. Tin or brass wings being attached to the upper end of the tube will keep it in a vertical position during its descent to the bottom of the sea; and the shock on its striking the bottom will cause the bar of iron within the tube to fall and produce the percussion and explosion. Should it be found difficult to make the shell waterproof, Capt. Norton is satisfied that percussion-powder made from silver will explode by friction or percussion even when *mixed with water.—Proceedings of the Royal Society.*

NEW CARBINE.

A HANDSOME new Carbine, superior to every other hitherto submitted to the Board of Ordnance, has been introduced to the corps of Sappers and Miners. This instrument weighs only 8 lbs. 3 oz., and the barrel measures 2 feet 6 inches in length, having a bore equal to the present infantry musket, but with less windage, the balls having to be driven home in the same manner as in rifles. The stock, and indeed, the whole of the workmanship, is of the best description: each piece is labelled "Tower, 1841." The swords to be fixed on them instead of bayonets are 2 feet in the length of the blade, having one sharp cutting edge, and a sharp point for defending the men from the attacks of cavalry; and when attached to the carbine are exactly equal in length to the musket and bayonet of line soldiers. The lock of the carbine is constructed on the most approved percussion principle, and the caps have four Vandyke cuttings round the edges, to secure a firm hold of them in cold weather; whilst, as the cap splits instead of bursting in the action of igniting, it is rendered peculiarly safe, and not liable to disperse or startle the eye at the time of taking aim.—*Times, August* 20.

NEW PROJECTILE.

CONSIDERABLE interest has been excited during the past year by a third and final experiment of a tremendous Implement of War, invented by Captain S. A. Warner, so long ago as the year 1831. The subject was first brought before the public in the *Times* newspaper, August 26, 1840; and resumed on September 1, 8, and 12, in the same year; but not again noticed until February 22, 1841, in the report of an experiment exhibited by Mr. Warner, on Feb. 20. The trial took place in the grounds of Mr. Boyd, in the county of Essex, a few miles from London, in the presence of Sir Robert Peel, Sir George Murray, Sir H. Hardinge, Sir F. Burdett, Lord Ingestre, Col. Gurwood, and Captains Britten and Webster. A boat, 23 feet long, and 7 feet broad, was placed on a large sheet of water; this boat had been the day before filled in with solid timber, 4½ feet in depth, crossed in every direction, and clamped together with eight-inch spike nails. This filling-in was made under the inspection of Capt. Britten, who stated the fact, and also that the inventor never went near the workmen employed, that no suspicion might be entertained of any combustible materials being lodged in the hold of the vessel. Several of the gentlemen were rowed in a punt to the vessel, and examined for themselves, so that every doubt might be removed as to the cause of destruction being external, and not from the springing of any mine. When the different parties had taken up their positions, on a signal from the inventor, the boat was set in motion, and struck just abaft her starboard bow, and instantaneously scattered into a thousand fragments. At the moment of collision, the water parted, and presented to the eye the appearance of a huge bowl, while upon its troubled surface was a coruscation resembling forked lightning. A column of water was lifted in the air, from which were projected upwards for many hundred feet the shattered fragments of the vessel, which fell many of them several hundred yards' distance in the adjacent fields. The large spike nails were found snapped like carrots; the mast like a tree riven by lightning, and never before, as he assured us, had the writer witnessed so sudden and complete a destruction, though he had seen shell and rocket practice on the largest scale. How this mighty effect was produced was, of course, not disclosed to so numerous a party; but two naval officers present were perfectly aware of the mode of operation, and the inventor offered to go into details confidentially with one or two of the distinguished officers present. In answer to a question from Sir Henry Hardinge, the inventor stated that without a battering train, he could transport on a mule's back the means of destroying the strongest fortress in Europe. The existence of these tremendous powers is placed beyond all doubt, and the inventor asserts them to be completely under his control. The instrument which wrought so terrible an effect, lifting into the air a boat weighing two and a half tons, and filled in with five and a half tons of solid timber, and displacing at least fourteen or fifteen tons of water, was only 18lb. weight. The informant has handled it, and kicked it round a room when charged with its deadly contents, so portable and

at the same time so safe is it—a point of vast importance, when we remember the daily accidents that are occurring from the shells now used in our service. At Acre, most of those employed burst before they reached their object; they are liable to explode when rolling about a ship's deck, as was proved by the fatal accidents on board her Majesty's ship *Medea*, off Alexandria, and the *Excellent*, at Portsmouth, and are dangerous to carry in a common ammunition-cart on a rough road. The following additional details are from the report of the experiment in the *Literary Gazette*, in which is claimed the merit of first bringing the invention into notice:—

"The water of the lake, seventy-five yards in breadth, was thrown up all round to the height of several feet, and an extent of fifty yards; while a perpendicular column rose into the air, like a body of smoke, and sank, assuming something of the appearance of a fountain. All the spectators stood mute as if thunderstruck; for, in spite of all they had heard, few or none calculated on so entire a destruction. The huge mass of solid timber was a wreck of shreds, with here and there a large fragment, scattered over the fields. The noise of the explosion scarcely exceeded that of a gun, and this has been greatly modified by the inventor. This novel invention seems far to surpass the advances made by gunpowder over the Magian and Greek fires, since it has been discovered and perfected by the genius of a single man, so as to be even more under control than gunpowder. We have ourselves been favoured with a sight of two or three of the fragments, in the possession of Mr. Pote, taken immediately after the explosion. The step of the mast, a part which is with Sir R. Peel, is particularly worth attention: it is bent up so clean as to give one side the hollow appearance of bamboo within; while in the other, the heart of the wood is laid open, smooth and clean, along its whole length. No trace of scorching or blackening is visible any where; and it is remarkable that the mast was not only shivered longitudinally, but also divided across in several places; proving altogether that the power is not in the least that of lightning, and that it acts at once perpendicularly and horizontally."

Mr. Warner appears to have first explained his invention to His late Majesty, William IV., in 1831, who directed its merits to be investigated; and accordingly, Admirals Sir Richard Keats and Sir Thomas Hardy reported thereon, satisfactorily. Subsequently, at the request of Lord Melbourne's private secretary, Lieut. Webster examined the principle and practice of Capt. Warner's discovery, and in 1839, asserted their merits to be "so extraordinary as to vest the absolute sovereignty of the seas in the hands of the first power that shall adopt them. It is utterly impossible for any thing that floats to resist them for a single moment, either close quarters, or any given distance, even to a range of 5 or 6 miles. The strongest fortifications in Europe could not withstand these extraordinary powers for a single hour. In river ways, and against stockades, as in India, the largest armies would be annihilated without the chance of escape; and the most difficult mountain-passes would be utterly untenable against their operation. The countr would thus be rendered impregnable; for one hundred

sail of the line would be useless against a single vessel so constructed: and whenever it should be necessary to call this power into action, its effects could be attained by a trifling expense, and at the shortest notice." Notwithstanding these urgent representations, coupled with the assurance that Capt. Warner has been offered 300,000*l.* by a foreign power, for the secret of his invention, Her Majesty's Government, up to November, 1841, had not come to any definitive arrangement with the inventor*.

FORMS OF VESSELS.

MR. SCOTT RUSSELL has reported to the British Association the progress of "the Committee on Forms of Vessels," during the past year. In these experiments, a more simple apparatus has been employed than in any former series. The forms of body experimented upon are those of actual ships, or bodies analogous to those in use; the object being to supply the actual desiderata of hydrodynamics, and of practical ship-building. The experiments have been made on vessels of every size, from models of 30 inches in length to vessels of 1,300 tons; in water of variable depth, and in channels of various dimensions, so as, if possible, to embrace all the elements of the resistance. A minute description of some of the apparatus has been given, with some general illustrations; but, as the experiments are still in progress, no general statement of results has been entered into: the whole, it is expected, will be concluded by the summer of 1842.—*Athenæum*, *No.* 720.

IMPORTANT INVENTIONS FOR NAVIGATION.

THE imperfection attending the action of the log in ascertaining the rate at which ships are sailing, has long been felt, and other means of attaining the same object have been anxiously desired by all captains of ships. An apparatus has been contrived and patented by M. Clement, of Rochefort, called a *Sillometer*, or watch, for indicating the speed of a ship, which has successfully accomplished the purpose. M. Clement has also patented this invention in England, and two others connected with it. The *Sillometer* consists of a piece of copper, called by the inventor the *agent*, against which the water acts. This agent is attached to a moveable plug of the same metal, which slides in a copper tube fixed through the centre of the vessel to the keel; to this plug is attached a lever, which, by means of a vertical rod, acts on a second lever placed on the deck of the vessel, and communicating with a spring; the tension of the spring constitutes an equilibrium with the presence of the water on the *agent*, and serves to measure the rate at which the ship is moving by means of a hand, the movement of which on a graduated dial indicates, at every moment, not only the speed of the ship, but also the distance run in any given time, by marking all

* For further details of the invention, with Correspondence, and Debates in the House of Commons, on the subject, see a Pamphlet, entitled: "Is England's Safety or Admiralty Interests to be considered?" By F. P. Walesby, Esq., M.A. ,J.P. ,&c. Barrister-at-Law. Third Edition.

the distances passed within short intervals. A table annexed to the instrument allows the officer on the watch to note the distance traversed at the moment when his watch is relieved. The sillometer resolves many problems of great importance. It gives every moment the rate of the ship's sailing, and also the space traversed in any given time. It indicates positively either the influence of a sail furled or unfurled, of a change in the placing of the ballast or of the guns, and what is the most favourable direction of the wind for its action on the sails, which is very important either in giving chase or endeavouring to get away. It offers also the advantage of measuring, when at anchor, the force of currents on the keel. The second of M. Clement's inventions is called a *Direvometer*, or watch, to ascertain a ship's lee-way. It is moved by a paddle, that may be placed under the keel at will, and is supported by a plug sliding in a tube like that of the sillometer, but turning with the paddle and the rod. This motion is produced in two semicircles, one of which indicates the lee-way to larboard, the other to starboard. When at anchor, the instrument will show clearly the directions of the currents. The third invention is a *Submarine Thermometer*. It appears from the thermometrical observations of many scientific navigators, that in seas of unfathomable depth the water is not so cold as over banks; and that over banks near the shore it is less cold than over those at a greater distance, but colder than in the open sea. M. Clement, by making use of his sillometer tube, places at the bottom of the plug which sustains the *agent* of the sillometer a metallic thermometer, formed of a strip composed of two metals, and turned in a spiral shape, which is fixed by one end to the plug, and by the other to a vertical rod, which is so adapted as to turn two hands; one of which moves at the least alteration in temperature; whilst the other follows the angle of rotation of the rod. In the experiments made on the coast of France, results have been obtained which show the great services this instrument may render to navigation.—*From a French Correspondent of the Inventor's Advocate.*

H. M. S. TRAFALGAR.

THIS stupendous vessel, a first-rate of 120 guns, was laid in the Royal dockyard at Woolwich, in 1831, by Mr. Oliver Laing; and being completed, she was launched on June 21 last, in presence of the Queen and Prince Albert, and an assemblage of 300,000 persons. The following technical description of this majestic ship is from the *United Service Gazette*:—

She is a perfect man of war; has good space between her ports on every deck, clear of hanging chocks to the beams against the side, having no projections or obstructions in the way of fighting the guns; has great space on her orlop deck, the beams being continued all fore and aft, with a good flush three-inch flat, presenting at her sides a strong trussed figure, beautifully arranged with wood and iron, each standing in a different direction, the materials being so distributed as to give the greatest strength to the fabric; and, having no wing pillars nor officers' store-rooms, as formerly, gives a spacious accommodation

for taking troops in time of war, or an opportunity of messing her crew, keeping her guns on the lower deck clear and ready for action. This deck can be lighted by tube scuttles through the side between the beams of the gun-deck, giving ventilation for the benefit of the health of the crew, in addition to light, similar to a frigate's lower deck. The trussed figure is continued below in the hold throughout with strengthening pieces on the floor-heads, the size of the keelson, in the same direction, all fore and aft, instead of the old cross or thwart-ship riders formerly used in the ceiling, and the diagonal trussing being better distributed, not only adds consi'erable strength to the vessel, but greatly increases her stowage. The wings, which were formerly on the orlop, are now in the hold at the sides, which affords an opportunity of stopping a shot hole seven feet lower under water, and causes a circulation of air around the ship's side in the hold, which was never obtained before. Her main powder magazine is designed in midships, with platform in the hold for store-rooms, and a grating platform in midships for the hempen cables, and a third tier of tanks, which keeps them in a position to allow of every one being used without removing any from their places, as well as increasing the stowage of water. The shot lockers are taken away from the well, and shot-racks are fitted at the sides of the ship, by which the shot are placed single all round on both sides, keeping them free from corrosion, and always ready when required for action, and that immense weight removed from pressing down the vessel at the mainmast. She is fitted with safety keels, which add much to the strength of the ship as well as her preservation from shipwreck should she get on shore; the keels may be carried away, and the safety of the ship not endangered. She is built with a strong internal round stern, well adapted for fighting her guns, and externally a square stern, presenting a perfect and pleasing appearance, although unadorned with carved work, preserving the form and beauty of the ship without depriving her of the advantage of fighting her guns. The top sides are clear of any protection, no trunks being required to carry off the water over the sides from the several decks as formerly, each deck being delivered of its water by pipes leading into the common gun-deck scupper, by which the water is passed overboard; thus preserving the side from decay, and preventing the necessity of cutting scupper-holes in each deck. The head may be fitted with a copper pipe at the side of the stem, instead of the disagreeable appearance of wooden trunks, as usually fitted in men-of-war, which will keep the head perfectly clean, and the pipe so fitted cannot be displaced by any accident. The rudder is fitted very securely, and so remarkably safe that it could not be easily carried away as formerly; even if all the pintles were broken off, the rudder would keep in its place and work on the braces (an instance of this occurred to the Flamer when in the West Indies). The Trafalgar has an iron flange on the rudderhead, with three holes to receive an iron powl-pin, by which the rudder can be secured in midships or on either quarter, and the ship laid to in case of accident to the tiller. She has pipes in her quarter galleries conducting the water from every stool, similar to internal scuppers, thus

of sight; but by a few strokes from the condensing air-pump, she immediately rises to the surface of the water, and again floats. A Correspondent of *the Civil Engineer and Architect's Journal* recommends the fitting of boats with this preserver; as, in case of danger, they would become life-boats, superior to any yet invented for room, lightness, and buoyancy.

SAFETY ROCKET.

MR. CARTE, of Sheffield, has successfully experimented with his Rocket apparatus, for communicating with shipwrecked vessels. The width of the range was fixed at eighty feet; so correct was the firing, that all the Rockets passed within a few feet of a flag-staff placed in the centre of the range. The Rocket is placed in an elevated position, on a frame similar to that of a telescope-frame, and the rope is coiled in a box on the ground, in such a manner as to offer no obstruction to the progress of the Rocket. So simple is it that two or three gentlemen, previously strangers to the process, were enabled from observing Mr. Carte perform the experiments, to fire some of the Rockets with equal effect. Among those discharged during the evening, were two six-pounders, carrying a rope weighing 22lbs., with the exhibition of which the whole company were highly delighted.—*Sheffield Patriot.*

CLOTH BOATS.

SOME experiments have been made in France with Portable Cloth Boats, the invention of a Sieur Leclère. A flotilla of five of these little vessels, carrying twenty-eight persons, passed from the port of La Rapée to Saint Cloud, without accident; and the five were taken back by one man in a small hand-cart. During the transit they were several times brought to the bank, and lifted out of the water, taken to pieces, put together again, and re-launched in less than five minutes. The weight does not exceed from twelve to fifteen kilogrammes.—*Athenæum, No.* 702.

REMOVAL OF THE WRECK OF THE ROYAL GEORGE.

COLONEL PAISLEY has proceeded with this interesting labour at intervals during the past season. In the month of August, the operations were very successful. More timber was got up on the second than on any former day of the season; and soon after was fished up a brass 24-pounder, being the fifth gun this season. On the 16th, a charge of 106lb. was fired against a small bank of mud, full of staves and casks, &c., which was demolished; and a number of large fragments were laid bare by the explosion. An improved mode of getting up the timbers has been adopted: every diver is provided with an iron pricker, with which he feels for large timbers buried in the mud, on discovering any of which he introduces an iron dog below, with an eye at top, to which a strong rope is attached, and worked by the men at the crab or capstan of the lump from which he descended. Thus the floor timbers are raised above the surface of the mud, after which the diver, who stands by, watching this process, and interchanging signals

with the men above, attaches chain slings to it, by which it is finally raised. Without this ingenious though simple expedient, not above one half of the masses of wreck removed this year could have been got up.

The successful progress of the removal of the Wreck may be estimated by inspecting the immense stack of timber recovered and piled up in Portsmouth Dockyard, where it covers a space nearly 100 feet in length, and nearly 40 feet in main breadth; of irregular height, in some parts seven feet. The whole of this mass, estimated to contain 18,600 cubic feet, or 372 loads of timber, has been recovered since the 8th of May last; and as the shoal of mud from which these remains were extracted, stood ten feet in height above the bottom, at the commencement of the operations in 1841, but on leaving off (in November,) had been reduced to four feet, measured at the last neap tides, and as two pieces of the keel have been brought up this season, confident hopes are entertained that the whole remainder of the wreck *of* the *Royal George* may be removed in 1842, as well as the small wreck near her, possibly the *Lark* lighter, made fast along side of her when she went down, and shared the same fate.—*(Times, Nov. 8; abd.)* The Report of the operations in 1840 will be found in the *Year-book of Facts*, 1841, p. 34.

THE CALEDONIAN CANAL.

In the *Year-book of Facts*, 1840, p. 94, will be found a descriptive notice of the Caledonian Canal, its origin and object; its unfinished state, and the accident at Fort Augustus, in 1837; with the general result of Mr. Walker's Report to the House of Commons, of the state of the whole line, ordered to be printed in July, 1838. Upon being pressed to state what sum would be required to put the Canal in a proper and efficient working condition, inclusive of everything, Mr. Walker estimated the amount to be 200,000*l.* more, and advised that course to be adopted in preference to abandoning the Canal altogether; as he stated, that in the event of that plan to be followed, the expense of fence-works, &c., necessary to prevent the country from being overflowed, would be as great as the expense of repairing, and this without the possibility of a return; not to mention the claims of parties for compensation, &c.

After hearing other evidence to the same effect from other parties, the Committee became of opinion that the proposition for abandoning the Canal altogether was one that ought not to be entertained; and after making numerous inquiries with the object of ascertaining whether any increase of business would be likely to accrue if a certain passage through the Canal could be obtained, and having ascertained that point, and that thus the dangerous and tedious navigation of Pentland Frith might be avoided, they resolved, that the navigation of the Canal was insecure; that the state of the Canal should be immediately attended to, not only as regarded the preservation of the work, but also as relating to the security of life and property in the districts through which the Canal passed; that they could not recommend the abandon-

ment or shutting up the Canal; and that the insufficiency of water, the imperfect execution of the works, and the absence of steam-tugs, had prevented the development of the benefits to commerce which might be expected; that much benefit would arise to the trade and commerce on the Canal, if the works were placed in a sufficient state of repair, if the depth of water were increased, and the assistance of steam-tugs were afforded, as recommended by Mr. Walker; and for these purposes they recommended that a further sum of 200,000*l.* should be advanced by Government.

Up to the time of opening the Canal, the expenses of its construction had amounted to the enormous sum of 905,258*l.*, which amount had in May, 1839, been increased to 1,023,628*l.*, exclusive of a debt to the Bank of Scotland of 39,146*l.*

Subsequently to this Report, certain propositions were made to carry the recommendations of the Committee into effect by private enterprise, to which the latter agreed; when Government were unable to effect a transfer of the Canal upon the terms suggested; and, consequently, the navigation has remained under the charge of the commissioners during the past year.

Notwithstanding the severity of the winter of 1840-1, no further serious damage was sustained by the works, nor is any material deterioration of the general condition of the works apparent; still, it cannot but be felt, especially with respect to the very important locks of Gairlochy and Fort Augustus, that the lapse of every additional year renders their situation more precarious.

Little further of any interest appears upon the face of this Report, beyond the unpleasant fact that the receipts to the 1st of May for dues received to that day, amounted to 2,728*l.* 9*s.* 8*d.*, exclusive of a further sum of 173*l.* 0*s.* 7*d.* for rents; whilst, on the other hand, the expenditure amounted to 6,420*l.* 1*s.* 6*d.*, and the total debt to the Bank of Scotland, up to the same time, amounted to 23,592*l.* 9*s.* 1*d.*

It further states that during this time 1,283 vessels had made use of the Canal, paying in respect of tonnage-rates 2,728*l.* 9*s.* 8*d.*

It does not appear that anything has since been done towards carrying out the recommendations of the Parliamentary Committee: still, as observed in *the Times* abstract of the Report:—"if we can believe the evidence adduced before the House of Commons on the subject, there can be little doubt that the steps recommended would greatly increase the traffic, and would render it, presuming the Canal to be in such a state of solid repair as to be lasting, capable of paying its own annual expenses; and, perhaps, lay by enough to provide for future unforeseen contingencies. We confess we are adverse to seeing the enormous sum of money already expended, absolutely sunk and sacrificed, without making some further effort to make the Canal useful; and we should greatly regret to see the gigantic conception of Telford's mind sink into neglect and oblivion, without an effort to save it from such a fate."

WIDENING THE CLYDE.

MR. BALD has commenced his plan of widening this fine river. Its width, from the bottom of the harbour to Renfrew, varies from 165 to 190 feet; which it is intended to increase to 300 ft., 310 ft., and to 325 ft. at Renfrew Ferry; and at the same time to "sweeten" the course, or in other words, to remove angles and jutting points, and to make the line a straight one. If the Clyde be thus widened, it will be sufficient for any increase of trade. By not going beyond this width, the channel, Mr. Bald considers, will deepen itself, and in a few years, increase from 18 to 20 feet; whereas, if the river were widened to 400 feet, as originally contemplated, it would take 70 years to complete the operations, and a vast expense to maintain the width by dredging.

FLOATING BREAKWATER.

CAPT. TAYLOR, R. N., has read to the British Association a paper upon his invention of a Floating Breakwater, of timber, as a substitute for the breakwaters of solid masonry hitherto constructed.

In the *Times*, Oct. 28, is described a model of this new wooden Breakwater, about two feet long, and representing a perfect prism, Through the centre runs a very strong beam, or keel, crossed and re-crossed by smaller beams, in an almost endless series, and secured by bolts at both ends. These connect it with the beams which form the sides of the prism, and those again at the ends which form the angles, are secured by transverse pieces of timber. The strength and beautiful architecture which this model conveys of the invention cannot, however, be described without diagrams. The breakwater may be of any length, but is divided into sections of sixty feet: the timber employed is red pine, so arranged that three-fourths will be immersed; it being always eighteen feet below the level of the immersion, and six feet out of water. As the present iron mooring chains, if of requisite strength, would not only increase the weight but the expense of the breakwater, without adding to its usefulness, the difficulty is overcome by forming them of straight-grained timber—it being admitted that this material will bear a much greater strain than an equal weight of iron. The timber employed for this purpose is red fir, larch, or American ash, in lengths of twelve feet; three of which form a section of the mooring. The centre piece is nine inches deep, and four and a half inches thick; and those on either side nine inches deep, and two and a half inches thick; making the whole nine inches square. These are bound together with flat iron hoops, put on red-hot. At each end of the centre are three saw-cuts, about two feet long; and into the centre cut an oak wedge is driven, which spreads the timbers about four inches, and thus forms a dovetail. The specific gravity of these moorings, exclusive of connecting links, it is stated, will not exceed by 20 per cent. that of the water. The breakwater will be moored obliquely to the waves, and will admit the sea to pass under, over, and through it; thus breaking and dispersing the waves, and converting all within its barrier into smooth water. The inefficiency of stone breaks has been proved and

air more than water is the enemy of these structures. This was proved some time since at Plymouth, where the stones were dovetailed, and a hole having been made by a breach in the wall, the air was driven with such force into the cavity, that it actually forced out one of the stones from the very centre of the work. It is stated that upwards of 15,000 English vessels, 3,150 American and French, 1,000 Danes and Swedes, 1,000 Prussian, Norwegian, Dutch, and Russian, and 500 Spanish, Portuguese, and other vessels, pass Mount's Bay annually; amounting, in the aggregate, to 20,650 vessels; and with the average crew of ten men to each vessel, the entire number of seamen will be 206,500. The annual loss of lives, and the value of ships and merchandize destroyed, is immense; and to prevent this it is said a breakwater in the harbour of Penzance, costing only 52,400*l.* would suffice.

A breakwater on this principle is about to be laid down at Brighton, so as to make it a harbour.

PORTSMOUTH HARBOUR.

A COMPLETE survey of Portsmouth Harbour, its lakes, and approaches, has been recently made by Lieuts. Sherringham and Otter, and assistants. An extraordinary coincidence exists between the present survey, with all the improved methods, and still more improved instruments, and the old survey of Mackenzie, made in 1782, and the still more recent one of Mr. Park, who was Master Attendant here. The soundings, all over, have only varied in the slightest degree, during the above period, sixty years; the bar off the South-sea land-marks remains unaltered from its shape and size as recorded in the oldest minutes; it consists of no shifting matter, but is a firm substance of flint and chalk, almost concreted together with gravel.—*Civil Engineer and Architect's Journal*, No. 42.

THE PLYMOUTH BREAKWATER.

ONE of the most attractive papers read at the recent meeting of the British Association, was that "On the Plymouth Breakwater," by MR. W. Stuart; thus reported in *the Athenæum*, No. 722 :—

The importance of a Breakwater at Plymouth attracted the attention of the Admiralty in 1806, and in February of that year Mr. Rennie and Mr. Whidbey, the Master Attendant of Woolwich Dockyard, were directed to survey the Sound. As the results of their survey, they submitted a plan for a stone breakwater, and gave their opinions upon several plans previously proposed. The stone breakwater was to be 1,700 yards in length, at the top of which the middle was to be straight for 1,000 yards, and each end, 350 yards in length, was to incline at an angle of about twenty degrees to the straight part: it was to be ten yards in width at the level of ten feet above the low water of an ordinary spring tide, with a slope of three to one on the south or sea side, and one and a half to one on the north or land side; and to be constructed by blocks of limestone thrown promiscuously into the sea on the intended line, with the top of cut stone. This plan was favourably received, and an Order in Council issued in June 1811, for the execu-

tion of the work; and in August 1812 the first stone was deposited. Mr. Stuart then described in detail the progress of the work, and the various alterations found advisable. The south slope is regularly formed with blocks of granite, from the level of low-water spring tides, with a slope of five to one. A lighthouse is now being added to the western end, and a buttress for the protection of the lighthouse, and securing the front of the south slope. The force of the sea is so great, that stones of fifteen or even twenty tons have been taken from low water and carried over the top of the work. According to the original calculation of Messrs. Rennie and Whidbey, 2,000,000 tons would be required for the work, but, owing to the various extensions, the quantity is much increased; and between the 12th of August 1812, and the 31st of July 1841, 3,377,068 tons had been deposited. The estimated cost of the original breakwater was 1,013, 900*l.*; the whole outlay to the present moment is 1,111,700*l.*, and the cost of the breakwater when completed, including the lighthouse, will not exceed 1,300,000*l.* Various other breakwaters have been proposed to the Admiralty: one of cast iron in 1804; two of stone, and one of wood, by Mr. Bentham, in 1811. The wooden breakwater was to consist of 117 floats of wood, of a triangular or prismatic form; each float thirty feet in breadth and depth, forty feet in length, to be moored by iron chains, at a cost of 201,805*l.*; but the Admiralty resolved on a stone breakwater, and the thirty years' experience since elapsed have confirmed the author in his opinion of the wisdom of the choice. The stone breakwater is said to have occasioned an accumulation of mud and silt within the harbour, and a consequent diminution in depth of the water to the extent of five feet. In the original report of Messrs. Rennie and Whidbey is contained the following statement:—"From conversing with pilots and various other intelligent men whom we met at Plymouth, we have reason to believe, that the depth of water in the Sound is on the decrease, by the settlement of mud and silt brought down by the rivers from the interior country, and also by the embankment of the mud-lands within; thus diminishing the ancient receptacles of the water of the tide, which both in its flux and reflux occasions a powerful scour in its passage through the Sound."—The fact is, that a recent enclosure of 275 acres of the backwater of the Catwater above the Lara Bridge had just taken place; it seems evident that mud and silt were then in the Sound. On a consideration of the whole question, Messrs. Rennie and Whidbey were of opinion that there was no danger of the Sound becoming more shallow, and that no further deposition of silt or mud would take place, except immediately within or without the breakwater. In consequence of a communication, made in July 1838, to the naval authorities at this port, to the effect that a deposit was then going on in the Sound, the Admiralty directed Mr. James Walker to report fully on the subject, and the best means for providing against the apprehended injury to the anchorage. After a long and laborious investigation, and a minute survey, during which no less than 2,000 soundings were taken, Mr. Walker reported, that, taking the mean of the soundings that could be affected by the breakwater, the

result was that there was but very little increase or decrease; and that, if there was any decrease of depth in the Sound, (except close to the breakwater, and which could produce no practical evil), this was certain, that if it had taken place, it was but small,—certainly not enough to cause alarm, or to justify expensive measures for removing the cause. As to the destruction of the breakwater by the pholas, though connected with the breakwater since its commencement, Mr. Stuart never saw a perforation in the limestone by the pholas, except between the low water of spring and of neap tides; and these perforations only occur on the outer surface of the stone, and to a depth not exceeding three inches. He never discovered any such perforation in the interior of the work, although he had recently had occasion to remove stones, by the aid of the diving-bell, at the depth of five feet below low water, and which had been deposited there upwards of twenty-five years. Loose stones had been taken up from beaches, and from the bottom of the Sound, perforated by the pholas; but they must have been perforated before they got there, for the pholas had never, in such cases, been found alive.

The pholas animals do not, however, meddle with granite; and probably timber covered with hot tar would resist their ravages; as animals of this nature are peculiarly averse to the smell of tar and similar substances.

PLYMOUTH BREAKWATER LIGHTHOUSE.

A LIGHTHOUSE, designed by Messrs. Walker and Burgess, is in course of erection upon the western extremity of the Breakwater. It is to be constructed upon an inverted arch, the foundation of which is laid about one foot six inches below the level of low water spring tides; its centre, at the top, is 37 feet 6 inches from the western end or head of the breakwater, and at the level of low water 195 feet. The diameter of the head of the breakwater at the level of low water is 390 feet, and at the level of the top of the breakwater 75 feet. The Lighthouse is to be of granite, 14 feet clear diameter; and the centre light will be 55 feet from the top of the breakwater. The lantern, 12 feet wide, and 7 feet 6 inches high, is to show a dioptric fixed light of the second order, with mirrors; the south half to show a red light, to distinguish it from the coast lights; and the north side, towards the Sound, is to be white. The stones of the lower courses are to be secured with dowels of slate, independent of a vertical and horizontal dovetail; the dowels are 18 inches long, and 6 inches square at the centre, and sunk 8 inches into the lower course of stone, both ends being dovetailed and secured in their places by plugs in the upper, and by wedges in the lower stone. It is expected that the Lighthouse will be completed by the end of 1842.—*Civil Engineer and Architect's Journal*, No. 43.

THE MAPLIN LIGHTHOUSE.

THIS Lighthouse is placed upon the southerly point of the Maplin Sands, which form the northern extremity of the Swin Channel, at the entrance of the river Thames. The foundations—nine of Mitchell's patent mooring-screws were fixed in August, 1838; the erection was

completed in October, 1840; but the light was not completed until February 10 last*. Above the living-room is fixed the lantern, with a gallery all round: it is a polygon of sixteen sides, 12 feet diameter internally, and 16 feet high from the floor to the roof; the framing is principally cast-iron; the roof, interior lining, and the floor, are covered with copper. In the centre, raised upon a pedestal, is the beautiful apparatus of a second order of dioptric light, by Wilkins, of Long Acre. The height of the light above the main level of the sea is 45 feet, and may be clearly seen from the deck of a vessel in fine weather, upwards of ten miles off in all directions. The engineers are Messrs. Walker and Burgess.—*Civil Engineer and Architect's Journal*, No. 43.

SOUTH FORELAND LIGHTHOUSE.

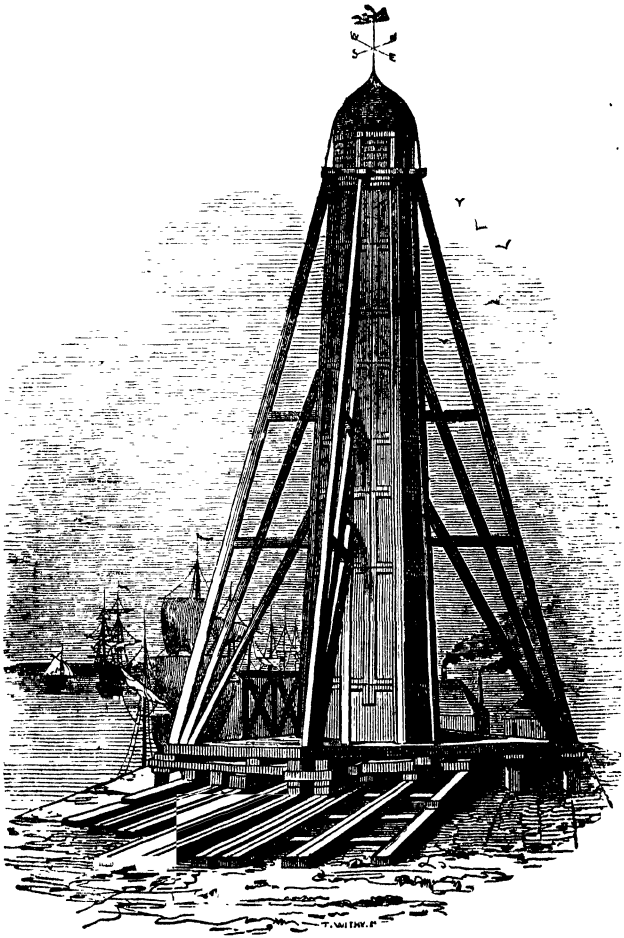
THIS Lighthouse, among the first erected in England, and said to have been built in the reign of Charles II., has been purchased of Greenwich Hospital, by the Trinity House, and removed. The original light was coals burnt upon the flat roof of the tower, which was supplanted in 1793, when a light was constructed for fifteen oil lamps. There is also a lower Lighthouse, to enable the mariner, in time of danger, to keep the two lights in a line, and thereby avoid the Goodwin Sands. A light similar to that at Grinez, on the opposite coast, will be built in the place of the old tower; and the height of both cliff and tower will, it is said, be about 400 feet above the sea-level.—*Times, Oct. 5; abd.*

REMOVAL OF SUNDERLAND LIGHTHOUSE.

THE removal of this Lighthouse from the north pier, in an entire state, to the eastern extremity of the pier, a distance of nearly 500 feet, was safely completed on September 30, under the able management of Mr. Murray, the civil engineer; who, in May last, submitted the following plan to the commissioners of the River Wear, when it was under their consideration to pull down and re-erect the Lighthouse on its new site. "The masonry was to be cut through near its foundation, and the whole timbers were to be inserted, one after another, through the building, and extending seven feet beyond it. Above and at right angles to them, another tier of timber was to be inserted in like manner, so as to make the cradle or base a square of twenty feet; which cradle was to be supported upon bearers, with about 250 wheels, of six inches diameter, and was to traverse on six lines of railway to be laid on the new pier for that purpose. The shaft of the lighthouse was to be tied together with bands, and its eight sides supported with timber braces from the cradle upwards to the cornice. The cradle was to be drawn and pushed forward by powerful screws along the railway, on the principle of Morton's patent slip for repairing vessels." The only deviation from this plan, in the removal of the lighthouse, was the substitution of a windlass and rope, worked by thirty men, for the screws. Not a crack, nor appearance of settlement, is to be found in the building.—*Times*, Oct. 5.

* For an illustrated description of the Wyre Lighthouse, constructed upon this principle, see Year-book of Facts, 1841, pp. 14, 15.

This Lighthouse was erected in the year 1803, by the late Mr. Pickernell, then engineer to the Harbour Commissioners. It is wholly



(Removal of Sunderland Lighthouse.)

composed of stone; its form is octagonal, fifteen feet in breadth across its base, sixty-two feet in height from the surface of the pier to the top of the cornice, where it is nine feet in breadth across; and the top of the dome is sixteen feet above the cornice, making a total height of seventy-eight feet; its weight, including the cradle and supporting timbers, is calculated at 320 tons.—Communicated by Mr. Murray to the *Civil Engineer and Architect's Journal*, *No*, 50; to the Proprietor of which able work we are indebted for the loan of the annexed engraving.

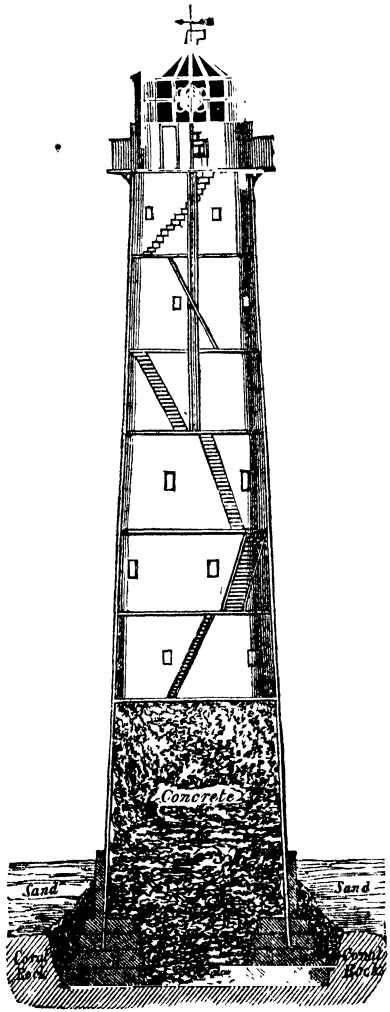
NEW FIXED LIGHT ON THE GOODWIN SANDS.

Capt. Bullock's Safety Beacon erected on the Goodwin Sands in 1840, and described in the *Year-Book of Facts*, 1841, p. 66, although of advantage, left much to desire, whether in relation to commerce, science, or humanity. Mr. Bush, civil engineer, having long contemplated the erection of a Fixed Light upon these perilous sands, and having secured the favourable attention of the Duke of Wellington to his project, he set about its execution; and caused to be cast at Thorncliffe Iron-works, near Rotherham, in Yorkshire, an immense base, 64 feet in height, and 30 feet in diameter, which is to be sunk 30 feet below the sands, on a chalky substratum; its weight is 120 tons. Upon this base, the platform of which is to be enclosed with iron railing, it is proposed to raise a column, 86 feet in height, upon the abacus of which will be placed the lantern, surmounted by a statue of Queen Victoria; the total altitude of base, column, lantern, and statue, being 190 feet. Within the shaft, it is stated, there will be accommodation for 100 men; and the lantern is to be sufficiently capacious for twenty men. The caisson for the foundation was to have been floated to its place on Sept. 15; but has been deferred till the ensuing spring. This new light is to bear the over-ambitious name of "the Light of all Nations." Its probable cost has not been explicitly stated; but every one must earnestly wish to see this bold design carried into execution.

CAST-IRON LIGHTHOUSE IN JAMAICA.

Morant Point, Jamaica, has long required the protection of a Lighthouse; but the great expense of a stone or brick erection, and the time required to complete either, have interfered with their execution. At length, Mr. A. Gordon recommended to the Commissioners appointed to carry the lighting of this Point into effect, the adoption of cast-iron, in consequence of the suggestion, some years since, of Capt. Sir Samuel Brown, and the subsequent erection of a small light-tower on Gravesend Pier, by Mr. Clarke. The result has been the construction of a Lighthouse of cast-iron, from Mr. Gordon's designs, in outline resembling that of the Celtic towers of Ireland.

The advantage which iron, when not in contact with sea-water, possesses over stone or other materials, is, that upon a given base a much larger internal capacity for dwellings and stories can be obtained with equal stability. The material admitting of plates being cast in large surfaces, there are fewer joints, and, consequently, greater solidity. A system of bonding the plates may also be adopted, which will insure the per-



(Cast-Iron Lighthouse, at Jamaica.)

fect combination of every part, so as to form an entire mass; and by the facility which such a plan offers for uniting the parts, the best form for strength and stability can be obtained. The time required for the construction of such a building in iron being less than that requisite for the preparation of one of stone, would, in many instances, influence its adoption; and from the comparatively small bulk and weight of the component parts of the structure, much greater facilities are afforded for transporting and erecting it at its destination. Thus, in less than three months from the date of the contract, the Lighthouse we are about to describe was cast and erected on the contractor's premises; and it was expected to have the light exhibited in Jamaica, on January 1st, 1842, being six months from the date of its commencement. The expenses of its construction, transmission, and erection, will not exceed one-

third the cost of a stone building of equal dimensions; and in Jamaica, where stone is not naturally produced, but must have been transported from a distance, the expense would considerably exceed this ratio. Another advantage of iron lighthouses is their security from electric influence, the material itself being one of the best conductors of the electric fluid; for, if proper means be taken to transfer the electric fluid from the base of the tower to the sea by means of copper conductors, no danger need be apprehended from its effects. This lighthouse is the first of its kind that has been practically carried out; and from its having to withstand destructive hurricanes and frequent earthquakes, such as occur in the West Indies, it will afford a good example for future practice.

The tower is to be founded on a coral rock, a little above the level of the sea; the face of this rock is about ten feet beneath the surface of the sand, and will be excavated to receive the base of the tower, resting on and cased with granite, to prevent the natural filtration of the sea-water from acting upon the iron. This course of granite is grooved to receive the flange of the lower plates of the tower, from which the lightning conductors are to be continued to the sea. The diameter of the tower shaft is eighteen feet six inches at its base, diminishing to eleven feet under the cap; it is formed of nine tiers of plates, each ten feet in height, varying from one to three-fourths of an inch thick. The circumference is formed of eleven plates at the base, and nine at the top: they are cast with a flange all round the inner edges; and when put together, these flanges form the joints, which are fastened together with nut and screw bolts, and caulked with iron cement. The cap consists of ten radiating plates, which form the floor of the light-room; they are secured to the tower upon twenty pierced brackets, and are finished by an iron railing. The lower portion, namely 27 feet, is filled up with masonry and concrete, weighing about 300 tons, and so connected with the rock itself, as to form a solid core of resistance. The remaining portion of the building is divided into store-rooms and berths for the attendants in the lighthouse.

The light-room consists of cast-iron plates five feet high, on which are fixed metal sash-bars filled with plate-glass; these terminating with a point, are covered with a copper roof, whence rises a short lightning rod, trebly gilt at the point. The light is of the revolving kind, consisting of fifteen Argand lamps and reflectors, five in each side of an equilateral triangle, and so placed as to constitute a continuous light, but with periodical flashes. The lantern and light apparatus are by Deville.

To preserve as low a temperature as the circumstances and climate will permit, the iron shell is to be lined with a non-conducting material, as slate or wood, leaving an annular interstice, through which a constant ventilation will be effected, so as to carry off the excessive heat; in which it will, doubtless, be assisted by the evaporation of the sea-spray, which may be accidentally cast upon it, as it will be placed within sixty yards of the ordinary water level. To preserve the two lower tiers from oxydation, they will be coated with coal-tar; and

Mr. Gordon intends to set them in granite, with a bituminous cement. The only bracing which has been thought requisite is a few cross-ties at each horizontal joint, over which the iron-tongued wood floors are laid.

The several rooms are provided with five apertures, fitted with oak sashes filled with plate glass. The approach to the door-way, which is about ten feet above the level of the sand, will be by means of stone steps; ladder irons are also provided, in the event of the stone steps being carried away by a hurricane.

Over the entrance is a large tablet of iron, supported by two smaller ones; and on them, in bas relief, are inscribed the date of erection, (1842,) the names of the commissioners, &c. :—

"On the designs and specification of Alexander Gordon, civil engineer, London."

And on the side supporters :—

"Captain St. John, R. A., Island Engineer." | "C. Robinson, Engineer, London, *fecit*."

The whole of the castings were executed at the foundry, (late Bramah and Robinson's,) at Pimlico, and put together in the yard of the manufactory, prior to their removal to Jamaica; where the work will be re-erected by a derrick and crab from the inside, without the aid of any external scaffolding.

These interesting details have been communicated by Mr. A. R. Penton, to the *Civil Engineer and Architect's Journal*, No. 49; the Editor of which valuable work states, that the whole expense of the lighthouse, including the passage over the Atlantic, will not exceed 7,000*l.*; and that the entire weight of the iron-work is about 100 tons. The masonry has been prepared in this country, which has been more economical than if the work were done in Jamaica; and three mechanics have been sent out with the work, to put it together on its destined spot. In the *Times*, Oct. 14, the height of the lighthouse, from the foundation to the roof, is stated at 105 feet.

IRON HOUSES.

M. RIGAUD, of Brussels, has constructed an Iron House. The walls are hollow, and the hot air circulates from a central point in the kitchen, through the intervals in the walls; and by means of valves, the quantity to be admitted may be regulated. A house consisting of seventeen rooms will cost 1,165*l.*, while a house of the same size in brick would cost 1,157*l.* The rooms are arranged on three floors; the whole weight is 797¼ tons. The advantage of this structure of house is its permanent nature, and the facility with which it may be moved. The expense of carrying it from Brussels to Liege, to Ghent, or to Antwerp, would be about 25*l.*—*Athenæum*, No. 703.

CAST-IRON CHURCH.

THE whole of the frame-work of the windows, doors, groins, roof, pulpit, and ornamental enrichments of St. George's Church, Everton, Liverpool, are of cast-iron. The length of the Church is 119 feet, the breadth 47 feet. A great proportion of the larger manufactories erected in England within the last ten years, are all iron, except the walls; and within two years past, several cottages and villas have been put up near London, which are exclusively cast-iron—walls, doors, steps, roofs, chimneys, sashes, &c. When once finished, such buildings require no repairs; and the finest ornaments cost little more than plain castings.—*Cambridge Chronicle.*

THE LONDON DOCKS.

ABOUT two acres, on the east side of Gravel-lane, and adjoining the eastern basin, have been added to these Docks, at an expense of nearly 20,000*l.*; and the sum of 100,000*l.* has been expended during the last six years in building the new jetty in the principal basin, the new wool and indigo warehouses, guard-house, refreshment-rooms, &c.

REPAIR OF WESTMINSTER BRIDGE.

THIS work of extreme difficulty is hastening to completion. Within the first half of the year, the second coffer-dam was closed with great success: indeed, it appears to be one of the greatest triumphs of hydraulic engineering, to find a dam, (erected in a tidal river, with a rise and fall of eighteen feet of water, and exposed to every trial of one of the severest winters on record,) so completely to resist the efforts of its most insidious adversary, that after the wear and tear of five months, there was scarcely sufficient water from leakage to supply the ordinary demand of the works; and this too on ground that was declared unsuited for the purpose, by the engineer who constructed the bridge, and by all who succeeded him up to the time when the present repairs were commenced.

The above dam incloses the fifteen feet and sixteen feet piers. Of the former, the foundations were similar to those in the first dam, the caisson resting on a bed of gravel, underneath which was the blue clay: they have since been secured in the manner described in former notices*; and the masons have proceeded with the new facing, of Bramley-fall stone, above the lowest low-water mark; and also with the extension of the pier on the upper side, whereby the roadway may, at any future time, be widened twelve feet, without having again recourse to the expensive preparation of coffer-dams.

The fifteen-feet pier is the one memorable in the history of the bridge, as having, by its sinking, delayed the opening to the public for three years; and so ineffectual were the means taken, contrary to the judgment of Labeyle, to remedy the sinking, that the pier remained

* For previous notices of the repairs, see Year-book of Facts, 1839, p. 43; and Year-book, 1840, p. 93.

in an unstable condition; and had it not been for the successful repair lately effected, must finally have occasioned the destruction of a portion of the bridge.

On the removal of the ground about the pier, the joints of the dove-tailed piling were found anything but close, and several of the piles had been broken in the driving. New street piling was, therefore, driven all round, inclosing the foundation, thus preventing the escape of the finest particles of sand from under the pier. The old piles were afterwards sawn off at a low level, in preference to drawing them, which, it was thought, might disturb the ground. During the driving of the piles, considerable movement took place in the adjoining arches, showing evident symptoms of further sinking in the pier; and to prevent any injurious effect upon the masonry, strong shoeing of whole timbers was fixed from the coffer-dam to the soffit of the sixty-four feet arch, the stones of which have in consequence remained nearly uninjured, although several of the mortar-joints were broken.

The whole of the disturbed foundation-timbers of the pier have been removed, as also the loose and muddy ground to the solid clay; under the foundations, a body of concrete has been filled in, level with the under-side of the caisson; and to increase the bearing of the pier, timbers have been laid parallel to the sides of the caisson, crossed by others, placed eighteen inches apart, and inserted to the length of two feet six inches under the masonry; whilst, to insure their perfect bearing, each timber has been cut wedge-form, and driven tight into the space it was intended to occupy. This operation has been continued all round the pier, thus increasing its bearing surface about three feet throughout.

From that level a mass of brickwork has been built, backed with concrete, to receive the stone work of the pier, which, in this case, forms a projecting footing of masonry; and the space within the street piling is finished with a capping similar to the other piers.

Thus, we see that great error had hitherto prevailed about the settling of this pier: it was always attributed to the ballast-men lifting gravel too near the foundations, and the late Mr. Telford and others, in their plans for securing the pier, had only one object in view, that of preventing any further scour from the river; whereas, there was another and more serious danger to guard against, and without the assistance of the coffer-dam the sunken pier could *never* have been made secure; on the contrary, any attempt by driving piles or otherwise, if access could not have been had to the interior, might have proved fatal to the adjoining arches.—*Abridged from the Civil Engineer and Architect's Journal*, No. 44.

The bridge, after being closed four weeks, was re-opened to the public. During this interval, the well-known hollow arch was removed, and spandrel walls, with longitudinal arches in brickwork, substituted, so as not only to strengthen the pier, but to remove a serious cause of danger, threatened by the pressure of the hollow arches on the haunches of the adjoining main arches; and a whole course of stone throughout one arch was removed and restored.

HUNGERFORD AND LAMBETH SUSPENSION BRIDGE.

THIS bridge, from Hungerford Market, across the Thames, to Lambeth, has at length been commenced. The engineer is Mr. I. K. Brunel, F.R.S.: the iron-work is by Messrs. Sandys and Co., in Cornwall; cost 17,000*l.*; weight 700,000 tons; length 1,410 feet, thus divided: from each shore to pier, 370 feet; centre between piers, 670 feet; viaduct 28 feet above high-water mark, or three feet higher than the crown of the centre arch of Waterloo-bridge; for foot-passengers only—toll one halfpenny; total cost, (including approaches,) 102,254*l.* 7*s.*; estimated return by tolls, steam-boat traffic, &c., 9,010*l.* per annum.

TENSION-BAR FOOT BRIDGE.

MESSRS. STEVENSONS, of Edinburgh, have executed over the river Whitadder, in Berwickshire, a Bridge on the tension-bar principle, noticeable for its simplicity of construction and moderate cost. The Whitadder is subject to heavy floods; several attempts have been made to build a foot-bridge, by which it might be crossed at all times, but the floods and ice during the winter have destroyed the erections by carrying away the piers.

Messrs. Stevensons completed their bridge in six months. Its total length is 160 feet, and its breadth four feet; the planking is sixteen feet above the water, which rises eleven feet on the piers during floods. The bridge consists of two main openings of sixty feet span, and a smaller one of twenty-four feet span. The beams are supported upon piers of coarse Graywacke rubble. The two in the centre measure ten feet by seven feet at the base, and batter to six feet six inches by four feet at the top: that most exposed to the water is founded upon rock, at the depth of four feet from the bed of the river; and the other is founded upon a platform of timber laid on gravel. A causeway of river-stones is laid around the base of the piers, to protect their foundations from the run of the water. The beams for supporting the roadway planking are of red pine, and the scarphs occur at different places, and exactly over the uprights. The planks are firmly fixed together by oaken treenails, three feet apart, driven right through, and wedged at both ends. The ends of the main beams fit into cast-iron shoes, and the tension-rods, which go under the beams, and support them by means of the uprights, pass through auger holes in the centre of the beams, and are secured by screw-nuts to the back part of the iron shoes. The diameter of the tension-rods is one inch: the screws are used to tighten up the rods, which is done until the beams are quite rigid. The main beams and iron-work are by Maxton and Co., of Leith Engine-works, and were proved with one and a half ton weight. The entire cost was 237*l.* 18*s.* 5*d.*—*Civil Engineer and Architect's Journal; abd.*

TRUSSING ROADWAYS OF SUSPENSION BRIDGES.

MR. RENDEL has submitted to the British Association, a model of the Montrose Suspension Bridge, the roadway of which had been re-

cently restored, and a peculiar system of trussing adopted. Suspension bridges were peculiarly subject to undulatory motions, which proved extremely destructive to them. These undulatory motions arise from the action of the wind, and the circumstances are such that the wind may tend to raise the roadway at one end, and depress it at the other; and various means had been devised to prevent these motions. In 1838, a considerable portion of the roadway of the Montrose Bridge was destroyed; and Mr. Rendel being employed to restore it, it struck him that, if great stiffness were given to the roadway by a system of longitudinal trussing, the desired object would be attained. He adopted, therefore, a system of vertical and longitudinal trussing, extending above and below the line of the roadway, so that the neutral axis of the truss is in the roadway. This had succeeded most completely. In an ordinary gale of wind, the original roadway would be subject to a wave of from three to five feet in height, but he was satisfied that the present roadway is not subject to a wave of as many inches. The weight of the roadway has not been increased by more than five or six per cent.

NEW SUSPENSION BRIDGE.

Mr. Rendel has exhibited to the British Association, a model of the Suspension Bridge which crosses the estuary of the South Esk in Scotland. In point of proportions it was the second bridge of the kind in the kingdom—only one bridge exceeding it in size. After various accidents, Mr. R. inferred that if a system of trussing were to be employed, it would effectually prevent the upward as well as downward motion. Vertical and longitudinal trusses were therefore made, extending above and below the line of the bridge; the bridge being divided into three compartments, viz. a carriage and two footways. This had answered exceedingly well; for while formerly in a gale of wind the motion extended to three or four feet, it did not now exceed three or four inches. The weight of the new certainly exceeded that of the old roadway, but not more than seven or eight per cent. The dimensions of the bridge were—length between the points of suspension, 450 feet; width of roadway, 16½ feet; and width of footway, 4 feet 2 inches.

WELL-DIGGING.—PIER-BUILDING.

M. Fauvelle describes a process which is extensively used in Roussillon, for digging Wells; and which has been applied by Sir J. Brunel, on a large scale, in constructing the descending-shaft of the Thames Tunnel. In most parts of Roussillon, at a yard or two below the surface, a layer of quicksand is met with, which cannot be dug twenty inches deep without the sand falling in, and filling up the excavation, so as to prevent the usual course of digging a well, and building the brickwork afterwards, for it would cost more in timbering and framework than the whole well is worth. A stout circular oaken kerb is, therefore, placed on the ground, the walls of the well being built several yards high upon it; and then from the inside t shifting soil

is excavated, until the well, with the brickwork, is carried down to the required depth.

M. Fauvelle has lately built the pier of a bridge by the above method, on the bed of a river, consisting of pebbles and sand, resting upon clay. On the bank, he placed an oaken kerb, on which he built a well, or circular brick tower, sixteen inches thick, seventy feet in circumference, and eighteen feet high; which was secured internally, so as to resist all pressure. Excavations were then begun within the well, and it gradually descended until it became necessary to use the dredge, by means of which, in about a fortnight, it was got down into the clay bed, and then filled with stones and concrete, and rammed to a solid mass.—*Translated from the French, in the Civil Engineer and Architect's Journal*, No. 40.

THE CADOGAN CHAIN PIER, CHELSEA.

EARL CADOGAN, the lord of the manor, has erected a handsome and convenient pier for steam-boat passengers, on a novel construction, at an expense of between 3,000*l.* and 4,000*l.* This erection was constructed by Mr. Cubitt, from the design and under the direction of Mr. Handford, the surveyor and architect of the manor. The Pier is situated in the mall of Cheyne-walk, and forms one of the most interesting objects of the place.

GIGANTIC CHIMNEY.

A CHIMNEY of extraordinary dimensions is in course of erection at St. Rollox Chemical Works; and will, when completed, be elevated upwards of 600 feet above high water level at the Broomielaw. It is founded upon a sandstone rock, 20 feet below the surface of the ground. The diameter of the outer chimney is 50 feet at the foundation, 40 feet at the ground surface, and will be diminished in one unbroken curved line, or "batter," to a diameter of 14 feet 6 inches, when it has attained an altitude of from 420 to 430 feet. The inner chimney is a cylinder of 16 feet diameter, rising perpendicularly 260 feet. This inner chimney is unconnected with the outer one, but comes very nearly in contact at its termination, allowing only space for the expansion arising from the temperature. The bricks used in the works are a composition of common clay and fire clay, containing a small portion of iron ore.—*Civil Engineer and Architect's Journal*, No. 50.

VAST GRANITE COLUMN AT ST. PETERSBURG.

A STUPENDOUS Column has been erected at St. Petersburg, in honour of the late Emperor Alexander, which, in construction, rivals that of the best ages of antiquity. The shaft is monothilitic, of polished granite, 84 feet in height; and the pedestal is also a single block of the same material. Possessed as we are in Great Britain of granite quarries, capable of supplying stones of almost unlimited dimensions, it is to be regretted that such an example should be lost upon the directors of our public works.—*Mr. T. L. Donaldson; Proceedings of the Institute of British Architects.*

VAST CONSERVATORY.

A NEW Glass Conservatory has been erected for the Horticultural Society, at Chiswick, under the superintendence of Mr. Ainger. This Conservatory is conical, and almost entirely of glass, of which it comprises 11,000 feet; and it is heated by 2,700 feet of pipe. It was feared that glass would not retain the heat sufficiently; but it has proved, in this respect, as good as a brick wall.—*Literary Gazette*, No. 1252.

ST. GEORGE'S CHAPEL, WINDSOR.

AT length, the windows of this superb structure have been put into a course of repair. The massive stone-work of the great western window has been taken down, and the window entirely rebuilt, the valuable stained glass being replaced. Three windows on the north and south sides of the west end of the choir, hitherto darkened, have been filled with transparent painted glass, so as to improve the light in this part of the chapel, though diminishing the effect of West's painted window over the altar. The architect of these repairs is Mr. Blore; and the glass has been executed by Mr. Willement.

RESTORATION OF WINDSOR CASTLE.

THE whole cost of Sir Jeffry Wyatville's works was 771,000*l.*, and they included the following works, new, rebuilt, or thoroughly repaired: New, St. George's Gate; New, Octagon Turret to Devil Tower; York, Lancaster, Chester, Prince of Wales, Brunswick, George the Third, and Round, Towers; George IV. Gateway; a great length of Walling; a new Turret to the Stuart Buildings; Grand Entrance Tower; Front of St. George's Hall; Kitchen Gateway; two Octagon Turrets; Gallery from the Devil Tower to St. George's Hall, 550 feet long; New Terrace, 1,060 feet long, some part of the walls being 30 feet high; lowering the Court-yard from three to six feet, removed 13,000 cubic yards. Internally: The Sovereign's Apartments, with a Corridor 500 feet long; Kitchen and Servants' Apartments; State Apartments; St. George's Hall; Ball Room; Waterloo Gallery; Grand Staircase. In the reconstruction of the Keep, Sir Jeffry managed, with great skill, to sustain the increased weight of this enormous pile on an artificial rock of concrete: from the level of the road, on the west side, to the top of the flags left of the Keep, is a total height of 203 feet, of which the Flag-tower is 25 feet, and the Flag-staff 50 feet; the diameter of the Keep is 102 feet. During the reign of William IV. and Queen Victoria, the works left unfinished by George IV. were successfully prosecuted by Sir Jeffry, until his death in 1840, when the task devolved upon Mr. Henry Ashton, by whom the New Stables are being constructed, at an expense of 70,000*l.*—*From Illustrations of Windsor Castle*, by Sir Jeffry Wyatville; for a neat *précis* of which work, alike important to the professional man and the amateur, see the *Civil Engineer and Architect's Journal*, No. 47.

HAZLEDINE'S PUBLIC WORKS.

THE following is a summary of the Public Works of Mr. W. Hazledine, the eminent iron-founder, of Shrewsbury, who died Oct. 26, 1840:—

Pontycysstyle cast-iron Aqueduct over the river Dee, and the valley at Llangollen, in 1802.
A Bridge, 150 feet cast-iron, over the Bonar, in Scotland.
A Bridge, 150 feet cast-iron, over the Spey, in Scotland.
The Lock-gates on the Caledonian Canal.
The beautiful Waterloo Bridge, 105 feet span, near Bettws-y-Coed, on the Holyhead Road.
The iron Swivel Bridge at Liverpool Docks.
The Liverpool New Market Columns.
A Bridge, 150 feet span, of one arch, and two arches of 105 feet, over the Esk, near Carlisle.
The Menai Suspension Chain Bridge.
The Conway Suspension Chain Bridge.
The Iron Roofs for the Dublin Custom House and Storehouses.
The Iron Roofs for Pembroke Stores, &c.
Many Swivel Bridges for Sweden.
A large quantity of three-feet Pipes for the East and West Indies.
A Bridge, 150 feet, at Eaton Hall.
A Bridge over the Severn, at Tewkesbury, 170 feet span.
A Bridge over the Dee, 105 feet span.
A Bridge at Plymouth, five arches, of 100 feet, 96, and 81 feet span.
A Bridge at Bath.
Holt Fleet Bridge, over the Severn, near Worcester, 150 feet span.
The Swivel Bridges at the London Docks.
The Marlow Chain Bridge.
Montrose Chain Bridge.
Several small Iron Bridges in Shropshire, and other parts of the kingdom; besides the Lock-gates on the Ellesmere, and other Canals.

At the time of Hazledine's death, there were in progress at his foundry several pairs of iron Lock-gates for Newport, S. Wales, each pair weighing 120 tons, and larger than any previously executed.—*From a Memoir in the Shrewsbury Chronicle.*

NOVEL APPLICATIONS OF BITUMEN.

THE Parisian Bitumen Company have made a new application of this material, which promises to be of great service in engineering works. It consists in cementing large masses of rubble-stone with the bitumen in a liquid state, and this has been successfully and extensively practised on the works of the Upper Medway Navigation Company. The river is divided into levels by weirs and locks: some of the former are of squared masonry; but others are less expensively constructed, by throwing in the rubble-stone of the country to the desired shape and height of the weir; the bitumen is then melted and run in between the stones, and the whole forms a mass of such solidity as to resist the heaviest floods; it is impervious to water in every part, and it is supposed that it will not require one-tenth of the repairs usually bestowed upon weirs of the ordinary construction.

The great advantages of the use of Bitumen are cheapness and facility of construction: it may be employed in foundations of bridges and large buildings, as forming a compact body capable of resisting any pressure, bearing any weight, and becoming perfectly solid in five

minutes after being laid; and it will effectually prevent vermin from getting into houses, or burrowing near the foundations. Among other novel uses of Bitumen, are its employment for tesselated pavements of different colours, and ornamental floors of railway stations, churches, halls, &c.; it being equally durable with Yorkshire stone, much warmer to the feet, and not more than half the price of that material.—*Civil Engineer and Architect's Journal, No.* 48; *abd.*

EARTHENWARE PAVEMENT.

M. Polonceau, of Paris, has invented a composition for paving, formed of plastic clay, sand, cement, and pulverized charcoal. The pavements formed with this composition are six-sided prisms in the hexagonal form; the joinings are all either perpendicular or oblique to the motion of the wheels, and this without being subject to the inconvenience arising from having the paving-stones placed diagonally; because the angles of the hexagon are stronger than those of the rectangle; and this advantage has been considerably augmented by reducing the sides of the prism in cutting a number of small ridges from three to four centimetres in size.

The only object in thus subdividing the surfaces of the blocks is to obtain more obtuse angles; but the triangular space which is the consequence of it is also useful as a receptacle for the bitumen with which these paving-stones are cemented together.

Each paving-block is perforated through the centre with a vertical hole, and on the outside there is a groove in which the bitumen lodges, which, by this means, is more effectual in rendering the different paving-stones more firmly united, and in preventing them from sinking. In order to render this method of cementing more easy, the outsides of the paving-blocks are cemented when they are taken out of the furnace, and before they are cold.

Great exactness of form can be readily given to the earthenware blocks. They are easily put together, and their joinings are so very close that the wheels can never be locked in them. Notwithstanding this absence of furrows, the *céramique* pavement, as it is called by the inventor, is well adapted to horses, for the surface never becomes slippery. As it does not become round at the edges, there is much less liability to slip; besides, the holes in the centre of the pavement, and the triangular cavities at the edges, being filled with gravel mixed with bitumen, they form so many rests for the horses' feet.

The firmness of these pavements, M. Polonceau remarks, has given rise to one objection. It has been apprehended that it would be extremely difficult to make openings for the gas and water pipes; but the difficulty would be avoided by filling the vertical holes in the centre of the pavement with gravel without bitumen; it would be even quite sufficient if this precaution were only adopted at one of the two rows placed above the pipes, because the communication with the exterior would then be quite as easy as it is in the usual method of paving.—*Inventors' Advocate.*

CAOUTCHOUC PAVEMENT.

MR. FREEMAN, of Westminster, has patented an Improved Pavement; to produce which, India-rubber is cut up into threads and placed within a cylinder having a series of teeth on its inner surface; a second cylinder similarly equipped on its external surface revolves within the first, by which means the India-rubber becomes heated and reduced to a sort of pasty mass. In this state, it is saturated with charred sawdust, and then pressed into moulds: the bottom of the mould is covered with a layer of coarse sand, which becomes imbedded in the composition, on that which in use is to be the upper surface of the block. The blocks thus formed are to be hardened by continued exposure to the atmosphere. For street paving, the size recommended is twelve inches square and three inches thick, while for foot pavements a thickness of one inch will be sufficient; for covering walls, the blocks are to be the size and shape of the ordinary bricks. The blocks are to be united by means of India-rubber cement. Ground stone, or sand, may, it is stated, be used instead of the charred sawdust.

IMPROVED PAVEMENT.

MR. E. LOMAX has detailed to the Institution of Civil Engineers "An Improved Plan of Paving Streets;" proposing that a breadth of two feet six inches near each side of the street should be paved with stone, for the horses to travel upon, the carriage-wheels still running upon wood; by which means all the advantages of that kind of pavement would be preserved without risk to the horse. In very wide streets, a centre track might also be paved without risk to the horse. By this plan, the labour of the horse would be greatly diminished, a considerable portion of his power being now lost, because the wood pavement is less favourable for the footing of the horse than for the motion of the wheels.

NEW PUDDLING FURNACE.

ON June 21, MM. Andelavre and Lisa, owners of the iron-works at Treveray, and MM. Thomas and Laurens, civil engineers, presented to the Academy of Sciences, at Paris, specimens of iron obtained by means of a new Puddling Furnace, heated entirely by the gas proceeding from the combustion of wood. They found that such a furnace would melt 6,000 lbs. of iron per diem; and also that all the heat which was commonly lost in the ordinary smelting furnaces, would serve to refine and transform into good iron bars all the rough iron that should issue from them. M. Dumas, who had been charged by the Academy to report on this process, and on the iron so obtained, spoke highly in its favour.—*Literary Gazette*, *No.* 1275.

CASTING OF THE JULY COLUMN, AT PARIS.

THIS column is entirely of bronze, and each tambour is one piece; the base of the column extends about sixteen yards, and the capital, at the most extended place, has the enormous dimensions of twenty-six metres, eighty-five feet. The cost was 46,880*l.* This monument, undoubtedly, marks a new era in the history of bronze casting, and

places France in the first rank in this pursuit. In it, the artist, M. Soyez, has got rid of the use of iron as a means of consolidating isolated parts of figures, and particularly in supporting members; he casts these parts full by turning the figure upside down, which is an important innovation. He gets over the resistance of the sand of the mould on the contraction of the metal, not only by the weight of the mould, but by the progressive tenacity of the bronze while cooling. This tenacity, which may be considered as proportional to the area of the section of the part so cast, is increased at pleasure, by accessory parts placed in the mould as wanted. It is thus that the Genius of Liberty was cast, having, as it were, a second shapeless leg, placed parallel to that which supports the figure, and intended to become at the period of contraction, auxiliary to the statuary leg to which it was united by the two extremities.—*Revue Générale de l'Architecture; Civil Engineer and Architect's Journal, No.* 47.

THE CAST-IRON ORNAMENTS OF BERLIN.

THE raw ore from which they are manufactured does not cost more than 1*s.* 6*d.* per cwt.; but wrought into ear-rings the value becomes 2,734*l.* 2*s.* 6*d.* per cwt., and made into shirt buttons, about 3,000*l.* per cwt. It would not be easy to point out any other metal in which art can increase the value of the raw material forty thousand-fold.—*Mechanics' Magazine, No.* 951.

METHOD OF ZINCING COPPER AND BRASS.

M. BOETTIGER has covered plates, devices of Copper, Brass pins, &c. with a brilliant coating of Zinc, by the following method: having granulated zinc by pouring the fused metal into a mortar of heated iron, and stirring it rapidly with the pedestal until it is solidified,—the metal thus granulated is placed in a porcelain capsule, or in some other non-metallic vessel. A saturated solution of sal-ammoniac is poured over it; the mixture is boiled; the objects to be *zinced* are now placed in it, previously dipped in dilute hydrochloric acid; and in a few minutes they are covered with a brilliant coating of zinc, which it is very difficult to remove by friction. The galvanic action is thus explained: the double chloride of zinc and ammonium formed is decomposed by the zinc and plate of copper; the chlorine disengaged from the sal-ammoniac goes from the zinc; the ammonium is disengaged in the form of gas; and the undecomposed sal-ammoniac combines with the chloride of zinc to form the double chloride, a very soluble and easily decomposed salt. If then an excess of zinc exist with the solution in contact with the electro-negative copper, the salt is decomposed into its elements, and the reduced zinc is deposited on the negative copper.

SUBSTITUTE FOR TINNING.

MESSRS. CLARKE, of Wolverhampton, have, at length, succeeded in producing for hollow ironware a smooth white enamel, which so expands or contracts with the metal as not to chip or crack, and is in every respect equal to the ingenious method long practised in Ger-

many, instead of "tinning" the interior surface. The great importance of this discovery to our own manufactures is, that the hollow ware manufactured in this country may be purchased at less than half the price of that imported from the Continent.—*Abridged from the Staffordshire Examiner.*

IMPROVED TINNING.

MESSRS. RICHARDSON AND BRAITHWAITE have patented certain Improvements in Tinning Vessels, which consist in employing an alloy instead of pure tin, which is thus composed:—10 oz. of nickel, 7 oz. of thin sheet iron, and 10 lbs. of tin are melted together, under a flux composed of 1 oz. of borax, and 3 oz. of powdered glass; which produces an alloy much better adapted to the purposes of tinning than any thing heretofore adopted. It is used in the same way as pure tin has heretofore been employed, and produces a firmer, more adherent, less fusible, and much whiter surface.

NEW COPPER COINAGE.

THE copper penny-pieces lately issued from the Mint, designed by Mr. W. Wyon, the chief engraver, display his usual grace and skill in execution. The metal, however, is so ill prepared, that upon very many of the pieces the surface has broken up in flakes. They are not well struck up, *i. e.*, the parts in the highest relief are not clearly expressed: yet, at the Royal Mint, we have the finest machinery in the world for striking coins! The dies are evidently very badly made, exhibiting cracks and depressions; and great numbers of dies have actually been broken. And many of the surfaces of the coins are extremely rough, either from the bad quality of the metal, or from burning the die in the process of hardening.—*Correspondent of the Athenæum, No.* 693.

COPPER-MINE IN JAMAICA.

THE Copper-mine recently discovered in Jamaica is situate in Mount Vernon, six miles east of Kingston. The lodes run from east to west, with a dip to the north; the veins of ore are found near Lucky Valley estate, at the base of the mountain. The richest ore is a sulphuret, yielding 40 per cent. of metal; and it is obtained in vast quantities from a shaft opening upon a small stream sufficient to carry away the debris. There is also a carbonate, which yields 11 per cent. of metal by the humid process: this is a very beautiful ore; the matrix consists principally of lime-stone, argillaceous sand-stone, slate, schist, and a fine black sand-stone. The black sulphuret, which is abundant, resembles wet and rotten coals, is soft when extracted, but hardens in the sun, is full of pyrites, and when dry perfectly friable. Several hundred-weights of ore have been sent to London and Swansea for smelting, reverberatory furnaces being wanted in Jamaica to perform the operation perfectly.—*Civil Engineer and Architect's Journal, No.* 45.

NEW SHOE FOR HORSES.

M. JOUY, residing in Poland, has invented a new method of Shoeing Horses, for which the Emperor of Russia has awarded him 50,000 roubles, besides an exclusive patent. Jouy covers the entire hoof with iron, and the base of his shoe, or as it is called, sandal, is perfectly smooth. It requires no nail, is extremely cheap and light, and is being adopted throughout Russia.

LIME-WORKS AT AMBER GATE.

MR. STEPHENSON has commenced burning Lime at these works, and is sending it to the different places adjacent to the North Midland Railway. The kilns are handsomely built, and are from 30 to 40 feet high. The lime-stone is procured from Crich, about two miles distant, and is conveyed on a tramway, passing near Crich, through a tunnel between fifty and sixty yards in length ; further on is an inclined plane, worked by a wheel, which lets down six waggons full of lime-stone, and draws up the same number of empty waggons. Nearly adjoining is another inclined plane, rising one yard in three and a half, and worked by a a large drum, round which passes a wire rope; and attached to the drum is a lever, by which one man may regulate the speed of the waggons, or stop them. These Works, when completed, it is stated, will be the most extensive in England, and will be able to turn out upwards of 200 tons of lime per day.—*Sheffield Patriot.*

EVAPORATING POWER OF COAL.

ON February 8th, Dr. Fyfe read to the Society of Arts for Scotland an interesting account of a series of Experiments on the Evaporating Power of various kinds of Coal, (including Anthracite,) as obtained by combustion in furnaces. The general result of these experiments seems to be, that the practical heating power of all Coals is almost exactly in proportion to the quantity of fixed carbon; there appearing to be no heat whatever procured from the volatile matter of the coal. This circumstance Dr. Fyfe accounts for, by supposing that the hydrogen and volatilized carbon abstract, in passing to the gaseous state, as much heat as they develope during combustion.

MINE VENTILATOR.

A MACHINE for ventilating mines has been invented; consisting of an eccentric fan, with four or more vanes, containing within a strong coating of iron, in connexion with wheel-work, by which it is made to revolve with great rapidity. For mine-work, the machine is attached to the projecting end of a tube carried to any given depth, and the unfailing effect of its action is the displacing of the impure air, and the substitution of that which is requisite to sustain life. It is equally effective for ventilating ships' holds, assembly rooms, &c.—*Abridged from the Post Magazine.*

VENTILATION OF THE OLD BAILEY COURTS.

Dr. Reid's new Ventilating arrangements have been introduced into the Central Criminal Courts, Old Bailey. The operations were commenced by removing the central seating in the New and Old Courts, below which have been constructed very large chambers for the introduction of air, to be supplied at any required temperature from an apartment constructed without the Courts, in a situation where the air is defended as much as possible from external contamination. In this chamber, the air can be filtered, and otherwise freed from impurities suspended in it; after which it is either drawn into the Courts by the operation of an enormous discharge, placed upon the highest part of the building, or propelled into them by the action of a fanner, according to the state of the external atmosphere, the number of persons attending the Courts, and other circumstances affecting the quantity of air required. Throughout the Courts, a large body of air can be introduced, with the least possible impetus upon the person; whence it will pass into the roof of the Old Court, which has been converted into an immense foul air chamber for receiving also the vitiated air from the hall, passages, staircases, and various rooms. From this general receptacle of foul air from the whole building there is but one discharge—by a gigantic cowl, 15 feet in diameter, which moves as easily as the smaller cowls on the surrounding chimney-tops; although the weight of this immense cowl is nearly two tons, and the point of the arrow of the guiding vane weighs 150 lbs.

In excavating for the tunnels requisite for conveying the air into the Courts, the workmen came upon the old London wall, and opened in it two vaults, through which they had to pass. The supply of fresh air to the Old Courts passes under the passage from Newgate, (the walls of which were underpinned, as the work advanced,) and is then led under the grand jury-room, thence under the hall, and terminates before it reaches the chamber under the Court, in two central vaults. The channel for the supply of air to the New Court proceeds directly from the fresh air chamber. During the works, the drying of the plaster was hastened by quick lime being placed so as to act upon the moisture in the plaster.—*Times, August* 23; *abd.*

IMPROVEMENT OF ARNOTT'S STOVES.

The liability to explosion in these stoves is considered by Mr. W. J. N. Hearder to arise from having the door air-tight; the only aperture for air being the valve of the ash-pit. The air so admitted is immediately decomposed, and nearly the whole of its oxygen is abstracted; so that, by the time it has passed up through the fuel, and reached the upper chamber of the stove, it has not oxygen enough left to support combustion. The heat evolved by the lower stratum of fuel, acting upon the upper stratum of fresh or unignited fuel, liberates from it the inflammable gas which it contains, and which also accumulates in the top of the stove. A mixture is then formed analogous to the fire-damp of coal-mines, ready for explosion whenever the requisite oxygen or degree of temperature shall be present. Under these

circumstances, should the door be opened, a burst of flame outward may be the result; or should a puff of wind down the chimney carry the mixture down through the ignited fuel, an explosion may ensue. Other causes, such as the sudden shutting or opening of a door of an apartment, may occasion the downward draught and consequent explosion. Now, carburetted hydrogen will not explode when the proportion of air to the hydrogen exceeds a certain limit; so that, if air be supplied to the top of the stove greatly preponderating over the hydrogen, the latter will burn off in a flame at the moment of its formation, or be carried up the flue. Mr. Hearder, therefore, proposes as a remedy, perforations through the lower edge of the door; so that air may be admitted on a level with the top edge of the fire-brick, through which a constant in-draught of atmospheric air will be insured, sufficient to obviate the evil. The heat evolved by the perfect combustion of this inflammable gas, under these circumstances, will, he says, more than compensate for the admission of cold air into the upper part of the stove. The perforations just mentioned will also obviate, in a great measure, the want of ventilation. The author suggests the insertion of a small rarefying apparatus in the vertical shaft connected with a descending flue.—*Proceedings of the British Association; Athenæum, No.* 721.

THE BUDE LIGHT.

Mr. Gurney's Bude Light in the House of Commons has been found very economical. The expense of wax, the old method of lighting, amounted during the session to 1,300*l.*, and the nightly cost for the House of Commons alone was 5*l.* Under Mr. Gurney's contract, the charge per annum for lighting the House is 100*l.*; and that for the Committee-rooms, library, &c. 130*l.* The nightly cost of the House of Commons itself is only 12*s.* Thus, by Mr. Gurney's new method, there accrues to the country an annual saving of 1,030*l.*

The Bude Light has also been successfully introduced in Christ Church, Albany-street, Regent's Park; where a more perfect illumination is produced by two lustres than by seventy-two Argand burners. The perfect ventilation of the church is likewise effected by flues ascending from these lustres, through the ceiling, into the open air, which carry off all heat, noxious products of combustion, and air vitiated by respiration. These advantages are peculiar to a light of this power, as lights of less power must be placed at such a distance from the ceiling, in order to illuminate the lower parts of the building, as would render it impracticable to carry ventilating flues from each burner.

FIRE-PROOF BUILDINGS.

M. Louis Leconte, of Leicester Square, has patented a plan for constructing Fire-proof Buildings, by employing iron frames filled with concrete for the walls upon the basement story, which is to be built according to the ordinary methods up to one foot or more above the ground. These frames are to be set to the required height with

steady pins; and similar frames are to be employed for the internal partition-walls, doorways, window-frames, &c. The flues of the chimneys are formed of iron or other metal pipes placed in the thickness of the walls. To give steadiness, the joinings of the iron-work are to be filled with lead. The main and cross beams may be of cast-iron, or iron and wood; or bent plate-iron, with a bar passing through it lengthwise; and wire-work is to be used for laths in the ceilings and other plaster surfaces.

Mr. Baddeley's popular *résumé*, in the *Mechanics' Magazine*, No. 915, states the total number of Fires in the metropolis, in the year 1840, to have been 681, being 97 more than in the year 1839; number of lives lost, 31; alarms from fires in chimneys, 98; false alarms, 84: total number of calls on the London Fire-Engine Establishment 863, being a considerably greater number than in any year since its formation.

PATENT HEATED GAS BURNERS.

Mr. W. S. Smith, of Leamington, has invented and patented a new method of consuming Gas, by burning it in a highly heated state, instead of cold, as in the ordinary method. This is accomplished by merely causing the tube conveying the gas to the burner to pass over the flame; and the saving by this improvement is stated to amount in different burners from twenty-five to forty per cent.; besides other advantages. For the details of this invention, see *Mechanics' Magazine, No.* 908.

GAS AT THE ANTIPODES.

The *Colonial Gazette* announces the lighting of Sydney by Gas, and points to it as a striking instance of the enterprise so characteristic of Englishmen, that they should have been the means of introducing "one of the most brilliant inventions of modern times into one of the newest and remotest settlements of the globe, while the long-established cities of South America and India are still unenlightened by it."

REFRIGERATOR FOR BREWING.

Mr. R. Davison has constructed a Machine for cooling Brewers' Wort expeditiously, without deteriorating the quality of the liquor. The wort is pumped up at a slow and regulated speed into a recipient at the top of the machine, there divides into a series of thin films or streams, and trickles down the inside of a number of thin metallic tubes, set vertically, with their upper extremities quite level. Up these tubes is forced a current of air, at any required velocity, which, meeting the descending wort, cools it inside, whilst a constant change of cold water takes place around the exterior of the tubes. The wort, on leaving the vertical tubes, is received into a second refrigerator, containing a number of horizontal pipes, through which cold water flows. By this process, the wort is cooled without producing any

prejudicial effect upon its quality, and with a rapidity which may be extremely advantageous.—*Proceedings of the Institution of Civil Engineers.*

MANUFACTURE OF CIGARS.

THE greatest manufacturers of Havannah Cigars are Cabanas, Hernandez, Silva, and Rencareiul; there are a hundred others of less note, who make from 10,000 to 100,000 a day. The cigar is composed of two distinct parts, the inside and cover. For these, two different kinds of leaves are used, of which the latter is generally finer in texture, as well as more pliant. These leaves are damped the night previous to their being made up; when rolled, they are placed on a large table, where they are divided into the various qualities of first, second, third, &c., and priced accordingly. Those which are most carefully rolled are called *Regalias*, and are sold at 22 dollars, 23 dollars, and 26 dollars a-thousand; while the second-best, which are of the very same tobacco, and made by the same man, (only with less care,) are sold at 14 dollars, others as low as 6 dollars. D. Hernandez employs about fifty men in his manufactory. Of the best common cigars, a workman can make a thousand in a day; of the Regalias, 600; so that the daily issues from that immense *fabrica* are about 30,000 cigars, which, at 14 dollars per thousand, would give nearly 100*l.* a-day. They pay an export duty of half a dollar per thousand, and an import duty in England of 9*s.* Allowing for freight and insurance, twenty per cent. profit to the importer, and twenty more to the retailer, the best Havannah cigars should be sold in London at 5*l.* per thousand, which is 18*d.* per sixteen, or about 1¼*d.* each; instead of which they are generally charged 30*s.* to 40*s.*, and sometimes 60*s.*, and from 3*d.* to 4*d.* a-piece. The very best in quality do not find their way to Europe, because they are not fashionable here: they are generally dark-coloured; whereas, a light-coloured and smoothly-rolled cigar is preferred to the strong and highly-flavoured rough ones, which are the best. The finest tobacco in Havannah grows in the Vuelta Abaga, or lower district.—*Standard, Oct.* 28.

PREPARATION OF POTATOES.

MR. C. GRELLETT, of Hatton Garden, has patented the following invention for the adaptation of Potatoes to the making of bread, biscuits, pastry, &c. A paste of potatoes is prepared in one of the four following ways:—

The skins of the potatoes being removed by a suitably constructed grating machine, the potatoes are boiled and then reduced to a paste. The potatoes are skinned, boiled, dried, and reduced to the state of flour. The pulp of potatoes deprived of the feculent parts is made into a moist paste. Or, the potato pulp is boiled, dried, and reduced to the state of meal.

The apparatus for drying consists of a chamber into which hot air is conveyed, having been previously passed over lime, to abstract all possible moisture; this hot dry air is admitted into the drying chamber

by sliding valves, and when charged with moisture is drawn off by a revolving fan.

The mill for grinding the preparation of potatoes consists of two vertical stones, whence the meal or flour passes to a bolting-cloth, through which the finest particles fall, the larger being raised by a screw and reground. The fine particles pass through hollow metal columns into a suitable vessel, from which they are moved by an endless screw, turning in a double cylinder, into a box. This double cylinder is of zinc, the internal space being filled with flannel saturated continually with cold water, so as to cool the flour in its passage. From this box the flour is raised, by cups placed on an endless band, into the drying chamber.—*Mechanics' Magazine, No.* 932.

WINE FROM RHUBARB.

THE claim for this improvement in making wine is the application of the product from the stems or stalks of the plant rhubarb. In the month of May, when rhubarb is green, the stalks of the leaves are used in the following proportions :—five pounds of stalks are bruised in a suitable vessel, to which is added one gallon of spring water; and after remaining in mash three or four days, the liquor juice is poured off; when to every gallon of this juice three pounds of loaf sugar are added, and allowed to ferment for four or five days in a suitable vat: as soon as the fermentation has ceased, the liquor must be drawn off in a cask and allowed to remain until the month of March, when all fermentation will have finished: it must then be racked off, and more lump sugar must be added. In the month of August, a second crop of rhubarb will be ready to gather for this improved method of making wine.

CONSUMPTION OF FOREIGN BONES.

THE year ending 5th January, 1836, is the first in which we find mention of Customs' duties paid on "Bones of animals and fish, except whalebone." Before that time, the duty was too small to escape being lumped with other "miscellaneous" duties, and under that head. In that year the duty is stated specifically to have been 1,594*l.* It continued to rise every year till it reached 2,720*l.* in the year ending 5th January, 1841. The duty is 1*l.* per every 100*l.* value. This increase is partly, perhaps, owing to the use of animal charcoal, made from bones, for manufacturing purposes. But is not a large share of it to be attributed to the enterprise of our agriculturists? We find a similar increase in the importation of nitrate of soda under the name of cubic nitre, and we know that the fertilizing properties of these manures have lately excited much attention. It may seem at first sight a small matter, but it is not so if it points out a new and profitable field for the employment of capital.—*Facts and Figures, No.* 2.

IMPROVED HOUR-GLASS.

AT the Royal Dublin Society's recent exhibition of Irish manufactures, a model of an improvement on the Hour-glass, invented by

Christopher M'Dermott, of Irishtown, was shown. The sand, instead of passing silently away, strikes a bell upon its exit, which intimates that the period for which the glass was timed has expired, and gives notice to turn it. The sand, as it runs, divides its time on a dial affixed to the instrument; so that if the glass be timed for an hour, the minutes will be marked on the dial as the sand passes.—*Mechanics' Magazine, No.* 936.

EXPEDITIOUS SALTING.

Mr. C. Payne, of South Lambeth, has patented the following expeditious method of Salting Meat. The meat is placed in a strong iron vessel, which is closed air-tight, and the air then exhausted from it by an air-pump; a communication being opened with a brine-vessel, whence the brine flows into the receiver until it is about half filled; when the air-pump is again worked to draw off every particle from the meat, &c. The brine is then permitted to fill the receiver, and a further quantity is injected by means of a common forcing-pump, the pressure being regulated by a safety-valve loaded with about 100 or 150lb. upon the square inch. After remaining under this pressure for about fifteen minutes, the meat is effectually cured, and may be taken out of the receiver.

THE ROCK HARMONICON.

This very extraordinary Musical Instrument is constructed of rough stones collected in the immediate neighbourhood of Skiddau. The stones, the longest of which is four feet six inches in length, about one and a half inch in thickness, and about three inches in breadth; and the shortest of which is about six inches in length, half an inch in thickness, and an inch in breadth; are placed across a pair of wooden bars, covered with twisted straw, and form the keys. These are struck by wooden hammers, and emit very melodious sounds. The power of the instrument extends to a compass of five octaves and a half, accompanied by all the semitones. The inventor, Mr. J. Richardson, was upwards of thirteen years almost incessantly employed in bringing his invention to perfection; and, in its present state, it produces tones of the richest harmony, full of sweetness, and of the most delicate modulation.—*Times*, July 24.

THE CEPHALASCOPE.

Mr. Curtis, the aurist, has ingeniously adapted the Stethoscope to discover the causes of diseases of the ear, in the same way that it had hitherto been employed in detecting diseased affections of the chest and abdomen. To the instrument in its new form, Mr. Curtis has given the appropriate name of *the Cephalascope*. It differs from the Stethoscope chiefly in the greater size of the bowl, which is large enough to inclose the external ear. "When used, the mouth and nostrils are closed, and from the sounds then conveyed by the instrument to the ear of the examiner, he is said to be able, after a little practice, to discriminate, with great exactness, between healthy and

diseased states of the Eustachian tube, tympanum, &c." The instrument is engraved in the *Mechanics' Magazine*, No. 949.

ANATOMICAL MODELS.

THE Society of Arts have voted their gold Isis medal to Mr. Simpson, surgeon to the Westminster General Dispensary, for the application of papier-mâché to the making of anatomical figures and models of morbid anatomy. The materials in general use for anatomical models were wax or plaster, of which the former was found to be too expensive to come within the means of lecturers and students in general, and was too delicate to be handled in the lecture-room without incurring the chance of considerable damage. The plaster of Paris models were also objectionable, on account of their great weight and brittleness. The material which Mr. Simpson uses is paper, worked into moulds taken from dissections; this produces a model of extreme lightness, and is so hard that it may be freely handled without danger of damage. The external surface is painted in oil-colour, representing the appearance of the dissection. The right side of the figure which Mr. Simpson exhibited to the Society, represents the superficial arteries, veins, nerves, and muscles; the left side shows the second and third layers of muscles, the deep-seated vessels, and more particularly those parts concerned in surgical operations. The internal parts are removeable, so as to exhibit the natural arrangement of the thoracic and abdominal viscera; the brain and its membranes; the spinal marrow, tongue, &c.—*Times*, May 7.

NEW ARTIFICIAL LEG.

M. LEPAGE, a stone-mason of Paris, having had the right leg crushed by an enormous stone, submitted to amputation; and being poor was obliged to follow another trade, and became a shoemaker. The ordinary wooden leg without joint did not suit his new condition: he broke several; and he therefore contrived a leg with two joints, the one corresponding to the knee, the other to the hip. By means of a button applied to a spring, which descends laterally from the superior to the inferior articulation, these two joints are easily accessory to different movements, especially those of sitting down and rising up. The contrivance is very ingenious. The cost is about two guineas.—*Bull. de l'Acad. Roy. de Méd.*, and *Brit. and For. Med. Rev.*

PAINTING MACHINE.

M. LIEPMANN has nearly perfected his Machine for the Printing of Oil-paintings, noticed in the *Year-book of Facts*, 1840, p. 52. He has allowed a number of friends of the arts to witness the process of the printing. It has been clearly proved that his method of printing differs entirely from any hitherto known; and, at the same time, requires no after-touches with the pencil. Several of the company, who are well-known and eminent persons, wrote their names on the canvas prepared for the impression; and in a few minutes the female assistant of the inventor completed the printing of the picture, which was a mi-

niature portrait of Francis Mœris, in the same room, and in the presence of the whole assembled party, whom the inventor had not left for a moment.

The *Russian States Gazette* also thus decribes the process :—A small wooden frame, covered with canvas, was presented to each of the persons present, who wrote his name on the back of it. These frames were then delivered to a young girl, who is the assistant of M. Liepmann, and, in a few minutes, every copy was returned with a coloured ground-plan, if it may be so expressed, of the picture; the lines and tone of colour were more decided the oftener it was put into the machine, till, at length, there appeared on each frame a perfect copy of the portrait of Francis Mœris, in the Royal Museum of this city, which required nothing more than the glazing and putting in the high lights, as is done in an oil-painting just finished with the pencil. This portrait of Mœris is celebrated for its beautiful carnation, and for its extremely difficult and varied tone of colour; and M. Liepmann made choice of it, as well on this account, as because many doubts were expressed, when he made his well-known copy after Rembrandt, whether a picture of smaller dimensions could be produced by the new process. —*Abridged from the Literary Gazette*, No. 1258.

ASPARAGUS AND BEET PAPER.

A PAPER-MAKER of Ghent has discovered that the refuse ends of Asparagus make excellent paper, at half the expense of paper made from rags; and that a still greater economy is obtained by mixing the pulp of Asparagus with that of Beet-root.—*Mechanics' Magazine*, No. 932.

PAPYROGRAPHY.

THIS is a new invention for reproducing drawings, manuscripts, and all kinds of designs, by much cheaper means than hitherto. M. de Maune, the inventor, having, with his prepared metallic ink, traced the drawing on common writing paper, by a secret operation, contrives to make the lines rise in relief from the paper, and become extremely hard and durable. He fixed this matrix on a plate of metal, on which he then places the paper to receive the impression. Over the paper he places a piece of silk, and passes it under the roll of a copperplate press; when the characters or lines on the manuscript or drawing are reproduced, stamped in upon the paper. The designs thus fixed on the plates will stand many impressions being taken from them. The most important part of the invention is, however, the casting of metal plates from the matrix-drawing on the paper. By this engraving on paper, may be obtained impressions equal to those from wood-engravings, the design being the only expense; and it will produce, without end, as many engraved plates and impressions as may be required, at a cost of one half that of the ordinary process; and with a precision equal to that of the original drawing. Some of the specimens present the designs, and the printed copies from them in relief from two to three millimetres in height, obtained solely from the matrix

traced upon paper. The invention is applicable also to printing woven fabrics.

NEW LITHOGRAPHIC PROCESSES.

MR. C. J. HULLMANDEL has patented a process for producing "a new effect of light and shadow, imitating a brush or stamp drawing, or both combined, produced on paper; being an impression from a plate or stone" peculiarly prepared. For this purpose, the plate or stone is first grained as for a chalk-drawing; and the drawing being completed, with a brush, hair-pencil, or stump, and lithographic ink and water, the stone is prepared with an acid as usual with chalk drawings. It is then well dried, and over the drawing is poured a solution of resin in a volatile solvent; and as this evaporates, the resin cracks, or retracts as in laying a ground upon copper or steel, previous to engraving in aquatint. The stone is next carefully warmed to set the resin, and exposed to the action of nitric, muriatic, or other acid, capable of acting upon the stone, combined with gum-water; the etching action of the acid on the exposed surfaces of the stone producing "the new effect of light and shade." The following ground is recommended by the patentee:—Dissolve in a quart of spirits of wine, four and a half ounces of resin, and a quarter of an ounce of common pitch; let it stand three days, and then strain.

The Bavarian government has granted a patent for a new lithographic process, to which its inventor has given the name of Lithosterotypie. The process consists in tracing the subject on the stone, with a new black or coloured ink, and then laying on the spaces a combination of acids, which eats away the stone, so as to leave the lines of the ink tracing in relief greater than that of printing types. From the stone thus prepared any number of impressions, it is said, may be taken by the common press, much clearer than those which are obtained by the ordinary lithographic process.

DOUBLE PATENT FILTER INKSTAND.

IN the Filter Inkstand, as originally constructed by Perry and Co., the filtered ink was forced up into the dipping-cup, by turning a screw, which caused the descent of the piston of a small air-pump. The present improvement consists in fitting a neat cover to the dipping-cup, which is attached to a crank lever working the piston; so that the very act of raising the cover causes a flow of ink into the dipping-cup, which the closing of the cover again returns to the body of the inkstand. By this novel and scientific arrangement, a supply of clear fluid ink is presented in the dipping-cup, by merely lifting the lid; while shutting it down again withdraws it, in which state it can never overflow. When filled, the inkstand will continue to give a regular daily supply of clear ink for many months. The improvement is by Mr. T. B. Daft, and is named "Double" from being the subject of two patents.

IMPROVED INK.

Mr. H. Scott, of Brownlow-street, Holborn, has patented the following Improved Manufacture of Ink, or Writing Fluid:—

To make eighty gallons of ink, forty-eight pounds of logwood chips are soaked in soft water two days; they are then placed in an iron boiler with eighty gallons of soft water, and boiled for an hour and a half; the logwood chips are then taken out, and their place supplied by forty-eight pounds of Aleppo galls in coarse powder, and the boiling continued for another half hour. This mixture is removed from the fire, and allowed to remain for twenty-four hours, frequently stirring it; the clear liquor is then drawn off, and forty pounds of sulphate of iron in powder added to it, and stirred daily for a week; at the end of that time four gallons of vinegar are next added: seven and a half pounds of gum arabic dissolved in water and strained are next added by degrees; and at the expiration of a few days, twenty ounces of concentrated nitrate of iron are put into the mixture, which is allowed to stand until sufficiently black; the clear liquor is then poured off from the sediment, and the following substances added to it:—

Half a pound of Spanish indigo is ground fine in the ink, and three pounds of Prussian blue ground in water. Four ounces of gas-black, (gas smoke deposited on glass,) are ground in one ounce of nitrate of iron; and after remaining a few hours, these substances are added to the ink, which is stirred daily for a week, and the clear liquor then drawn off for use. The claim is for the application of nitrate of iron and gas-black.—*Mechanics' Magazine*, No. 936.

MOSAIC AND PORCELAIN TABLES.

At the Polytechnic Institution, are two costly Tables: one a splendid mosaic table of Swedish porphyry, consisting of nearly 10,000 pieces, price 3,000 guineas; the other, the celebrated porcelain *Table des Marchaux*, painted by Isabey, which is stated to have cost 12,000 guineas, and is to be sold for 5,000 guineas.

ENGLISH MOSAIC.

An imitation of the Florentine *pietra dura* is made to a great extent in Derbyshire, where the Duke of Devonshire's black marble, said to be equal to the famous *Nero Antico*, is inlaid with malachite, Derbyshire spars, and other stones; but the inlaying is only by veneers, and not done in the solid, as at Florence. This, with the softness of the materials, makes the Derbyshire work much cheaper; yet, for a table, twenty to twenty-four inches in diameter, thirty guineas is asked. Were a little more taste in design and skill in execution shown, the Derbyshire work might deserve to be more valued; as the materials, especially the black marble, are beautiful.—*Mr. C. H. Wilson; Trans. Soc. Arts, Edinburgh.*

VARNISH FOR DRAWINGS.

The Marquis de Varennes has succeeded in *fixing* drawings in crayons, or with the stump, by applying varnish *to the back* of such

drawings. The varnish, after saturating the paper, is sucked up by the particles of colour, by virtue of their capillary attraction; and the alcohol of the varnish, evaporating speedily, leaves the resinous particles firmly adhering to the colours, and giving them such tenacity that the drawing may be rolled, and even rubbed, without injury. The proportions of such varnish should be one part of ordinary gum-lac to twelve parts of spirits of wine, rendered colourless by the application of animal charcoal; or else, one part of the white tincture of gum-lac to two parts of rectified spirits of wine.

DIAGRAPHE.

By this highly-improved instrument, the telescope is made to move with increased facility, by means of a circular arc introduced into the apparatus. The instrument, however, requires some further improvement to be made in the eye-piece, to prevent straining of the sight. Altogether, the Diagraphe is not so well known to British architects and draughtsmen as it ought to be.

MODEL MAPPING.

Mr. J. B. Denton, of Gray's Inn Square, has called the attention of the agricultural interests to the superiority of Model Mapping as a means of delineation; and to its application as a basis for Draining and Irrigating operations. The author shows forcibly the advantages to be derived not only from a proper collection of the waters on an estate, but from their proper distribution and application to useful purposes. He also recommends Model Mapping in all designs for the draining of towns.—*Civil Engineer and Architect's Journal, No.* 50.

MOULDS FROM PLASTER CASTS.

Sir John Robison uses the following mode for obtaining Moulds for Plaster Casts. The object, of which the mould was required, was immersed in a mixture of common glue, dissolved in brewer's sweet-wort of about the consistency of thick cream, and allowed to remain until the mass became stiff; it was then released by cutting the mould open, when it would be found to resume its original form like Indian rubber: holes were made in it for pouring in the plaster of Paris, and carrying off the air; and from such moulds, casts of the most delicate objects could be taken.

IMITATIVE CARVING.

A patented process for executing Decorative Carving and Sculpture is now in active operation in Ranelagh Road, Pimlico. An iron mould is first cut from a plaster or wood model; the mould is heated to red-heat, and applied to a piece of damped wood with great force, and repeated until the wood is burnt to the required form. The char is then cleaned off, and any undercutting requisite is done by hand: when finished, the work has the appearance of old oak, and the surface may be brought almost to a polish, so as to be nearly equal to first-

rate carving. The cost is about one-third, and even one-fifth, of that of real carving.

PLATE-GLASS FLOORS.

PLATE-GLASS is now manufactured three-quarters of an inch thick, and is used unpolished, in floors, where a light is required to be thrown down upon a story below. It is also employed as a substitute for coal-plate, when the top-surface is ground.—*Civil Engineer and Architect's Journal, No.* 50.

SOCIETY OF ARTS.

H. R. H. the Duke of Sussex, President of the Society, delivered the annual prizes. The following are the awards in Mechanics and other Practical Arts :—

To Mr. Andrew Ross, 33, Regent Street, for his spherometer, the silver medal.

To Mr. W. Harrison, Newhaven, for his life-apparatus for shipwreck, the silver medal.

To M. Henri de Jay de Beaufort, Perigeaux, Dordogne, France, for his self-acting vice for carpenters, the silver Isis medal.

To Mr. David Thomas, 18, Goswell Road, for his apparatus for preventing the guttering of candles, the silver Isis medal.

To Mr. Thomas Weeks, 2, Bull's Fields, Woolwich, for his machine for tinning sheet-copper, the silver medal.

To Mr. William Hill, 12, Tottenham Court, New Road, for a valve for the large pipes of organs, the silver medal.

To Mr. Hugh Powell, 24, Clarendon Street, Somers Town, for his mode of mounting the body of a microscope, the silver medal.

To Benjamin Barrow, Esq., 59, St. Ann's Street, Liverpool, for a splint for fractured limbs, the silver medal.

To Mr. Robert Murray, 122, Regent Street, for his process for taking voltatype impressions from non-conducting substances by means of plumbago, the silver medal.

To Lewis Thompson, Esq., Royal Polytechnic Institution, for his method of assaying the ores of manganese, the gold Isis medal.

To Mr. Ed. Bentley, 41, Moorgate Street, for his method of preserving vegetable juices, the silver medal.

To George Simpson, Esq., Bedford Street, Bedford Square, for his anatomical models constructed in *papier mâché*, the gold Isis medal.

To Messrs. D. and H. Potts, 5, Selby Street, West Waterloo Town, Bethnal Green, and 1, Samuel Street, Booth Street, Bethnal Green, for their looms for weaving wicker chair-bottoms, the silver Isis medal and 6*l.* 6*s.*

To Mr. William M'Grath, 10, Mape Street, Waterloo Town, Bethnal Green, for his improved roll for weaving velvet, 5*l.*

To Mr. S. Gildersleve, 7, Providence Street, Blue Anchor Lane, Bethnal Green, for his shuttle-boxes for weaving wide velvets, 2*l* 2*s.*

To Mr. James Slater, 27, Robert Street, Hart's Lane, Bethnal Green, for his shuttle-boxes for weaving wide velvet, 3*l.* 3*s.*

To Mr. Samuel Larwood, 9, James Street, Church Street, Bethnal Green, for his shuttle-boxes for weaving wide velvet, 3*l.* 3*s.*

To Mr. Wm. Rooke, 17, Russell Court, Drury Lane, for an apparatus for throwing the shoot of wide woven fabrics, 3*l.* 3*s.*

The thanks of the Society were voted to six persons for various inventions; four prizes were voted to amateurs in the fine arts; and seventeen to artists for drawing, &c.—*Literary Gazette.* No. 1273.

SCHOOL OF DESIGN.

THE fourth annual distribution of the prizes took place in Somerset

House, on August 23; H. R. H. Prince Albert presiding. The following were the prizes distributed:—

To Mr. G. F. Lambart, for the best lithograph from nature. Given by the Right Hon. the President of the Board of Trade. 5*l.* 5*s.*

To Mr. J. Patterson, for the best painting of a group of flowers from nature. Given by the Right Hon. the President of the Board of Trade. 5*l.* 5*s.*

To Master C. King, for the best design for a salver. Given by Mr. J. G. Bridge. 3*l.* 3*s.*

To Master G. Dyer, for the best design for a silver tankard. Given by Mr. J. G. Bridge. 2*l.* 2*s.*

To Mr. O. Hudson, for a large design for painted glass. Offered by Mr. Alderman Copeland, M.P. 5*l.* 5*s.*

To Mr. G. Thompson, for a specimen of arabesque painting. Given by Mr. H. T. Hope. 5*l.* 5*s.*

To Mr. J. Evans, for the best design for mousseline de laine. Given by Mr. J. Thomson. 5*l.* 5*s.*

To Mr. W. C. Wild, for the best design of a drawing-room paper. Given by Mr. J. Thomson. 3*l.* 3*s.*

To Mr. H. Durrant, for the best plaster model of leaves and flowers from nature. Given by the Council. 3*l.* 3*s.*

NEW HOUSES OF PARLIAMENT.

On June 10, the embankment-wall towards the river was entirely completed. The superstructure of the river-front, and a considerable portion of the north and south fronts, had been carried up thirty-two feet above the level of high water. The foundations of the lower buildings towards the internal courts were brought to a level with the surface. The excavations for the foundations of the House of Lords, the House of Commons, the Victoria Tower, the Royal Staircase and Gallery, were nearly completed. The number of men then employed on the works was 446. By November, the east and west wings, and the whole of the river-front, had been carried up to the top of the first-floor windows.

MANUFACTURE OF SUGAR.

In 1837, Mr. Vincent, nephew of Mr. Freon, a rich planter in the Isle of Bourbon, having come to France, was led to inspect the improvements in the manufacture of sugar from beet-root, as carried on by Messrs. C. Derosne and Cail. Their apparatus appeared to him to be equally applicable to the cane; and, on his return to Bourbon, he ordered a complete set of the machinery to be sent to him at that island. Three crops have since been manufactured by it, and with increasing success—

From	1838 to 1839,	he made	1,000,000 lbs.
—	1839 to 1840,	——	1,800,000
—	1840 to 1841,	——	2,000,000

So marked is the difference between the new and old system, that the neighbouring proprietors have ceased to manufacture on their own estates, and obtain higher prices from Mr. Vincent. Besides the sugar, it is stated that a juice is produced which exceeds 30 or even 40 per

cent. that obtained by the old process: the quality of the sugar, too, is infinitely superior. Their raw sugars, clarified, constitute the new white and clayed sugars, and are altogether comparable in whiteness and quality to good refined sugars, for which they may be substituted. Next year, with an accession of machinery, Mr. Vincent is prepared to manufacture 4,000,000 lbs. more than in 1840-1; and thus the Isle of Bourbon may export, from one establishment, 6,000,000 lbs. annually—by far the most considerable which has yet been offered by any colony.

The Dutch have carried the means to Java; and the Brazils will, probably, not be slow in following the example which has already reached the Havannahs and Mexico. Bengal, Surinam, Demarara, &c., are all alive to this important mercantile object.—*Journal de Havre.*

FLEXIBLE IVORY.

It has been long known, that, in subjecting bones to the action of hydrochloric acid, the phosphate of lime, which forms one of their component parts, is extracted. Bones preserved in this manner retain their original form, and acquire great flexibility. It is by this process that M. Charriere, a skilful maker of surgical instruments in Paris, softens the Ivory of which he makes use to manufacture flexible tubes, probes, and other instruments. These pieces, after receiving the required form and polish, are steeped either entirely or partially in acid, diluted with water, where they remain as long as required. The ivory, after having undergone this preparation, becomes supple, flexible, elastic, and assumes rather a yellowish colour. In the course of drying, it again becomes hard and inflexible; but the flexibility of the ivory may be restored by wetting, either by surrounding it with a piece of wet linen, or by placing sponge in the cavities of the pieces. Some pieces of ivory have been kept in a flexible state in the acidulated water for eight days; they were neither changed nor injured, nor too much softened; they had acquired no taste, nor any disagreeable smell. With respect to the excellence of the articles thus manufactured by M. Charriere, it may be observed, that they have been examined by competent judges, and approved by the Royal Academy of Medicine. This preparation of flexible ivory may give rise to various useful applications of it in the arts or in manufactures.—*Inventor's Advocate.*

WOOL OF THE LLAMA.

Mr. Woolaston, who has resided for some years among the mountains of Thibet, has lately discovered a species of the Llama, the colour of which is perfectly black, and the hair is as soft as silk, and peculiarly suitable for weaving. It is much finer than wool, and would suit the shawl manufacture of Glasgow and Paisley: the hairs average twelve inches in length, and are of a jet-black colour, so that they do not require dyeing, to entertain a darker shade. A large quantity of twist has already been bought up, and sent to France, at from 12*s.* to 14*s.* per lb., where the raw unspun material has realized from 2*s.* 6*d.* to 3*s.*

per lb. The much-esteemed Indian shawls are manufactured from the fine soft hairs which form the under coat of the Cashmere hill goat; and the above animal, the Alpaca, (the native name,) affords a hair equally as soft and long as that of Cashmere. The black Cashmere shawls have always fetched higher prices than any others of a similar description in the market; and probably, the beautiful silky hair of the Alpaca is largely employed by the Cashmere weavers.—*Abridged from the Times*, Nov. 13.

INDIAN CRIMSON DYE-ROOT.

On the coast of Coromandel is found an aquatic dwarf shrub, called *Sal-Balu* or *Sand-Baul*, the root of which yields a beautiful and permanent Crimson Dye for cottons, little if at all inferior to the Adrianople, or Turkey red. No acid or alkali has yet been found to discharge the Sal-Balu dye: a vast quantity of cotton-twist is stained with it, and sold in the bazaars in the southern districts of Hindostan. A salookdar, (small freeholder,) possesses the secret of employing this dye-root, by which he derives annually a very considerable revenue.—*Times, Dec. 9; abd.*

THE COCHINEAL OF HAYTI.

The *Cactus Coccinellifer*, or prickly pear, is indigenous to the island of Hayti, where it is very abundant. Some 30 years ago, M. Thiery repaired to Oxaca, in South America, and, with much difficulty, succeeded in bringing back with him to St. Domingo various specimens of the living Cochineal, with a view to establish a *nopalery* in the above island; but in this speculation, for want of ready means, M. Thiery did not succeed. The cochineal insect now, however, swarms in Hayti, so as nearly to suffocate the plant upon which it subsists; yet it has been much neglected as an article of commerce, chiefly on account of the inhabitants being utterly ignorant of the mode of curing the insect, so as to render it marketable. The insect of Hayti is smaller than that in Mexico and Oxaca, which can only be accounted for by the neglect on the part of the people of the country, since M. Thiery first introduced it into the island. It, nevertheless, is found to impart to silks and woollens a very strong and brilliant crimson and scarlet dye, when properly treated, and might be collected and cured at a very trifling cost. It appears that the natives of Hayti do not possess a practical knowledge how to divest the fly of the downy matter. When the *cocci* are first picked from the shrubs, they should be almost immediately killed, or they will so expend their larvæ in a few hours, that nothing will be left of them but the case or shell which contained the same. They are most effectually destroyed by baking in a slow oven until they are hard and crisp; and the flocculent matter is to be removed by putting them into a sieve or basket, and shaking them for some time together; by this means the insect will assume a black appearance, precisely resembling that sort which are received under the appellation of *mastique* of New Spain, which are considered best in quality, and realize the highest price in the market. The South American nopa-

lists have been invariably jealous of their cochineal monopoly, and will not impart to a foreigner the secret of classifying their samples; but it is reasonable to suppose them to be passed through sieves of different sizes, by which means the larger are separated from the smaller grains, which are severally distinguished under the heads of *grana fina* and *grana sylvestris*, and having been thus classed, they are priced accordingly. The cochineal of Bengal has been as much neglected as that of Hayti, upon a precisely similar account; and has been suffered to grow wild, and disperse itself over the face of the whole of the above country. If any person of adventurous spirit were to settle in Hayti, and turn his attention seriously to the cultivation and curing of the cochineal in the above-named island, he would, doubtless, be amply repaid, as the insect is extremely prolific; whilst it might ultimately be the means of beating down one of the greatest commercial monopolies which New Spain has, for centuries, upheld; and which she, to the present day, continues exclusively to boast of.—*Correspondent of the Times, November* 26; *abd.*

STEERING BALLOONS.

A FRENCH gentleman and his son have been experimenting in Paris, and at St. Denis, in Ballooning, and have succeeded in rising to a height of about 250 metres, with a balloon constructed by themselves; and by ingenious mechanism, they proceeded to the west, notwithstanding a pretty strong wind blowing from that point. They then returned, and sailed about in various directions, the balloon rising or lowering at the will of the aeronaut, without the apparent use of any kind of ballast; the experiments lasting three hours.

SUBSTITUTES FOR DOOR SPRINGS.

THE Scottish Society of Arts have awarded two Silver Medals: 1. For Doors opening either way, particularly for Double Doors, which, though opening freely when pulled or pushed by the hand, have no tendency to open by the force of the wind. 2. A new method of Shutting Doors which open either way, without the use of springs, and requiring no additional space beyond what is necessary for the door itself.—See *Report*, 1840.

PRECIOUS STONES USED IN JEWELLERY.

On Feb. 19, Mr. Tennant read to the Royal Institution a paper "On the Precious Stones used in Jewellery." The arrangement followed was according to the degrees of hardness. He commenced with the diamond, which is the hardest of all, being composed of pure carbon, (charcoal). On account of its brilliancy it has become in all parts of the world generally sought after, as it is discernible at a distance where all other gems are unperceived. Diamonds occur of various colours: one named by Hertz, the weight of which was 177 grs., was of a deep sapphire blue tint; it is as unique in colour as in size, and is mounted as a medallion, bordered with rose diamonds, &c.; its value is estimated at 30,000*l.* These gems are sold by the *carat*. A diamond of

ordinary quality, weighing *one* carat, usually sells for 10*l.*; those weighing *two* carats are worth about 30*l.*; *three* carats, 60*l.*; *four* carats, 100*l.*, and so on. When, however, the weight amounts to *twenty* carats, the purchasers become few. The King of the French possesses the finest diamond known: its weight is 136½ carats, but prior to being cut it weighed 440 carats; it cost the purchaser 135,000*l.* The most inferior kinds are reduced to powder and used by the lapidary, &c., and under the name of *diamond dust* sell for 16*l.* per ounce. The Marquis of Westminster possesses a diamond of a triangular shape which was valued at 30,000*l.*, but when sold by public auction fetched only 7,000*l.* The Emperor of Russia has one, the weight of which is 193 carats. The Emperor of Austria possesses a very fine yellow diamond; and these, with the addition of twelve others of minor value, are all of any moment at present in Europe. Diamonds are found in mines and in the rivers in South America and India, and were formerly raked out from the beds in searching for gold; they are sifted and picked. The smaller ones are used by the seal-engraver in cutting crests, by jewellers for watches, and by lapidaries. Mr. Tennant cursorily passed through the entire series of precious stones, giving their structure and composition, and the uses to which they are applied, either in the arts or as ornaments; and concluded by exhibiting the various processes of cutting and polishing stones with the lapidary's wheel.—*Polytechnic Journal, No.* 19.

THE CHINESE SCHOLAR'S LUTE.

THIS stringed instrument, the Kin, was the one played upon by Confucius and the sages of antiquity; and is, therefore, held sacred by men of letters. It is made of the Wootung, or *Dryandria cordifolia.* It is convex above and plane below, and is wider at one end than at the other; it has two quadrangular apertures in the plane surface, which open into as many hollows within the body of the instrument; and it is furnished with seven silken strings of different diameters, which pass over the smaller end, and are distributed between two immoveable pegs below. A bridge within a short distance of the wider extremity gives these strings the necessary elevation and a passage to the under surface, where, by means of a row of pegs, they are tightened or relaxed at pleasure. The length of the sounding-board is divided by 13 studs of nacre, or mother-of-pearl, as a guide for the performer; and they are placed so that the length of each string is bisected, trisected, &c.; that is, divided into aliquot parts as far as the eighth subdivision, with the omission of the seventh, the number of sections being represented by the arithmetical series

2, 3, 4, 5, 6, 0, 8.

Thus, the intervals or magnitudes of the different tones sounded by this instrument, do not accord with those produced on our violin, but agree more with the old Scotch music. The study of this instrument, and the art of playing upon it, are rendered extremely difficult by the complexity of the Chinese notation of written music; which leads to

frequent omissions and blunders. Thus, every air which a Chinese plays has cost him the labour of many months to learn; and so tiresome is this acquisition, that some extemporize very prettily without being able to play a single air. Their performance, however, is very graceful; and, though the melody be simple, every scope is given to variety by the mode of touching the strings. These details, by Mr. Lay, were, on April 1, communicated by Mr. S. H. Christie to the Royal Society. In conclusion, the author enters into an examination of the musical theory of the sounds produced by this instrument.

DISCOVERIES ANTICIPATED.

FROM time immemorial, the inhabitants of some distant regions carried on their nocturnal manufactures by means of natural gas, obtained through a hollow reed thrust into the earth. Arriving at modern times, navigation by the Archimedes screw, as a propeller, through the means of steam, attracted the notice of the Scottish Society of Arts, in 1840; but above twenty years previously, an experiment with similar screws, adapted to a boat, on the neighbouring lake, Lochend, by Mr. Whytock, a member of the Society, proved its efficiency, though on a smaller scale. In Scotland, an Agricultural Society was established in 1723; a thrashing machine appeared in 1735; and a reaping machine in 1763.—*Sir J. G. Dalyell's Address, Nov.* 1840.

CONDENSING CYLINDER STEAM-ENGINE.

THIS is a contrivance, intended, according to a pamphlet written by Mr. B. Boyman, to save the loss of power occasioned by the imperfect exhaustion of the cylinder in steam-engines of the ordinary construction; and by which Mr. Pilbrow, the inventor and patentee, considers that he will save *more than half* the fuel of Mr. Watt's Rotative Engines.

In Mr. Pilbrow's Engine, the ordinary condenser and air-pump are replaced by a double-acting air-pump of the same size as the steam-cylinder, called the condensing cylinder; in the interior of which the condensation is effected by injection alternately above and below the piston, which is, of course, solid, like the steam-piston. The two cylinders are connected at top and bottom by passages, with valves to open and close the communication alternately. The action will be as follows: while the steam-piston is ascending, the air-pump piston is descending, and the two cylinders communicating at top, the steam which performed the previous down-stroke will flow into the condensing cylinder, and be condensed by the jet; by this, as we know from the experience of ordinary condensing engines, the vacuum above the air-pump piston will be maintained at nearly its maximum, while the expansion of the cylinder will be nearly the same as in ordinary condensing engines. Mr. Boyman, however, supposes that, "during its condensation, the uncondensed steam will keep giving to the condenser piston, until completely annihilated, just as much power as it offers

resistance to the effective action of the steam-piston." The exhaustion on the under side of the condenser-piston will be the maximum throughout the stroke, so that the resistance to the motion of the steam-piston (exclusive of friction, and the resistance to the discharge of the condensement in the latter part of the stroke,) will be equal to the mean pressure of the used steam remaining in the steam-cylinder, *minus* the difference between the maximum and mean exhaustion in the condenser; and this difference, which is insignificant, is, after deducting the surplus power required to work his large air-pump, the true gain of power obtained by Mr. Pilbrow's engine, (which we think probable,) will be found negative, or a loss.—*Abridged from the Civil Engineer and Architect's Journal, No.* 48.

ECONOMY OF THE CORNISH STEAM-ENGINES.

THE Telford medal has been adjudged by the Council of the Institution of Civil Engineers to Mr. Parkes, for his paper "On the Action of Steam in the Cornish Single Pumping Engine." This communication, though growing immediately out of others of the same author, and depending upon the facts contained in them, is of a tolerably distinct character; being an attempt to explain, on theoretical principles, the action of steam on the piston, and to unfold the Economy of the Cornish Engines. This subject has occupied the attention of the Institution during the last four years, and the discussion first assumed a settled form during 1837, on the receipt of the communication of Mr. G. H. Palmer, who, reasoning on certain data as to evaporation, and on the physical facts which involve the constancy of the sum of the latent and sensible heat of steam of all elasticities, and of the absorption of heat by matter on dilatation, came to the conclusion that no power could be gained by expansive working; and that, consequently, this could not be the cause of the economy of the Cornish engines. The discussion was revived in 1838 by Mr. Wicksteed and Mr. Henwood, the former furnishing the first recorded experiment in which the water raised was actually weighed; the latter giving careful and detailed observations on the quantity of steam employed, the mode of its distribution, the duty performed by a given quantity of fuel, and the measurement of the water raised. Taking for data the facts furnished by Mr. Henwood for the Wheal Towan, and by Mr. West for the Fowey Consols Engines, Mr. Parkes has analysed the quantity of action attainable from the quantity of water as steam consumed, and expanded to the extent used in those engines, and has found the steam's force unequal to the resistance overcome. After satisfying himself from various phenomena attendant on the working of these engines, that the amount of resistance opposed to the steam was not overrated, he was led to conclude that from the instantaneous and free communication effected between the cylinder and boiler of these engines, by the sudden opening of the large steam valves, a force must be transmitted to the piston, of a kind distinct from that of the steam's

simple elasticity. This force he denominates the steam's percussive action; he adduces various proofs that this description of force has operated on the piston, and that it alone was equivalent, in the instance of the Fowey Consols Engine, to drive the piston through $\frac{87}{100}$ths of its stroke. The author considers the effect produced on the piston of a Cornish engine, by the sudden impact of highly elastic steam, to be similar to that obtained from water in the hydraulic ram. He has not in his paper entered on the consideration of the absolute amount of percussive force, which can he afforded by an aëriform fluid in motion, but has confined himself to the determination of the quantity of action, which he conceives to have been derived from that source in the particular engines examined.*

The number of Pumping Engines reported upon in Messrs. Lean's Monthly List for July, is 54. They consumed, in that time, 3,440 tons of coal, and lifted 33,000,000 tons of water 10 fathoms high. The average work of the whole is, therefore, 54,000,000 tons lifted one foot high by the consumption of one bushel of coal. The greatest individual performance during the above month was that of Taylor's South Wheal Basset Single Engine, (86 inches cylinder, and 11 feet cylinder stroke,) which raised the enormous quantity of 101,595,300 tons of water, by the consumption of one bushel of coal.—*Mechanics' Magazine, No.* 945.

MINIATURE STEAM-ENGINE.

In the window of a watchmaker, in the Commercial Road, has been exhibited a Miniature working Model of a Steam-Engine. This unique piece of mechanism is the production of a young man totally unacquainted with the improved principles of steam power. The engine has been admired by some of the best working engineers of the day, and weighs something less than half an ounee. The engine, boiler, and appurtenances, weigh together an ounce and a quarter. The boiler is heated, and the steam generated, from water by means of a spirit-lamp; the engine will work with a single charge of water for nearly half an hour, with a velocity equal to 500 revolutions in a minute. The whole machine may be deposited in a good sized pill-box.—*Times.*

ANTHRACITE AS FUEL FOR FURNACES.

Dr. Fyfe has submitted to the Institution of Civil Engineers, some experiments made with Bell's patent furnace, "On the Combustion of Anthracite, and its Value as a Fuel for Steam-engine and other Furnaces." The objects sought to be obtained by the apparatus are, to insure a larger amount of evaporation, by passing heated air, unmixed with the products of combustion, through tubes in the boiler and surrounded by the water, thus increasing the evaporating surface; and that the surplus caloric taken originally from the fuel, and not

* From the Report of the Council I. C. E. For a notice of Mr. West's Engines, see Year-book of Facts, 1840, p. 10: and of W. Wicksteed's Results, in Year-book, 1841, p. 11.

given out in its passage through the water, should be beneficially used in aiding the combustion beneath the boiler. It has been found in the manufacture of iron that anthracite could be advantageously used by means of heated air; the author, therefore, considered that the experiments upon the apparatus, (the intrinsic merits of which he does not at all discuss in this communication,) afforded an advantageous opportunity for ascertaining in what manner the fuel could be successfully employed under steam boilers. The author's opinion is, that when anthracite is completely burned, the practical evaporative power will be found directly in proportion to the amount of fixed carbon contained by it—that with the exception of the loss of heat which is always transmitted to the brick-work of the furnace, and of that which is carried up the chimney to keep up the draught, the whole of that evolved by the fixed carbon will be retained by the water; because from good fuel there is little or no escape of gaseous matter, and hence the superior efficacy of anthracite. From the analysis of a number of specimens of anthracite, the author found the quantity of fixed carbon to amount to 90 per cent. The evaporative power of these fuels, as fixed by Berthier's process, (*la voie sèche*,) would amount to 12.3 lb. of water for each pound of coal consumed. He calculates that 6 lb. of anthracite will evaporate one cubic foot of water under the ordinary circumstances of a steam-engine boiler, and taking the average specific gravity of bituminous fuel at 1280, while that of anthracite is 1410, there is a difference of nearly 10 per cent. in favour of the latter, considering the space in which it can be stowed. It is essential that its rate of combustion should be such as to raise steam rapidly, its capabilities for which the author then proceeds to examine; and deduces from the experiments that the combustion of the anthracite was carried on so as to produce a greater amount of evaporation, in a given time, than could be obtained from bituminous coal. The result is attributed in some degree to the use of heated air.—*Athenæum*, *No.* 731; *abd.*

EXPLOSION OF STEAM BOILERS.

Dr. Schafhaeutl, in an elaborate inquiry upon this subject, combats the idea of the Explosion of Boilers arising from the formation of hydrogen gas; and a careful examination of the circumstances, and the results of his experiments, convince the author that a simple mechanical arrangement, applicable to all boilers, might be introduced, so as to diminish the danger arising from the sudden development of an explosive force. He proposes to connect with the bottom of the boiler, by means of a pipe, an extra safety valve of a given area, loaded to five-sixths of the absolute cohesive force of the boiler plate. In the event of a sudden development of steam, the first shock would act upon the valve, and open it, which would have the effect of depriving the wave generated of its destructive force; and at the same time diminish the violence of the second shock from the top of the boiler, by having permitted the escape of a portion of the water from the boiler.

Natural Philosophy.

TERRESTRIAL MAGNETISM.

MAJOR SABINE has read to the British Association the Annual Report*, (drawn up by Sir J. Herschel,) of the Committee appointed to superintend the Simultaneous Observations on Terrestrial Magnetism and Meteorology, and the progress made. Observations for August, 1840, have been received from St. Helena; for September, from Toronto; for October, from Van Diemen's Land; for March, 1841, from the Cape of Good Hope: the delay at this latter place did not arise from want of exertions: from each returns now are regularly transmitted. At the portable observatories erected at Kerguelen's and Van Diemen's Land, the May and June returns were recorded; during the August term the magnetometers were hourly registered, and the reductions have been begun and are being continued. During term-time, three observations are regularly made at intervals of two and a half minutes; aurora discharges also are noted. The first report from Madras is

* Almost simultaneously with this communication, intelligence was received of the South Polar Expedition, dated Hobart Town, April 17, 1841, announcing the return of the *Erebus* and *Terror* to that port, after a voyage of six months to the Antarctic Pole; and that "these British ships proceeded eleven degrees lower south than the *Astrolabe* or *Zélé*, and four degrees more than any other vessel has ever yet reached; that they were enabled to fix the exact position of the South Magnetic Pole at about 100 miles distant from them; and that some extraordinary mistake appears to have affected the calculations of the Americans who approached these regions."

The *Erebus* and *Terror* entered the main part of the ice, on their voyage of discovery towards the South Pole, on the 5th of January, 1841, being then in lat. 66 deg. 45 min. S., and long. 174 deg. 13 min. E. On the 10th of the same month they descried land in lat. 71 deg. 56 min. S., long. 171 deg. 17 min. E.; and coming up to it on the 12th of January, they took possession of it in the name of Her Majesty. This land extends south to 79 deg. Proceeding onwards, a large volcano, emitting dense clouds of smoke, was observed on the 28th of January, in lat. 77 deg. 31 min. S., long. 167 deg. 30 min. E. On the 2d of February they reached to the utmost extent of their voyage, viz. lat. 78 deg. 4 min. S., and long 173 deg. 12 min. W., and were here stopped by icebergs 150 feet high, and by fields of ice which were traced as extending 300 miles to the eastward.

Although, in the course of the voyage, Captain Ross was enabled to verify the correctness of many of the spots laid down in the charts of the former, he also discovered one singular error, namely, the existence of water over a large space described as land; and which the *Erebus* and *Terror* actually sailed over for a very considerable distance, leaving the land 300 miles from the latitude laid down in the American chart. It is said that the sea in this direction abounds in seals and sperm whales.

dated January 1st, 1841. Accounts have reached the Committee also from Brussels, from Prague; and from Cadiz; where the observatory has been completed. M. Bogoslawski's letter from Breslau to Major Sabine bears date July 3d, 1841. At last, it stated, the arrangements here are satisfactory; the three magnetometers have been mounted in one room. Although difficulties occurred to interrupt the progress of this result, the good cause had not suffered, not one of the material terms in 1841 has been omitted: the variations in horizontal and vertical force have been registered, and all is going on well. Lloyd's practical instructions have been followed, and the absolute declination and intensity have been obtained for the terms of August and November, 1840. Accounts had been received from Norway: the instruments purchased by the Council of the Royal Society are to be fixed at Christiana. A private observatory at Havannah promises essential service. Observations are making in Russia at four places; on the 1st of January, 1841, they were all in a state of forwardness, and the results becoming more distinct. On the 12th November, 1840, the Erebus and Terror left Van Diemen's Land; on board, and during temporary expeditions, daily observations have been made with the magnetic instruments. Magnetic surveys also have been made in sundry districts. Major Sabine dwelt on the importance and advantage of magnetic surveys at the present juncture: they form integral parts of the mass, and thereby the results obtained are extended from points to distance. One important survey in the British possessions in North America has been undertaken by Government. Lieutenant Younghusband has been appointed to this especial service for three years. The Master-General of the Ordnance also has added a second officer at the Cape of Good Hope, in anticipation of the survey of South Africa. For that of British Guiana, by Schomburgk, instruments have been supplied out of the grant: the portable magnetometer to be returned. Instruments have been supplied by Government to, and great advantage is expected from, the known scientific zeal of the African Expedition. Captain Caldecott, by direction of the Rajah of Trevancore, is carrying out the magnetic survey of Southern India; that of the north of India also is in contemplation. It is highly desirable that in these surveys a regular and concerted system should be followed connectedly with Professor Lloyd's instructions, which, besides their practical utility, are highly satisfactory.—The grant of 50*l.* has been exceeded by 12*l.*

Major Sabine read a letter which he had received from Sir John Franklin, stating that Captain Ross had been less disappointed than Sir John had expected at the discoveries of the French and Americans in the high southern latitudes. He considered that they had not at all interfered with the great objects of his voyage. It was true they had discovered a little more land, but this was nothing in comparison with the great magnetical problem to be solved. Sir J. Franklin believed that Captain Ross would discover the magnetic pole or poles. He commented on his very complete mass of observations, and on his zeal and attention; nothing, he says, escapes his vigilance. In conclusion,

Sir John strongly advised another expedition to the north-west passage.—*Literary Gazette*, No. 1282.

For notices of the several Observatories, and some excellent observations on the paramount importance of these co-operative investigations, see *Year-book of Facts*, 1841, pp. 101-105.

There has likewise been submitted to the Association a series of curves, representing the simultaneous changes of the magnetical elements, observed at Toronto, Dublin, Brussels, Prague, Milan, St. Helena, and Van Diemen's Land, on the term-days of May and August, 1840. This communication, (reported in the *Athenæum*, No. 722), produced remarks from Mr. Snow Harris, M. Quetelet, Major Sabine, and Professor Christie, relative to the disturbing causes producing oscillations in the needle, which, although producing no change in the mean point, were important to observe whenever they take place, in order to trace their source. The opinion appeared to be, that they had origin in local or meteorological causes, electrical state of the atmosphere, sudden fall of rain, &c. Mr. Snow Harris never should be satisfied until the needles to be observed were placed *in vacuo*; too much care, he was convinced, could not be taken to free them from the disturbances caused by the surrounding air.

On Feb. 11, were read to the Royal Society, "Contributions to Terrestrial Magnetism, No. 2," by Major Edward Sabine, R.A.—This paper is the second of a series, in which the author proposes to communicate to the Royal Society the results of Magnetic Observations in different parts of the globe, having for their object to supply the requisite data for deducing the numerical elements, corresponding to the present epoch, of the general theory of Terrestrial Magnetism. It consists of two sections: 1. the observations of Captain Belcher, R.N., and the officers of H.M.S. *Sulphur*, at twenty-nine stations on the west coast of America, and the adjacent islands, between the latitudes of 60° 21′ N. and 18° 05′ S. 2. A new determination, by the same officers, of the magnetic elements at Otaheite, made in consequence of the discrepancies in the results obtained by previous observers, and of a note in M. Gauss' *Allgemeine Theorie*, in which Otaheite is spoken of as a highly important station for the future improvement of the calculations of the theory. Abstracts are given of the original observations which are deposited in the Hydrographic Office of the Admiralty, as well as a full detail of the processes of reduction by which their results have been computed. The values of the horizontal and total intensities are expressed in terms by which the results of observation are immediately comparable with the maps of MM. Gauss and Weber in the *Altas des Erdmagnetismus*. By an investigation into the "probable error" of a single independent determination of the magnetic intensity with Hansteen's apparatus, derived from the data furnished by Capt. Belcher's observations, the author shows the extreme improbability that the differences in the results obtained at Otaheite by Messrs. Erman, Fitzroy, and Belcher, should be occasioned by instrumental or observational error. They are also far greater than can, with any degree of probability, be ascribed to pe-

riodical or accidental variations in the magnetic force from its mean value. The only known cause adequate to their explanation is what may with propriety be termed *Station error;* that is, local disturbing influences, in an island composed chiefly of volcanic rocks, and where the spots of observation selected by the different observers may not have been precisely the same. By a reference to the magnetic survey of the British Islands, the occurrence of station error is shown to be frequent in countries of far less decided igneous character than Otaheite; and that its existence may always be apprehended when rocks of that nature approach to, or rise through, the superficial soil. The absolute determination of fixed observatories are as liable to station error as those of the magnetic traveller, since no continuance or repetition of the observations can lead to an elimination of the error; it consequently presents a practical difficulty to the proposed determination of the elements of the theory from exact observations at only a few selected positions on the globe. The remedy is to be found in the combination of fixed observatories and magnetic surveys, and determined *mean* values.

CONVERTIBLE PENDULUM.

On April 12, was read before the Society of Arts for Scotland, a paper "On the Proper Form for a Convertible Pendulum;" by Edward Sang, Esq.

The determination of the exact length of a second's pendulum is a problem of great importance; and it serves, on the one hand, to exhibit the intensity of gravitation at different places on the earth's surface, and, on the other hand, to verify or to restore standards of linear measure.

As any pendulum with which we can operate is, of necessity, compound, the computation of the length of a simple pendulum must be founded on the dimensions of the various parts of the pendulum actually used. The first attempts to determine the intensity of gravitation by this method were, accordingly, made by the help of pendulums of as simple a structure as possible, such as a heavy sphere suspended by a slender wire. But these attempts have given place to a method, exceedingly simple in itself, and involving an elegant property of oscillating bodies. The property is this—that if a second knife-edge be fixed upon a pendulum at a distance below the first equal to the mean distance of oscillation, the motion on the one knife-edge will be performed in the same time as on the other. Hence, if we adjust a pendulum so that its oscillations on two opposed knife-edges be performed in equal times, the distance between those edges will be the true length of the corresponding single pendulum.

Mr. Sang shows how advantage may be best taken of this beautiful proposition; and concludes by stating that a convertible pendulum may best be constructed of the simple cylindric rod of a rigid and heavy metal; the one knife-edge being placed as near as possible to the one end, and the conjugate knife-edge at about two-thirds of the

length of the rod distant. When this form of pendulum is used, the projection of the knife-edges in one plane causes an inequality in the times of oscillation in different directions, which must be removed by making gratuitous projections at right angles to the edges, and by altering the weight of these, until, by trial, with a temporary knife-edge moving round on a collar, the required adjustment be obtained.—For the details of this paper, see *Jameson's Journal, No.* 61.

PRESERVATION OF STEEL CHRONOMETER BALANCE-SPRINGS.

Mr. Dent has stated to the British Association, that it is customary to "blue" the Balance-springs of Chronometers, and has shewn from experiments that this blue oxygenated surface, (or coating,) greatly increases the elastic force of the spring, and that on its removal, the balance-spring suffers a nearly corresponding loss; that this rigid oxygenated coating, on its first formation by heat, increases the strength of the balance-spring, more than the additional application of gold on its surface: and there is this difference, that while this blue oxygenated surface may be considered as a first process of rust, the gold surface is a protection from the ill effects of damp and saline atmospheres, to which chronometers are subjected on shipboard, and particularly in tropical climates. Mr. Dent first applied the gold to a chronometer balance-spring which had been previously rated: on its being replaced in the chronometer, he found the rate of the chronometer to be losing forty-one seconds in twenty-four hours, which was caused by the removal of the blue oxygenated surface, and the gold coating not increasing the elastic force to compensate for the removal of the blue surface from the balance-spring,

Professor Christie has similarly prepared magnetised needles, considering the gilding process to be the prevention of oxydation. As to the difference in the weight before and after gilding it is 225·4 grains before being submitted to the electrotype process, and 227·8 after; addition, 2·4 grains. The addition to a balance-spring is stated by Mr. Dent to be only 1-40th of a grain.

ON WAVES.

Although the Report read by Mr. Scott Russell to the British Association in 1840 (see *Year-book*, 1841, p. 106) "On Waves" was then considered as final, Mr. Russell, at the late Meeting, read a "Supplementary Notice," explaining one or two doubtful results. An apparatus capable of generating large waves in a triangular channel had been constructed. The point to be determined regarding the velocity of the great primary wave in the channel of triangular section, was this—whether the velocity were that which is due by gravity to a depth of one-fourth part of the depth of the channel, or of one-third. The difficulty of this determination arises from several causes. First of all, the wave in the triangular section has a less continuous form than in the rectangular channel; and secondly, the portion of fluid in the angle of the channel at the bottom does not acquire the same motion of translation with the remainder of the fluid in the wider parts of

the channel. These causes tend to retard the motion, and to render it matter of doubt whether the actual velocity approaches nearer to that due to one-third or one-fourth of the depth. An example of the results obtained by experiment is as follows :—

The velocity due to $\frac{1}{3}$ of the depth being 6.5 feet per sec.
.. .. $\frac{1}{4}$ .. 5.7 ..
The velocity observed by experiment was 6.3 ..

The general conclusion being, that the velocity of the great primary wave of translation in a triangular channel is nearly that due to one-third of the depth, making allowance for the resistance of the small portion in the angle of the bottom—the result being nearer to the velocity due to one-third than to one-fourth of the depth. The next point investigated was a curious phenomenon, to which Mr. Russell has given the designation of the "great wave." This phenomenon is, in some respects, the counterpart of the great wave of translation. It has this curious property, that instead of being propagated across other waves, as the common oscillatory waves are, both in their negative and positive portions, this negative wave and the positive wave, when meeting, had the effect of neutralizing each other so perfectly, as altogether to leave the fluid in a state of rest, with the exception only of certain residual oscillatory waves of the second order. With this wave, a number of curious phenomena were associated; and it appeared to form an important element in the resistance of fluids to the posterior portion of a ship, while the positive wave was closely associated with the resistance to the anterior part. A series of experiments had also been made on a point which had not previously been examined—the influence of the velocity of the wave on the resistance of a fluid to bodies moving with velocities remote from the velocity of the wave —whether, when a body moves with a *given* velocity *less* than that of the wave, it will be more or less resisted, according as the velocity of the wave is more or less remote from its own; and whether, when a body moves with a *given* velocity *greater* than that of the wave, it will experience more or less resistance, according as the velocity of the wave is more or less remote from its own. The general result is, that with velocities less than that of the wave, the resistance increases in a certain manner as the velocity of the wave diminishes; and that in velocities greater than that of the wave, the resistance diminishes as the velocity of the wave diminishes. Slowness of motion of the wave, while it is least favourable to low velocities, is most favourable to high velocities; hence rectangular canals are best for low velocities, and sloping sides for high velocities.

Prof. Whewell stated that since he arrived at Plymouth, he had received a letter from the Astronomer Royal, in which he mentions that he had commenced a theoretical examination of this important subject of Waves. One curious result has already become apparent. It was well known, that in several places, as, for instance, at some places in the Frith of Forth, three, and sometimes four, tides occur in the twenty-four hours. These, it was supposed, had their origin from two tidal waves arriving by different routes, and at different

times, at the mouth of the channel, up which each propagated its own tide wave: these, though they might occasionally blend into a single wave, yet retained their separate identity so complete, that, local circumstances favouring, they were found again to separate, and thus produce those supplementary tides. Already, Prof. Airy finds that there are certain elements in the theoretical examination of waves, which promise very clearly to lead to the origin and nature of these separately identical, and yet blended, waves. Prof. Whewell asked Mr. Russell, whether it was true, as reported, that these curious tides in the Frith of Forth had been observed and recorded in a work printed upwards of one hundred years since? Mr. Russell replied, that he was not himself cognizant of the fact; but that he had heard it stated, that Dr. Robinson had, in conversation, asserted it to be so. The fishermen seem to have been for a long time quite familiar with them, and had given them a name.—*Athenæum, No.* 720.

RESEARCHES ON THE TIDES.

Prof. the Rev. W. Whewell has read to the British Association his "Report on Tides at Leith and Bristol." "The subject of tides," he said, "for a long time has been a matter of reproach, which the unlearned have felt the right to pass on the learned. 'After all, you learned know but little of the tides.' This will soon be only traditional; for now a great deal is known, and almost to a minute can the time and place of high tide be predicted." After years of labour, there remain but few facts in relation to tidal phenomena to observe; unless, indeed, in remote countries, or more especially in the Pacific, whence observations would be valuable. The former Reports explained the epoch of alternations of high water dependent on the parallax or apparent size of the moon, and of her declination or her position, high or low, in the heavens; also, on the parallax and declination of the sun; but neither calculated for the day on which high water was observed,—at Bristol for instance. The tidal wave had origin in the ocean, and there received the forces to determine its height. The epoch of parallax and declination, therefore, would be anterior to the time of observation, and the best epoch has been determined to be between thirty-eight and forty-four hours before the time of high water. This discovery, the result of enormous labour and years of observations reduced, enables the calculator to project a curve, (the elementary curve of prediction), which the tides ought to follow; but the observed tides deviated therefrom. Some residual phenomena were to be included in the reduction for correction, involving only inches in the height, for the epoch before described explained the fact. The remaining irregularities were so trifling, that Professor Whewell, wishing to wind up the inquiry, was desirous to pass them by. On the 14th January, 1841, however, Mr. Bunt stated in a letter that he was led to conceive that the pressure of the atmosphere had somewhat to do with the irregularities. This is not an entirely new idea; although, through the intelligence, zeal, and perseverance of Mr. Bunt, a new and important result has been realised.

We need not detail the mode or the repeated elaborations of calculation adopted by Mr. Bunt; suffice it to say, he has determined the epoch of the barometer to be contemporaneous, that is, that the height of the tide varies according to the pressure of the atmosphere at the time of observation, and not as in the epoch of parallax and declination, a day and a half antecedent; nor of any time subsequent, but, as before said, contemporaneous with the observation. And further, he has established, that for every inch of variation in the barometer, a rise or fall of the tide to the extent of about fourteen inches ensues; and this coincides very nearly with the difference between the specific gravities of mercury and water.

A conversation ensued with regard to some minor points, but the speakers all agreed as to the exceedingly satisfactory results of the investigation, and as to the great tidal question being now soon set at rest. The observations at Leith extended over a period of several years, ending in 1840; and they afforded means of obtaining the correction of parallax and declination at that port. Professor Whewell submitted Mr. Ross' Tables as the Report, stating that he thought it desirable to connect the observations at Leith with those of other places; for which purpose he intended to apply for the grant to be renewed for 50*l*. He further remarked on the value of such tables, and on the already apparent agreement of observations with the equilibrium theory.—*Literary Gazette, No.* 1281.

Prof. Whewell next stated, that the times of high water on the east coast of Britain, and the north coast of Belgium, Holland, and Germany, had led him to conclude that there must lie towards the middle of the German Ocean, a central space, in which the rise and fall of the tides vanishes. Capt. Hewett, who was lost in H. M. S. *Fairy*, in the German Ocean, had endeavoured to decide this point by observation in 1838, 1839, and 1840; and Prof. Whewell read to the Association a letter from Capt. H., showing that a place had, in fact, been found, where the tide was much smaller than it is on any part of the coast. For this letter, illustrated with a diagram, see the *Athenæum* Report, No. 722. The place of no fall nor rise of the waters was 52° 27′ 30″ N. lat., and 3° 14′ 30″ E. long., on the Dogger-bank, the existence of which Mr. Walker referred to this cause.

EXTRA HIGH TIDES OF THE THAMES.

THE following Table shows the Heights of Extraordinary High Tides for the last twenty years, by which it will be seen that the rise on October 18th last was the highest:—

		ft.	in.		ft.	in.
1821 ..	Dec. 28 ..	27	1½	..	2	10½
1824 ..	Dec. 23 ..	27	3	..	3	0
1827 ..	Nov. 21 ..	27	5½	..	3	2½
1834 ..	Jan. 29 ..	27	2	..	2	11
1836 ..	May 2 ..	26	10	..	2	7
1841 ..	Oct. 18 ..	27	7	..	3	5

The total heights are those of the rise of tide above the sill of the Blackwall entrance to the West India Docks, which is 24 ft. 3 in.

below H. W. Trinity standard, and 6 ft. 5 in. below L. W. of the same standard. The other column shows the rise of tides above zero, or Trinity high-water mark.—*Civil Engineer and Architect's Journal, No.* 50.

ASCENT OF THE JUNGFRAU.

In August, a party, consisting of seven travellers and six guides, started for the Jungfrau: of whom, Prof. Agassiz, of Neufchatel; Prof. Forbes, of Edinburgh; M. Chatelier, of Nantes; and M. de Lapre, of Neufchatel; and also four of the guides; reached the top. They left the Grimsel on August 27, and ascended the vast mass of glacier between the Oberland and the Vallais, crossed the upper glacier of the Aar, and over an icy summit 11,000 feet high. Descending with much labour for about five hours the glacier of Viesch, they reached the chalet on the glacier of Aletsch, where they passed the night. This glacier they crossed early on the 28th, being all tied together by ropes, and passing some of the crevices of unknown depth, and too wide to leap, upon a ladder laid across. Some of these were very dangerous, from their coverings of soft snow which concealed them; and from the edge of one they had to mount a wall of snow, to which they clung by digging their feet into it. This was soon succeeded by a slope of smooth hard ice, the greater part at an angle of 45 degrees, and about 800 feet high, with precipices of immense height, descending to Grindelwald and the Roth Thal on either side. To this they mounted by cutting with a hatchet a place for each footstep, as they ascended, which required above two hours. From the top of this an inclined plane led them to the summit, a point from which they cut off the snow, to enable each in succession to stand upon it. They reached at 4 P.M., a height of 13,768 English feet. The view was partially clear, and very magnificent, intersected by clouds rising from the valley, and some of them above 12,000 feet in height. The thermometer stood at 25° Fahrenheit. They placed a flag on the top, and descended backwards by the icy stair they had cut, crossing the glacier by moonlight, and again reaching the chalet at half past eleven, after a walk of nearly eighteen hours. In 1812, two guides reached the summit; and in 1829, two Grindelwald peasants: but, until the present, no traveller had ever attained its inaccessible peak, which obtained for it the name of the Jungfrau, or Virgin Alp.—*Caledonian Mercury.* See also *Jameson's Journal*, No. 62, p. 376.

CALCULATING BOY.

Among the many boys employed for calculation, on the Ordnance Survey of Ireland, is one named Alexander Gwin, eight years old, and a native of Derry, who has got by rote the fractional logarithms from 1 to 1,000, which he will repeat in regular rotation, or otherwise. His rapidity and correctness in calculating trigonometrical distances, triangles, &c. are extraordinary: he can, in less than one minute, make a return, in acres, roods, perches, &c. of any quantity of land, by giving him the surveyor's chained distances; while the greatest arith-

metician, with all his knowledge, will certainly take nearly an hour to do the same, and not be sure of truth in the end.—*Times, Oct.* 21.

HENRI MONDEUX, THE CALCULATING BOY.

M. CAUCHY has presented to the Academy of Sciences, at Paris, a Report on this remarkable mental calculator. It appears, that when he is required to multiply the one by the other of two given numbers, he often divides these numbers into sets of two figures; having observed that in those cases where the factors are equal, the operation becomes more simple. The rules which he employs to form the product, or rather the power required, are precisely those which the formula known under the name of the binomial theorem of Newton would give. Guided by these rules, he can state at the same instant, when required, the squares and cubes of a variety of numbers. As he knows nearly by heart all the squares of all the whole numbers under 100, the division of the larger numbers into sets of two figures enables him to obtain their squares more easily. He has thus been enabled, in presence of the Academy, to state almost instantaneously the square of 756. Mondeux has of himself discovered the well-known method, which gives the sum of a progression. Several of the rules which he has contrived for resolving different problems are those which are deducible from certain algebraical formulæ; as examples, may be cited the rules by which he calculates the sums of squares, cubes, fourth, and even the fifth powers of natural numbers. To resolve two simultaneous equations of the first degree, Mondeux employs a method which ought to be made known. He seeks first the difference of the unknown quantities; and in order to arrive at this object, he subtracts the one question from the other, after having multiplied the first by the proportion which exists between the sums formed successively to each other with the co-efficients of the two unknown quantities. This process may be simplified, as Mondeux has observed, viz., by subtracting the one equation from the other, after having divided each of them by the sum of the co-efficients which affect in the first place the two unknown quantities: then, the resulting equation immediately would furnish the difference between the two unknown quantities, from which the unknown quantities themselves can be easily deduced. If required to resolve a single equation of a degree higher than the first, Mondeux employs a method which may be illustrated by an example: he was asked to find a number, such that its cube increased by 84 affords a sum equal to the product of this number by 37. Mondeux gave the numbers 3 and 4 as an answer. To obtain them, he began by transforming the equation required to be resolved, and dividing the two numbers by that sought: then the proposed equation was reduced to the following:—to find a number such that its square increased by the quotient obtained by dividing 84 by the number will produce 37. By means of the transformation pointed out, Mondeux immediately perceived that the required number was inferior to the square root of 36, viz. 6; a few trials would soon enable him to arrive at the numbers already mentioned. Mondeux also

resolves questions of indeterminate analysis. He was required to give two squares, the difference of which should be 133: he immediately gave 66 and 67; and being asked for a more simple solution he answered 13 and 6. He reasoned thus: the difference between the squares of the numbers sought exceeds the square of their difference by a quantity which is equal to the double of this difference multiplied by the smallest. The question proposed may therefore be stated thus:—"To subtract from 133 a square such that the remainder may be divisible by the double of the root." If we try the following squares in succession, 1, 4, 9, 16, 25, 36, 49, we find that 1 and 49 will alone answer. By subtracting 133 and dividing the remainders, 132 and 84, by the roots doubled, that is by 2 and 12, we obtain 66 and 67: the numbers given by Mondeux. Mondeux has no memory for the names of persons, places, and objects. Even the names of geometrical figures, and the construction of squares or cubes, make less impression on him than the study of the properties of the numbers by which they are represented. Mondeux is the son of a shepherd: M. Jacobi, of Tours, hearing of his fondness for figures, took him and educated him.—*Athenæum*, *No.* 691.

REASONING FACULTY IN ANIMALS.

M. Leonard has long devoted himself to the task of educating animals, with a view to the establishment of the following propositions—viz., that they possess the faculties of observation, of memory, and of comparison, and have the power to feel, compare, judge, reflect, conclude, &c., as if endowed with human intellect; that the germ of this power exists in those animals more especially destined to be serviceable to man; and that by dint of cultivation their capacities may be improved to the point of rendering them of increased utility in no slight degree. At a private exhibition, at his apartments, he has made several experiments in London, during the past year.

M. Léonard has two dogs instructed after this method. They are fine Spanish pointers, about three years and a-half old, and are named respectively Braque and Philax; the latter having the largest physical conformation, and the former a more perfect docility, and quicker apprehension. Having shown the degree of attention which they pay to the direction of their master in matters of ordinary occurrence, M. Léonard proceeds to exhibit their capabilities on a more elevated scale; and, placing before them a series of numbers selected at will by any person present, enumerates them carefully in the order in which they lie, and then directs either dog to bring him any that may be required. They perform this feat with remarkable accuracy, though not with mechanical precision; for they generally range through the series till the remembered number meets their eye, and fixes their attention. In this arrangement of numbers, no regular rotation is observed; but they are arbitrarily chosen, as 3, 7, 4, 9, 2, &c. So it is with words; there is no accustomed formula; any person present names a particular word, which the dog may have never heard before, and with which he is familiarised only by two or three repetitions

enunciated carefully; he is then left to pick them up in the proper order till the word is formed. These results distinctly prove the dogs' acquaintance with abstract form, and demonstrate the possession of memory.

Next is an instance of the relative intelligence of the two animals. The larger dog, Philax, was first employed to spell the word, and, after two successful hits, at length brought a wrong letter. His companion, Braque, was then desired to find the right one; and, after searching the floor carefully again and again, he came to the conclusion that the missing letter was in the other dog's mouth, and, without further hesitation, went to him, took it away, and placed it on the chair—subsequently completing the word from the remainder. A more difficult task was then assigned to the animals—that of exercising memory and comparison in combination: and for this purpose, four pieces of bread and a bone of meat were laid down, and numbered irregularly —not by the exhibitor, but by one of the spectators; again the exercised faculties of the dogs enabled them to arrive at correct results—though from the difficulty of the undertaking, not so rapidly as before —a circumstance which speaks even more favourably for their powers than their immediate success would have done, as it proves the entire absence of preparation or collusion. A variation was also made in this experiment by the pieces of bread being numbered, and the meat called after its name—the distinction between the ideal and the substantial being accurately shown. There would have been nothing surprising in this, if the dogs had been desired to choose the meat from the numbers; but to select particular numbers where several were concerned, and the attraction of the meat being very likely to interfere with their scholastic philosophy, a right conclusion was the more admired. We should notice one peculiarity in M. Léonard's mode of giving directions. He rarely looks at the dog to whom he assigns any particular duty; but by his look, tone, and manner, addresses himself more directly to the one of whom it is not required. The simple utterance of the name shows the attention paid to his commands by each.

The finale to the exhibition was a game at dominoes, played by Braque with ourselves, in which five pieces were chosen indiscriminately for each player. It was curious to see the wistful look with which Braque regarded his numbers before playing, and the accuracy with which he placed them to correspond with the one last laid down. Towards the close, he was at fault, not having the number to answer; and, after moving uneasily on his seat for a few moments, he uttered a low growl and a short howl, sufficient to indicate his embarrassment; on another number being given to him, he immediately made the pair. In order to test him still further, M. Léonard suggested that he should be cheated; when, after examining the table with a very puzzled air, he finally, and without any sign being made, bent his head down and pushed the offending domino out of its place, declaring by the action, as distinctly as the words could have done, that placing it there was a mistake. Throughout the exhibition, there

was nothing that indicated the slightest preparation—indeed, everything was placed at the will of the spectator.—*Observer Newspaper.*

SOUNDING MOUNTAIN.

On June 5, was read before the Royal Asiatic Society, a paper by Lieut. Newbold, of the Madras army, containing a narrative of a visit made by himself, in June last, to the Gibel Nakus, or Mountain of the Bell, on the peninsula of Mount Sinai. This curious hill has been long celebrated for the extraordinary musical tones elicited from it, which have generally been compared to the deep booming of a church-bell. Of the cause of the phenomenon many opinions have been broached. The Arabs in the neighbourhood, with their ordinary propensity to a belief in the marvellous, attribute it to the real bells of a subterraneous convent swallowed up by some convulsion of nature; and the Christian monks of Mount Sinai countenance the belief, by the idle story that the sound was first heard after the destruction of one of their convents in its vicinity. The ideas of European travellers on the matter have been sometimes scarcely more reasonable. Some have supposed the sounds to be caused by the dropping of sand into the cavities of the rocks; others, by its motion over hollow rocks; others, again, have attributed them to subterraneous volcanoes: and a few have supposed that the action of the wind upon the elastic plates of mica, which is a component part of granite, may have been the origin of the sound. Lieut. Newbold seems to have proved that the opinion of Capt. Wellsted is correct: that the sound is produced by the rolling down of the sand put in motion by the wind, or by persons walking on its surface. Lieut. Newbold left Wadi Tor, on his visit to the Mountain of the Bell, on the 10th of last June. After two hours' riding and a short walk of half an hour, he reached the place, which he described as a bell-shaped hill, from 350 to 400 feet in height. On its western side, which faces the Red Sea, is a slope of about eighty feet, covered with a very fine quartzose sand, varying in depth from five or six inches to as many feet, according to the form of the sandstone rock with its covers. This is the spot from whence the mysterious sounds issue. Not the slightest noise was heard; but their Arab guide, desiring them to wait still at the bottom of the slope, began to ascend the slope, sinking to his knees at every step. The travellers soon heard a faint sound resembling the lower string of a violoncello slightly touched; and being disappointed at the result, determined to ascend themselves, in spite of the intense heat of the sun and extreme fineness of the sand. On reaching the summit, they sat down to observe the effect. The particles of sand set in motion not only those below them, but, though in a less degree, those all around them, like the surface of water disturbed by a stone. In about two minutes, they heard a rustling sound; and then the musical tone above alluded to, which gradually increased to that of a deep mellow church-bell, so loud that it rivalled the rumbling of distant thunder. This occurred when the whole surface was in motion; and the effect upon themselves the travellers compared to what they sup-

posed might be felt by persons seated upon some enormous stringed instrument, while a bow was slowly drawn over the chords. They descended while the sound was at its height; and soon after it began to lessen with the motion of the sand, until, at the end of a quarter of an hour, all was perfectly still again. Lieutenant Newbold remarked that the surface of the sand was in every part traversed by waves, or furrows, from one to two inches in height; and that the triangular form of the face of the slope increased in length as they got nearer the earth; he also noticed that the sand in motion, when near the top, produced shriller notes than when lower down, and, consequently, that the lowest notes were heard at the bottom. He appears, from this, to draw some analogy between the increasing length of the waves and that of the chords of a stringed instrument. While the experiment was making, there was a steady breeze from the west blowing against the surface of the sand; and this he considers essential to the production of the sound, it having been found that the sounds are much fainter in still weather, or even quite inaudible. When the weather is wet, no sounds are produced; because the sand is then agglomerated, and will not slide at all. The paper concluded with a remark by Lieut. Newbold on the singularity of the phenomenon, observing, that he had seen in Spain, Arabia, and Egypt, many localities where loom-sand had accumulated under circumstances apparently similar to those of Gibel Nakus, but where nothing has been heard of a similar nature. —*Literary Gazette, No.* 1273.

ANOMALIES IN CRYSTALLIZATION.

In the imperfect cubes of boracite, M. Delafosse conjectures that the molecular particles are, not in the form of cubes, but tetraedrons; and hints that very possibly one of these tetraedrons, by presenting its base at the angle of the general cube of the crystal, makes that angle imperfect, while another tetraedron may at another angle present one of its vertices. He applies similar reasoning to the crystals of beryl, quartz, and tourmaline.— *Literary Gazette,* No. 1255.

LIGHT DURING CRYSTALLIZATION.

On April 27, a letter was read to the Chemical Society, from Mr. Scanlan, of Wolverhampton, describing the appearance of flashes of light, which he has observed during the crystallization of nitrate of strontian in the dark.

ROCK CRYSTAL SPUN.

M. Gaudin, on June 7, resumed* before the Academy of Sciences, at Paris, his very interesting experiments on the melting of Rock Crystal (quartz), and on the subsequent crystallisation, and even casting of it. By the use of his oxy-hydrogen blow-pipe, he succeeded in melting

* See Notices of M. Gaudin's process; in Year-book of Facts, 1840, p. 121; and Year-book, 1841, p. 119.

crystals of aluminum and silex, such as the white sapphire and the ruby. After vain attempts with compounds of silex and aluminum precipitated with their colouring matter, he employed a mixture of ammoniacal alum, or potassic alum, with three or four hundredth parts of chromate of potassium. These two salts ground together with a little water, formed under the action of increasing heat a transparent liquid, which was afterwards condensed into a friable porous paste. He hollowed out this paste into the form of a crucible, with which he capped his blow-pipe; and then, blowing upwards, had found the interior of this crucible become studded with a multitude of exceedingly small rubies, of beautiful colour and the finest water. Finding his blow-pipe too small, he made another one of a block of platina; and, by means of this, he succeeded in melting and spinning out rock crystal as easily as glass. He found that silex in a state of fusion is one of the most ductile substances in nature, and that the faculty of spinning glass depended on the quantity of silex it contained. It did not crystallise on cooling, but was very volatile: this hindered him from obtaining globules of more than three millimetres in diameter. He, however, spun out threads of silex so thin and fine, that they admitted of being tied in a knot, and had an iridescent appearance; they were so light, too, that the wind easily carried them away; and a quantity of them could be rolled up in the fingers, looking like cotton. Threads of pure quartz were always cylindrical and transparent; those from sandstones and millstones were opaque, and had a nacreous appearance. Beryl and emerald did not yield threads so well as other silicious stones; but from the opaque colour of the threads of emerald, he inferred that a mixture of emerald and sandstone would melt down into artificial pearls of great hardness. Aluminum he found to be deprived of all viscosity, and hence it was impossible to spin threads from the ruby, or from Syrian garnet, topaz, fluorure of calcium, (fluor spar), or the sandstone of Fontainbleau (Paris paving-stone). He had made from melted quartz some admirable microscopic lenses, and pivots for mariners' compasses; he had also drawn out sticks of quartz applicable to tools for burnishers and watchmakers.—*Literary Gazette*, No. 1275.

REAL CONSTITUTION OF THE ATMOSPHERE.

MM. Dumas and Boussingault observe: it is generally admitted that the air is composed of a mixture of oxygen and nitrogen, and its invariableness is explained by supposing that the green parts of plants under the influence of solar light decompose all the carbonic acid developed in the respiration of animals, and the putrefaction of organized bodies. Some, however, regard the air as being not a mixture, but a chemical compound of 20 of oxygen and 80 of nitrogen. (Prout, Dobereiner, Thomson, &c.) Others, and these the majority, consider it as a mixture of 21 of oxygen and 29 of nitrogen; and, lastly, in the opinion of some, (Dalton, Babinet), the composition of the air varies according to the height in the atmosphere.

The plan employed by the authors in submitting these questions to a fresh examination, is distinguished from others in that they estimate the weight instead of the measure of the gases, and thus analyze the air by weighing successively the oxygen and the nitrogen which it contains. The following are their results:—

They fix the density of oxygen at 1·1057, and that of nitrogen at 0·972; numbers a little different from those given by other chemists. They demonstrate that the relation of the volume of the oxygen to that of the nitrogen in the air is not expressed by simple numbers; and that the air cannot be regarded as a chemical composed of 20 volumes of oxygen and 80 of nitrogen. They presume the mixture to be uniform in all times, in every latitude, and at every height. "If the atmospheric air," they add, "be a reservoir of oxygen for the use of animals, and a reservoir of carbonic acid for the use of plants, it is so considerable a store that the consumption, supposing it not to be compensated, would remain almost insensible after a long series of years." They have calculated that supposing each man to consume a kilogramme of oxygen per day, and that the oxygen disengaged by plants did no more than compensate for the other causes of its absorption, the whole human race, and three times their number, would not consume in a century the eight-thousandth part of the oxygen which nature has placed in the respirable air.—*L'Examinateur Médical; Medical Gazette*, No. 724.

SUPPLY OF AIR.

THE Air which surrounds us weighs as much as 581,000 cubic kilometres of copper; its oxygen weighs as much as 134,000 of these same cubes. Supposing the earth peopled with a thousand millions of men, and estimating the animal population at a quantity equivalent to three thousand millions of men, we should find that these quantities united consume in a century only a weight of oxygen equal to 15 or 16 cubic kilometres of copper, whilst the air contains 134,000 of it.

It would require 10,000 years for all these men to produce a perceptible effect upon the eudiometer of Volta, even supposing vegetable life annihilated during this time.—*Chemical Statics; by M. Dumas.*

ANALYSIS OF THE WATERS OF THE AFRICAN COAST AND RIVERS.

THE Lords of the Admiralty lately transmitted to Prof. Daniell, of King's College, eight bottles of water taken up in the rivers and on the coast of Africa, with a request that he would analyze them, and report as to their effects on the copper sheathing of ships, of which they were found to be especially destructive; when some very curious and unexpected results came out incidentally, tending to show the probable cause of the miasma which has such destructive influence on that coast. "The most remarkable circumstance," says Professor Daniel, "disclosed by the analysis of these waters, is the strong impregnation of the majority of them with sulphuretted hydrogen; which, in the case of the water from Lopez Bay, amounts to almost as much per gallon as in the Harrowgate waters. The proportions of the saline

contents do not differ materially from those which are usually found in sea-water. The extraordinary presence of this gas would naturally lead at first to a suspicion that it might arise from some change which had taken place in the waters after they had been bottled, from the decomposition of some animal or vegetable substance; but this suspicion is inconsistent with facts. On the other hand, it is difficult to conceive how such a striking and important fact as the impregnation of the waters of the ocean, upon such a long line of coast, with this deleterious gas, could so long have escaped observation. It is highly desirable, in many points of view, that its existence should be substantiated, and the limits of the phenomenon both along the coast and in the ocean, ascertained by further evidence. Its effects upon the copper sheathing of ships cannot fail to be highly injurious; and a question of still higher interest even arises,—whether this deleterious gas may not contribute to the well-known unhealthiness of the coasts, from which these waters are taken.

"Upon searching for evidence of a similar phenomenon having been observed before, I have found in the *Philosophical Transactions* for 1839, a memoir by the late Dr. Marcet, 'on the specific gravity and temperature of sea-waters, in different parts of the ocean, and in particular seas, with some account of their saline contents.' Out of sixteen specimens which he examined, he found one which was brought by Capt. Hall from the Yellow Sea, in the Chinese Ocean, which, from the account which he has given, must probably have been as highly charged with sulphuretted hydrogen as those which I have just examined from the coast of Africa; and he observes, 'there is something in the development of sulphur in sea-water, which is by no means well understood.' He also noticed, that a specimen brought by Mr. Schmidtmeyer, going to South America, from latitude 10° 50′ north, longitude 24° 26′ west, had an hepatic smell, and had blackened the bottle in which it was contained. If the existence of this curious phenomenon should be confirmed, the origin of the sulphuretted hydrogen will probably be found to be the same as that of the same gas in various saline lakes in different parts of the world, from which trona or natron is derived. The mud of the Lonar Lake in India, of a lake near Maracaybo, in South America, and of similar lakes on the north of Africa, are all found to be thus impregnated. The sulphuretted hydrogen thus adhering to the clay, has been supposed to be derived from volcanic sources; but Mr. Malcolmson, in an able memoir lately printed in the *Geological Transactions*, says, that he has observed 'the same phenomenon in the salt-water inlets along the Indian coast, wherever the bottom contained argillaceous and carbonaceous matter;' and he ascribes the effect to the decomposition of the sulphates in the water by the carbon, and the clay only prevents its passing off into the air, or mixing with the water, by the power of adhesion. The subject is full of interest, both in a practical and scientific point of view, and well worthy of investigation."

In a subsequent Report on additional specimens, Professor Daniell observes:—"It is impossible not to speculate upon the origin of the

deleterious gas, which has now been proved to impregnate the waters upon the Western Coast of Africa, in such enormous quantities, through an extent of more than sixteen degrees of latitude. It appears to me, that there are only two sources to which it can with any probability be referred, namely, submarine volcanic action, in which case its evolution might be considered direct or primary; and the reaction of vegetable matter upon the saline contents of the water, in which case it would be secondary. The probability of a volcanic origin is, I think, small, from the absence, I believe, of any other indications of volcanic action, and from the great extent of the coast along which it has been traced. What is known of the action of vegetable matter upon the sulphates, and the immense quantities of vegetable matter which must be brought by the rivers within the influence of the saline matter of the sea, renders, on the contrary, the second origin extremely probable. Decaying vegetable matter abstracts the oxygen from sulphate of soda, and a sulphuret of sodium is formed. This again acting upon water decomposes it, and sulphuretted hydrogen is one of the products of the decomposition. You will perceive that there is a large proportion of the sulphates in the different specimens of water which have been analyzed; and there can be little doubt, I imagine, that extensive mud banks must be formed at the mouths of most of the rivers on the western coast of Africa, within the tropics, consisting chiefly of vegetable detritus in the exact state which is most favourable to the action which I have described. This view rests upon experimental evidence, and upon considerations of great cogency, derived from the unhealthiness of certain well-known situations in which decaying matters from tropical vegetation are brought into contact with sea-water. I feel more than ever convinced, that the evolution of sulphuretted hydrogen is intimately connected with the unhealthiness of such stations.

"When this matter was first brought under my consideration, I was surprised that the nauseous smell which must necessarily be evolved from water impregnated with this gas, at so high a temperature as that of the equinoxial regions, had not been noticed. I have in consequence turned to some of the accounts of the late travels in Africa, to seek for evidence upon the subject; and in the narrative of an expedition into the interior of Africa, by the river Niger, by Macgregor Laird, and R. A. B. Oldfield, I found the following important observations: 'The principal predisposing causes of the awful mortality, were, in my opinion, the sudden change from the open sea to a narrow and winding river, the want of the sea-breeze, and the prevalence of the deadly miasma, to which we were nightly exposed from the surrounding swamps. *The horrid sickening stench* of this miasma must be experienced to be conceived: no description of it can convey to the mind the wretched sensation that is felt before and after day-break. In those accursed swamps, one is oppressed not only bodily but mentally, with an indescribable feeling of heaviness, languor, nausea, and disgust, which require a considerable effort to shake off.' Now, these observations were made in the very locality from which some of the first waters which I examined were taken, and nothing more is wanting to

identify the cause of the rapid decay of ships' copper with that of the mortality of the climate. It has been experimentally found, that so small a mixture as a fifteen-hundredth part of sulphuretted hydrogen in the atmosphere, acts as a direct poison upon small animals; and the sensations of languor and nausea, described by Mr. Laird, are exactly those which have been experienced by persons who have been exposed to the deleterious influence in small quantities. The peculiar unhealthiness of mangrove swamps in all parts of the world, I have little doubt, arises, from that tree requiring salt-water for its growth, and its decaying foliage being thus brought into immediate contact with the sulphates. The hypothesis also agrees with the fact, (which I believe has been established,) that the unhealthiness of such situations does not extend to any considerable distance from the sea."—*Athenæum*, No. 690.

NEW BAROMETRIC INSTRUMENTS.

MR. BURSILL has read to the British Association the following remarks on the defects of Barometers, and a description of the means he has provided as a remedy:—

A standard barometer to indicate the direct pressure of the atmosphere all over the globe, totally independent of change of temperature, has long been a desideratum; it being a well-known fact, that the mercury employed in the construction of barometers is liable to expand or contract about the one-hundredth part of its volume, by a change of temperature amounting to only 90° Fahrenheit: so that, even during the ordinary changes of the atmosphere, and still more particularly in the ascent or descent of mountains in tropical climates, a question immediately arises, as to how much of the rise or fall of the barometer should be attributed to increased heat or cold; and, although such question may, in fact, be solved in reference to the thermometer at the time of observation, it is only by the aid of a complicated formula—not easily understood, except by scientific persons—not easily retained by them, since the length of the barometrical column is perpetually varying from other causes besides temperature, and the difficulty of making an exact computation thereby greatly increased. In addition to the defect already mentioned, it is an equally incontrovertible fact, that barometers generally are, as at present constructed, open to another source of inaccuracy; since the height of the mercurial column is frequently more or less than is apparent upon the graduated scale, owing to a change of level of the mercury within the cistern, and which change of level always accompanies any rise or fall of the barometer. It is true that the latter evil can be lessened, in exact proportion as the size of the cistern is augmented; but such enlargement of the cistern, without altogether removing the evil, renders the barometer expensive, and far less portable; while a variety of different-sized cisterns gives rise to great discrepancy in the observations. In Bursill's patent Standard-syphon, patent Syphon-marine, and patent compensating-cistern Barometers, these difficulties have been overcome, by arrangements equally novel and efficient,—and so simple, that the

manner of using the barometer is at once intelligible to persons of ordinary capacity; while to those who have devoted much attention to this interesting subject, great satisfaction will, it is hoped, be derived, by an investigation of the principles upon which these valuable machines are constructed.—*Literary Gazette*, No. 1284.

Dr. Daubeny has exhibited to the Ashmolean Society, at Oxford, a Barometer for measuring heights, of a new construction, made by Buntin, of Paris, which completely obviates the risk of fracture and of derangement to which these instruments are liable in travelling, as constructed in this country. The principal improvements in it were introduced by M. Gay-Lussac, who bent the tube in the form of a syphon; and, after filling it with mercury, sealed it at both ends hermetically, thus preventing the escape of the metal, as in barometers with a leather or iron cistern; whilst the pressure of the atmosphere was admitted by means of a capillary aperture on the side of the shorter limb, too small to allow of a particle of mercury oozing through. The maker of this barometer, M. Buntin, has likewise made some further improvements by a contrivance to prevent the air from passing up the tube, and thus deranging its indications when the instrument is shaken in travelling.—*Oxford Herald.*

LIMIT TO MINING OPERATIONS.

Mr. E. Hodgkinson, in some remarks on experiments conducted in several coal-pits in the neighbourhood of Manchester, and the salt-mines near Northwich, in Cheshire, with a view to ascertain the change of temperature at certain depths, observed that the only conclusion he had been able to come to on this subject was, that the temperature increased with the increase of depth. He had made no allowance for the difference of depth in reference to the level of the sea. Mr. H. added that one thing was very certain, viz., that from the increase of temperature downwards, a limit would be fixed to all our mining operations at a depth of two miles.—*Mining Journal.*

INSTRUMENT FOR ASCERTAINING MEAN TEMPERATURE.

On August 2, M. Arago presented to the Academy of Sciences, at Paris, an Instrument, made by M. Jurgensen, for ascertaining the Mean Temperature of the Atmosphere during a given period. This was effected by the aid of a sort of chronometer, made exceedingly liable to expansion or contraction in its springs by heat or cold; and shewing, in an exaggerated manner, the effects of such expansion or contraction in its rate of going. The ordinary rate of this chronometer at a certain temperature being known, it became easy to find, from its gain or loss, how much the rate of expansion or contraction had been increased in the time required, and hence to ascertain what the mean variation of the temperature had been during that period. The ascertaining of the mean temperature by ordinary thermometers is known to be a work of labour, requiring numerous observations and calculations.

IMPROVED THERMOMETER.

M. VULTZ has improved the common flint Thermometer, by sinking the scale to the depth of two-thirds of its diameter into the material of the scale; by which arrangement the parallax in one direction is compensated by the refraction in another, so that, in all positions of the eye, the degree read off is the same.—*Proceedings of Society of Arts for Scotland.*

EDUCATIONAL MICROSCOPE.

MR. ROSS has completed, for educational purposes, a compound Microscope of strength, durability, and steadiness, and of a very simple construction, which contains all that is requisite to use, with perfect success, magnifying powers to 350 times linear. It is made the basis of the most complete compound microscope, so that the various mechanical conveniences and appendages which constitute the most perfect instrument may be applied at the convenience of the purchaser. The optical part consists of three combinations, which, in conjunction with two eye-pieces, give magnifying powers of 30, 60, 80, 120, and 250 times, and with an additional eye-piece 350 times, with definition capable of resolving the usual test-objects, such as the markings on the scales of Menelaus, clothes-moth, and Brassica, and exhibiting the stronger order of markings on the scales of the Podura. —*Microscopic Journal*, No. 7.

NEW REFLECTING MICROSCOPE.

MR. GUTHRIE modifies Amici's Microscope, by removing altogether the plane speculum, and placing the object to be viewed in the axis of the tube. This arrangement is to the microscope, what Sir W. Herschel's is to the reflecting telescope. In order that the object may be properly illuminated, the part of the tube next the mirror is wholly removed, and three pillars substituted for it, to one of which the stage for the object is attached, and regulated by an adjusting screw.—*Jameson's Jounal*, No. 44.

IMPROVED MICROSCOPE.

M. DONNE has made a small addition to the instrument, which is very useful in a class-room: a small lamp is placed in a kind of dark lantern, which is adapted to the microscope so as to throw light upon the reflecting mirror: all the other parts of the instrument are fixed; for example, the object is retained upon the platinum by a small compressor, so that when the focus is ascertained, the microscope may be passed from one person to another without any other preparation than to direct the eye to the object.—*Athenæum*, *No.* 689.

NEW POCKET MICROSCOPE.

M. SOLEIL, of Paris, has constructed a Pocket Microscope, specially for medical men, botanists, and travellers. This instrument, magnifying 300 times, gives results equally satisfactory with "the superior" microscopes of ordinary manufacture. It may be applied to

all the microscopes of Trécourt and Oberhauser. The price is only 35 francs: it may be made into a table microscope by means of a foot on which it can be fixed; and is so arranged that the observer can obtain the *direct* light from the sky, or from a lamp, without the necessity of a reflecting mirror.—*Comptes Rendus; Microscopic Journal, No.* 3.

THE STANHOPE LENS.

M. Ch. Chevalier details the following as some of the inconveniences of the Stanhope Lens:—

1. The focus, not being capable of adjustment, two individuals of different sight cannot make use of the same instrument:

2. As the object to be examined is fixed to the lens, it is requisite, on its removal, to rub the lens, in order to remove any adherent matter; and which, on account of the repeated friction, will soon be found scratched and unfit for use:

3. The magnifying power of this lens is too small to allow of its employment in a great number of instances, in which it would be exceedingly useful, on account of its great portability.

These disadvantages M. Chevalier has remedied, by employing a doublet, furnished with a very thin piece of glass, which is fixed in front of the lenses, in a ring, (*barillet*), and put in motion by a very simple piece of mechanism. The instrument, supplied with this arrangement, may be adjusted to the focus of the operators, and is not so likely to be affected by the causes above mentioned.

M. Lerebours has made some remarks on M. Chevalier's objections to the use of the Stanhope lens, as above quoted. The *first* inconvenience exists, as M. L. asserts, in theory, *but only in the most near-sighted individuals;* and, in support of this opinion, he states, that he has never met with a person who saw indistinctly with Stanhope lenses. To the *second* objection, M. L. cannot see how the surface of the Stanhope lens becomes more scratched than the lamina of very thin glass used by M. Chevalier. *Thirdly*, The Stanhope lenses usually magnify 40 times; he has, however, made them with a manifying power of 80 diameters. According to the experience of micrographers, excessive enlargement is rather an inconvenience than an advantage; above all, in instruments intended for excursions. He further adds, that M. Chevalier, in detailing what appear to him as imperfections in the Stanhope lens, has omitted to speak of its advantages. Thus, he says nothing as regards the extent of field afforded by this lens, which amounts to 35 degrees; while Wollaston's Doublet, which he uses, scarcely has a field of 15 degrees, and costs four times the money.—*Comptes Rendus; Microscopic Journal, No.* 4.

INSTRUMENT FOR MEASURING REFRACTION.

Mr. Alexander Bryson, of Edinburgh, has invented an Instrument for Measuring the Refracting powers of different substances: it consists of a compound microscope, with a moveable platform under-

neath, for holding the refracting medium over a fine line, which is to be viewed through it. The platform must be raised or lowered, until the line is distinctly seen through the microscope; and as the distance at which this takes place depends on the refracting power of the medium, the graduated scale on which the platform moves indicates such refracting power. This invention is of great importance to the mineralogist and the chemist, as it enables them to ascertain the refracting power of very minute substances.—*Inventor's Advocate, No. 77.*

DISTANCES BY THE TELESCOPE.

MR. BOWMAN, in determining distances by the aid of the Telescope, proposes to observe the number of divisions of a graduated staff placed at a distance; and much ingenuity is shown in determining the distance, by making necessary corrections on this observed number. The author thinks his method would be more accurate in surveying than the actual measurement by the chain, particularly in uneven ground; and asserts that the error in taking any distance could not exceed the $\frac{1}{1000}$th part of the entire distance; hence, by dividing the entire distance, even when large, into a number of parts, he conceives great precision would be attained.—*Proc. British Assoc., Athenæum, No. 722.*

REFLECTING TELESCOPES.

UNFORTUNATELY, Sir William Herschel never made public the means by which he succeeded in giving such gigantic development to his telescope, and the construction of a large reflector is still a perilous adventure. According, however, to a Report by Dr. Robinson to the Irish Academy, Lord Oxmantown has overcome the difficulties, and carried to an extent which even Herschel himself did not venture to contemplate, the illuminating power of this telescope, along with a sharpness of definition little inferior to that of the achromatic; and it is scarcely possible, he remarks, to preserve the necessary sobriety of language in speaking of the moon's appearance with this instrument, which Dr. Robinson believes to be the most powerful ever constructed. However, any question about this optical pre-eminence is likely soon to be decided; for Lord Oxmantown is about to construct a telescope of six feet in aperture, and fifty feet focus, mounted in the meridian, but with a range of about half an hour on each side of it.—*Athenæum, No. 694.*

NEW CAMERA LUCIDA.

SIR JOHN ROBISON has devised a cheap and easily used Camera Lucida, applicable to the delineation of flowers and other small objects. A piece of plate-glass is made to stand in a vertical position by means of a support: it rests on a table covered with white paper, and the object is placed on the paper on one side of the glass. On looking down from that side of the glass diagonally, an image of the object is

seen on the paper on the other side, and a drawing of it can be readily taken.—*Proc. Society of Arts, Edinburgh.*

SINGLE VISION.

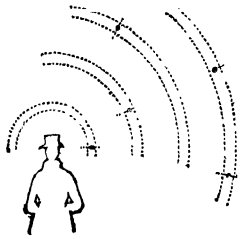
THIS subject belongs to a class of questions intermediate between Natural Philosophy and Pathology, the research of which as a branch of science has been recommended by Bacon, in his *Novum Organum.* Dr. Woodhouse, in accounting for the phenomenon, considers "that the parts immediately acted upon by any existing power, do perceive." This position admits of dispute: it is well known that during the Taliacotian process, an injury inflicted on the new-made nose is felt on that part of the forehead from whence the skin had been removed. (See Johnson, on Sensation.) Dr. Woodhouse suggests, among others, these experiments. Let C be an object looked at, and P one interposed. Two images of P will appear. If P be moved towards C, these images will mutually and *equally* approach towards coalescing. Exp. 2. Let a candle be placed a few feet from the observer, and let him look at a pencil between the candle and his eyes: two images of the candle will appear; but, contrary to the first experiment, when the pencil is moved, one of the images remains stationary, the other proceeding along to coalesce with it.

From similar experiments, and some physiological considerations, the Doctor infers that one eye may be regarded as a *master eye* wholly occupied with vision, the other being nearly or wholly passive. Dr. Woodhouse concludes with the following problem, which had been already treated by Wollaston, viz.: "When a picture looks at you in one part of a room, it will look at you in another." The author's solution seems simple and satisfactory.—*Essay on Single Vision,* in *Philosophical Magazine, No.* 121.

COLOURS OF THE DEW-DROP.

THE Rev. Dr. Scoresby has devised a simple method of observing the resplendent Light and Colours of the Dew-drop, by aid of a telescope which can be adjusted a very *short* focal distance; so that, by being drawn out beyond the usual focus, objects at the distance of only three or four yards may become distinctly visible. There are obviously particular positions, in which the largest number of the drops are always to be seen. The simplest way of finding the fitting globules for examination, is to turn the back to the sun and take the shadow of the observer's head on the ground as the guide. Within a few inches, most brilliant drops, reflecting like the diamond, will be seen, and sometimes exhibiting colours. But, within, perhaps, a yard or two of the shadow, (at an angular distance of 10° or 12°,) if the sun have considerable altitude, globules of a most gorgeous character may be observed; whilst others, at a greater distance, will present, by a slight motion of the head, almost all the phenomena in succession of the solar arch. If the globule be to the right of the observer, (the back being to the sun), and *any colour* be seen, let the head be

inclined to the right until white light aloneis reflected. Then, by slowly returning the head towards the left, a succession of colours will be seen, differing, however, in their order according to the number of reflexions and refractions. When at a large angular distance, (such as nearly half a right angle from the shadow of the head of the observer,) the series commonly observed is bluish, like the sapphire; pale blue; brilliant white, like the diamond; straw colour; pink; orange; orange approaching to red. At this angular distance, (40° to 50°,) Dr. Scoresby has generally found the nearer drops to the eye (as those within 5 to 10 yards,) exhibiting scarcely more than three different or distinct colours; but in the remote drops, (as those at 15 or 20 yards distance,) the above variety might be seen.



In the globules, however, at small angular distances, the reverse order of colours was observed. On May 1, at eight o'clock in the morning, the sun being very bright, and the globules of dew numerous and large, Dr. Scoresby observed one, at about a yard from the shadow of his head, of singular beauty and splendour. Its brilliancy, when reflecting only white light, outvied, if possible, that of the diamond: and the tints which successively appeared in examining it with a small telescope, under a slight change of position, were singularly rich, and indeed, gorgeous. The globule was a little to the right of the shadow of the head, and when examined, as above recommended, from right to left, the succession of colours was as follows:—green, bluish-white, resembling in lustre and fire the diamond. The order here, omitting the two first tints, was that of the primary rainbow.

Dr. Scoresby has not succeeded in determining whether there are any particular angles at which the development of colour is resoluble. As observed without a telescope, colours could rarely be seen, except the orange, and that not very distinctly. It occurred to Dr. Scoresby that the parallax occasioned by the distance of the eyes, might actually bring a different tint to each eye, and so confuse or mix up two tints. And this was found to be so far the fact, in observing the nearer drops of dew, that when examined with one eye, unassisted by the telescope, more distinct tints were seen, especially in looking through a tube or through a small hole in any interposed substance. Reflected obliquely from a plane mirror, however, with one eye placed near the reflecting surface, the spectrum became much more obvious and capable of analysis into different tints.

Dr. Scoresby's remarks on this beautiful class of phenomenon, which "may afford a new source of interesting observation by those of a scientific turn of mind," will be found at length in *Jameson's Journal, No.* 61.

HYDROPHANOUS SHELLS.

In a great number of the beautiful land-shells of the Philippine Islands, collected by Mr. Cumming, the pattern, upon immersion in water or other fluid, becomes entirely obliterated till evaporation restores the colours to all their pristine brilliancy. In other of these shells, the very reverse is the result of immersion. The external whitish porous epidermis, which veils the shell when dry, suffers the bright colours to shine out when immersed in water. *Bulinus velatus* is described as above, as it appears on immersion, and before it becomes dry: but, in the latter state, the beauties of the shell are shrouded, and the colour of the sutural bands, peeping out between interstices in the epidermis, gives to these bands a moniliform appearance.

Sir David Brewster having examined the land-shells from which the pattern disappears on immersion, and re-appears when dry, considers the phenomena as perfectly analogous to those of hydrophanous opal, tabasheer, and other porous substances.

The phenomenon in the land-shells is still more beautiful when we examine them by transmitted light. The pattern, which is white by reflected light, is dark by transmitted light, and *vice versâ*. This is particularly beautiful in the *Helix pulcherrima*, where the ground of the white pattern is almost black by reflected light, and of a light reddish colour by transmitted light; the pattern, which is white by reflection, having a dark red colour by transmitted light.

In all these shells, the difference of structure by which the pattern is produced, does not exist in the shell, but in the epidermis: hence the pattern may be wholly obliterated by removing the epidermis; and this consists of one or two layers, only the upper one being porous when the pattern is white. On immersion, the fluid enters the pores of the white epidermis, and having nearly the same refractive power as the epidermis, no light is reflected at the separating surface of the water and the pores which contain it; so that the light passes through the membrane, which thus loses its white appearance. When the water escapes from the pores by evaporation, or is driven from them by heat, the membrane again reflects white light from the numerous surfaces of its pores.

As the colouring matter resides in the shell itself, its peculiar colour is seen through the epidermis as distinctly where it is porous as where it is not porous, when the porous portion has been rendered transparent by the absorption of a fluid.

If we apply oil or varnish to the white pattern, we may obliterate it permanently, or we may change it into a pattern entirely different from the original one.—*Mr. Broderip, and Sir David Brewster; Proceedings of the Zoological Society; abridged.*

DALTONISM.

Prof. Wartmann, of Lausanne, has noticed to the British Association a certain deficiency of vision, which he calls Daltonism. He observed that one of the most extraordinary affections to which the eye

is subject, consists of an incomplete vision of colours, which has been called Daltonism, after the celebrated Professor, who was the first to describe it in an exact manner. The Daltonians form two classes—that of the *dichromatics*, who only discern two colours—generally black and white, and who appear endowed with a remarkable faculty of vision in a state of darkness; and that of the *polychromatics*, who have the definite perception of at least three colours. Daltonism is not always hereditary; it does not, even, always date from the birth. Decided colours appear black to many Daltonians, if they be not illuminated by a very brilliant light. The number of colours of which the polychromatic Daltonians are sensitive is not constant—some only see three, others four (among which blue and red may be expressly mentioned). The extremes of red and violet are often not distinct; a fact which the Professor thought to have a connexion with the question of the number of elementary colours. The degree of polish of the coloured surface, has an influence on the appreciation of colours. Some Daltonians have an equal cognizance of the brightness and the discoloration of *supplementary* tints, which we do not recognize as such. Two colours appear to us blended by a succession of intermediate tints, which the Daltonians see in contrast. The Daltonians see exactly as we do, the mixed rays discovered in the spectrum by Fraunhofer, at at least in all that portion which appears to them illuminated.

Professor Whewell said, that he had himself had an opportunity of witnessing this defect of vision in some individuals: there were few persons who were ignorant of the fact, that it prevailed in the family of the celebrated Troughton; and, if he recollected rightly, the males only of that family were subject. He mentioned a lady of his acquaintance, to whom the colour of the bright side of a laurel leaf was undistinguishable from that of a stick of red sealing-wax. He remembered that when the celebrated man from whose name the present communication had been denominated, was receiving, at Cambridge, a small portion of those honours which he had so nobly earned, and of which his transcendant fame was so deserving, he had asked him what other object the Doctor's gown which he wore, and which was of a bright scarlet, resembled: he pointed to some of the evergreens outside the window, and said, that, to his eye, their colours were quite alike. On the other hand, the lining of the gown, which was pink silk, he could not distinguish from sky-blue.

Professor Whewell objected to the term *Daltonism* or *Daltonian*, as a name connected with defects: he ridiculed the idea of a polychromate or bichromate Daltonian; he infinitely preferred Sir J. Herschel's description, "idiopt" for this peculiarity of vision.

NEW POLARIZATION OF LIGHT.

M. Biot has discovered a new kind of Polarization of Light, which he proposes to call Lamellar Polarization, since it results from the special action of light on the superposed laminæ of certain systems of crystallization. It is totally distinct from double molecular refraction,

and might or might not co-exist with that kind of refraction in the same crystal.

EFFECT OF COLOURED LIGHT ON PLANTS.

A Correspondent of the *Journal of the Franklin Institute* considers the following results worthy of the attention of all engaged in the study of vegetable economy. He planted in a box some curled cress-seed, and so arranged bottles of carmine fluid, chromate of potassa, acetate of copper, and the ammonia of sulphate, that all but a small space of the earth was exposed to light, which had permeated three-fourths of an inch of these media. For some days, the only apparent difference was that the earth continued damp under the green and blue fluids, whereas it rapidly dried under the red and yellow. The plumula burst the cuticle in the blue and green lights, before any change was evident in the other parts. After ten days, under the blue fluid there was a crop of cress, of as bright a green as any which grew in full light, and far more abundant. The crop was scanty under the green fluid, and of a pale unhealthy colour. Under the yellow solution, but two or three plants appeared; yet they were less pale than those which had grown in green light. Beneath the red bottle, the number of plants which grew was also small, although rather more than in the spot the yellow covered. They, too, were of an unhealthy colour. The order of the bottles was now reversed, fixing the red in the place of the blue, and the yellow in that of the green. After a few days' exposure, the healthy cress appeared blighted; while a few more unhealthy plants began to show themselves from the influence of the blue rays in the spot originally subjected to the red. It is evident from this that the yellow rays not merely retard germination, but positively destroy the vital principle in the seed. Prolonged exposure uncovered, with genial warmth, free air, and, indeed, all that can induce growth, fails to revive the blighted vegetation. These experiments have been repeated many times, varying the fluids, but the results have been the same.

THIN PLATES EXPOSED TO POLARIZED LIGHT.

On May 6, was read to the Royal Society, a paper by Sir David Brewster, "On the Phenomena of Thin Plates of Solid and Fluid Substances exposed to Polarized Light." From a theoretical investigation of the phenomena described in this paper, the author deduces the important law, that when two polarized pencils, reflected from the surface of a thin plate, lying on a reflecting surface of a different refractive power, interfere, half an undulation is not lost, and white-centred rings are produced. When the inclination is exactly 90°, the pencils do not interfere, and no rings are produced.

SPECIFIC HEAT OF BODIES.

On Jan. 11, M. Reynault communicated to the Academy of Sciences, at Paris, the result of some new experiments made by him on bodies in various states; such as metallic alloys, oxides, sulphu-

rates, chlorates, &c. He found the specific heat of alloy, ascertained at a point far from fusion, to be exactly the mean of the specific heats of the metals composing it. If the heat be taken near the point of fusion, very different results will be obtained; attributable to part of the latent heat reverting to the state of apparent heat, and adding itself to the specific heat. In the case of metallic oxides, he had determined, that for those of the same chemical formula, the specific heats were in the inverse ratios of the atomic weights. An important exception existed, however, in the case of oxides of zinc and magnesium, which gave equal numbers for the products of their caloric capacities multiplied by their atomic weights; but which, nevertheless, differed considerably from the product constantly furnished by the oxides of the same formula. This anomaly, which corresponded to the isomorphism presented by the two bases, was also observed for aluminum in the form of corindon. These divergences, in fact, were found to correspond to modifications presented by these bodies in their molecular constitutions, which considerably changed their capacities for heat. This variation in specific heat, due to an alternation in the manner of molecular aggregation, explained the phenomenon of spontaneous incandescence manifested in certain oxides upon an elevation of temperature.—*Literary Gazette*, No. 1253.

POLARIZABILITY OF HEAT FROM DIFFERENT SOURCES.

PROFESSOR FORBES believes that the curious fact formerly announced to the Royal Society of Edinburgh, of the greater permeability of mica, laminated by heat, to heat of low temperature, contrary to the usual character of the same substance, (a property which he has since extended to changes of mechanical conditions of surface,) may very probably explain, as M. Melloni anticipates, the difference in point of fact long contested between them as to the equal or unequal Polarizability of Heat from different sources.—*Jameson's Journal*, *No.* 62.

RESEARCHES ON HEAT.

IN the *Transactions of the Royal Society of Edinburgh*, Vol. XV., Part 1, is printed the Fourth Series of Professor Forbes's elaborate *Researches on Heat*, extending to 55 sections; and reprinted in the *Philosophical Magazine*, Nos. 121 & 122. The leading Facts contained in this paper are these:

I. The peculiar, (*red-like*,) character of films of smoke in transmitting heat of low temperature is partaken—A. By simple powder of charcoal. B. By, (at least some,) other dull earthy powders. C. By surfaces simply *dull*, or devoid of polish. D. By surfaces irregularly furrowed, as with emery or sand-paper. E. By polished surfaces, on which fine distinct lines have been drawn. F. By the mechanical lamination of transparent mica, which, as a continuous medium, possesses opposite properties.

II. The following media seem *indifferent* to the kind of heat which

they transmit:—A. The thinnest gold leaf is impervious to any. B. Metallic gratings transmit all kinds of heat in a proportion which is, probably, exactly as the area of the interstices which they present. C. Thread gratings. D. In a state of powder, most crystalline bodies *approach* to a condition of opacity for heat.

III. The following bodies, in addition to those commonly known, transmit most heat of high temperature (*violet-like heat*). A. Several pure metallic powders. B. Rock-salt in powder; and many other powders. C. Animal membrane.

IV. Heat of low temperature is most regularly reflected at imperfectly polished surfaces. It is also most regularly transmitted. These facts are of great importance to the theory of heat; and may, probably, suggest inquiries of no small interest with regard to light, and especially the phenomena of absorption.

TEMPERATURE OF PLANTS.

A COMMUNICATION has been read to the Linnæan Society, by Professors Vrolik and De Vriese, of Amsterdam, containing the results of some new experiments on the increase of Temperature observed in the spadix of *Colocasia odora* at the time of flowering. They enclosed a spadix in a jar filled with oxygen, and after the lapse of some little time it was found that the whole of that gas had disappeared, and its place been supplied by an equal volume of carbonic acid gas. The development of temperature in the spadix goes on while there remains any oxygen in the jar; but as soon as the whole of that gas has been absorbed, the temperature is found gradually to diminish. The authors are inclined to believe that the oxygen in the jar combines with the carbon of the spadix to form carbonic acid gas.

CIRCULATION OF CHARA.

THE cause of the circulation in Chara has hitherto escaped research; the known moving powers in no way explain it. Dutrochet was led to investigate whether there did not exist some physical motion, of which the cause was equally unknown, and which might bear some analogy to the motion observable in Chara. By reasoning on the subject, he was led to consider that a similarity existed to the movements produced by small particles of camphor when placed on the surface of water, and provided they were motionless, would cause the fluid to be put in motion in their vicinity. Is it not then, says Dutrochet, reasonable to conclude that the moving power which animates as it were the pieces of camphor, is identical to that animating the fixed green globules situated on the internal walls of the central tubes of Chara; and from which green globules evidently emanates the motive force of the circulating fluid in contact with them, and that also of the inert corpuscles contained or carried with the fluid? The result which Dutrochet arrives at, after a lengthened and comparative series of experiments, is, that the physiological power (force) producing the circulation of Chara, and the physical force which produces the movement of camphor when placed on the surface of water, are iden-

tical.—[In this memoir, which is of considerable length, the author enters into the history, and gives the results of his experiments, with a view to detail the true cause of the movement of camphor on the water; and he then takes successively the several experiments he has made on the circulation of Chara, and endeavours to apply them by comparison to analogous experiments made with the camphor.]—*Comptes Rendus; Microscopic Journal, No.* 3.

ANIMALCULAR CONSTITUTON OF CHALK.

PROF. EHRENBERG has communicated the result of his continued researches* on the living animals of the Chalk, to the Academy of Berlin. He stated, that he had received from Berzelius some fresh mud from the sea-coasts of Sweden, which the Archbishop of Gottenbürg had collected in the Island of Tjoern, in the Cattegat. The most important, in a scientific point of view, were twelve living species, which had only hitherto been met with in a fossil silicious state, in the chalk marls of Caltanisetta in Sicily, and at Oran in Africa. Amongst them occurs, in a living state, the *Grammatophora*, (hitherto *Navicula*), *Africana*, which has only been met with in a fossil state in the marls of Oran; the recent *Oceanica* also has only been met with in the marls of Greece. There is also to be met with in the waters of the Cattegat, a prismatic infusorial form, which Ehrenberg has observed in the marls of the Oran; which would belong to the genus Staurastrum, if it could be placed in the subdivision of Infusoria, characterised by a soft vertex, (*carapace*), and which is distinguished by having four apertures at the four angles. He proposes to class it under a new genus, by the title of *Amphitetras antediluviana*. Among the living forms of the Northern Seas, he has also found one similar to the *Dictyocha Speculum*, but spiny, like the *D. aciculata* of Sicily. Lastly, he has discovered a series of eight species of the genus Antinocyclas, of the radiated subdivision, destitute of a septum; which form the great mass of silica in the chalk marls of Caltanisetta, and especially of the Oran marls, and which are characterised by the number of their rays. The species possessing 6, 7, 8, &c. rays are particularly observable, and are known by the terms *A. biternarius*, *A. septenarius*, &c. In addition to these discoveries, Ehrenberg, since this communication, has found in the water of Cuxhaven, in the living state, three silicious Polythalamia of the white chalk, and two silicious Infuriosa of the chalk marl. These are *Rotalia globulosa*, *R. perforata*, *Textilaria globosa*, *Gallionella sulcata*, *Navicula didymus*. To these seventeen forms, occurring in a living state, and also fossilised in the chalk formations, Ehrenberg adds two silicious Infusoria, which have since been detected in the chalk marl, viz., *Striatella arcuata* and *Tessilla catena*. These nineteen forms now noticed, combined with these announced in October 1839, and June 1840, make twenty-one genera and forty species of Polythalamia and Infu-

* For an Abstract of Prof. Ehrenberg's previous Researches, see Year-book of Facts, 1841, p. 111.

soria, which are now found alive, and also occur in a fossil state in the chalk formations.—*Athenæum, No.* 717.

EHRENBERG'S NEW METHOD OF OBSERVING THE ANIMALCULAR COMPOSITION OF CHALK.

PLACE a drop of water upon a lamina of mica, and put into it of scraped chalk as much as will cover the fine point of a knife, spreading it out, and leaving it to rest a few seconds; then withdraw the finest particles, which are suspended in the water, together with most of the water, and let the remainder become perfectly dry. Cover this remainder, so spread out, with Canadian balsam, the turpentine of the *Pinus (Abies) balsamea*, and hold it over a lamp until it becomes slightly fluid, without froth. A preparation thus made seldom fails; and when magnified 300 times in diameter, we see that the mass of the chalk is chiefly composed of minute well-preserved organisms. In this preparation, all the cells of the Polythalmia appear at first black, with a white central spot, which is caused by the air contained in the cells, which, as is well known, appear under water as annular black bodies; but by degrees, the balsam penetrates into all the single cells, the black rings of the air-vesicles disappear, and we recognise all the small cells of the Polythalamian animals, often presenting a very pretty appearance.—*Note to Mr. Weaver's View of Ehrenberg's Observations on the Organic Composition of Chalk; Ann. Nat. Hist.*

AIR IN SNOW.

M. BOUSSINGAULT has communicated to the Academy of Sciences, at Paris, the result of some experiments he had been making upon the quantity of Air contained in the pores of Snow; and, in analysing it, he has come to the same results as De Saussure had formerly done, that the air in snow contained less oxygen than the atmospheric air; and this he conceived to be confirmative of Dalton's theory as to the nature of the air at great elevations.

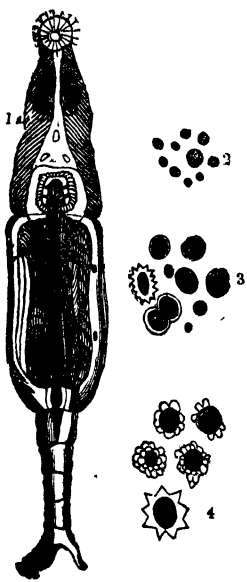
RED AND GREEN SNOW.

M. CH. Martins, who twice accompanied the French expedition to Spitzbergen, is of opinion that the colouring matters of the Red Snow, *Protococcus nivalis*, and of Green Snow, *P. viridis*, "are one and the same plant, only in different stages of development." Prof. Meyen, however, considers it to be still a question whether the colours of the snow are really produced by different states of the same species; but he has no doubt that the so-called Protococci belong, not to the vegetable but to the animal kingdom, being true Infusoria; that P. viridis is identical with Ehrenberg's *Euglenia viridis*, and P. nivalis with his *Euglenia sanguinea*, (the *Enchelides sanguinea* and *Pulvisculus* of authors); that these Enchelides "exhibit at times a perfectly motionless state, in which they appear spherical;" and that in this state they have been described as Protococci: that, "it is these spherical, reposing animalcules, which often appear in incredible numbers, and, surrounded with a kind of slime, form more or less thick skins, which

frequently cover the bottoms of shallow standing waters;" and it is in consequence of observing that these animalcules, after long remaining in this passive and inert state, occasionally resume their activity, that so many philosophers have spoken of a metamorphosis of Infusoria into plants, and *vice versâ*.—*Newman's Phytologist, July*, 1841.*

ANIMALCULES OF THE RED SNOW.

THE researches of Mr. Shuttleworth, (noticed in the *Year-book of Facts*, 1841, p. 216,) on the colouring matter of Red Snow, show that the red-coloured snow of the Alps is not solely vegetable, but that it contains a great number of animals. Dr. C. Vogt, taking with him Ehrenberg's great work on Infusoria, and two microscopes, to the glacier of the Aar, has there studied this red snow in a fresh state, and has obtained some important results: as the discovery of new and curious forms, their mode of life, their development and reproduction, in the midst of eternal snow, &c. But, the most surprising circumstance was the diversity of form exhibited by individuals collected from different localities: whence it is probable that each station possesses beings proper to it, associated with a certain number of other types more generally distributed.



Dr. Vogt then describes six organisms of the red snow, the most interesting of which is a Rotifer, a variety of *Philodina roseola*, Ehr., met with abundantly in the snow of the lower glacier of the Aar. Dr. Vogt soon perceived in it eggs of a deep red hue in different periods of development; he also afterwards met with them, together with the Philodina, in the crevices of a polished rock below the glacier of Rosenlain, in the vicinity of Guttannem, and even on the borders of the lake of Neufchâtel, where the *Philodina roseola* with coloured eyes is very abundant.

In the accompanying figure, the *Philodina rosea* of the red snow, is seen magnified 180 diameters, and the different forms of its eggs 360. The animal is shown from above, the body extended as in the ordinary act of pro-

* See Year-book of Facts, 1841, p. 216, for Notices of Papers on Red Snow, by Prof. Agassiz, Dr. G. W. Arnott, and Messrs. Forbes and Shuttleworth.

gression on the bottom or side of the vessel in which it is kept. The three principal regions of the body are very distinct:—1. The head and neck, with the different organs of sense, and the commencement of the digestive system; 2. The trunk, which is nearly cylindrical, and is enveloped in a furrowed cutaneous carapace; 3. The articulated feet.

The anterior extremity, with its cilia, is expanded as in the act of touching; the rotatory organs are contracted: a little posterior to these may be seen in the median line, the respiratory tube, which is equally contracted; when spread out, it is much longer, and is furnished at its extremity with stiff cilia. Behind this tube the eyes are met with, which are obliquely placed; they are colourless in the variety from the Alps, whilst they are red or yellow in the common variety. Next comes the pharynx, with its two teeth, from whence proceeds the intestinal canal, which, in the figure given by Dr. Vogt, is of a blue colour, the animal having been fed on indigo. The intestinal appendages are distinguished from the ovary by their intense red colour. The foot, capable of expansion and contraction, is also seen. It is composed of seven rings; the fifth and sixth are armed with two points, the seventh is furnished with two claws, very much analogous to the posterior feet of the *Chenilles*. On either side of the body may be seen, in four different places, the organs which Ehrenberg described as vibratile branchiæ, but which in reality are nothing more than enlargements of two lateral vessels given off from the respiratory tube, and furnished with cilia. Similar vibratile enlargements are seen at the union of the neck with the body, in two situations in the middle of the body, and one at the side of the anus. The head and neck, as well as the feet, may be withdrawn into the coriaceous carapace of the body, which is susceptible of considerable dilatation and contraction. Fig. 2, imperfectly developed eggs. Fig. 4, winter eggs not developed, with the covering in the form of a rosette; both met with in red snow. Fig. 3, accumulation of the ordinary eggs of Philodina.—Translated from the *Bibl. Univ. de Genève*, in No. 6 of the *Microscopic Journal*, edited by D. Cooper, M.R.C.S.; a periodical commenced during the past year, and a valuable addendum to our scientific literature.

Electrical Science.

HEAT PRODUCED BY VOLTAIC ELECTRICITY.

MR. J. P. JOULE has investigated the cause of the different degrees of facility with which various kinds of metals, of different sizes, are heated by the passage of Voltaic Electricity. He employed a coil of wire, which was to be subjected to trial, placed in a jar of water, of which the change of temperature was measured by a very sensible thermometer immersed in it; and a galvanometer, to indicate the quantity of electricity sent through the wire, which was estimated by the quantity of water decomposed by that electricity. The conclusion he draws from the results of his experiments is, that the calorific effects of equal quantities of transmitted electricity are proportional to the thickness opposed to its passage, whatever may be the length, thickness, shape, or kind of metal, which closes the circuit: and also, that *cæteris paribus*, these effects are in the duplicate ratio of the quantities of transmitted electricity; and consequently, also in the duplicate ratio of the velocity of transmission. He infers from his researches, that the heat produced by the combustion of zinc in oxygen is likewise the consequence of resistance to electric conduction.—*Proceedings of the Royal Society.*

HEAT AND ELECTRICITY DISTINCT.

ON June 15, was read to the Electrical Society, a letter describing "Some Experiments that show that Radiation, a property of Heat, is not a property of Electricity;" by M. Roberts, Esq. The experiments were those in which a Bennett's electrometer was exposed to the influence of a charged conductor, and the leaves, which, by induction, had diverged, collapsed the instant the charge was removed from the conductor. This would not be the case if electricity radiated as heat does: it would then pass through the interstices of the air and produce a permanent effect upon the instrument. The author, in conclusion, said, that "the establishment of facts such as these would throw much light upon the nature of electricity; and its dissimilarity from, or analogy it bears to, heat, will be one great means of penetrating more deeply into these mysterious agencies."

NEW ELEMENT, OR PRODUCT OF ELECTRICAL ACTION.

MR. F. DE MOLEYNS has read to the British Association his experiments on the production of a new element called ozone. Prof. Schönbein stated, that the disengagement of this "odorous substance" depended,—1st, Upon the nature of the positive electrodes; 2nd, Upon the chemical constitution of the electrolytic fluid; and, 3rd,

Upon the temperature of that fluid. He added, that his experiments went to shew that well-cleaned gold and platina were alone capable of disengaging the odoriferous principle; and that the *more easily* oxidable metals, as well as charcoal, did not possess that quality at all. The results of Mr. De Moleyns's investigation appeared to prove:—1st, That the disengagement of the peculiar odour was not confined to the *less easily* oxidable metals; 2nd, That by certain arrangements, *all metals*, when positive electrodes, may be made to develope the odoriferous principle; 3rd, That certain positive metals, not acting as electrodes, will evolve this principle; 4th, That charcoal forms no exception to this rule; 5th, That all substances, whether crystalline in structure or otherwise, possessing the property of appearing luminous by friction, or of yielding sparks when struck, also possess the property of discharging, under such circumstances, the peculiar odour; 6th, That iron and nickel develope this principle more than any other metal. Mr. De Moleyns, observing the odour to be produced at the points connecting an electro-magnetic machine with the battery, constructed an apparatus by which magnets were made to revolve within a glass cylinder, which could be exhausted at pleasure, or filled with various gases; by such means, he obtained a vacuum, and operated in *dry* air, collecting the matters evolved over distilled water; and by such modes he proved that ozone could not only be produced in a dry atmosphere, but also in a vacuum—mercurial and common. These and other experiments led Mr. De Moleyns to the conclusion, that the ozone of Schönbein, which he proposed to name Electrogen, must be admitted into the list of supposed elements: that it was *not* an union of an electrolytic compound whose action was *unknown:* and that probably it existed in combination in various forms of matter, which at present are considered, but which in reality are *not*, elementary.—*Athenæum*, No. 719.

ATMOSPHERIC ELECTRICITY.

On May 18, a letter was read to the Electrical Society, from T. Price, Esq., containing many interesting facts on the power exercised by the points of living vegetables in "drawing off" electricity from the atmosphere. That many important functions in vegetation result from this, the author concluded from the singular circumstance of dew being deposited only on the apex or points of leaves. Apparently smooth leaves are, when examined by a microscope, found studded with these natural attractors; and, what is still more illustrative of the case in question, plants vegetate with more vigour in an electrified atmosphere than when the soil is electrified.

SMALL ATMOSPHERIC ELECTRICAL APPARATUS.

On August 17, Mr. H. Weeks described to the Electrical Society, this improvement, in which the insulating apparatus is similar to that in the larger one already described by him in the Proceedings of the Society: the collecting arrangement is a pointed wire in the place of 365 yards of wire; though the use of such an apparatus is very limited. Mr. Weekes mentions, that a lighted candle, in a metal can-

dlestick, insulated on wax, will gather indications of electricity when other means fail.

ELECTRICITY IN REFERENCE TO MORTALITY.

MR. FARR, in his letter to the Registrar General, states, that the electric state of the atmosphere was not observed during 1838, but that it is indicated by the deaths from lightning, which, in the kingdom, amounted to 24: in winter, 1; spring, 10; summer, 11; autumn, 2. The tables of mortality thus afford us an electrometer.—*Athenæum*, No. 698.

ELECTRO-VITAL CURRENTS IN ANIMALS.

ZANTEDESCHI and Favio state that in warm-blooded Animals there exists an Electro-vital or Electro-nervous Current in the cutaneous tissue, which passes continually from the extremities to the cerebro-spinal axis, and may be detected by means of the galvanometer. In the same animals, there is an electro-vital current, which passes from the cerebro-spinal axis to the internal organs placed under the skin. These currents are fuller in proportion to the weakening of the system. When death occurs, the currents are reversed. Pain weakens or suspends the electro-vital currents: voluntary movements or convulsions increase their strength.—*Athenæum*, No. 689.

GALVANISM AND POLARITY, AND THE STRUCTURE OF ROCKS.

WHENEVER we meet with Rocks admitting of the preservation of organic remains, the number of these decreases as we descend in the series, till we arrive at a period when the physical monuments of the globe bear no trace of organized beings; an abyss which gives no record of life, and sets a bound to our zoological inquiries. But the researches of the geologist do not end here: it still remains for him to investigate changes connected with great moving forces, with Galvanism, and with Polarity, manifested in cleavage, and joints, and all the other problems connected with the primary rocks; and these inquiries, it is believed, will in future form one of the most important parts of geological investigation.—*Prof. Sedgwick; Jameson's Journal*, No. 62.

ELECTRICITY IN RAILWAYS.

MR. E. STEPHENSON, the engineer, has always considered the generation of heat to resemble, in a striking manner, the generation of electricity by the common electrifying machine; and some experiments made within Mr. Stephenson's own knowledge lead to the opinion that all bearings of machinery put electricity in motion; and consequently, render it probable that machinery kept in motion is not so likely to oxidize as when left in a state of rest. Thus, the rails of a railway do not rust; but if a rail be laid down near the railway, and be not worked, it will speedily rust, whilst the rails worked exhibit no such effect; and this Mr. Stephenson believes to depend upon the electricity being set in motion by the journeys of the carriages. If this view be at all correct, *we may look upon every railway carriage as a species of electrifying machine.*

MOTION OF CAMPHOR IN WATER.

On Jan. 4, M. Dutrochet read to the Academy of Sciences, of Paris, an interesting paper "On the Motion observable in Particles of Camphor, when placed in very small quantities in Water;" and "On the Cause of Circulation in the Vessels of the Chara." He placed an exceedingly small quantity of camphor, not exceeding half a millimetre in diameter, and then examined the results with a microscope, operating in a watch-glass reversed. The camphor immediately dispersed, and attached itself to the sides of the glass, where it kept up only a slight trepidation. He then put in the water a drop containing molecules of clay in suspension; these immediately precipitated themselves towards the camphor, and, when nearly reaching it, split themselves into two currents, one running to the right, the other to the left, their velocity diminishing as they left the camphor. They described elliptic curves, and then returned to the camphor, again to leave it. M. Dutrochet hence inferred, that the moving force was of an electric nature; and has concluded that the circulation of the latex in the chara is also caused by electricity, as had been previously suspected, but not proved.—*Literary Gazette*, No. 1252.

MANUFACTURE OF PLATINUM.

A correspondent of the *Philosophical Magazine*, No. 119, suggests that the price of Platinum might be reduced by the electrotype process; its high cost being, in some measure, due to the labour required to reduce it to a malleable state by the method of Wollaston. He recommends the metal to be at once reduced from its solution by the slow action of electricity, as this mode involves no labour, while the necessary apparatus is cheap. The same method might also be applied to reduce nickel to a malleable state; which being a cheap metal, not liable to rust, might, perhaps, be advantageously substituted for some purposes, for platinum.

VOLTAIC BATTERIES.

In the following Table, the intensities of the Batteries which are most generally used, are inversely as the number of pairs which would be just requisite in order to overcome the resistance of water to electrolyzation.

Mr. Grove's	Platinum. Nitric Acid.	Amalgamated Zinc. Dilute Sulphuric Acid.	1 / 0·93	Constant Intensities.
Prof. Daniell's	Copper. Sulphate of Oxide of Copper.	Amalgamated Zinc. Dilute Sulphuric Acid.	1 / 1·54	
Mr. Sturgeon's	Iron. Amalgamated Zinc. Dilute Sulphuric Acid.		1 / 3·33	
Mr. Smee's	Platinized Silver. Amalgam. Zinc. Dilute Sulphuric Acid.		1 / 3·58	
	Copper. Amalgamated Zinc. Dilute Sulphuric Acid.		1 / 5·40	

Without entering particularly into the respective merits of these arrangements, it may be stated that each of the first four may be used advantageously, according to the circumstances in which the experimenter is placed, or the particular experiments which he wishes to execute. The zinc-iron battery is somewhat inconvenient, on account of local action on the iron; but then it presents great mechanical facilities in its construction. Mr. Smee's and Mr. Grove's are also very good arrangements; but the battery of Daniell is the best instrument for general use, and is, unquestionably, the most economical.

In the above table, the intensity of zinc-iron immersed in diluted sulphuric acid is somewhat overrated. Recent experiments prove that when the iron is in its best condition, it possesses the same power as the platinized silver. The iron battery is attributed to Mr. Sturgeon, who constructed one of these excellent instruments early in 1839. It consisted of 12 cast iron tubes, furnished with strips of amalgamated zinc; but the experiments of this gentleman were not published so early as those of Mr. Roberts. Prof. Daniell, (*Phil. Trans.* 1836, p. 114,) observes that iron is sometimes more efficient than platinum in voltaic association with amalgamated zinc.—From an elaborate paper, (18 pages,) "On the Heat evolved by Metallic Conductors of Electricity, and in the Cells of a Battery during Electrolysis," by J. P. Joule, Esq. In this investigation, Mr. Joule had occasion to work very extensively with different voltaic arrangements, and he has repeatedly ascertained their relative intensities by the mathematical theory of Ohm; so that the foregoing results must be considered of great practical value.—*Philosophical Magazine*, No. 124.

POWERFUL VOLTAIC COMBINATION.

On Jan 20, at the London Institution, Mr. Grove, in reviewing the history of the Voltaic Battery, showed how the chemical theory had led to all the improvements of that instrument. The original pile was defective, as from the small intervening stratum of liquid, chemical action was soon exhausted; hence the troughs of Cruickshank and Wollaston. A second defect was the waste of local action, now remedied by amalgamated zinc, the inactivity of which is explained by the chemical theory. A third defect was the reaction occasioned by the precipitation of cations upon the negative metal, remedied by Mr. Daniell's introduction of sulphate of copper. However, as the chemical theory supposes that the power of this voltaic combination is as the affinity of oxygen or chlorine for zinc, minus its affinity for copper, a wide field was still open for the increase of power: thus, solutions of silver, gold, or platina, would be efficient, did not their expense preclude their practical employment; the nitric, iodic, chloric and bromic acids, whose elements are united by a very feeble affinity, are still more effectual than any metallic solution; and fortunately, the nitric acid, being commercially manufactured, is sufficiently cheap for the purpose.

The Battery exhibited on this occasion was, probably, *the most powerful ever seen*, although of very small size: it consisted of 100 pairs of zinc and platina plates 2 inches by 4, with interposed burned

pipe-clay diaphragms, and was charged with concentrated nitric and dilute sulphuric acid; its superficial relation to the great battery of Davy was 1·40.

The arc of light was from 3 to 4 inches long, and of great volume; its prismatic spectrum was of extreme brilliancy, and it was polarized and depolarized by Mr. Grove, showing its identity with solar light.—*Philosophical Magazine*, No. 116.

GALVANIC PLANT PROTECTORS.

MESSRS. TREGGON and Co. prepare this ingenious Protector, which perfectly secures dahlias and other delicate plants from attacks of molluscæ. During a trial of twelve months by the original inventor, it was found that not a plant was injured that had the protection of these galvanic circles; although during the same period, plants on all sides suffered severely that were not so protected.

The following cut and description will explain its operation.

The Protector consists of a conical ring of zinc about 4 inches in height; the top end (*a b*) is flanged off about a quarter of an inch, and cut into vandyked points; immediately under is a ring of copper neatly fitted (E F).

(Galvanic Plant Protector.)

It is thus used:—the bottom of the zinc ring (*c d*) is pressed into the soil until the lower edge of the copper ring is about one inch and a half above the surface, care being taken to inclose within the ring the rods of such plants as may require them, otherwise the molluscæ find a road to the plant by the rods. The molluscæ may crawl up the zinc with impunity; but on coming in contact with the copper, will receive a galvanic shock, and immediately turn away, or fall to the ground. If the larger of this tribe attempt to stretch across and above the copper belt, avoiding contact, they would be incapable of holding by the points. The protector acts in wet or dry weather, and is always in action.

For the protection of fruit trees, the same principle is applicable.—Strips of zinc and copper are prepared by Treggon and Co., which being judiciously placed along the wall, and round the stems of each tree, effectually preserve them.—*Abridged from the Mechanics' Magazine*, No. 925.

CALORIFIC SUSTAINING BATTERY.

MR. DE MOLEYNS has noted to the British Association his discovery of a voltaic combination of extraordinary energy. To this combination he has given the designation of the Calorific Sustaining Battery, from its amazing calorimotive powers. He states that the

energy of the combination is such, that with three pairs of metals, exposing no more than six square inches of surface, the battery will liberate five cubic inches of mixed gases per minute; heat to a bright red, six inches of platinum wire, 1-50th of an inch in diameter; and charge electro-magnets proportionally. Mr. De Moleyns adds, that the combinations are such that there is no counteraction, so that he has the sum of the affinities instead of their difference. There is also the additional advantage that there are no unpleasant fumes, and that the battery can be made to sustain its power for any period required.

ELECTRIC THERMOMETER.

MR. E. SOLLY has substituted for the battery the following Thermo-electric arrangement, which he finds to give abundance of power, and is not liable to the defect which the use of the battery involved.

A piece of copper wire, 1-24th of an inch in diameter, and of sufficient length to reach from the furnace to Mr. Solly's sitting-room, was joined by twisting the ends to a similar piece of soft iron, the ends of both having been previously well cleaned with sand-paper. The two wires were then secured in a convenient manner by small nails to the walls of the rooms they had to pass through, care being taken that they were not any where in contact with each other, except at the two extreme points of junction; the one of them was so placed in the flue of the furnace that it was completely exposed to the action of the hot-air and smoke at that part where the flue left the body of the furnace; whilst the other joint was in Mr. Solly's room in contact with the thermometer, and surrounded with cotton, so as to protect it from sudden changes of temperature. The copper wire was then divided about a foot from the joint thus protected; and the two ends of the wire being connected with the extremities of a galvanometer coil, the apparatus was complete.

A metallic circuit was thus made, consisting of two elements, including the additional length of copper wire in the coil of the galvanometer. The one joint or point of contact was, of course, always far hotter than the other, from the combustion in the furnace; whilst the other junction would always remain very nearly at the temperature of the air, and its variations could be readily known by the thermometer in contact with it. A current of electricity was thus generated, proportioned to the difference of temperature between the two joints, and a deflection of the galvanometer was caused, which increased when the furnace became hotter, decreased when it cooled, and at all times indicated accurately the changes of temperature taking place; thus giving Mr. Solly a thermometer which indicates, without his moving from the table, the exact rate of combustion going on in the furnace, 500 yards distant from the indicator. And so satisfactory has this arrangement proved, that Mr. Solly is convinced it would be found a very useful indicator of temperature in stoves, flues, and hot pipes, in many situations where a common thermometer is inapplicable.—*Abridged from the Philosophical Magazine*, No. 125.

ELECTRICITY OF STEAM.

THIS important phenomenon has been investigated by several inquirers during the past year.* Dr. C. Schafhaeutl, in the *Philosophical Magazine*, No. 114, considers the Electricity obtained from a jet of high-pressure Steam to be of similar origin to that obtained from the insulated and separated positive metallic disc of Volta's Electrophorus. He then details experiments, from which he concludes that steam, pure and free from contact with water, has, like all other gases, the property of being a non-conductor of electricity. The facility with which the spark passes through the water-gas is noticeable; the striking distance of the spark having increased from half an inch to one inch and a quarter; for, according to Mr. Harris's discoveries, the striking distances are, in ordinary cases, in the inverse ratio to the density of the gas.

If we now consider the fact, that the electricity of a jet of condensed steam is, according to Mr. Armstrong's experiments, positive; that the quantity of electricity obtained from a jet of high-pressure steam is in proportion to its condensation; further, that the steam contained in the boiler presents no appearance of free electricity; and that, according to Mr. Pattinson's experiments, both water and boiler are negative, which is a necessary consequence of Mr. Armstrong's experiments;—we perceive a simultaneous development of electric polarity in opposite directions from a central or neutral point, as in the magnetic steel-bar; and this development of electric polarity can only be ascribed to the opposite change of molecular arrangements, as well as chemical condition of the water and steam column; and we must consider both electric poles as co-existent, and not separately.

If we ascribe the electricity of steam to its condensation, the circumstances under which that condensation takes place are likewise of great influence. The smallest jet of high-pressure steam develops more free electricity than 100 times greater quantity of low-pressure steam; another condition under which electricity is produced from a jet of steam, seems therefore to be *its rapid expansion* when issuing from the boiler; or probably, the quantity of caloric becoming latent during the expansion of high-pressure steam, has some relation to the quantity of electricity being set free. Even electricity in thunder-storms seems to be ascribable partially to the rapid currents of air whirling towards the centre of the clouds, as caloric is absorbed whilst the thunder-clouds are charging themselves.

In the same No. (114) of the *Philosophical Magazine* are some important experiments by Mr. Armstrong; in which he assumes as a fact, established both by reason and experiment, that the steam is in a neutral state in the boiler; and he thinks that he is equally supported in saying, that it does not exhibit positive electricity after leaving the boiler, so long as it retains its aeriform fluid.

* For the earliest details of this phenomenon, by Messrs. Armstrong and Pattinson, with Remarks by Prof. Faraday, see Year-book of Facts, 1841, pp. 132, 133, 134.

In No. 115 (*Philos. Mag.*) Mr. Williams notes from a repeated experiment, "that when steam, confined under pressure in a boiler, is suddenly allowed to escape into the open air, the liberated steam has its capacity for electricity increased; consequently, it leaves an insulated boiler in a negative state, which proved to be the case; for, on raising the safety-valve by means of a silk string and a piece of sealing-wax, *the gold leaves of the electrometer* opened one quarter of an inch with *negative electricity.*" Mr. Brayley, in a note, adverts to the precise analogy of volcanic lightning to the electric sparks given by effluent steam. Next is the important fact that steam issuing under a pressure of about 40 atmospheres, from the boilers of Mr. Perkins's steam-gun, is able only slightly to move the gold leaves of a voltaic condenser. Dr. Schafhaeutl then details some experiments made with a common Marcet boiler, from which he infers that "the observed free positive electricity in this case was solely attributable to the sudden condensation and separation of water from steam, caused in the experiment by its coming into contact with the internal surface of a glass bell." Next are experiments by M. Peltier, showing it to be "at the moment of the separation of the combined molecules of water that electricity is produced; it is at the moment that a chemical decomposition takes place, and not during the separation of the excess of water."

In the *Philosophical Magazine*, No. 117, will be found "Further Remarks," by Dr. Schafhaeutl. In No. 118 of the same Magazine, Mr. Armstrong thus briefly recapitulates what he had written on the subject:

1. That he had succeeded in producing a powerful electrical development by discharging highly compressed air from an insulated receiver of considerable capacity.

2. That on repeating the experiment a great number of times, he found the electricity manifested in the receiver to be generally *negative*, but occasionally *positive*.

3. That the intensity of the development had proved exceedingly unequal, the receiver having sometimes been so highly electrified as to yield a spark a quarter of an inch long; while at other times its electricity had been so feeble, that frequently he could detect no electricity at all.

4. That the electricity of the emitted air had been positive in every instance that he had tried it.

5. That he had more frequently succeeded in producing an electrical development when the receiver was cold, and contained a little moisture, than when it was warm and dry.

At the close of this paper, Mr. Armstrong supposes that the same cause which excites electricity in the steam-cloud, produces also the contrary electricity of the boiler; but, if it be so, he is not aware that there is any known principle upon which the effects can be explained, especially as the electricity of the boiler appears quite independent of the proximity of the jet.

For a further paper by Mr. Armstrong, see *Philosophical Magazine*, No. 121.

Mr. Armstrong remarks that "the production of electricity by steam has several advantages over the common method of obtaining it. An Electro-steam Apparatus is self-acting, which leaves the operator at perfect liberty to attend to results. Its high temperature renders its action independent of dampness in the atmosphere, which so greatly impairs the energy of an electrifying machine; and finally, its extreme simplicity secures it from derangement."

Mr. H. Meikle has communicated to *Jameson's Journal*, No. 59, some observations on the electrical phenomenon in the condensation of steam, observed at the Cramlington Colliery, near Newcastle, and noticed in the *Year-book of Facts*, 1841, p. 134. Mr. Meikle observes how inaccurately scientific men have expressed themselves regarding this phenomenon, calling it "the rapid production of electricity, which appears to accompany the generation of steam;" "the evolution of electricity by vapourization;" and "the evolution of electricity during the conversion of water into vapour;" whereas, the electricity is evidently evolved by a process just the very reverse, viz. by sudden change of transparent steam into water; for a cloud just consists of minute drops of water. The novelty in this case seems, after all, to consist chiefly in the intensity of the electricity; for the evolution of positive electricity, when transparent aqueous vapour suddenly assumes the form of a cloud, had been so often observed before, as to leave little doubt that it will be found to hold universally when once adequate means have been devised for protecting it; and conversely, that steam, instead of evolving electricity at its formation, must then absorb it as a necessary and constituent ingredient. Prof. Faraday thinks that the case at the Cramlington Colliery "brings us much nearer to the electrical phenomena of volcanoes, water-spouts, and thunder-storms, than before;" but not nearer, Mr. Meikle presumes, than Mr. Espy's new theory (published near a dozen years ago by Mr. M.) does; because it refers these phenomena to the evolution of electricity by the sudden condensation of aqueous vapour.

On June 4, Prof. Grove shewed at the London Institution, the electric spark as produced by the condensation of effluent steam. At one extremity of a brass insulated conductor was suspended a copper plate of about seven inches diameter: the jet of steam issuing from a tube connected with the boiler of a model low-pressure steam-engine, impinged upon this plate, and several sparks of a quarter of an inch in length were drawn from the conductor. The electricity of the conductor was shewn to be positive. A Leyden phial was charged, &c.

ELECTRO-MAGNETIC LOCOMOTION.

Mr. R. Davidson, an ingenious mechanic of Aberdeen, has succeeded in employing the Electro-magnetic power in producing Motion, by simply suspending the magnetism without a change of poles. The mode employed by Jacobi, Davenport, and Störer, consisted in keeping the repulsive power, (equal to a third only of the attractive power,) in operation during one half of the time, and the attractive power during the other half. Mr. Davidson simply communicates and cuts off alter-

nately the galvanic current to and from a pair of electro-magnets that always act attractively, so as to exert a constantly moving force upon the machine which is put in action. By this means, Mr. Davidson has exhibited in Edinburgh several working models of different machines; as a turning-lathe, a printing-machine, a saw-mill, and a locomotive carriage, driven by electro-magnetism.—*Scotsman; abridged.*

NEW ELECTRO-MAGNETIC MACHINE.

On August 17, Mr. B. Hill described to the Electrical Society his new Electro-magnetic Machine. The polarities of the rotating magnets were so adjusted as to make available both the attractive and repulsive results, thus producing a power equal to the *sum* of three; whereas in other machines, the power is equal only to the difference.

ELECTRO-MAGNETISM AS A MOTIVE POWER.

At the meeting of the Leipsic Polytechnic Society, in April, Herr Störer exhibited his Electro-magnetic Machine, consisting of only two concentric circles of spiral iron bars, surrounded by conducting wires for the reception of the electric current. Each circle contains twelve single bars, placed at the distance of from two and a half to three inches from each other, the bars of the outer circle being about half an inch separated from those of the inner. The outer circle is fixed; the inner forms the periphery of a moveable disc, swinging-wheel, or pinion. This mechanism is brought into connexion by two conducting wires with a galvanic battery, in such a manner that in the first place the bars of the one circle with positive electricity surround those of the other with negative electricity; then suddenly, by an arrangement in the conducting apparatus, the current is changed, and thereby electricity of the like name is produced in both circles. By this operation, the opposite bars, in consequence of the different magnetic power communicated to them, first attract each other; then instantly becoming, by the inversion of their poles, similar magnets with equal force, repel each other. By this regularly repeated alternation of attraction and repulsion, each bar of the internal moveable circle is in succession drawn towards all the bars of the external fixed circle, and then driven as it were back on the next, whereby the whole disc is brought into a state of uniform motion.

The present machine, though only double the size of the one Herr Störer first constructed, which had six pair of bars, acts with a six-fold increase of force. Each galvanic element consists of a copper cylinder, a zinc cylinder within it, and a chemical mixture by which they are connected. As respects the effect of the number of elements employed, Herr Störer makes the following observations, the accuracy of which he has proved by experiments:—"In the connexion with a single element the machine raises, with moderate velocity, 3lb.; with two elements, 13lb.; with three, 25lb.; with four, 40lb. This is approximately an ascending gradation of power in the ratio of 1, 4, 8, 12, whence it certainly would appear that the force might not be

found to augment exactly in the relation of a progressive increase of the elements." According to Herr Störer's calculations, the connexion of a battery of 50 elements, with a machine in cubical contents 26 times greater than the one exhibited, would produce an effect equivalent to 50-horse power.—Abridged from the *Leipsic Allgemeine Zeitung*.—For Jacobi's researches, of which Herr Störer's machine is an amplification, see *Year-book of Facts*, 1841, p. 138.

ELECTRO-MAGNETIC PRINTING-MACHINE.

On Aug. 2, the first public exhibition of Mr. Bains's Electro-Magnetic Printing-Machine took place at the Polytechnic Institution. This novel application of electro-magnetism was introduced and explained in a succinct lecture on the subject, and by a comparison between the inventions of Professor Wheatstone and others with the above instrument. It surpasses its predecessors in this striking and most important point—viz. that while previous inventions required the constant attendance of some agent at the terminus to which the communication was to be made, this instrument may be left at the terminus wholly unprotected and watched; and yet the information communicated from the other extremity of the line would be found legibly in type by the curator, on his return after a short or prolonged absence. Mr. A. Bains, the inventor and patentee of the machine, was in attendance, and explained its capabilities.—The apparatus consists of a dial-plate, inscribed with the alphabet and numerals, with a revolving hand, moved by ordinary clock-work. On the other side of the room stood the important portion of the invention—that which furnished in type the communication to be sent forth from the dial-plate already described. Between these two machines, a connexion, (capable of being extended in practice to any length,) by means of wire-conductors, communicating with two electro-magnets placed on a frame, and connected with a cylinder covered with paper, upon which the type was to leave its impression, was an horizontal wheel, in which types to correspond with the letters and figures on the dial were fixed. This wheel was ingeniously brought in contact with an inking roller, and these three portions of the machine were all brought into motion horizontally. The party directing the communication stands at the dial-plate first described, and fixes a peg under the letter desired to be communicated. The index or revolving hand performs its rotation until its progress is arrested by coming in contact with the peg. A small trigger is next pulled, the galvanic power is then brought to bear by the aid of the communicating wires upon the two electro-magnets, with their machinery on the second frame, and the letter thus communicated is printed upon the paper affixed to the cylinder.—The machine, though at present it may fail as a speedy means of communicating information in print, still by the adoption of a code of signals, (by which one letter or character might be construed to denote a sentence or describe a subject,) the invention might be made extremely valuable.—*Abridged from the Times.*

EXPERIMENTS WITH A WATER BATTERY.

On Oct. 9, Mr. Noad described to the Electrical Society his employment of a Water Battery consisting of 500 pairs, and thus produced effects closely analogous with those from the electrical machine. Among the results, the deposition of carbon, when the electrodes were placed in the flame of a candle, was very characteristic of the peculiar action under these circumstances. The nature of the deposit was first noticed by M. Gassiot.

VOLTAMETER, &c.

On April 20, was described to the Electrical Society, by J. P. Gassiot, Esq., F.R.S., a Voltameter, containing five pairs of electrodes, so arranged as to enable the experimenter to use one or more pairs at pleasure. From G. Mackrell, Esq., were also read details of experiments, wherein the five terminal wires of a voltaic battery were ignited at the surface of acid water, forming a part of the circuit. The negative wire was heated to a greater degree than the positive. There was likewise read from T. Pollock, Esq., a description of the deflections of the Galvanometer, dependent on the change of colour, &c., produced in certain liquids by the application of heat to one arm of a tube containing them. The author concludes that Dr. Black's law of capacity for heat will enable us to explain the electrical phenomena.

THE GYMNOTUS AT THE ADELAIDE GALLERY.

On Oct. 19, there were read to the Electrical Society, the results of certain experiments made by Prof. Schonbein with the Gymnotus at the Adelaide Gallery; after which the author examined the reasons which have induced some philosophers to attribute its electrical powers to the peculiar physical or mechanical construction of the electric organ, and adduced a mass of facts in proof that this organ bears very little analogy to Volta's pile. For instance, it consists of a combination of substances possessing naturally but a very feeble electro-motive power; and yet the fish will give shocks equal in force to those obtained from a very large Leyden jar charged at its maximum, or from 200 pairs of a highly-excited voltaic battery. Again, the creature dwells in a conducting medium, which completes at all times the circuit between the poles of its organ, and yet no passage of electricity occurs but at its will; it is precisely as if it possessed a means of insulating or uninsulating the apparatus at pleasure; although physiologists have not detected any arrangement fitted for such a purpose. The fish can regulate the intensity of its discharges at will; which is especially evident when a comparison is made between the effects by touching it with the human hand, or through the medium of a metallic conductor. The power evidently depends upon an intimate union, of which we know not the nature, between the vital powers and the physical functions of this organ; for, like all vital organization, the power is exhausted by repeated efforts.—*Translated by the Secretary of the Electrical Society.* [The *Year-Book of Facts*, 1840, contains two papers, (pp. 129

and 138,) on the Gymnotus, by Prof. Faraday; and a third paper, by M. Gassiot, (p. 130,) with a vignette of the creature in the title-page. It will be seen that Prof. Faraday agrees with his predecessors in recognizing the identity of the peculiar power of the Gymnotus with ordinary electricity; thus differing materially from the above views of Prof. Schonbein.]

THE TORPEDO.

On March 4, was read to the Royal Society, a paper, entitled, "Miscellaneous Observations on the Torpedo," by J. Davy, M.D.—The experiments described in this paper were made on a single fish, of middle size, recently taken out of the water. Portions of the electrical organs, cut transversely in thin slices, exhibited under the microscope many elliptical particles, apparently blood-corpuscles, the long diameter of which was about 1-800th, and the short about 1-1000th of an inch, with a few filaments, apparently nervous, irregularly scattered —some of them tortuous, and all about the 2000th of an inch in diameter. The latter bore no resemblance to muscular fibres. The blood contained some globular particles, having a diameter of the 4000th of an inch, mixed with the elliptical. The mucus for lubricating the surface was found to contain globules apparently homogeneous in substance, but of irregular outline, and in size varying from the 2000th to the 270th of an inch.*

ELECTRO-CHEMICAL PRINTING IN COLOURS.

Mr. Baggs, of Cheltenham, has patented the following application of the Chemical powers of Electricity to Printing in Colours. The mode of printing is as follows:—Pieces of metal of $\frac{1}{16}$th of an inch thick are cut in the form to be delineated from plates of different metals. Thus, if it were desired to print a yellow flower with green leaves and a brown stalk, the flower would be cut out in iron, the leaves in copper, and the stalk in silver; these pieces are soldered upon a copper plate, and their surface ground to a true plane. The required lines are next formed in the leaves and flowers with a graver in the usual way; it is then ready for printing. Paper, in order to be printed from this plate, is wetted with a solution of carbonate of soda, and placed on the negative pole of a galvanic battery with the plate upon it; on bringing the positive wire in contact with the plate, the alkali of the carbonate passes to the negative pole, and the acid to the positive pole; where, acting upon the different metals, it produces a copy of the design in its proper colours. To print by means of frictional electricity, the design is formed by cementing a number of very small platinum wires on to a glass plate, which is laid on paper moistened with any suitable solution. If iodide of potassium and starch be used, on passing a charge of electricity through it, a purple impression of

* For Mattucci's elaborate researches on the Electrical Phenomena of the Torpedo, see Year-book of Facts, 1839, p. 109; and for a paper by Professor Faraday, Year-book, 1840, p. 109.

the design will be produced; but other metals and solutions may be used.

The second portion of the patent proposes an improved mode of employing tests in printing.—*Mechanics' Magazine, No.* 940.

ELECTRO-MAGNETIC CALICO-PRINTING.

Mr. Lockett, of Manchester, has patented the application of the Electro-magnetic precipitation of copper to engraving for Calico-printing. In order to form a cylinder, a shaft or mould is taken of the size required, which may be a conductor, and form part of the finished cylinder; or it may be a non-conductor, and removed from the cylinder after it is completed. This shaft being immersed in a solution of copper, is connected with the positive wire of a voltaic apparatus. A surface of metal, from which the cylinder is to be formed, is placed in the vessel touching the shaft, which metal is connected with the negative pole of the battery, by the action of which the cylinder is formed.

The patentee also explains a method by which he erases any desired portions of engraved plates or cylinders, by filling up the engravings on such parts with metal. Those portions of the plate or cylinder that are to remain unaltered, are protected by coating them with a suitable varnish. The parts to be erased are to be thoroughly cleansed with diluted nitric acid, (one part nitric acid to twenty parts of water,) and are then filled up by precipitating copper upon them by the electro-magnetic process.

After the cylinders have been formed in this manner, they are finished, by having a smooth and true surface given them by means of rotary files or cutters, turned by suitable gearing.

ELECTRO-MAGNETIC CLOCK.

The following are the details of the Electro-magnetic Clock, recently invented by Mr. C. Wheatstone, and described before the Royal Society:—The object of the apparatus is that of enabling a single clock to indicate exactly the same time in as many different places, distant from each other, as may be required. Thus, in an astronomical observatory, every room may be furnished with an instrument, simple in its construction, and therefore little liable to derangement, and of trifling cost, which shall indicate the time, and beat dead seconds audibly, with the same precision as the standard astronomical clock with which it is connected; thus obviating the necessity of having several clocks, and diminishing the trouble of winding up and regulating them separately. In like manner, in public offices and large establishments, one good clock will serve the purpose of indicating the precise time in every part of the building where it may be required; and an accuracy insured which it would be difficult to obtain by independent clocks, even putting the difference of cost out of consideration. Other cases, in which the invention might be advantageously employed, were also mentioned.

In the electro-magnetic clock, which was exhibited in action in the

apartments of the Society, all the parts employed in a clock for maintaining and regulating the power are entirely dispensed with. It consists simply of a face with its second, minute, and hour hands, and of a train of wheels which communicate motion from the arbor of the second's hand to that of the hour hand, in the same manner as in an ordinary clock train; a small electro-magnet is caused to act upon a peculiarly constructed wheel, (scarcely capable of being described without a figure,) placed on the second's arbor, in such manner that whenever the temporary magnetism is either produced or destroyed, the wheel, and consequently the second's hand, advances a sixtieth part of its revolution. It is obvious, then, that if an electric current can be alternately established and arrested, each resumption and cessation lasting for a second, the instrument now described, although unprovided with any internal maintaining or regulating power, would perform all the usual functions of a perfect clock. The manner in which this apparatus is applied to the clocks, so that the movements of the hands of both may be perfectly simultaneous, is the folllowing. On the axis which carries the scape-wheel of the primary clock a small disc of brass is fixed, which is first divided on its circumference into sixty equal parts; each alternate division is then cut out and filled with a piece of wood, so that the circumference consists of thirty alternations of wood and metal. An extremely light brass spring, which is screwed to a block of ivory or hard wood, and which has no connexion with the metallic parts of the clock, rests by its free end on the circumference of the disc. A copper wire is fastened to the fixed end of the spring, and proceeds to one end of the wire of the electro-magnet; while another wire attached to the clock-frame is continued until it joins the other end of that of the same electro-magnet. A constant voltaic battery, consisting of a few elements of very small dimensions, is interposed in any part of the circuit. By this arrangement, the circuit is periodically made and broken, in consequence of the spring resting for one second on a metal division, and the next second on a wooden division. The circuit may be extended to any length; and any number of electro-magnetic instruments may be thus brought into sympathetic action with the standard clock. It is only necessary to observe, that the force of the battery and the proportion between the resistances of the electro-magnetic coils and those of the other parts of the circuit, must, in order to produce the maximum effect with the least expenditure of power, be varied to suit each particular case. In the concluding part of the paper, the author points out several other and very different methods of effecting the same purpose; and in particular, one in which Faraday's magneto-electric currents are employed, instead of the current produced by a voltaic battery: he also describes a modification of the sympathetic instrument, calculated to enable it to act at great distances with a weaker electric current than if it were constructed on the plan first described.

Messrs. Barwise and Bain have patented a mode of communicating Motion to Clocks by Electricity; for details of which see *Mechanics' Magazine*, *No.* 940.

PERFORATION BY ELECTRICITY.

On July 20, Mr. Crosse illustrated to the Electrical Society, the Perforation of Non-conducting Substances by the Mechanical Action of the Electric Fluid. Two wires were laid end to end and tied firmly on a piece of window-glass, and a quick succession of sparks was passed between them by connexion with the respective conductors of a powerful machine; the result was a perforation. The same was varied in several ways; and was afterwards successfully tried with a crystal of quartz. The author concludes that even diamonds may be thus drilled.

SOUNDING THE SEA BY ELECTRO-MAGNETISM.

Mr. Bain has, for this purpose, contrived the following ingenious apparatus. To the bottom of the hammer of a bell is attached a piece of soft iron, which is placed opposite an electro-magnet; and it is so arranged that when the communication between the coils of wire round the magnet and galvanic battery is completed, the magnet attracts the iron and holds back the hammer. As soon as the connexion is broken, the magnetic power ceases; and the hammer, acted on by the spring, strikes upon the bell. This part of the apparatus is intended to remain on the deck of the vessel when the soundings are made. The insulated wires from the galvanic battery, properly protected from the action of water, serve for the cord to which the weight is to be attached.

When the pressure of the weight bears on the hook, the electrical current is interrupted, and the magnet keeps the hammer from the bell; but when the weight rests on the ground the connexion is broken, the attraction of the magnet instantly ceases, and the hammer, being thus liberated, is forced against the bell by the spring. It thus indicates with the utmost precision the moment the weight reaches the bottom of the sea.—*Mechanics' Magazine*, No. 923.

ENGRAVING BY VOLTAIC ELECTRICITY.

Messrs. Spencer and Wilson, of Liverpool, have patented the following improvements in Engraving on Metals by Voltaic Electricity. The plate to be engraved is first coated with an etching ground, or other protecting substance, through which the drawing, &c. is made with a fine-pointed instrument; taking care that the metal is completely exposed wherever the lines are required. The plate thus prepared is connected with the negative pole of a galvanic battery, and placed in a vessel containing a solution of sulphate of copper. A second plate of copper, connected with the positive end of the battery, is then placed in the same vessel with the plate that is to be engraved.

The electric circuit being thus completed, it will begin to bite out the metal from those parts of the first plate which have been exposed by removing the etching ground; the extent of this action being regulated by the distance of the two plates from each other, by the quantity and intensity of the electric current, and the time allowed for its action. When a cylinder is to be engraved in this manner, is is to be

prepared by the same method as the plate, and placed within a cylinder of copper in the solution.

To engrave on steel, it is placed in a solution of common salt, or some other alkaline, earthy, or metallic salt, and is opposed by a steel plate in lieu of copper. When silver is to be engraved, a solution of sulphate of soda or sulphate of silver is employed, and a silver plate in opposition. In the case of gold, the solution should be a solution of hydrochloric acid, or a soluble chloride, with an opposing surface of gold.

Other metals can be engraved by this process in like manner.—*Mechanics' Magazine, No.* 924.

Mr. G. H. Hoffman, of Margate, proposes certain modifications of the processes at present in use. A flat copper-plate, such as is used by engravers, is to be covered with thick soft etching-ground; in this grooves are to be scratched or cut, or dots stippled with a blunt or sharp point down to the copper, as in common etching: the plate is then to be immersed, and the copper deposited in the usual manner, and the electric action to be continued until the deposit forms one solid sheet. The compound plate is then to be heated over a spirit-lamp, so that the etching-ground may be melted and run out. The plates are then to be separated, and after carefully polishing with hot oil of turpentine, the engraving will appear bright, sharp, and perfect.—*Athenæum, No.* 708.

A Correspondent of the *Athenæum*, No. 696, has communicated the two following methods:—Take a tablet of plaster of Paris, and, having heated it, apply wax for absorption to all the faces save that on which you intend your drawing to be, and to that one apply your drawing, executed with lithographic ink, on lithographic transfer-paper. Let the side of the tablet on which is the transferred drawing, be now dipped in weak acid and water, and then permitted to absorb a solution of sulphate of copper. By electro-metallurgy, a deposition of copper can be made on all parts stained with the sulphate. Ere this coating be too thick, let the tablet be removed from the vessel in which this last operation has been carried on, washed carefully, dried, and a mixture of isinglass and gin be poured on it; its redundancy be gently blotted off with blotting-paper till the surface be level, (*i. e.* the copper lines and isinglass cement be of the same height): again let the deposition take place, and again its succeeding operation; after which let common black-lead be rubbed over the whole surface; and the deposition being renewed, a copper mould, from which a type-metal block may be subsequently cast, is now formed. *Another method.*—Draw with a pen dipped in warm isinglass coloured cement, and when your drawing be dry, for an instant expose it to steam, and then coat it with leaf gold. Proceed by electro-metallurgy, as in the last method, and no cast is necessary.

ELECTROTYPE MANIPULATION.

On May 16, Mr. C. V. Walker read to the Electrical Society, "Some general Observations on Electrotype Manipulation, and on the

construction of a constant Acid Battery," resulting from a long series of experiments. He described the most advantageous diaphragms, battery cells, and materials for moulds, and spoke very much in favour of "a constant acid battery," the construction of which was described. It is slow in its action, but the deposits obtained are in every respect good. No battery can be better fitted to deposit coatings on objects.

Mr. C. V. Walker has also published a little manual of "Electrotype Manipulation: being the Theory, and Plain Instructions in the Art of Working Metals, by precipitating them from their Solutions, through the agency of Galvanic or Voltaic Electricity." This little treatise familiarly explains the several processes in manipulation, and the precautions to be observed to insure success; as in the preparation of moulds, voltaic apparatus to be used, browning, coating casts, multiplying engraved plates, &c.

Mr. Smee's volume of *Elements of Electro-Metallurgy* must be considered as the most valuable contribution of the year to the knowledge of this very interesting process. In illustrating its popular application, Mr. Smee observes:—Now "a person may enter a room by a door having finger-plates of the most costly device made by the agency of the galvanic fluid—the walls of the room may be covered with engravings, printed from plates originally etched by galvanism, and multiplied by the same fluid—the chimney-piece may be covered with ornaments made in a similar manner—at dinner, the plates may have devices given by electrotype engravings, and the spoons gilt by the galvanic fluid."

Mr. Smee's work consists principally of the results of his own experiments, by which he has fully developed the laws of metallic precipitation. To the manufacturer and the artist it must be invaluable, from the multiplicity of information it conveys on the subjects of gilding, plating, making coins and medals, copying seals and plaster casts, sculpture, printing, and engraving. The botanist may learn from it how to make an imperishable *hortus siccus*.

"The dentist requires, for artificial teeth, an exact cast of the mouth in gold, platina, or palladium. Now the cost of the manufacture of this is so expensive, that many are prevented from availing themselves of these valuable appendages. It is absolutely necessary that the gold should fit very accurately, or else the wearer is not able to use them. Electro-metallurgy might be brought to aid the mechanic.

"Even to the surgeon electro-metallurgy seems likely, in many cases, to be very valuable; for when he is desirous of exerting constant pressure on any part, or of confining any part in a particular position, he can make a copper instrument exactly to suit any individual case that may occur, by first taking a cast in plaster of Paris; or, which will be more simple, by a piece of gummed sheeting."

ELECTRO-METALLURGY.

THE applications of the Electro-metallurgic process have been so numerous during the past year, that we can only attempt to record a few of the more striking illustrations and results.

On Jan. 22, Mr. Brande illustrated, at the Royal Institution, this very popular scientific novelty. The elementary facts of Electro-metallurgy, and the best arrangements for throwing down the copper on the medal to be copied, being premised, Mr. Brande observed that the copper precipitated is entirely free from impurities, and greatly superior to common copper. If the metal could be thrown down on a plain, it could also on an engraved plate, most successfully; and, when separated, the galvanic plate would be a perfect copy in relief of the engraved one, and serve as a matrix for further depositions, plate after plate, if required, in indent, whence impressions may be taken *ad infinitum*. The voltatype prints are considered fully equal, if not superior, to proof engravings. Thus, then, may the most costly engraving be multiplied, and be greatly reduced in price: that superb engraving of Knox preaching before Mary, which cost between two and three thousand guineas, and can, consequently, only be sold at a high price, may have endless prints worked from the plate by means of the voltatype. Not only have engraved plates been copied, but those bitten out with acid, and those perfected by burnishing called mezzo-tinto. Steel-plate engravings can also be copied, as well as wood-cuts, plaster casts, seals, &c. The requisite for the operation with non-conducting substances, however, is that the material, wood or wax, &c., should be, where the copper is to be deposited, coated with a metallic film. Mr. Murray has found to this end the most simple and sufficient means—the black-lead brush. A coating of black-lead is the nucleus of the precipitated metal, and hence the device should be completely covered with it. The other parts of the material, if, for instance, plaster of Paris, and pervious to moisture, should be, previous to being placed in the solution, soaked in tallow. The specimens were numerous and beautifully-engraved plates, both in relief and indent, medals, coins, fruits, vegetables, &c. The brightness and peculiarity of the colour of the copper covering a cucumber, orange, &c. exhibited all their characteristics of form and figure; and the incrustations were curious and ornamental. Our potters and calico-printers, gilders, and other manufacturers, will soon feel the benefits to be derived from this new art.—*Literary Gazette, No.* 1254.

Mr. A. Smee subsequently read to the Royal Institution a paper upon the Laws of Electro-Metallurgy; in which he particularly enforced the grand principle, that to obtain any requisite state of deposition, from any metallic solution, from any strength of solution, from any salt, the galvanic power must be regulated to the strength of the metallic solution. Among the illustrations, the reduction of gold with relation to gilding was explained; and a silver spoon was gilt in the presence of the audience, with the potassa solution of the oxide of gold. Several silver forks and spoons, a sugar basin gilt of an excellent colour by this process, were exhibited; and the lecturer stated that it was coming into use at Clerkenwell, which would materially save the health of the workmen, who suffer severely by the mercurial fumes of the present process. The reduction of silver was exhibited from the ammonio-carbonate, and several medals made in this way were shown.

A large candelabrum, and other articles, were exhibited, plated by Elkington, of Birmingham, by a process patented by him.—For further details of this paper, see *Athenæum, No.* 697.

Gilding and Plating.—On Sept. 21, Mr. C. V. Walker described to the Electrical Society, "A Method of Electro-gilding and Electro-plating at the expense of a gold or a silver Anode." The object is usually effected at the expense of a gold or silver solution, forming one of the exciting liquids in a single cell; and its strength is maintained by adding, from time to time, fresh supplies of the salt. Mr. Walker, however, has proved by experiment, that from cyanide of silver, when electrolysed with a silver anode, an anion will be released that will combine with the anode, and that the like result attends the electrolysis of the cyanide of gold. The author employed a silver plate, which was considerably consumed; and a gold wire, which was also much acted upon. He recommends this as a surer, more simple, and a much more economical method; and conceives that by this means, the expense of each operation is reduced to a minimum. The communication contained a description of a "Regulating Apparatus," to be employed when rich deposits are required; with instructions for the management of the apparatus, &c.

Seals.—Instead of applying spirits of wine as hitherto directed, hold the sealing-wax impression over the mouth of a Florence flask, having a small tube, from which the vapour of spirits of wine is proceeding, by the agency of a lighted candle placed below; black-lead powder is instantly applied by a camel hair brush; and, lastly, a fine point of wood being nicely passed over it, produces a burnished surface. Another plan:—when you remove the copper deposit from the sealing-wax, touch the back with a soldering-iron, for the purpose of tinning the surface; and then having poured on lead or the fusible alloy, you obtain a sufficient mass to enable you to form a seal.

Busts.—The Bavarian sculptor, Stigelmayer, has brought to great perfection the galvano-plastic process. In the space of two or three hours, colossal statues in plaster are covered with a coat of copper, which takes with the greatest accuracy the most minute and delicate touches, giving the whole the appearance and solidity of the finest casts in bronze. M. Stigelmayer has also applied his process to the smallest objects, as flowers, plants, and even insects, bringing them out with such accuracy, that they seem to have been executed by the hands of the most skilful artists.—*Letter from Munich.*

Mr. Cheverton, the artist in ivory, has produced a small Electro-Bust, reduced by him in the first instance from Chantrey's model, of Dr. Dalton. It is the united result of his peculiar art of mechanical sculpture, and the new art of electro-metallurgy. It has all the appearance of having received the highest finish which the best chasing could bestow, and yet we are assured that it has not been touched in the way of improvement since it came out of the mould. A bust of some destructible material being prepared, a metallic coating is formed over

its surface by electro deposition, which on the removal of the inclosed mass, constitutes the mould for the electro-type bust to be deposited in, and from which it is detached by piecemeal. The preparatory process, by which the destroyed figures are produced, is not disclosed by Mr. Cheverton; but his facilities for multiplying them are such, that notwithstanding this apparently costly item in the manufacture, the Electro-Busts may be sold at one-half the price of bronzes in general.—*Mechanics' Magazine, No.* 928.

Medallions.—On Jan. 21, Mr. A. Smee delivered to the Numismatic Society a lecture on the Application of Electro-Metallurgy to the purposes of the numismatist. He first explained the principle of metallic precipitations by galvanism, which he illustrated by a piece of zinc and silver, the latter becoming coated with copper, when the two were immersed in a solution of that metal. The metals generally, and carbon, were then adverted to as capable of being employed instead of silver. The apparatus to be practically used by the numismatist, he divided into two kinds—the single cell, and the battery apparatus. In the first, the arrangement of the zinc and medal to be copied are similar to the constant battery. The battery apparatus is composed of two distinct parts, a galvanic battery and a precipitating trough. In the trough, a plate of copper is placed to be dissolved, in a solution containing two-thirds of saturated solution of sulphate of copper to one-third of dilute acid, containing one part of acid to eight of water; but Mr. Smee stated that any solution would suffice, as he could obtain copper of any quality. He then drew attention to the various modes by which Electro-Medallions might be made. By the first, a mould was taken directly by galvanic precipitation; but he recommended that this should never be attempted with valuable coins or medals. He next mentioned silver leaf, tin-foil, fusible metal, type metal, semi-fluid pewter, lead, &c. as capable of being used, but he stated that all these processes were, more or less, objectionable. The process for making moulds from non-conducting substances was next described: stearine, white-wax, bees'-wax, and rosin, sealing-wax, &c. were mentioned, as answering for the purpose of moulds. The latter was recommended for small coins and medals not less than half-a-crown. All these different moulds required preparation; that is, they must be coated with some conducting substance before they are placed in the metallic solution. Mr. Smee prefers plumbago; and he dwelt upon the different qualities of that material. The last non-conducting substance mentioned, was plaster of Paris. After the mould was made, it required to be saturated with tallow, stearine, spermaceti, white wax, &c. The process was shown at the lecture, by boiling a small plaster cast in tallow; after this preparation, the cast is black-leaded, and then it is ready to receive the metallic precipitation. Medals made by this process were exhibited to the Society; they were bronzed by a process devised by Mr. Smee. He then gave a brief sketch of other applications of Electro-Metallurgy, and exhibited electro-coppered baskets, fruit, leaves, and vegetables. At the conclusion, an electrotype copper-plate weighing fourteen pounds, made by Mr. E. Palmer from an ori-

ginal by Burnett, was exhibited to the Society: the impressions of both the original and duplicate were shown, and no difference could be detected between them.—*Athenæum, No.* 692.

On October 11, M. Arago presented to the Academy of Sciences, at Paris, a galvanoplastic bas-relief in silver, by M. Soyez, being the first application of the process to this metal. M. Soyez was of opinion that the process might be applied on such an extensive scale, that even the bronze work of the great elephant on the Place de la Bastille might be formed by means of it, instead of being cast.—*Athenæum, No.* 730.

COPPER VESSELS MADE BY ELECTROGRAPHY.

Mr. A. Jones has patented the application of Electrography to manufacturing purposes, by the production of tubes and vessels of all kinds in copper deposited by the voltaic agency. Moulds of wood, clay, earthenware, plaster of Paris, wax, or other non-conducting substances, are formed and coated with some conducting material in the usual manner; or the moulds are made of lead or other metal more fusible than copper. The mould is placed in a solution of nitrate or sulphate of copper and surrounded with a large cylinder of sheet copper, or of copper turnings enclosed in wicker. The mould is then connected by a wire with the positive end of a galvanic battery, and the surrounding copper with the opposite end, when the operation goes on for five or six days, at the end of which the article will be completed. The patentee also adapts a similar method for uniting the parts of metal together; the part not to be acted upon being protected by any of the resinous varnishes.

The claim is, to the manufacturing of copper tubes, and also of vessels, such as urns, covers, kettles, stew-pans, and the like, of the usual substance of such copper articles, wholly from copper, deposited or thrown down by the action of voltaic or galvanic electricity, as hereinbefore described, upon moulds.—*Mechanics' Magazine, No.* 928.

ANIMAL MAGNETISM.

During the past year, public attention has been again attracted to Animal Magnetism, in consequence of some exhibitions of its pretended powers in the metropolis. In July, M. Lafontaine, of Paris, operated at the Hanover Square Rooms, upon a youth, his servant, who became generally magnetised, that is, thrown into a state of insensibility, in two or three minutes, by a few mesmeric passes over the head, and by the contact of the thumb, which produced a sleep like death. Pins were thrust into the hands, temples, &c. of the patient without producing the slightest external symptom of suffering; and he held the wires of the voltaic battery, which shook his arms like rattles, but he seemed alike unconscious. He was then unmagnetised, and appeared in perfect health, and declared that he did not recollect anything that had happened to him. M. Lafontaine next operated upon two females, whom he sent to sleep in a very few minutes. At another exhibition, two gentlemen of Cambridge University presented themselves to M. Lafontaine; one of whom he sent to sleep in a very brief period; whilst the other, a more robust individual, gave striking evidence by being

acted upon by some very potent agency—by a sensation of suffocation in the throat, wildly dashing about the hands, the eyes gleaming wildly, and such symptoms as to alarm even the sceptics; and when unmagnetised, his return to sense was evidently a painful process.

Accounts of these experiments appeared in the *Times*, and other newspapers; and consequently, magnetism again became "a nine-day wonder." The Editor of the *Medical Gazette*, however, considers M. Lafontaine to be but "a poor magnetiser, or rather, that his patients were of an inferior class. The phenomena which they exhibited were of the most ordinary kind: they were merely thrown either into a state like that of a natural somnambulist, or into a deep cataleptic sleep, in which they were insensible, and some of their limbs rigidly fixed. But there was neither *clairvoyance* nor *prevoyance*, nor the development of any extraordinary power of the muscles, or of the imagination, or of the invention. The phenomena were far less striking than those produced in the patients of either Dr. Elliotson or the Baron Dupotet, and far less marvellous than those which formed the staple of the modern magnetisers in France." The Editor continues:—"It would not be difficult to show that the fallacy which lies at the foundation of a belief in Animal Magnetism—that is, in the possession by any person of a power, peculiar and else unknown, by which he can produce in others, conditions in which their senses are displaced, or any of their faculties marvellously exalted. We believe that every rational man, accustomed to observe diseases, finds in the real facts of magnetism no more than the results of diseased conditions, whose natural occurrence is well known, though rare; and which are produced in those who are unfortunately subject enough to such influences, by various impressions on the mind."

"In the exercise of animal magnetism, there is not employed any force different from those which are in operation every day, or deserving to be called by any other name than the force of imagination, or of imitation, or of fear, or of some commonly employed impression on the mind. There are in the facts of animal magnetism no other things than were known before it was invented; no others than have been often seen, both before and since, in diseases over which no pretended magnetic influence had ever been exercised; no other than exist in the ordinary phenomena of catalepsy and somnambulism, as they occur in those diseased from natural causes. On this too much stress cannot be laid,—the *facts* of animal magnetism are not new, nor peculiar to it; and the novel effects to which it pretends to give rise, the seeing without eyes, the discernment of internal diseases in the patients themselves or in others, the power of prophesying death, and other events, the peculiar discernment of metals, the magnetising of inanimate objects, the cure of organic diseases—all these, and all like them, are fallacies."—See *Medical Gazette*, *No.* 714, *August* 6.

It should be added that M. Lafontaine has since failed to magnetise individuals who submitted themselves to him; so that his recent exhibitions have only revived popular credulity for a short time, ultimately to disabuse the public mind of belief in his pretended art.

Chemical Science.

CHEMICAL SOCIETY OF LONDON.

THIS Association has been formed for the advancement of Chemistry, and those branches of science immediately connected with it, by periodical meetings for the communication and discussion of discoveries and observations relating to such subjects; an account of which shall be published by the Society, in the form of Proceedings or Transactions. The formation of a library of books relating to its proper subjects, of a museum of chemical preparations and standard instruments, and the establishment of a laboratory of research, are also ulterior objects of the Society. Its first meeting took place on March 30; Prof. Graham in the chair.

ACTION OF INORGANIC COMPOUNDS ON THE BLOOD.

ON Jan. 21 and 28, Mr. Blake, M.R.C.S. read to the Royal Society a paper "On the Action of certain Inorganic Compounds when directly introduced into the Blood;" the result of experiments with the salts of baryta, strontia, lead, silver, soda, ammonia, magnesia, zinc, &c., which he had injected into the arterial system of certain animals. The salts of zinc had the most deleterious action on the heart; the salts of silver were like those of lead, but less deleterious; soda was like silver. With the salts of baryta, the muscular action after death was remarkable. The contractions were always in the thorax and the anterior extremity; the longest period after death when they occurred was 30 minutes. The lungs were enlarged, and hepatised. The author noticed the views of Haller and Orfila on the same interesting subject, and traced a close connexion between the physiological action of the salts in question and the chemical character.—*Literary Gazette*, No. 1254.

SOLIDIFICATION OF SULPHUR.

M. REGNAULT has noticed a curious fact, relative to Sulphur, when solidifying, after it has been previously reduced to the state of a paste. It is known that sulphur, when kept in fusion for a certain time, changes its colour, becomes of a hyacinth-red, and acquires the property of remaining soft for a long time, by plunging it into cold water. M. Regnault has observed, that sulphur, in this state, when submitted to a temperature of about 208 degrees Fahrenheit in a stove, liberates a great quantity of heat in becoming solid, so as to raise the thermometer suddenly to 231 degrees. When the solidification is effected, the thermometer returns to the temperature of the stove, and there continues.

ATOMIC WEIGHT OF CARBON.

M. DUMAS has communicated to the Academy of Sciences, at Paris, the result of experiments carefully conducted by M. Stas and himself, for ascertaining the exact Atomic Weight of Carbon, which they had reason to suspect had been estimated rather too high by Berzelius; and they conclude that the number which expressed the proportion in which carbon would combine with other substances should be diminished about two per cent. Thus, in the composition of carbonic acid, instead of allowing the proportions to be 800 of carbon and 306 of carbon, they should be altered to 800 of oxygen and 300 of carbon. This is a most important result, since it will alter the formulæ of an immense number of chemical combinations.—*Literary Gazette*, No. 1250; *abd.*

CONVERSION OF CARBON INTO SILICON.

ON May 3, was read to the Royal Society of Edinburgh the following paper on "Experimental Researches on the Production of Silicon from Paracyanogen."—By J. Brown, M.D. The author intimated in a former paper, that he had been led to infer from experiments that two familiar substances, long and universally regarded as distinct elements, are only modifications of one and the same material form; and having extended his inquiries, he now ventures to maintain that Carbon and Silicon are isomeric bodies. The method in which he establishes this proposition is very simple, and consists in the description of a number of processes by which carbon may be transferred into silicon; and crucial experiments, intended to prove that there is no intelligible source of fallacy in the processes which are given. Accordingly, the present communication is of a very practical character. It is composed of five sections: the first treats of the production of silicon from free paracyanogen; the second of the formation of amorphous, mixed siliciurets of copper, iron, and platinum, by the reaction of paracyanogen on these metals; the third, of the quantity of nitrogen separated from paracyanogen when it is changed into nitrogen and silicon; the fourth describes processes for the preparation of definite and crystalline siliciurets of iron from the paracyanide of iron, and from ferrocyanide of potassium; and the fifth gives easy formulæ for the extraction of silicic acid from the ferrocyanide of potassium by the action of carbonate of potassa.

If Dr. Brown's observations be corroborated by those who repeat his singular experiments, there will be opened up a new sphere of geological inquiry of the highest order. With the aid of a transelemental chemistry, (for we understand Dr. Brown has transformed several other elementary forms besides carbon,) we may approach the subject of the molecular genesis of the earth; and the geological relations of carbon and silicon are certainly sufficiently striking to warrant the entertainment of this hope. As it is, there are several points in natural history which seem to be illustrated by the particular case of transformation now in hand. As one instance, we could

specify the siliceous character of many organic remains, found in circumstances in which the source of silicon is perplexing and unintelligible.

Professor Traill has no hesitation in saying, that since the early days of Davy, when that great chemist brought the metalloids to light, no investigation has been made approximating in importance to the present.

Professor Christison has searched, along with the author, but in vain, for grounds of fallacy, and he has formed the very highest estimate of the value and importance of these results—*Annals and Magazine of Natural History; June.*

The following are directions for the preparation of silicic acid from ferrocyanide of potassium.*

"Mix equal weights of anhydrous ferrocyanide of potassium and carbonate of potassa, and keep the mixture five hours, (for 2000 grains of the ferrocyanide,) at a good white heat, in a well-closed crucible of hammered iron. The product yields to water a mixed solution of cyanide of potassium, undecomposed carbonate of potassa, and silicate of potassa. The silicic acid may be separated by adding an excess of hydrochloric acid, ignition, and elutriation."—*Medical Gazette, June* 25.

Dr. R. H. Brett and Mr. J. D. Smith have performed a series of experiments on this alleged conversion of carbon into silicon; and the result in every one of their experiments is that the *carbon of paracyanogen is incapable,* by such of the processes as they have tried, which are recommended by Dr. Brown, of *conversion into silicon;* and are, in every instance, in complete opposition to those published by that author.—See *Philosophical Magazine,* No. 124.

To this letter Dr. Brown has replied, that Dr. Brett and Mr. Smith having specified that "the paracyanogen employed by them was produced by the decomposition of hydrocyanic acid," is sufficient to render almost all their experiments of no value. Again, Dr. Brown does not think that the authors have striven as they might: his experiments cost him eighteen months' incessant labour, and many a failure. Even so late as November and December, he tried to effect the alleged transformation before a celebrated physician and chemist six weeks in vain; but at last succeeded, or appeared to succeed.—See *Philosophical Magazine,* No. 125, p. 388—391.

CONVERSION OF FIBRIN INTO ALBUMEN.

M. LATELLIER has performed successfully the experiment of Denis, viz. of converting Fibrin into Albumen, by boiling 46 grs. of fibrin, well washed and pressed, in 155 grs. of water, and 7 grs. of carbonate of soda, until the magina which the mixture formed has disappeared. The result is in accordance with the view broached by Dr. Thomson, of Glasgow, upwards of thirty years ago, that albumen owed its fluid state to the presence of soda.—*Athenæum,* No. 691.

* Edinburgh Monthly Journal of Science, for June, 1841.

CHEMICAL RAYS OF SOLAR AND ELECTRICAL LIGHT.

M. BECQUEREL has arrived at the following conclusions "On the Chemical Rays accompanying Solar and Electrical Light."

1. The chemical rays which accompany solar light, and which act on the salts of silver, consist of at least two orders of rays: first, of the ordinary chemical rays, which I have named the excitators; and, secondly, of rays, which I have termed the continuators, and which only continue an action commenced by the first.

2. These latter, by their refrangibility, occupy the higher portion of the solar spectrum; that is to say, they accompany the red, orange, yellow, and green rays, and, perhaps, also the least refrangible of the blue: but in this latter case they are mixed up with the excitators.

3. Coloured screens: some allow only the continuators to pass, others both orders of rays.

4. The second order of rays also continues the action commenced by the chemical agent of electrical light; and may be of use in the examination and analysis of the chemical action of this latter agent.

AIR CONTAINED IN SNOW.

ACCORDING to Dalton, the quantity of oxygen in the atmosphere diminishes in proportion to the distance from the surface of the earth. Gay-Lussac, however, did not find this to be the result of his experiments: for air which he obtained at the height of upwards of 20,000 feet, contained the same proportion of oxygen as that procured from the neighbourhood of Paris. M. Boussingault has found, in common with others, that Air obtained from Snow contains less oxygen than that of the atmosphere. But this holds good with regard to the snow of the Andes, as to that of Paris. He admits, however, that this may not be the composition of the air as it exists in the snow; because, in order to obtain this air, it is necessary to melt the snow; the gas of the flask comes in contact with the water, little if at all impregnated with air resulting from the melting: and it is well known that in such circumstances oxygen dissolves more readily in water than the azote, and that the air with which water is saturated is richer in oxygen than that of the atmosphere. M. Dumas and M. Boussingault are at present examining the composition of atmospheric air*.—*Athenæum*, No. 697.

DEATH FROM AN EXPLOSION OF CARBONIC ACID.

AT the School of Pharmacy, in Paris, M. Hervy was preparing some Carbonic Acid in its liquid form, in Thilorier's apparatus, which is composed of two cylindrical reservoirs, of about the thickness of ten centimetres. Each of those cylinders had an interior space of about four litres. The carbonic acid was produced by the action of sulphuric acid on the bicarbonate of soda, which were introduced simultaneously into one of the cylinders. A communication was then established between this first cylinder and the other, and the carbonic acid passed into the second cylinder by distillation. In the first cylinder remained a residue, consisting of sulphate of soda, which was

* See page 106 of the present volume.

taken out to replace it by a new supply, in order to obtain a determinate quantity of the liquid carbonic acid: a quantity which, as we have seen, may be raised to four litres. The first cylinder is supported on two trunnions, which keep it in equilibrium, and allow an extensive degree of oscillation.

It was when M. Hervy was balancing the cylinder on the trunnions, to effect the mixture of the acid with the soda, that the explosion took place. At this moment, there was no one near except M. Hervy, and a friend who was assisting him. The latter was thrown down by the explosion, but was not struck by any fragment of the machinery. Not so M. Hervy. The apparatus was on the floor of the room, and the whole effect of the explosion was directed against his legs, which were cruelly mutilated, so as from the commencement to hold out little chance of saving his life. Amputation of one of the limbs was performed next day; and in three days more this unfortunate victim to science had ceased to exist.

The explosion was accompanied with a frightful noise, and considerable injury to the apartment. It is almost unnecessary to add, that this experiment will not again be attempted in connexion with the public lectures.—*Journal de Pharmacie.*

PRODUCTION OF SULPHURETTED HYDROGEN.

Dr. Lankester has read to the British Association, a paper "On the Production of Sulphuretted Hydrogen by the Action of Vegetable Matter on Solutions containing Sulphates." Dr. Lankester stated that observation had enabled him to detect sulphuretted hydrogen in water, by the presence of some peculiar animalculæ which caused a red deposit: he found it in lakes and springs near Askerne, in the dropping well at Knaresborough, and other places situated on or near the great tract of magnesian limestone in that district. He then enumerated a series of experiments, instituted with a view of investigating the source of sulphuretted hydrogen; from which he came to the conclusion, that it arose from the decomposition of the sulphates, in contact with vegetable matter. In allusion to Prof. Daniell's experiments on the waters from the African coast*, the author stated, that Dr. Clem has recently detected sulphuretted hydrogen to a very considerable extent in the sea waters of the British coast. Dr. Lankester is of opinion that the elements for the production of sulphuretted hydrogen are as abundant around our own island, as on the coasts of Africa; but it is not developed to so great an extent, from the want of a high degree of heat. Dr. Daubeny remarked, that running water soon lost its sulphuretted hydrogen; and the confervæ grew at Knaresborough immediately the waters were, by exposure, freed from this gas, thus distinctly marking its presence or otherwise.

NEW PURIFICATION OF GAS.

On Aug. 16, M. Dumas read to the Academy of Sciences, at Paris, a communication from Prof. Mallet on a New and Improved Method

* See page 107 of the present volume.

of Purifying Coal and other Gas for economical purposes. One of the inconveniences of coal gas arises from the pyrites, or sulphate of iron, which abounds in all coal formations, and which communicates to the gas a mixture of sulphuretted hydrogen gas of a deleterious nature, which is difficult to be entirely got rid of; and which when combined with ammonia, another substance frequently found in coal gas, becomes very dangerous. When the hydrosulphate of ammonia passes to the gas-burner in contact with the flame, the sulphur becomes converted into sulphuric acid, which is not only pernicious to the persons who breathe it, but also destructive of articles of furniture, colours, &c. The common method is to purify gas with a solution of lime: but this forms a substance which cannot be profitably employed in commerce; and this makes the operation so expensive, that fresh lime is not used so frequently as it ought. Hence the purification of the gas is seldom complete. M. Mallet has determined that common gas contains both the hydrosulphate and the hydrocyanate of ammonia; and also that in the purification by lime, the acids only become fixed, while the ammonia is left free. He has, therefore, commenced by fixing the ammonia by means of a salt of iron or of manganese; and the portion of sulphuretted hydrogen which escapes from the first condensation is afterwards easily retained by means of a solution of lime. The ammoniacal salt formed by the first part of this process becomes a saleable product; and the quantity of lime required for the second becomes much reduced, since most of the sulphur is retained by the iron or the manganese. The gas thus purified has a much less offensive smell, and is much less unwholesome, than that prepared in the usual way. This memoir was referred to the Monthyon-prize committee.—*Literary Gazette*, No. 1284.

INFLAMMABLE AIR FROM ALCOHOL.

PELOUZE and MILLON, by passing alcohol over anhydrous barytes, elevated to a dull red temperature, found that carbonate of barytes was formed, and carburetted hydrogen was given off. This is the first instance in which this gas has been formed artificially; when formic acid is heated with an oxide, it is decomposed into carbonic acid, which unites with the oxide, and into pure hydrogen. In this case, half of the hydrogen comes from the water which has been decomposed by the carbon of the formic acid under the influence of potash. This action, it occurred to the chemists mentioned, might also extend to alcohol. They passed carburetted hydrogen procured from alcohol over hydrate of barytes, and obtained hydrogen in large quantities. Naphthaline disengaged the same product. The anhydrous oxalates, when heated with barytes, afford, as is well known, carbonic oxide. By substituting hydrate of barytes, hydrogen is procured; carbonic oxide, also, under the same circumstances, affords pure hydrogen; even charcoal itself does the same. Pelouze and Millon have drawn the following conclusions: anhydrous barytes takes up from organic substances all the carbonic acid which their elementary composition permits them to furnish; hydrate of barytes extends the decomposition

further, and tends to burn all the carbon, while the hydrogen which proceeds from the decomposition of the water, is disengaged in a free state.—*Athenæum*, No. 689.

AN EVER-BURNING FLAME.

A PAPER has been read at the Royal Irish Academy, by Mr. G. J. Knox, "On a Principle for producing an Ever-burning flame." "A belief," he observed, "in the discovery of an ever-burning lamp appears to have been prevalent in all ages; and tradition informs us that lamps have been found in tombs, where they have continued burning for upwards of 1,000 years, of which mention has been made in the works of St. Austin, Plutarch, Pliny, Ludovicus Vives, Baptista Porta, and Licetus. The Rosicrucians, who laid claim to the knowledge of every thing mysterious, pretended to have rediscovered the secret of their construction, which was supposed to have been buried in the tomb of their founder. Dr. Plott, in a treatise which he has written upon this subject, alludes to a lamp mentioned by St. Austin, in his book *de Civitate Dei*, which was hung up in the temple of Venus; and to another found in the tomb of Pallas the Arcadian, (who was slain by Turnus in the Trojan war,) which continued to burn after its removal from the tomb and exposure to the air—proving that these lamps were not supplied from any bituminous source, or volcanic fire.

Mr. Knox considers the requisites for an ever-burning lamp to be,—a perpetual wick, which might be made of gold wire, or asbestos; and a perpetual supply of fuel, which he imagines the bituminous springs of Pitchford, in Shropshire, or the inflammable gases issuing from fissures in coal mines, would afford. That such could supply fuel for a flame, so long as the bituminous spring existed, or the gas continued to exhale from the mines, is evident; but it no more deserves the appellation of an ever-burning lamp, than does a fire arising from any volcanic source. The desideratum for such a lamp is, that it should contain, within itself, a *renovating* principle; such as, probably, does the luminous atmosphere encompassing the body of the sun, supposed by Sir William Herschel to be electrical. That electricity was the principle upon which such a lamp could be constructed having occurred to Mr. Knox some years ago, he concluded that, if by an arrangement of metals a thermo-electric current could be produced of sufficient intensity to decompose water, the heat produced by the burning of the two gases arising from the decomposition, would be sufficient, when applied to the alternate metallic junctions, to continue the electrical current of the thermo-electric pile; while the gases, which in burning become aqueous vapour, might be condensed by passing through a long tube, through which being conveyed to the closed vessel in which the water had been originally placed, they would again undergo decomposition, recombination, and condensation. Such a thermo-electric arrangement has been discovered by Prof. Botto, of Turin, who has obtained decomposition of water from a series composed of a great number of wires of platinum and iron. To prevent the apparatus from acquiring in time the same temperature, the alternate junctions

of the metals, to which the heat is not applied, might be connected with the pedestal upon which the lamp is placed; and the pedestal be either allowed to rest in a cold situation, or else be connected by wires with some extensive cooling surface."—*Athenæum*, No. 697.

FIRE FROM HOT-WATER IN WARMING BUILDINGS.

Mr. G. GURNEY has read to the British Association the details of "Some Experiments showing the Possibility of the Use of Hot-Water in Warming Buildings; and of Explosion in Steam-Engine Boilers." Mr. Gurney endeavours to prove that steam under high pressure is partially decomposed; and that, in a state of gaseous vapour, it is capable of heating the iron flues to such an extent that linen is charred, gunpowder fired, and fusible metal fused by it. Mr. Gurney suggests the use of fusible metal in some parts of the pipes as a preventive of fire; for, melting when the flues become too highly heated, it will allow the escape of the vapour, and, of course, assist in cooling the pipe.

SPONTANEOUS COMBUSTION.

ON March 16, the Rev. R. Hussey read to the Royal Society, a paper on Spontaneous Combustion; the object of which was to examine how far the popular notion among the peasants of the Tyrol was admissible, of the woods on high elevations taking fire spontaneously; as well as to consider the chemical theory of spontaneous combustion in the case of certain oils, more particularly in reference to the late occurrences in Her Majesty's dockyards.

Mr. R. Hunt, who has been engaged in an inquiry into the origin of the fire that broke out some time since in H. M. S. *Talavera*, has reported to the Admiralty, that it proceeded from the spontaneous ignition of masses of oiled oakum, oiled and painted canvas, and saw-dust, which had been allowed to accumulate in a large bin on the edge of the dock, immediately beneath the roofing under which the ship lay.—*Mechanics' Magazine*, No. 945. (See *Year-book of Facts*, 1841, p. 88.)

Mr. Booth has read to the British Association a communication on Spontaneous Combustion, as the probable cause of many unexplained "fires." The author enumerated a great variety of vegetable and animal products which possess the property of passing spontaneously into combustion. He also exhibited a table shewing the number of fires in London in a given time, particularizing the different trades, and, where it was possible to obtain the information, the causes of these fires. Mr. N. Hearder adverted to the spontaneous explosion of iron bomb-shells, instances of which had recently occurred; and mentioned some experiments which he had performed a few years since on combustion in vacuo, but which, in consequence of an accident which deprived him of sight, he found himself incapable of continuing with accuracy. They related to the effect of diminished pressure in modifying and restraining combustion.

ELASTIC FORCE OF STEAM.

On Jan. 18, M. Biot communicated to the French Academy a highly valuable and curious Table of the Elastic Force of Steam at various temperatures, showing the variations. These forces had been ascertained by several experiments in a practical manner: but M. Biot had arrived at the same results by means of an analytical formula, and they had been collected by him into a general table. This table showed the electric force of aqueous vapour for every centesimal degree of the air thermometer, corrected for the dilatation of the glass, from 22° below zero to 220° above zero; that is to say, for all the interval within which the experiments had been made. The formula gave the same results as the experiments, and expressed them in millimetres of mercury reduced to the atmosphere of melting ice, under the atmosphere of Paris.—*Literary Gazette*, No. 1254.

NEW PROCESS FOR PURIFYING WATER.

Prof. Clark, of Aberdeen, has patented a New Process for "rendering certain Waters, (that of the Thames being among the number,) less impure and less hard, for the supply and use of manufactories, villages, towns, and cities."

Chalk, it appears, is to be found in the waters supplied by the several companies to the inhabitants of London; each pound of chalk being combined with 7 oz. carbonic acid, besides the 7 oz. of the same acid which the chalk naturally contains. A pound of chalk, dissolved in 560 gallons of water by 7 oz. carbonic acid, would form a solution not sensibly different, in ordinary use, from the filtered water of the Thames, in the average state of that river. Chalk, or carbonate of lime, becomes bicarbonate of lime when it is dissolved in water by carbonic acid. If lime-water, (*i. e.* water holding in solution lime, or burnt chalk,) be mixed with a solution of bicarbonate of lime, (such as the Thames water,) very soon a haziness appears, then a whiteness, and the mixture soon acquires the appearance of whitewash. At length, the white matter subsides, and in process of time leaves the water perfectly clear, the subsided matter being nothing but chalk.

What occurs in this operation will be understood, if we suppose that 1 lb. of chalk, after being burned to 9 oz. caustic lime, is dissolved, so as to form 40 gallons of lime-water; then another pound is dissolved by 7 oz. extra carbonic acid, so as to form 560 gallons of a solution of bicarbonate of lime; and the two solutions are mixed, making up together 600 gallons. The 9 oz. caustic lime from the 1 lb. of chalk unite with the 7 extra oz. carbonic acid that hold the other pound of chalk in solution. These 9 oz. caustic lime and 7 oz. carbonic acid form 16 oz., that is, 1 lb. of chalk, which, being insoluble in water, becomes visible, at the same time that the other pound of chalk, being deprived of the extra 7 oz. carbonic acid that kept it in solution, re-appears. Both pounds of chalk will be found at the bottom after subsidence. The 600 gallons of water will remain above, clear and colourless, without holding in solution any sensible quantity either of caustic lime or of bicarbonate of lime.

Such is the theory of the patented process; rules for its application to the several waters, and for ascertaining the proportion of lime or lime-water proper for each, and thus making these theoretical principles available in practice, will be found in the specification. (See *Repertory for Patent Inventions, Oct.* 1841.)

The advantages of the process are: 1. *The water will be much softened.*

The other advantages are:

2. *The prevention of Fur in Boiling,* by removing the bicarbonate of lime, which being otherwise gradually decomposed into carbonic acid and chalk, the latter becomes deposited on the boiler, whilst the former escapes as gas.

3. *The separation of vegetating and colouring matters.* 4. *The destruction of water-insects.*

When it is stated that the supply of water to London is not less than 40,000,000 gallons per day,* and the weight of chalk contained in this large quantity is not less than 24 tons *per diem*, or 8,000 tons *per annum*, some idea may be formed of the necessity for introducing a mode of filtration, or chemical agency, which will remove so much deleterious matter from the first of the necessaries of life. The expense of softening the water by the addition of soda would be 1,000*l.* per diem, or 99 per cent. more than by the new process. (*Times, Oct.* 6; *abd.*)

The Hardness of Water is known by all chemists to be owing to the presence of sulphate or carbonate of lime, which is counteracted by the use of soap. Prof. Clarke proposed to ascertain the quantity of soap necessary to form a lather on a given quantity of water, and has arrived at these results: it requires $2\frac{1}{2}$ oz. curd soap to soften 1,000 lbs. of London water; that of Aberdeen, 4 oz.; Edinburgh, 10 oz.; Glasgow, $10\frac{1}{2}$ oz.; New River, 26 oz.; Thames, 29 oz.; and so on.

It appears that 100 gallons of London water require 32 oz. of the best curd soap to form a lather of such consistency that it shall remain on the surface five minutes; whereas, the same quantity of water purified by Prof. Clark's process, requires not quite 11 oz. The amount of the consumption of soap in the metropolis is stated by Mr. W. Hawes at—

12,000 tons at 50*l.*	£600,000
Soda, 3,000 tons, at 13*l.* 6*s.* 8*d.*	40,000
	£640,000

The Parliamentary returns of 1834 show the gross amount of water-rent paid to the metropolitan companies to have been about 270,000*l.*; and, if we allow for the increase alleged to have taken place in the consumption, the Professor infers that the value of soap and soda con-

* We may form some idea of this bulk, if we conceive the supply of one day to be contained in a reservoir of a square form, each side being 200 feet. the depth of the water would be 160 feet. The quantity in demand is every year increasing.

sumed is double the amount of water-rent. "Hence, if there be a saving of only 10 per cent. upon the value of soap and soda consumed, it would correspond to a saving of 20 per cent. on the gross water-rent." By the use of the purified water, too, the wear and tear of clothes in washing may be saved.

Prof. Clark, in a pamphlet*, whence these details have been abridged, observes that his improvement "is a triumph of chemical art over mechanical; that, by bringing into collision well-known chemical properties of chalk, itself the largest impurity, water free from this impurity and from all these defects can be obtained from sources at hand—water to a degree of purity such as the Patentee has not been able to hear of within a circle around London of more than 30 miles distance; and, not only at hand and purer than money could command by mechanical means, but in a copiousness of supply that must be as exhaustless as the Thames." The late Mr. Telford, it appears, recommended, in 1834, that certain river-waters should be brought from a distance for the better supply of the metropolis, the cost of which was estimated at 1,200,000*l*; but this was for supplying only a portion of the companies.

PURIFYING WATER BY CHARCOAL.

ANIMAL charcoal is well known to withdraw certain salts from their solution in water. The water kept in a new cistern having become tainted by dissolving a portion of lime and cement, M. Girardin, of Rouen, ordered about 24 lbs. of ivory black, (animal charcoal,) to be thrown into the cistern, and in fifteen days the water contained no lime in solution.—*Athenæum, No.* 691.

APPARATUS FOR DISTILLING SEA-WATER.

THIS patent "Distillation," shown at Mr. Robinson's manufactory at Pimlico, is constructed on the principle of the continuous transfer of heat through a series of vessels by evaporation. Thus, steam being generated in the boiler, is admitted into a chamber, surrounded by water, where it is condensed, and forms distilled water; then the water runs off into a suitable vessel. The heat transferred from the condensed steam to the water with which the condensing chamber was surrounded, produces renewed evaporation, and the steam from that second boiler is conveyed to a second condensing chamber placed in a third vessel of water. This process is repeated in the same vessel, and may be so continued through five or six condensing chambers. In the apparatus shown at Pimlico, there are only three condensing chambers; and the hot water in the last vessel is pumped back to the first boiler until it becomes saturated with salt water, when it is blown off. This is an addition of two chambers to the ordinary still, with an in-

* A New Process for Purifying the Waters supplied to the Metropolis by the existing Water Companies. By Thomas Clark, Professor of Chemistry in the University of Aberdeen. Second Edition.

crease of distilled water, from 130 to 140 per cent. from one fire. Under a working pressure of steam in the boiler of 10lb. to the square inch, 20lb. of distilled water have been produced experimentally by the combustion of 1lb. of coal. In a trial of three hours' duration, 59 gallons have been evaporated from the three vessels above constructed.

It is proposed, when the apparatus is employed on board ship, to place the fire on the upper deck, and the distilling or condensing chambers on the lower deck, or in the hold; by which arrangement the fire will serve for cooking.—*Abridged from the Inventors' Advocate.*

Admiral Baudin and other officers, specially appointed for the purpose, have recently examined M. Lallier's Apparatus for converting Sea-water into Fresh. The apparatus submitted to them was large enough for a vessel of 500 tons, and is composed of a cook's range, with appendages for distilling and filtering: the space which it requires does not exceed that of a customary range for ships' use. The mechanism is so simple, that a common ship's cook may superintend the whole process. In eight hours' time, 30 gallons of sea-water were distilled, at an expense of 82lb. of coal; the produce was equal in quality to the finest spring water.—*United Service Journal.*

ACTION OF SEA WATER ON GLASS.

Sir David Brewster has exhibited to the Philosophical Society of St. Andrew's a bottle of wine from the *Royal George*, which had been exposed to the action of sea water. This bottle he received from Mr. Lyell, of Kinnerdy, for the purpose of examining the remarkable decomposition produced by the action of salt water. The thin films of glass which covered the bottle like a silvery incrustation had all the properties of the brilliant scales of decomposed glass found in Italy, and produced by nearly 2000 years' exposure to the elements. Upon a careful examination of the surface of the bottle, Sir David found that the scales were throughout filled with veins like those of agate, and coincided with the lines in which the glass had been twisted in the mechanical operation of forming the bottle. The lines in which the cohesion of the particles of the glass was the least were the soonest decomposed by the action of the sea water. This curious fact disclosed the cause of the similarly waved structure in the decomposed glasses of Greece and Rome.—*Scotsman.*

PREVENTION OF THE OXYDATION OF IRON.

M. F. L. Allamand has invented a composition which preserves Iron and Steel from Oxydation, by entering into the pores, without in any degree affecting their external appearance, or having the least blemish; so that steel instruments, fire-arms, &c., retain their polish, and are in some degree better fitted for use, after having been subjected to this application. The composition is: pure Malacca tin, 120; silver filings, 4; yellow tincal, 12; purified bismuth, 12; purified zinc, 12; regulus of antimony, 4; nitre, 11; salt of Persicaria, 1. Articles, either plain or chased, appear superior to platina, and retain, after the

application, all the hieroglyphic characters, figures, letters, and other engravings or cuttings, which were thereon previously. The method of purifying the metals for the process, the mixture, and mode of application, will be found in the *Inventors' Advocate.*

PROTECTION OF COPPER SHEATHING.

MR. PRIDEAUX has detailed to the British Association a series of interesting "Inquiries into the Causes of the increased Destructibility of Modern Copper Sheathing;" from which the author is inclined to fear the fault is still to be sought in the copper itself. Thus, one vessel lasted in good condition for nine years, whilst the other came to patch in three; both lying most of the time in the same harbour. On neither was there any distinct indication of protective or destructive influence in the nails. "Meanwhile, as nails must be used, and present a large metallic surface to the salt water, as well as numerous points of contact with the copper, calculated to give great effect to small electro-chemical differences, either in protection or destruction, it would seem that we ought to render them slightly electro-positive to rolled copper, by the addition of zinc, which would not injure their flexibility nor enhance their cost. The test, by the galvanometer, would be easily applied, (after a little practice,) in making up the metal for casting them, if it be important to continue the present system of their manufacture."

Another method of Protection, which came out in these investigations, is beginning to occupy public attention: a coat of fish-oil, laid on when the copper was new, to keep it bright, has been found to preserve it. Coal-tar has also been found to have this effect.

ANOMALOUS PRESENCE OF IRON.

M. TARGIONI TOZZETTI has detected iron in *Oscillatoriæ*, in the thermal springs of Rapolano, although no iron exists in the water. The iron contained in these *Oscillatoriæ* accumulates by degrees in the cavities where water is contained, as in the stony pits which are formed; and thus its presence can be sought after, and proved by chemical analysis. This remarkable observation opens much the field of inquiry of late promulgated respecting the influence possessed by exceedingly minute organized bodies accomplishing the production of certain minerals.—*Comptes-Rendus; Microscopic Journal, No.* 3.

NEW OXIDE OF IRON.

M. PELOUZE has communicated to the Academy of Sciences, at Paris, M. Freney's discovery of an Oxide of Iron more oxygenated than the peroxide. This was attained by heating an oxide of iron to a white heat with potassium, or peroxide of potassium and saltpetre. This product is a ferrate of potassium of a violet colour, possessing a strong tinctorial power, and analogous to cameleonite of manganese.—*Literary Gazette, No.* 1252.

YELLOW PRUSSIATE OF POTASH.

On April 13, was read to the Chemical Society, a paper "On the Preparation and Formation of Yellow Prussiate of Potash," by Prof. Liebig. Upon this communication, Mr. Lowe observed that the preparation of Prussiate of Potash from the waste gas-liquor was difficult, owing to the presence of sulphur: but he believed that the suggestions of Professor Liebig would enable chemists to remove this obstacle to the manufacture.—For details, see *Philos. Mag. No.* 119.

PHOSPHATE OF YTTRIA.

Mr. O. Sims, of Shelton, Staffordshire Potteries, has announced a considerable and very accessible source of that hitherto very rare mineral, Phosphate of Yttria. The crushed cobalt ore, from Johannisberg, in Sweden, when converted into zaffre, or dissolved by acids, leaves a yellowish mineral in crystalline grains, in the proportion of about one pound avoirdupois from one thousand pounds of ore. This mineral is the phosphate of yttria. It may be decomposed by fusion with alkaline carbonates, or by boiling with pretty strong sulphuric acid.—*Proceedings of the Chemical Society.*

VANADIUM IN SLAGS FROM COPPER-SLATE.

The bituminous marl-slate of geologists, a member of the magnesian limestone series, frequently contains copper pyrites, and ores of copper, in which state it is named copper-slate. This is prepared and smelted on account of the copper it contains in some districts in Germany, such as Maunsfield, Sangerhausen in Thuringia, &c. The slags of the copper-slate of the latter, according to M. C. Kersten, of Freyberg, afford a portion of the metal named Vanadium; thus indicating its presence as an ingredient in the sulphur slate.—*Jameson's Journal*, No. 62.

ON MINIUM.

Chemists are still divided in opinion as to the true constitution of Minium. M. Levol is induced to believe it to be a compound of two oxides, from these considerations. In supposing minium to be a peculiar oxide, intermediate between these oxides, it is inexplicable how it happens that minium cannot be converted into binoxide by calcination with chlorate of potash, an effect which it readily produces with the protoxide of lead.

Oxalic acid constantly converts binoxide of lead into protoxide, but does not alter minium; and this is at once a method of purifying, and a good characteristic of minium. As this acid, as well as protonitrate of mercury, and sulphurous acid, reduces the binoxide of lead to protoxide, and has no action on minium, it may be inferred, not only that minium is a compound of the two oxides, but that it is a compound of remarkable stability.—*Ann. de Chim. et de Phys.; Philos. Magazine, No.* 16, which see for the Analysis of Minium.

PRESERVATIVE PROPERTY OF SULPHATE OF COPPER.

It is stated in the *Mining Journal*, that Sulphate of Copper may be applied to the Preservation of Wood for one-fifteenth of the cost of the Kyanizing process; and that the French government are so satisfied of its superiority, that they have resolved to employ it, on a large scale, at the Arsenal at Rochfort. Mr. Warburton, M.P., stated in evidence before the Committee of the House of Commons on the Timber Duties, in 1835, that besides applying the sulphate of copper as a wash, he caused some wood intended for kitchen-floors to be previously soaked in a wooden trough containing a solution of sulphate of copper. His knowledge of the use of this salt as a preservative of wood from the dry-rot was derived from that distinguished chemist, Dr. Hyde Wollaston. This led Mr. W. to try the effect of soaking wood in other metallic salts, among which sulphate of tin and sulphate of zinc were found also to answer in preventing the vegetation of fungus. Mr. Warburton's information has been elicited by a discussion as to the validity of a patent lately taken out by a Mr. Margary for this identical preservative process.

COMPOSITION OF PYROPE.

This mineral, long confounded with garnet, is known to be distinguished from it by containing chrome, and by exhibiting not the dodecahedral, but the hexahedral form. The best analyses of it, however, which are by Kobel and Wachmeister, are obviously imperfect; of which no better proof can be given than that Gustavus Rose, in his Crystallography, does not attempt to give the formula of the mineral, but contents himself with enumerating the different oxides of which it is composed. Under these circumstances, Dr. Apjohn has analysed Pyrope, and detected in it yttria, one of the rarest of the earths; one, in fact, which had previously been known to exist only in a few minerals of exceeding scarcity.—*Proceedings of the Royal Irish Academy.*

ARTIFICIAL CEMENTS.

On June 1, was read to the Chemical Society, an extract of a letter from Prof. Kuhlman, of Lille, "On Artificial Cements and the Silicification of Chalk." Mr. Kuhlman has discovered that to masses of the softest limestone, or friable chalk, a great degree of hardness may be communicated, superior to that of many cements and marbles, by immersing them in a solution of silicate of potash. By a few days' exposure afterwards, the mass becomes very hard, when four or five per cent. of silica is communicated to it in this way. The limestones thus silicified promise also to be suitable to lithography. A decomposition of the carbonate of lime is shown to take place by the action of the silicate of potash, silicate of lime being formed, and carbonate of potash, the last of which comes from the stone and may be washed away. He maintained that the silicification of many limestone rocks has taken place by the action of water holding silicate of potash in solution, upon pure calcareous rocks, or by a natural process analogous to M. Kuhlman's artificial one.

ARTIFICIAL OIL OF ANTS.

DŒBEREINER, when preparing formic acid by the action of sulphuric acid and oxide of manganese on sugar, found that the liquor which distilled over, contained a small quantity of oily matter which rendered it milky. To this he gave the somewhat fanciful name of "Artificial Oil of Ants." Mr. Stenhouse has analysed this oil, and proved it to have a very different composition from oils in general; as it contains oxygen and hydrogen only in the proportions to form water, while all other known oils contain a great excess of hydrogen. —For the analysis, see *Philosophical Magazine, No.* 115.

VOLATILE OILS.

ON Jan. 18, M. Gay-Lussac presented to the Academy of Sciences, at Paris, several Oils more volatile than turpentine, and, in fact, equal in volatility to sulphuric ether, which he had produced by the decomposition of turpentine by heat. M. Bossignon stated, that he had produced Naphthaline much purer than had hitherto been done, and at the reduced cost of 3 francs per gross, instead of 5 francs.—*Literary Gazette, No.* 1254.

HYPOSULPHUROUS ACID.

M. LANGLOIS has obtained this Acid perfectly pure by decomposing the hyposulphate of potash, by means of per-chloric acid, which forms an insoluble salt with the potash. The acid thus obtained is liquid, colourless, slightly of the consistence of syrup, and of acid and bitter taste.—*Athenæum, No.* 691.

HYDROCHLORIC ACID.

DR. GREGORY, of Aberdeen, has found that by using two equivalents instead of one, a pure acid is obtained; and the chief impurities, sulphuric acid and the sulphates, are got rid of by a very simple apparatus, by which, even in a sitting-room, Hydrochloric Acid may be made at 3*d.* or 4*d.* per lb.—*Proceedings of the Chemical Society.*

NEW ACIDS FROM CASTOR OIL.

MR. TILLEY, of Edinburgh, has ascertained that by treating Castor-oil with nitric acid a volatile oily acid is formed, similar in its smell to butyric acid. It is slightly soluble in water, and forms with barytes and similar bases soluble salts, which crystallize. During the continued oxidation of the castor-oil there are formed suberic, oxalic, and some other acids; and when the action is completed, there remains what is supposed to be œnanthic acid. The author is prosecuting his investigation.—*Athenæum,* No. 696.

CAMPHORIC ACID.

WYDLER AND KELLER have proved that what was supposed by Berzelius to be an intermediate compound between Camphor and camphoric acid, is merely a mixture of the two bodies, from which the camphoric acid is separated by bases. They also found the analysis of

sulpho-camphoric acid, by Walter, to be incorrect. It contains the elements of hyposulphuric acid.—*Athenæum, No.* 696.

HYDROCYANIC ACID.

Dr. R. D. Thomson has submitted to the British Association, the following "New Extemporaneous Process for the Production of Hydrocyanic Acid for Medical Use." The importance of prussic acid as a remedial agent, has induced the author to bestow much attention upon the production of this acid, so as to obtain it always of uniform strength. The process recommended by Dr. Clarke, of Aberdeen, is superior to every other, but an objection to his process is the great difficulty of procuring pure cyanide of potassum. The author believes the following process to be less liable to objection than any at present used. The first step consists in forming a pure cyanide of lead. This object may be effected in various ways; either by precipitating acetate of lead by hydrocyanic acid, as prepared from the ferrocyanide of potassium, and sulphuric acid, in a stoppered bottle; or by distilling the mixed materials into a Wolf's bottle, containing a solution of acetate of lead. In either case, a definite compound of cyanogen and lead will be obtained, which is to be carefully washed and gently heated. The next step in the process consists in decomposing it, by means of sulphuric acid. In order to obtain an acid of the strength of the *Acidum Hydrocyanicum dilutum* of the London Pharmacopœia, or containing about two per cent. of absolute acid, the following formula is recommended;—

43.36 grains of cyanide of lead.
2 fluid drams of dilute sulphuric acid, London Pharmacopœia.
6 fluid drams of pure distilled water.

Introduce the cyanide of lead into a stoppered bottle; mix the acid and water in a glass vessel, allow the mixture to cool, and then pour it upon the cyanide of lead. Close the stopper, and agitate the fluid and salt together. After standing for some time, pour off the supernatant liquor from the precipitated sulphate of lead, and preserve it in a stoppered bottle. This formula is founded upon the circumstance that the dilute sulphuric acid of the London Phnrmacopœia contains in each fluid dram about 9.5 grains of oil of vitriol—

(S O_3 H O).

2 drams will therefore contain 19 grains of oil of vitriol. The quantity required for saturating 43.36 grains of cyanide of lead is only 17.4 grains, but the small excess is useful in preserving the acid.—*Athenæum*, No. 721.

SUPPOSED HYDRATE OF PHOSPHORUS.

M. Pelouze supposed the white crust which covers Phosphorus that has been long kept, to be a hydrate of that substance; Mr. H. Rose regarded it merely as a modification of the state of aggregation; M. Mulder believed it to be a compound of oxide of phosphorus and

phosphuretted hydrogen. M. Marchand, by recent experiments, concludes the suggestion of Mr. Rose to be the correct one.

IMPROVED METHOD OF PREPARING PHOSPHORUS.

By the usual method of preparing this substance, which is of great importance in the manufacture of lucifer matches, so many gases are at once disengaged that there is much danger from explosions. In order to avoid this inconvenience, the mixtures of phosphate of lime, charcoal, and some parts of sulphuric acid, should be well heated in a copper vessel, the bottom of which has been previously heated to redness. This temperature will be sufficient to drive off all the water, which usually amounts to 10—15 per cent. By this means, much less phosphuretted hydrogen is evolved. It is best to mix at first only about 1 per cent. of charcoal with the phosphate of lime, and only after having heated the mixture to redness—to add the remainder of the ignited charcoal in order to volatilize the water and the sulphuric acid; because, if it is added all at once, the water begins to volatilize at the time when the phosphorus is disengaged. By this plan, very little phosphuretted hydrogen gas is emitted, the phosphorus produced is much more pure than that of commerce, and the second distillation is no longer necessary, since the oxide of phosphorus which remains can be readily decomposed into pure phosphorus and phosphoric acid by treating it with dilute nitric acid at the temperature of 140° to 150°.—*Athenæum, No.* 720.

PHOSPHATES AND ARSENIATE OF SODA IN CALICO PRINTING.

These salts have been substituted successfully by Messrs. Mercer and Blyth for the cow-dung, so long in use in calico-printing. They have taken a patent for their discovery. M. Shwartz, of Mulhausen, has made experiments on the same subject, and has confirmed the favourable result of the Manchester discoveries.—*Athenæum, No.* 711.

NITRATE OF SODA,

Which is now extensively used as a manure, is often adulterated with common salt, which does not cost one-tenth of the price. To detect the adulteration, throw a small quantity of the article into the fire; if it contain salt, it will produce a crackling noise; if pure, it will melt rapidly, with a low hissing sound.

DAHLIA CARMINE.

A kind of Carmine, very brilliant and pure, has been obtained by Mr. Rupprecht, of Vienna, from the florets of the Dahlia. He regards it as a valuable product, and says that he has obtained 235lb. of pigment from 200 square fathoms of land. It has already been applied to staining confectionery, artificial flowers, fancy paper and leather, and in the preparation of *rouge*. It seems, however, too fleeting for silks and cottons; only the deep clear purple dahlias will yield it.—*Gardeners' Chronicle.*

IMPROVED MANUFACTURE OF CALOMEL AND CORROSIVE SUBLIMATE.

DR. A. T. THOMSON has patented an improved method of manufacturing Calomel and Corrosive Sublimate, by combining chlorine gas with the mercurial vapour. The apparatus consists of a glass or other vessel set in brickwork, and communicating at one end with a large air-tight chamber; and at the other end, by means of a bent tube, with an alembic charged with a mixture of common salt, binoxide of magnesia and sulphuric acid, or binoxide of magnesia and muriatic acid. A quantity of mercury is placed in the glass vessel, and its temperature raised to between 50° and 60° Fahr., by means of an open fire beneath. As the chlorine gas is generated, it passes from the alembic, through the bent tube, into the glass vessel; and there combining with the vapour of the mercury, forms either a corrosive sublimate or calomel, according to the quantity of chlorine gas employed.

COMPOSITION OF GUANO.

AN analysis of this interesting and important substance, recently made by M. Voelckel, confirms what Klaproth found, viz., that the Guano, among its characteristic constituents, contains, besides unchanged uric acid, a considerable quantity of two of its usual products of decomposition, viz., oxalic acid and ammonia.

NEW ALUM.

DR. MOHR states that a variety of Alum has been, for some time, introduced into Germany, and is much recommended as containing the principles necessary to dyeing and calico-printing in a state of great concentration; so as to render its use more advantageous, and less expensive in carriage. This alum has not the slightest resemblance to common potash alum; it exists in flat quadrangular tables, which are slightly transparent, and dissolve very readily in water; the taste of this salt is sweetish, acid, and aluminous, and much more distinctly so than common alum: when heated in a crucible, it swells, and eventually becomes a gummy mass, which, when more strongly heated, gives out sulphuric vapours. Nevertheless, the mass, which has been heated to redness, is entirely and readily soluble in water. If pulverised sulphate of potash be thrown into a concentrated solution of this alum, a crust of common alum is quickly formed. The usual reagents prove that it contains sulphuric acid, alumina, a small quantity of potash, but no ammonia. M. Mohr found it to consist of—

Sulphuric acid	36·24
Alumina	13·91
Potash	1·50
Water	49·60—101·15.

This composition shows that the alum in question is, properly speaking, merely sulphate of alumina with an excess of acid, and combined with water of crystallization. The small quantity of sulphate of potash shows the origin of this salt, it being probably prepared with pulverised

and calcined pipe-clay and sulphuric acid not completely concentrated. This new alum is entirely free from iron.—*Journal de Pharmacie; Philosophical Magazine, No.* 121.

PROPERTIES OF GELATINE.

On July 26, M. Magendie read to the Academy of Sciences, at Paris, a Report on the nature of Gelatine. He gave an account of the experiments which had been commenced ten years ago, and were not even yet terminated. In the first series, it was attempted to feed dogs entirely on gelatine without any other nutriment whatever; it was given either dry or in jelly. Several dogs would not touch it at all, others ate it for a few days, and then rejected it; all, however, died of starvation under the system. The next series of experiments consisted in giving gelatine made agreeable to the taste; and, in particular, it was served in the form such as is found in the shops of the *charcutiers*, a form in which it is generally much sought after. The dogs to whom this substance was given as their exclusive aliment ate it in general with much avidity for a few days; then they refused it altogether, and all died of starvation within three weeks. In a third series, several dogs were subjected, some to complete abstinence, and others to pure water for their sole nourishment. Under this system, the young dogs generally died directly, some not surviving forty-eight hours; of the older dogs, those which had nothing at all given them died in just the same time as those which had been forced to live on gelatine alone; whereas, those which took water lived from six to ten days longer. The fourth series consisted of alimentary substances, such as bread, eggs, &c., mixed with gelatine and given to dogs. Some of the animals who ate as much as a pound English of gelatine, thus administered daily, lived eighty or ninety days; but all grew thin, and ultimately perished. If, while one of the animals was ill, fresh meat was given it, an amelioration took place immediately. The fifth series of experiments was that of giving to the dogs the *bouillon à la gélatine*, prepared for the patients at the Hôpital St. Louis, and the *bouillon* of the *Compagnie Hollandaise*. An animal fed on the former substance exclusively was well for fifty-six days, but got very thin; at the end of that time the latter substance was administered, and the animal got fat directly. Another animal, fed from the first on the second substance, became very fat on it; but, on the fifty-sixth day, the first kind of *bouillon* was substituted for the second, and he became thin almost directly. In a sixth series of experiments, dogs were fed on bones, from which the calcareous salts had been extracted by muriatic acid. Some beef-bones thus treated were totally refused by the dogs; and, in the end, they altogether refused mutton-bones on which they had at first fed, and died of starvation. A seventh series consisted of the administering beef-tendons and pure water, allowing the dog to eat as much as he liked. The first day the animal ate 3lb. of tendons, but at last became affected with diarrhœa, and he was only restored by having bones mixed with the food.—*Times.*

PAINTING WITH COLOURLESS FLUIDS.

MR. STEPHENS, of Stamford-street, has made a novel experiment, showing the possibility of Painting or colouring drawings, (without using any visible colour,) by the effect of chemical combination. In other words, the colours were developed in the process of painting from the liquids used. Colourless liquids were applied to the surface, and by using them successively, and combining them with due reference to their chemical qualities of producing particular colours, a very novel and striking effect was produced. Mr. Stephens clearly demonstrated the possibility of painting pictures by this novel method, and one advantage attending its adoption would be, that the colours not being produced until they had entered into combination with, and dyed the texture of the fabric operated upon, the picture would not be liable to erasure by friction, as when precipitated colours only, (as in the ordinary method of painting,) are used. Of course, a very minute acquaintance with the chemical nature of colours, and the combinations of which they are susceptible, would be necessary to the artist who would wish to execute with success this novel style of painting.—*Mechanics' Magazine, No.* 936.

CURING MEAT.

A NEW method of Curing and Salting Animal Substances, by mechanical means, by exhausting and condensing pumps, has been patented. The whole process does not occupy more than a quarter of an hour; it may be conducted at any season of the year, at any temperature; and to the meat any flavour or degree of saltness can be given, and the nutritious qualities preserved; whilst the contact throughout the mass is complete. It is also applicable to the preparation of hides for packing, and to their improvement for the tanner.—*Literary Gazette*, No. 1254.

PRESERVATION OF MEAT BY THE GANNAL PROCESS.

ON March 22, before the Royal Academy of Sciences, at Paris, M. Gannal, whose method of preserving dead bodies from putrefaction by injecting chemical solutions is well known*, was admitted to read a paper on his methods of Preserving Meat by similar processes. It may prove interesting to our readers to know that by order of the French Minister of Marine, two vases, each containing sixty pounds of beef and of gelatine prepared by M. Appert, according to his (M. Appert's) own method, were embarked for the island of Bourbon in the year 1822, and on their return to France in 1824 were found in the highest state of preservation.

ARSENIC IN THE HUMAN BODY.

"The Medico-forensic Inquiries into the presence of Arsenic in Animal Substances," have been followed up in France durng the past

* See Year-book of Facts, 1841, p. 170.

year; and the result has been the reversion of M. Orfila's conclusions, detailed in the *Year-book of Facts*, 1841, pp. 171-174.

On June 14, M. Regnault, in the name of a Commission, composed of MM. Dumas, Boussingault, Thénard, and himself, read to the Academy of Sciences, at Paris, a Report "On Marsh's Apparatus for the Discovery of Arsenic in Animal Substances;" a subject which, from the occurrences lately remarked on criminal trials of too painful celebrity, it became important to have definitively cleared up. The report was favourable to the accuracy of the apparatus in question. Memoirs upon different methods of proceeding with this apparatus, and other manners of detecting the presence of arsenic, had been sent into the Academy at various periods, by MM. Orfila, Flandin, Danger, Kœppelin, and other eminent chemists; all of which had to be examined and experimented upon by the Commissioners. They had instituted a completely distinct set of experiments for themselves with Marsh's apparatus, and had operated on dogs, to whom arsenic had been administered in very minute quantities. Thus, they had dissolved one milligramme of arsenious acid—an exceedingly small quantity—in 500,000 times its weight of water, and had further dissolved the matter so as ultimately to obtain a portion of liquid containing only one-millionth part of its weight in arsenic. This solution, and others successively stronger, were subjected to Marsh's apparatus, in order to ascertain the degree to which the susceptibility of the apparatus in detecting the mineral substance could be carried. The weakest of these solutions, that containing the one-millionth part of arsenic, gave arsenical stains by means of the apparatus; and thus its extreme sensibility was fully proved. In cases of poisoning, it was very rare that only so small a quantity as one gramme of arsenic should be used, and yet the apparatus would detect the presence of only the one-thousandth part of this quantity. The experiments of M. Orfila on the absorption of arsenic by all the organs of the body, when the poison was administered, had been found exact; and hence it was certain that the remains of a human body, even though in a state of decomposition, might be fairly subjected to the action of the apparatus, for purposes of legal evidence. As to the ideas which had been circulated of the substances used to react on arsenic containing arsenic themselves, they were proved to be erroneous; and it was perfectly easy to obtain nitric acid, sulphuric acid, zinc, &c., free from all admixture whatever of arsenic. Several chemists had been of opinion that antimony and other substances might produce stains by means of Marsh's apparatus, which might be mistaken for arsenical stains; but there were definite methods of testing such stains, and of removing all doubt. Certain suggestions for the improvement and for the more cautious manipulation of the apparatus were named in the Report. The Commissioners had come to a conclusion of the greatest importance, and had found that M. Orfila, with other chemists, was mistaken in supposing that arsenic existed in what has been called a normal state in the human body. There was no such thing naturally in the human frame, no arsenic in the bones, nor in the muscular integuments. M. Orfila

had frankly acknowledged himself to have been deceived on this point by his own experiments, and thus the subject was set at rest.

At a subsequent sitting of the Academy, (on July 19,) M. Magendie urged the importance of confiding experiments with Marsh's apparatus to chemists sufficiently instructed in the delicate system of experimentation required; to which M. Regnault replied, that the Commission agreed with M. Magendie, and wished it to be understood, that in no case should the sworn examiner depend only upon the physical characters of the stains obtained by Marsh's apparatus. It even proscribed the method of stains from being appealed to at all; and it wished to show that the sworn examiner ought in all cases to be obliged to put in the hands of the judges arsenic with *all its characteristics*. In the opinion of the Commission, Marsh's apparatus, regarded merely as a means of producing stains, was of no value; but considered as a means of concentrating the arsenic, in order afterwards to recognise its characteristics by other known chemical procedures, was in that case an apparatus that might be depended on, even in the most difficult cases. (It will be remembered, that in the case of Madame Laffarge the *sole* evidence upon which she was condemned was the *ipse dixit* of M. Orfila concerning stains obtained by Marsh's apparatus; those stains having been pronounced by him to be arsenical from their *appearance* alone. If, therefore, this report of the Commission be entitled to any respect whatever, M. Orfila's opinion is thereby declared to be erroneously, or rather insufficiently, grounded. This, added to the fact that *all other* means of detecting the supposed arsenic in the body of M. Laffarge had failed, would, in any other country but France, cause the whole of the proceedings in such a case to be set aside.)

A letter was read from MM. Flandin and Danger, the chemists, requiring explanations of part of the above Report which they fancied made against them. M. Dumas replied, that the positions advanced by MM. Flandin and Danger were these:—1. That stains may be obtained from Marsh's apparatus without arsenic. 2. That sulphites, phosphites, and organic substances, under an electro-chemical force, would produce such stains. 3. That these were the kind of stains which MM. Orfila and Couerbe had mistaken for arsenical stains, and had miscalled normal arsenic. The Commission, M. Dumas added, had found and proved that the first of these points was correct; that with regard to the second, it was erroneous, since these stains (obtained without arsenic) arose from nothing more than carbon deposited by the animal substances; and the phosphoric acid of which, being carried off, prevented the combustion. As for the third point, the Commission could not speak, *since they had never seen any normal arsenic*. M. Dumas, in the name of the Commission, declared their high opinion of the observations of MM. Flandin and Danger, and that they placed their experiments in the first line of those that they had been charged to investigate.—*Abridged from the "Paris Letter," in the Literary Gazette.*

In a recent number of the *Medicinische Annalen* is reported a

case, in which the hydrated peroxide of iron was successfully administered to five persons, three of them children, who had taken soup containing arsenic, and who exhibited the usual symptoms of arsenical poisoning.

In the *Medico-Chirurgical Review*, (Oct. 1840), two cases are related by Mr. Serph, of Welshpool, in which the *carbonate of iron* was successfully employed. In one of them, a boy of twelve had swallowed about a scruple of arsenic, and in the other a man had *rubbed* himself freely with a strong solution of arsenic and sulphate of copper; both of them presented the usual symptoms of poisoning with arsenic.—*Edinburgh Monthly Journal of Medical Science.*

DETECTION OF ARSENIC IN THE BLOOD (?)

DR. VAN DER BROECK, according to Raspail, has detected Arsenic in arterial and venous Blood by means of Marsh's apparatus. This fact, if confirmed, will operate against the evidence of Orfila given in the instance of the trial of Mad. Laffarge. Dr. Shafhaeutl, at the meeting of the British Association, at Birmingham, showed that all kinds of iron contained arsenic. Hence, the peroxide of iron which M. Laffarge had been taking medicinally, would undoubtedly convey arsenic to the system.

It may here be mentioned that "Arsenicated Candles" are again in use; some of the manufacturers having resumed the employment of Arsenic for effecting that which may be accomplished by harmless

TESTING FOR ARSENIC AND ANTIMONY BY HUME'S PROCESS.

MR. MARSH has found, in Testing for Arsenic, by several experiments, that Hume's test, (the ammonia-nitrate of silver,) is extremely useful as a discriminative test for arsenic or antimony. He uses it simply as follows: After the matter to be tested has been acted on in Marsh's apparatus, a piece of common window-glass, porcelain, or mica, is to have one of its surfaces moistened with Hume's test; it is then to be held horizontally, with its moistened side downwards, directly over the ignited jet of gas, about half an inch from the tip of the flame. If arsenic be present, the well-known characteristic lemon-yellow colour is instantly produced; if antimony be in the mixture, a curdy white precipitate is obtained: if, on the contrary, neither arsenic nor antimony is in the matter under examination, the hydrogen instantly reduces the silver of the test-liquor to the metallic state. It is really beautiful to see the admirable manner in which this test performs its duty.—*Communicated to the Philosophical Magazine*, No. 119.

THE DAGUERREOTYPE.—PHOTOGRAPHY.

THE following *résumé* of the principal contributions to this new process, since the publication of the *Year-book of Facts*, 1841, has been made with due regard to the minute manipulation requisite to ensure success.

CALOTYPE.

MR. H. FOX TALBOT thus describes his improved Photographic method, to which he has given the name of *Calotype*. The following is the method of obtaining the Calotype pictures:

Preparation of the Paper.—Take a sheet of the best writing paper, of close and even texture, and cut off the watermark. Dissolve 100 grains of crystallized nitrate of silver in six ounces of distilled water. Wash the paper with this solution, with a soft brush, on one side, and put a mark on that side whereby to know it again. Dry the paper cautiously at a distant fire, or else let it dry spontaneously in a dark room. When dry, or nearly so, dip it into a solution of iodide of potassium containing 500 grains of that salt dissolved in one pint of water, and let it stay two or three minutes in this solution. Then dip it into a vessel of water, dry it lightly with blotting-paper, and finish drying it at a fire; or spontaneously. All this is best done in the evening by candlelight. The paper so far prepared the author calls *iodized paper*. It is scarcely sensitive to light; nevertheless, it ought to be kept protected from the light. Shortly before this paper is wanted for use, wash a sheet of it with this liquid:—Dissolve 100 grains of crystallized nitrate of silver in two ounces of distilled water; add one-sixth of its volume of strong acetic acid: let this mixture be called A. Make a saturated solution of crystallized gallic acid in cold distilled water; the quantity dissolved is very small: call this solution B. When a sheet of paper is wanted for use, mix together the liquids A and B in equal volumes, but only mix a small quantity of them at a time, because the mixture does not keep long without spoiling: call this mixture the *Gallo-nitrate of silver*. With it wash the *iodized paper* on the marked side, by candlelight. Let the paper rest half a minute, and then dip it into water. Then dry it lightly with blotting-paper, and at a distance from the fire. The author has named the paper thus prepared *Calotype paper*, on account of its great utility in obtaining the pictures of objects with the camera obscura. If this paper be kept in a press it will often retain its qualities in perfection for three months or more, being ready for use at any moment; but this is not uniformly the case. It is best used a few hours after it has been prepared.

Use of the Paper.—The *Calotype paper* is sensitive to light in an extraordinary degree, which transcends a hundred times or more that of any kind of photographic paper; as in the following experiment:—Take a piece of this paper, and having covered half of it, expose the other half to daylight for the space of *one second* in dark cloudy weather in winter, when there will be a strong impression upon the paper, but latent and invisible, and its existence not be suspected by any one. To make it visible, wash the paper once more with the *gallo-nitrate of silver*, and then warm it gently before the fire. In a few seconds, the part of the paper upon which the light has acted begins to darken, and finally grows entirely black, while the other part of the paper retains its whiteness. Even a weaker impression than this may be *brought out* by repeating the wash of gallo-nitrate of silver, and again warming the

paper. Or, a stronger impression does not require the warming of the paper, for a wash of the gallo-nitrate suffices to make it visible without heat, in a minute or two. The Calotype paper will take an impression from simple moonlight, not concentrated by a lens. If a leaf be laid upon a sheet of the paper, an image of it may be obtained in this way in from a quarter to half an hour. This paper is, therefore, well suited to receive images in the camera obscura. If the aperture of the object-lens is one inch, and the focal length fifteen inches, the author finds that *one minute* is amply sufficient in summer to impress a strong image upon the paper of any building upon which the sun is shining. When the aperture amounts to one-third of the focal length, and the object is very white, as a plaster bust, &c., *one second* is sufficient to obtain a pretty good image of it, made visible by washing and warming. When the paper is quite blank, it is a beautiful phenomenon to see the spontaneous commencement of the picture, first tracing out the stronger outlines, and then gradually filling up the details. Watch the picture, and when it has attained the greatest degree of strength and clearness, stop further progress by washing it with the fixing liquid.

The fixing process.—First wash the picture with water, then lightly dry it with blotting paper, and next wash it with a solution of *bromide of potassium*, containing 100 grains of that salt dissolved in eight or ten ounces of water. After a minute or two it should be again dipped in water, and then finally dried. The picture is in this manner very strongly fixed; and with this great advantage, that it remains transparent; and that, therefore, there is no difficulty in obtaining a copy from it. The Calotype picture is a *negative* one, in which the lights of nature are represented by shades; but the copies are *positive*, having the lights conformable to nature. They also represent the objects in their natural position with respect to right and left. The copies may be made upon Calotype paper in a very short time, the invisible impressions being *brought out* in the way already described. But the author prefers to make the copies upon photographic paper, made by washing the best writing paper, *first* with a weak solution of common salt, and *next* with a solution of nitrate of silver. It requires from three minutes to thirty minutes of sunshine to obtain a good copy on this photographic paper. The copy should be washed and dried, and the fixing process, (which may be deferred to a subsequent day,) is the same as that already mentioned. The copies are made by placing the picture upon the photographic paper, with a board below and a sheet of glass above, and pressing the papers closely by screws or otherwise. After a Calotype picture has furnished several copies, it grows somewhat faint; but it may be restored by washing by candlelight with gallo-nitrate of silver, and warming. A second series of copies may now be taken. In reviving the picture, sometimes various details make their appearance which had not before been seen. The author terminates with a few experiments, as:—1. Wash a piece of the *iodized paper* with the gallo-nitrate; expose it to daylight for a second or two, and then withdraw it. The paper will soon begin to darken spontaneously,

and will grow quite black. 2. The same as before, but let the paper be warmed. The blackening will be more rapid in consequence of the warmth. 3. Put a large drop of the gallo-nitrate on one part of the paper, and moisten another part of it more sparingly, then leave it exposed to a very faint daylight; the lesser quantity produces the greater effect in darkening the paper; and in general, the most rapid darkening takes place at the moment when the paper becomes nearly dry; also, if only a portion of the paper is moistened, the edges or boundaries of the moistened part are more acted on by light than any other part of the surface. 4. If the paper, after being moistened with gallo-nitrate, is washed with water and dried, a slight exposure to daylight no longer produces so much discoloration; often, none at all. But by subsequently washing it again with gallo-nitrate and warming it, the same degree of discoloration is developed as in experiments 1 and 2. The dry paper appears, therefore, to be equal, or superior, in sensitiveness to the moist; only it receives a *virtual* instead of an *actual* impression from the light, which it requires a subsequent process to develope.—Abridged from the *Proceedings of the Royal Society*.

Lenses.—Prof. Petzval, in Vienna, has invented a new combination of achromatic Lenses, in order to make the whole aperture useful. Each of the achromatic lenses has an aperture of one and a half inch diameter, and both act together with their full apertures as a single achromatic lens of five and a half inches in diameter. The diameter of the image in its greatest distinctness is more than four inches. Professor Petzval's first experiments with this instrument were made in 1840. The plate was prepared with tincture of iodine, according to the process of M. Ashenon, of Berlin. On a clear day, the person sitting in the shade, never more than two minutes were required to obtain a perfect portrait. The present method of preparing the plate is, however, somewhat different. *Iodine* is exposed to the vapours of *chlorine*, and then the watery solution of the resulting brown semi-fluid combination is used instead of tincture of iodine. Under these circumstances, a portrait never requires more than eight or ten seconds, and whole groups of figures obtained in this way make a particularly beautiful effect. According to Prof. Von Eltingshausen, the plates become still more sensible when they become *first* iodised in the usual way, and *then* held over a feeble solution of chlorine in water, till they have assumed a reddish tint. Such a plate requires only two seconds in the shade, and less than one second in the sunshine; but the result is not certain. The brothers Netterer, of Vienna, have made another interesting discovery; having found that a plate treated as usual with iodine, and afterwards exposed in the dark for a short time to the vapours of *dichloride of sulphur*, received, in one minute, in the camera obscura, no perceptible image: but it appeared immediately when the plate was slightly heated, or exposed to the light. The recent numbers of the *Comptes-Rendus* contain several new processes by MM. Fizeau, Gaudin, and others. Prof. Petzval has constructed a camera obscura, in which there are two similar achromatic lenses, the distance between which can be increased

or diminished at pleasure; and which may be so managed as to unite nearly all the *chemical* rays into one focus. This is the principal thing to be attended to; the achromatism of the lenses with regard to the luminous rays being of no consequence.—*Letter from Dr. Schafhaeutl to Mr. H. F. Talbot; Literary Gazette*, No. 1277.

Mr. T. Davidson, optician, of Edinburgh, has produced an improved apparatus, by which both Landscapes and Miniature Portraits may be taken, by reversing the lenses: also, an improved Camera, and mode of polishing the plates without oil.

Photographic Paper.—Mr. Hunt has detailed to the British Association, the following paper "On the Influence of the Ferro-Cyanate of Potash on the Iodide of Silver, producing a highly sensitive Photographic Preparation." The author found that the ordinary photographic paper, if allowed to darken in sunshine, and then slightly acted on by any hydriodic salt, and washed, when dry, with a solution of the ferro-cyanate of potash, becomes extremely sensitive to light, changing from a light brown to a full black by a moment's exposure to sunshine. Following out this result, he discovered that perfectly pure iodide of silver is acted on with even greater rapidity, and thus it becomes easy to form an exquisitely sensitive photographic paper. The method recommended is the following:—highly glazed letter paper is washed over with a solution of one dram of nitrate of silver to an ounce of distilled water; it is quickly dried, and a second time washed with the same solution. It is next, when dry, placed for a minute in a solution of one dram of the hydriodate of potash in six ounces of water; and, being placed on a smooth board, gently washed by allowing pure water to flow over it, and dried in the dark at common temperatures. Papers thus prepared may be kept for any length of time, and are at any moment rendered far more sensitive than any photographic preparation, excepting the Calotype, (which it quite equals,) by simply washing it over with a solution formed of one dram of the ferro-cyanate of potash to an ounce of water. These papers may be washed with the ferro-cyanate, and dried in the dark: in this dry state, they are absolutely insensible, but they may at any moment be rendered sensitive by merely washing them with a little cold water. The paper is rendered quite insensible by being washed over with the above hydriodic solution, and from the photograph thus fixed many copies may be taken. The author then described the action of the spectrum on this preparation, and pointed out that the greatest effect was produced by the least refrangible rays; but that all the rays, excepting the *extreme red*, acted with considerable energy. The impressed spectrum was, in all cases, distinctly coloured from end to end; and it was found that the colours of superposed media left a corresponding tint upon the paper, but, unfortunately, as the paper dried, the colours faded. These results bring nearer the probability of being enabled to produce eventually photographic pictures in their native colours. The spectra formed on these pictures were all surrounded by a marked space, which was protected from the influence of the dis-

persed light, exhibiting another instance of the fact noticed before, by Sir John Herschel and the author, that a class of rays having peculiar negative properties emanate from the edges of the sun.—*Athenæum*, No. 720.

Plates.—M. Daguerre, with the view of increasing the sensitiveness of the prepared plates, has subjected them to the action of electricity, while in the camera obscura, and then immediately exposed them to the rays of light. The electric fluid, however, made the plates too sensitive; and so much so, that the mere opening of the covering of the plate inside the camera obscura could not be effected rapidly enough to prevent some portions of the impression being much more vivid than others. M. Daguerre, therefore, used a preparation not so sensitive as that which he commonly employed; and, upon again applying the force of electricity, it had obtained such a degree of sensitiveness, that, according to Mr. Fox Talbot, only the *millionth part of a second* is necessary for obtaining an impression; so that it is not expecting too much to anticipate that when further improvements shall be effected, the actions of the human body may all be taken by the Daguerréotype.—*Literary Gazette*, No. 1276.

Portraits.—The following is a new mode of preparation of the Daguerréotype Plates, by which Portraits can be taken in the short space of time of from five to fifteen seconds, according to the power of light, discovered by A. Claudet in the beginning of May, 1841.—"My improvement," says the author, "consists in using for the preparation of the plates, a combination of chlorine with iodine, in the state of chloride of iodine. I follow the preparation recommended by Daguerre. After having put the plate in the iodine box for a short time, and before it has acquired any appearance of yellow colour, I take it out, and pass it for about two seconds over the opening of a bottle containing chloride of iodine; and immediately, I put it again in the iodine box, where it acquires very soon the yellow colour, which shows that the plate is ready to be placed in the camera obscura. I have substituted for the chloride of iodine, chloride of bromine, and have found nearly the same result; but I prefer chloride of iodine as producing a better effect; and besides, on account of the noxious smell of bromine. The result of my preparation is such that I have operated in ten seconds with the same apparatus which, without any chlorine, required four or five minutes; when using only the original preparation of Daguerre, I have obtained an image of clouds in *four seconds*."

Mr. Goddard has also applied the Daguerréotype to the "taking of Likenesses from the Life." The chemical preparation of the compound metallic plate is the same as that in Mr. Beard's process. The vapour of iodine is not, however, the means employed, nor the resulting iodide of silver the highly-sensitive substance submitted to the sunlight, or even to the ordinary light of day, whereon the faces are fixed. A chloride, a bromide, a fluoride, or a combination of one or more of these with the iodide of silver, is, probably, the means employed by Mr. Goddard. The result is an admirable likeness in about five

seconds. The details of this process, as far as made public, will be found in the *Literary Gazette*, No. 1263.

Transferring Impressions.—A Correspondent of the *Mechanics' Magazine*, No. 943, communicates the following simple method of transferring Daguerréotype Impressions: Press a piece of black or dark paper covered with some glutinous wash, upon the Daguerréotype plate; and the deposit of mercury forming the lights, will come off with the paper when dry. The impression, the reverse of the Daguerréotype, is, of course, a correct picture of the object.

Coloured Photographs.—Sir John Herschel has communicated to the British Association, the following details, accompanied by some very beautiful coloured copies of engravings and mezzotintos, taken by the photographic process, "into the preparation of which no metallic ingredient enters, the whole being tinted with substances of vegetable origin variously prepared. The rays of the spectrum which have eaten away the lights in these photographs, are neither the so-called chemical rays beyond the violet, nor the calorific rays beyond the red. The action is confined almost entirely to *the luminous rays*, and of these more especially to those rays of the spectrum whose union forms a colour complementary to that of the ground-tint; a circumstance which, considering the great command of colour which this new variety of the photographic art affords, holds out no slight hope of a solution of the problem of a photographic representation of natural objects in their proper colours."

DAGUERREOTYPE PLATES ETCHED BY THE VOLTAIC PROCESS.

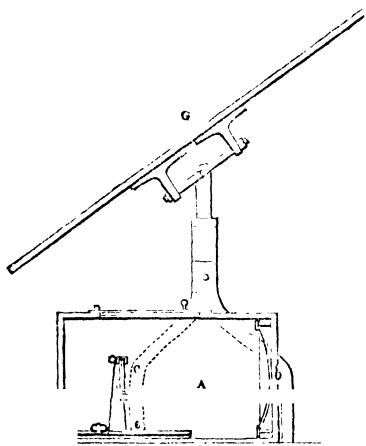
Prof. Grove has read to the Electrical Society, the following paper "On a Voltaic Process for Etching Daguerréotype Plates," illustrated by 20 or 30 prints obtained from the etched plates, by the etched plates themselves, and by electrotype copies of the same. The principles on which the process depends may be gathered from the words with which the author concludes:—"Instead of a plate being inscribed as 'drawn by Landseer, and engraved by Cousins,' it would be 'drawn by Light, and engraved by Electricity.'"

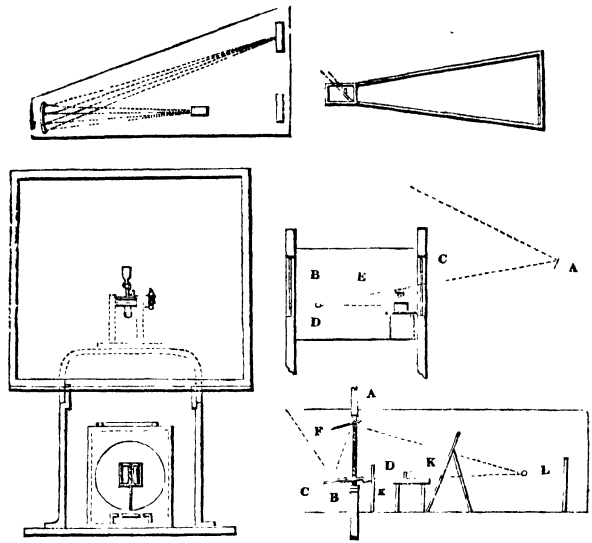
The secret of the process is to make the Daguerréotype the anode of a voltaic combination, in a solution which will not of itself attack either silver or mercury, but of which, when electrolyzed, the union will attack these metals unequally. This is accomplished by employing a solution of two measures of hydrochloric acid to one of water, and placing it in the Daguerréotype plate as an anode, with a plate of platinized silver of equal size as the other electrode. The result of the unequal action of the liberated anion upon the plate, is to produce a perfect etching of the original design; and this, when printed from, gives a picture having the lights and shades as in nature. But, if the plate is etched too deeply, the fine lines will run into each other; if sufficiently acted on to leave a perfect etching of the original design, which can be done with the greatest accuracy, the very cleaning of the plate by the printer destroys its beauty, and the molecules of the

printing ink being larger than the depth of the etchings, a very imperfect impression is obtained. At present, the great object attained is this,—a Daguerréotype picture can be obtained in the ordinary way, it can be etched according to the present process, and from this etching an indefinite number of electrotype copies can be obtained. As an illustration of the perfection attendant on this, the author states, that from a Daguerréotype plate, which had on it a sign-board measuring 1-10 by 6-100 of an inch, five lines of the inscription can be read distinctly by aid of a microscope applied to the electrotype copy. Among many advantages of his mode of etching, is, that local action is avoided.

BEARD'S PATENT APPARATUS FOR OBTAINING LIKENESSES, &c.

THE wood-cuts show various views of this Apparatus; the same parts being referred to by the same letters. *a*, is a rectangular box, at the inside end of which is fixed a concave reflector, of glass or metal, facing the other end of the box, which has an opening corresponding to the size of the reflector. *s*, is a light frame fixed by a support, *d* to *e*, with which it slides lengthwise on the bottom of the box. This frame will carry the prepared material on which the impression is to be made by the reflected image; the material may be retained in the proper position against the frame by a small spring, F, pressing against the material on the back; and between the spring and the frame, *e*, the prepared surface is slid. A small door is made on the top of the box for showing the focal image, and the frame is slid till properly adjusted to the focus. The box, *a*, should be placed on a table or other support, at such height that the centre of the reflector may be about as high as that part of the person which is intended to be in the middle of the picture. When the reflecting apparatus is to be used, the person whose likeness is to be taken should be placed in a chair, with a support for the head, to enable him to remain perfectly still, as the reflecting apparatus should then be placed with the end open immediately opposite to the person. A trial surface is then to be put against the frame, to receive the reflected image, and correctly





placed, by looking through the hole in the box, *a*, and the focus will be adjusted by sliding the piece *e;* the trial surface is then to be removed, and the prepared one substituted, and allowed to remain as long as requisite to form the image.

The size of the reflecting apparatus used by Mr. Beard is: the box, *a*, 15 inches long, 8½ inches high, 8 inches wide, and the interior black; reflector, 7 inches clear diameter, and 12 inches focus; the prepared surface for the picture is 2½ inches long, by two inches wide; but these dimensions may be varied. In bright daylight, the inclined roof, A, of the room should be glazed with blue glass, or otherwise, to soften the bright rays of light, so that the sitter may be as near as possible to the glass roof; but when it is bright sunshine, Mr. Beard uses a large looking-glass, or, what is better, a concave reflector, to collect the rays of light from the sun, and throw it on the person sitting.

Mr. Beard places the reflecting apparatus out of the centre of the large reflector, B, generally behind the large reflector, by means of a hole through it, towards the outer edge: and Mr. B. makes this reflector, B, cheaply, by a frame of wood of the requisite figure or shape, and covering the surface with pieces of looking-glass, 5 or 6 inches square. In preparing plates with silver surfaces, to fit them for receiving impressions or images, and then protect the surfaces

from change, Mr. B. takes sheets of copper, with a surface of silver, such as are commonly used in the Daguerréotype process; he places two such plates together, with their silver surfaces touching, the same having been carefully wiped with cotton, and dilute sulphuric acid, if requisite; and the two plates are then passed five or six times between a pair of smooth hardened rollers. The plates are next annealed, by heating them to a low red heat, and permitting them to cool. They are then again subjected to the acid process, and passed as before, silver face to face, between the rollers, now set somewhat closer; and this rolling and annealing is repeated, until the silver surfaces are highly polished throughout. Next, dip a tuft of cotton into nitric acid, and then into tripoli, and very lightly rub the silver surface of the plate, and then quickly rub off with *dry* cotton; in each rubbing observing a circular motion. Next, rub the surface transversely of the length of the plate, with velvet, upon which has been dusted impalpable powder of charcoal, when the surface will be ready for the iodine process.

Mr. Beard prefers mixing the iodine with nitric acid and water, or with bromine, or with both, or with bromic acid—all in equal proportions. He places a square glass vessel, somewhat larger than the plate to be operated upon, in a wooden box with a cover, and cut open at each end, so as to allow a plate of glass to slide closely across, and permit as little escape of vapour as possible, the plate-glass being somewhat more than twice the length of the box; and in one part, towards the end, an opening is formed through the glass, large enough to receive the metal plate, and yet not to allow it to drop through; by this means, the slide may bring the plate of metal directly over the box, that the vapours, as they rise, may come in contact with the silver surface placed downwards; and, in a few seconds, it will be ready to put into the reflecting apparatus, or into a dark case for holding such plates ready for use.

When the impression has been obtained, the plate is to be operated on by mercury, and the fixing and washing processes, like plates which have, by the Daguerréotype process, received an impression by aid of a camera; which does not form part of Mr. Beard's invention. In taking impressions by the apparatus above described, it is desirable to place a screen behind the person sitting to have a likeness taken, as ground plate-glass, or other semi-transparent surface, through which the shadow of the person may pass; and at the back of this screen, Mr. Beard has a moveable frame, filled with a white surface, capable of receiving the shadow passed through the semi-transparent screen; and by shifting this surface nearer or further from the screen, he obtains varying effects of light and shade in the picture produced. Sometimes, he uses a brown, blue, or black surface, particularly when taking images of plaster busts, or other white objects; for any other object, as well as the human face, having the apparatus placed suitably in front of it, will be received on the reflector, and reflected to the prepared surface. In using the large concave reflector, Mr. Beard stretches across the front a surface of tissue paper prepared with

boiled oil, as tracing-paper, which has the effect of scattering the light, and producing a better effect in the picture.—*Repertory of Patent Inventions*, vol. xv. p. 13; *somewhat abridged.*

LUMINOUS RADIATION APPLIED TO THE DAGUERREOTYPE.

On Jan. 11, M. Biot read to the Academy of Sciences, at Paris, a report on a memoir by M. E. Becquerel on this subject. The principal fact related to an observation, that certain luminous rays, which do not produce by themselves a sensible simple impression on certain substances, are able, nevertheless, to continue the action which other rays have begun to exercise on them. He divided rays into exciting rays and continuating rays. M. Becquerel having prepared a sheet of sensitive paper in a dark chamber, by impregnating it with bromure of potassium and nitrate of silver successively, two pieces of similar dimensions were cut off and placed successively at the bottom of a box, in which they were afterwards covered by a metallic plate, with certain interstices cut in it, so as to represent the outlines of a group of flowers. The paper was then exposed, with this plate on it, for less than a second, to the light in the *camera obscura;* and, on being withdrawn from it, and examined in the dark room by means of a wax candle, it showed only infinitely slight traces of a photogenic drawing. One of these pieces of paper was then laid aside in the dark room to be kept for future comparison. The other was again placed in the box, covered with a piece of red glass, but without the metallic plate, and then left for several hours in the *camera obscura,* to the full action of the light. On being taken out and examined, the group of flowers was found very visibly marked in black on a white ground, so that the image had been actually developed in the absence of an object. It was evident, therefore, that the whole image of the group of flowers had existed on the paper, though nearly imperceptible, and though it had been exposed to the action of the light for so short a time; while, in order to bring this image out, it was necessary that the rest of the paper should remain insensible to the action of the light transmitted through the red glass, although those parts that had seen the light through the metallic plate continued to be influenced by the red rays. This memoir was ordered to be printed in the *Recueil des Savans Etrangers.—Literary Gazette, No.* 1253.

On Jan. 18, M. Biot communicated the result of an experiment suggested by M. Arago, to ascertain whether the chemical action, commenced by the most active portion of the rays, corresponded to a molecular and permanent modification of the impressionable surface, or to a simple vibratory movement communicated to the surface by the first radiation, and continued by the red rays. It was, therefore, determined to allow a considerable interval of time to elapse between the two exposures of the sensitive surface to the two kinds of rays, the exciting and the continuating ones. If, after this interval, it should be found that the second kind of rays still possessed the property of continuing the action commenced by the first, it would be evident that the first impression received by the surface had produced a permanent

molecular change, and not a simple vibratory movement. The experiment fully confirmed this hypothesis, for a piece of sensitive paper which had received the impression of a first momentary exposure, and had then been kept several days in darkness, was found to be still changed as before by the action of the red rays. Another unforeseen result, however, was witnessed. The portions of the paper which had not been subjected to the determining action of the rays at the first exposure, and which the red rays had hitherto failed in affecting, were now coloured by them in a perceptible manner.

M. Biot then read a letter from Mr. Fox Talbot, announcing that he had produced sensitive paper capable of receiving an impression in eight seconds; the coincidence of which with M. Daguerre's improvement was remarked as fortunate for the advancement of photography. —*Literary Gazette, No.* 1254.

CAUSE OF THE PRODUCTION OF THE DAGUERREOTYPE PICTURES.

Mr. M. J. Roberts has thus attempted to elucidate this problem. We all know that light has a powerful effect on crystallization. Let us then suppose, that in the Daguerréotype process, the cleansed silver plate is exposed in the dark to the vapour of iodine; this deposits itself in a flocculent or powdery state upon the plate, unable to form the peculiarly-shaped iodic crystals, from the absence of light; but yet, all other requisites being present, it may be considered in an incipient state of crystallization, or balanced so finely, that the admission of the excitant light instantly throws it into plate-formed iodic crystals, but only in those parts where the light has impinged; and here its perfection of, or continuity of crystallization, is nearly in proportion to the intensity of light.

Having now the iodated plate removed from the camera obscura, where it has undergone a surface crystallization, more or less perfect in those parts where the lights and shades have fallen, we submit it to the mercurial vapour; the atoms, vesicles, or globules of this vapour, being very minute, attach themselves to all the minute inequalities of face in the iodine; on those parts which are fully crystallized, the vapour is precipitated on the flat tabular surface of the crystals, and here offering a continuous and equal angle of reflection to the eye, it appears white and resplendent. On the non-crystallized or imperfectly crystallized surface of the iodine, which being in a measure powdery, and offering no determinate angle of reflection to the eye, the mercurial vapour adheres, but in no flat surface or continuous determinate angle capable of reflecting a mass of light; it may be said it is here unpolished.

Again, may not the angle under which it is necessary to view a Daguerréotype picture be that of the facet of the iodic crystal, and this be a further confirmation of the above theory? The mercurial vapour covers the whole of the iodine, and thus protects it from the further action of light.—*Abridged from the Philosophical Mag., No.* 117.

Dr. Draper, in a paper "On some Analogies between the Chemical Rays and those of Radiant Heat," thus explains the variability of sen-

sitiveness in photogenic preparations: the yellow iodide of silver is excessively sensitive, because it absorbs all the chemical rays that can disturb it; whilst the lavender is insensitive, because it reflects them. Under this point of view, sensitiveness, therefore, is directly as absorption, and inversely as reflexion. The superiority of Daguerre's preparation over common sensitive paper may now be readily understood. It absorbs all the rays that can affect it, but the chloride of silver, spread upon paper, reflects many of the active rays. The former, when placed in the camera, gives rise to no reflexions that can be injurious; the latter fills it with active light, and stains the proof all over. Hence, the Daguerréotype has a sharpness and mathematical accuracy about its lines, and a depth in its shadows, which is unapproachable by the other. Moreover, the translucency of the white chloride of silver, as well as its high reflecting power, permits of particles lying out of the lines of light being affected, the luminous material becoming diffused in the paper.—*Philosophical Mag., No.* 123.

NEW SUBSTANCE FROM LICHENS.—NITROGEN IN ORGANIC BODIES, &c.

A LETTER from Prof. Liebig has been read to the British Association, announcing the discovery of a white crystalline substance, in large quantity, obtained by M. Schunk from the Lichens which are employed in preparing archil, (*Lecanora tartarea*, &c.) by extraction with ether. It differs from Erythrine and the compounds described by Dr. Kane, in its insolubility in water. It dissolves readily in alkaline solutions, and is capable of being again precipitated by acids, if the solution be recently made; but if kept standing for some hours, acids produce no precipitates: it has been decomposed, and is converted into carbonic acid, and *Orceine*. If the substance be dissolved in baryta water, and the clear solution boiled, a large precipitate of carbonate of barytes occurs, and the filtered solution gives, on evaporation, large quantities of *Orceine*. From this circumstance, a number of phenomena in the colour of lichens can be explained, which Dr. Kane has described in his work on that subject. Prof. Liebig also states he has performed many experiments on the legumen of beans, and some other leguminous plants. He has arrived at the conclusion, that this body is identical with the casein in the milk of animals. It has precisely the same composition, and contains the same salts—phosphate of potash, potash, magnesia, lime and iron—as the casein of milk. The Professor also mentions, that Dr. Will and Dr. Varrentrapp have devised an excellent method for determining the amount of nitrogen in organic bodies. The substance is mixed with a quantity of caustic potash, and hydrate of soda, and heated in an ordinary combustion tube to redness. All the nitrogen in the substance escapes as pure ammonia, which is condensed in a small and neat apparatus, containing dilute hydrochloric acid. This solution is mixed with chloride of platinum, evaporated to dryness in a water bath, and the excess of chloride of platinum is washed from the ammonia chloride by a mixture of ether and alcohol. From the metallic platinum which remains after the ammonia chloride is heated to redness, the quantity of nitrogen is to be calculated.—*Athenæum.*

Natural History.

ZOOLOGY.

GLOBULES OF THE BLOOD.

THE following is a synoptical view of the recent researches of physiologists on the Blood Corpuscles in the Mammalia; already noticed in the *Year-book of Facts*, 1839, p. 138; 1840, p. 185; and 1841, p. 182.

Carus has observed, that as decomposition of an animal body proceeds, the globules of the blood in the capillaries first become green, and then pass into a green-coloured fluid. This he considers as a further proof of the views of Schultz, that the globules of the blood, which are of no further use, become changed into bile.

Mandl has found that the globules of the blood in *Crocodilus lucius*, possess in comparison with their breadth a greater size, longitudinally, than the blood globules of any other animal whatever. Their breadth is $\frac{1}{60}$ to $\frac{1}{85}$ of a millimetre, their length $\frac{1}{85}$ to $\frac{1}{80}$ mm. Their nuclei are sometimes round—sometimes elliptical. In *Proteus Anguinus*, the breadth of the globules is $\frac{1}{80}$ mm., their length $\frac{1}{16}$ to $\frac{1}{18}$ mm. With the exception of the camels and dromedaries, the relation of the greatest breadth and length of the globules of the mammalia is, taking their diameters as = 1 : 1;—In the camels, the birds, reptiles, and fishes = 1 : $1\frac{1}{2}$ to 2; whilst in the crocodiles it is = 1 : 2 to 3.

Nasse gives the following measurements of the blood globules in man:—

	DIAMETER.		
Whole globule	0″,00027	0″,00028	0″,00030
Breadth of the ring	0″,00005	0″,000075	
Diameter of the central circle	0″,00015	0″,00017	
Thickness of ring	0″,000045	0″,000066	0″,000075
Apparent thickness of the centre	0″,00002	0″,00003	

According to Gulliver, *Perameles lagotis*, *Petaurus Sciurus*, *Macropus Bennetii*, *Dasyurus ursinus*, and *D. viverrinus*, have the globules of their blood of the common form seen in the mammalia, and $\frac{1}{4800}$″ to $\frac{1}{3000}$″. In *Auchenia Vicugna*, *A. Paco*, and *A. Llama*, they are elliptical, but smaller in the first creature than in the rest.

Tragalus Javanicus has the smallest of the hitherto examined globules, being generally $\frac{1}{12000}$″, sometimes $\frac{1}{15000}$″ to $\frac{1}{9000}$″.

Nasse found that in the embryo of the adder the blood globules were smaller than those of the mother.—*Valentine's Repertorium; Microscopic Journal*, No. 3.

CORPUSCLES OF THE BLOOD.

Dr. Martin Barry has read to the Royal Society, the Second Part of his paper "On the Corpuscles of the Blood." The observations recorded in this memoir are founded on an examination of the blood in every class of vertebrated animals, in some of the invertebrata, and in the embryo of mammalia and birds.

A notice of the first portion of this paper will be found in the *Year-book of Facts*, 1841, p. 184.

RELATIONS BETWEEN BLOOD, PUS, MUCUS, AND EPIDERMIS.

The general conclusions arrived at by Mandl, in his memoir read before the *Société Medicale d'Education*, June 3rd, 1840, are as follows:—1. The fibrinous globules of the blood, the globules of mucus, and those of pus, are identical. 2. All the globules are the product of the coagulation of the fibrin in the serum, which has transuded through the walls of the blood-vessels. 3. The liquid in which the globules swim constitutes the difference between pus and mucus. 4. If the fibrinous globules remain fixed to the surface of the membrane, where they are secreted, they become the nuclei of epidermoid cellules, which constitute the elements of the epidermis. 5. If, on the contrary, the fibrinous globules remain free on the surface of the membrane, they are expelled by the organism, and form an element of pus and mucus. 6. These two elements are simply filtered blood; that is to say, they contain all the elements of the blood, except the globules; the serum at the same time undergoing chemical alterations.—*Gaz. Med. de Paris; Brit. and For. Med. Rev. Jan.* 1841.

ANIMAL HEAT.

MM. Breschet and Becquerel have communicated to the Academy of Sciences, at Paris, the result of some experiments on the Heat of the Organic Tissues of Animals. They had proceeded, with this object in view, to shave the hair off some rabbits, and then had covered their bodies with a mixture of some glue, tallow, and resin. This substance stopped up all the pores of the skin, and caused death in a short time. The result of these experiments is, that an animal whose skin had shown a temperature of 38° Centigr., or about 100° Fahr., before the mixture was put on, gave a heat of 32° shortly after; and, at an interval of an hour, gave 24½° Centigr. or about 75½° Fahr. Another animal gave still lower indications of heat. It was expected that from all the pores being stopped up, internal fever would have been produced, and a great increase of heat have been displayed. These gentlemen also communicated the results of experiments on the relative heat of arterial and venous blood, confirming the commonly received opinion as to the superior heat of the former.—*Galignani's Messenger.*

DURATION OF LIFE OF SAVANS IN FRANCE.

M. Chateauneuf has collected the names of 900 members of the four Academies, who have been nominated since 1635 to the end of

1838, embracing a period of 200 years. The following are the periods of their appointment :—

20 to 30 years	138
30 — 40 —	240
40 — 50 —	262
50 — 60 —	142
60 — 70 —	90
70 — 80 —	26
80 — 85 —	2

147 of the academicians were born in the southern provinces, 156 in those of the east and north, 122 in the central provinces, 231 at Paris, and 20 in the colonies or abroad. Of the 900 members, 567 belonged to the ancient Academies, and 333 to the Institute; 742 are dead; 156 were alive on the 31st of December, 1840. Their combined ages when elected was 39,756 years, which gives 44 years for their age at nomination. This age is, however, slightly modified in the different academies. Thus, for the members of the French Academy, the mean age at nomination is 46 ; for that of the Inscriptions, 45 years; and 41 for that of Sciences. The mean duration of the lives of the 742 members deceased, was 67 years and 10 months, and the mean duration of their academic functions 26½ years. Of the 156 members alive in December, 51 were between 60 and 70; 17 from 70 to 80 ; and 8 from 80 to 90. Two members of the old Academy, (Cassini and Pastoret,) are still alive.—*Athenæum*, No. 717.

COMPOSITION OF THE BRAIN OF MAN.

M. Frenny, in analysing the Brain in different states and of different ages, has found the quantity of free fatty acids to be variable; and that it even sometimes increases when the fatty matters are left in a closed bottle. He has discovered the cause of this curious phenomenon by referring to the observations of M. Chevreul on the fat of carcases, and to the memoir of MM. Pelouze and Bondet, in which they mention the spontaneous saponification of palm oil. He further observes that it is the albuminous matter of the brain which has the property of eventually converting the olein into oleic acid. Lastly, he finds by analysis, that nearly all the fatty bodies occur in the white substance of the brain, and that the grey portion contains only traces; if, therefore, the anatomy of the brain were to be represented in a chemical point of view, it may be said that the substance which forms, so to speak, the frame of the brain, is originally grey; and that it is the fatty matter which infiltrates and spreads in the interior of this grey matter, that forms the white zones which constitute the white portion of the brain.—*Journal de Pharmacie; Philosophical Magazine*, No. 124.

CRANIA OF DIFFERENT RACES.

Dr. Morton states the following to be the Internal Capacity of the Cranium in different Races :—

	No. of Sculls examined.	Mean internal capacity in cubic inches	Largest.	Smallest.
Caucasian	52	87	109	75
Mongolian	10	83	93	69
Malay	18	81	89	64
American	147	80	100	60
Ethiopian	29	78	94	65

GROWTH OF HAIR.

M. MANDL is inclined from some phenomena which he has observed in the Growth of Hair, to arrive at a different conclusion relative to this process from that generally received. He states that, in individuals who have had their hair recently cut, each hair preserves its diameter to its free end, which presents a truncated extremity, where the eye may distinguish the section both of the cortical part, and that of the internal canal. But if these same hairs are examined after a long interval, each hair is found to be terminated by a pointed extremity, more or less long, but with its extremity closed. This change of form M. Mandl considers to be the result of a vital process, and as proving the possibility of a movement of fluids in the interior of the hairs. He thinks this opinion is still further supported by the fact, that when hair is kept long, instead of the formation of a pointed extremity, obliteration of the extremity of the canal alone takes place, which he supposes to be caused in all probability by the difficulty of the movements of the fluids. —*Amer. Jour. Med. Science; Comptes Rendus*, 1840.

DECOMPOSITION OF THE HUMAN HAIR.

DR. BIDDER, of Dorpat, has found a maceration for several weeks in muriatic acid to be the most effectual means of decomposing the fully developed hair into its fibrous elements. The hair is in this way rendered so soft, that by slight pulling it is torn asunder; it can be split into longitudinal threads even by rough preparation, and, by pressure in the direction of the breadth, it can be as completely separated as can be wished for microscopical investigation. There appear coarser and finer fibres uniting with one another in a plexus-like manner, and crossing in the most varied directions; the deviation from the parallel course being, doubtless, a consequence of the preparation. In the thinner fibres, some resemblance to the elastic fibres is produced by frequent union. But even these fibres are bundles of numerous fine fibrils. These, the elementary forms of the hair, present themselves as dark lines, becoming from place to place a little broader, and even at these broader spots, which are the remains of earlier cellular bodies, possessing a diameter of only 0·00041″, according to an estimate made of it at these very spots, which, indeed, are the only portions sufficiently broad to admit of being calculated. They are, therefore, the finest of all the elements of the body hitherto ascertained. * * * If the thickness of a human hair be estimated, on an average, at one-tenth of a line, then, to produce its diameter, there must be confined about 250 elementary fibres.

CURE OF STAMMERING.

THREE successful operations for the cure of Stammering have been almost simultaneously performed by the same number of eminent practitioners: 1, by Mr. Baird, of Manchester, in September, 1840; 2, by Mr. Yearsley, of London, in December, 1840; 3, by Professor Dieffenbach, of Berlin, in January, 1841. (Letter from Mr. Baird, in the *Medical Gazette*, April 9.) Mr. Baird's notion as to the cause of Stammering, and the mode of cure, are nearly the same as those of Mr. Yearsley. Mr. Baird conceives Stammering to be caused by the glottis being prevented from raising sufficiently the quantity of air required, and acting with that promptitude necessary to secure free and correct enunciation. Mr. Yearsley, on the contrary, conceives that *no* air is allowed to escape from the chest; and that there is besides an impossibility of any passing forward into the mouth, from the absolute closure of the anterior fauces by approximation of the dorsum of the tongue and palate. Mr. Baird thinks there is always a certain quantity of air admitted into the mouth of the greatest stammerer, although not enough to enable him to speak correctly and freely; and that the pressure of the lips causes this air to react on the epiglottis and root of the tongue, so as to cause a still further closure of the larynx and difficulty of egress of air. In proof of this, Stammering is most apt to happen when the labial or palatine consonants occur; the former from the action of the air just stated, the latter from the pressure of the tongue against the palate, tending to produce the same effect. The fact of stutterers being able to sing what they cannot speak, seems to favour the same view; and Dieffenbach's, Mr. Yearsley's, and Mr. Baird's modes of operating, tend to secure the same freedom of opening the glottis; the former by drawing the root of the tongue, and of course the epiglottis, upwards and forwards; the latter by removing the obstacle to its free opening, in allowing it to rise by removal of the enlarged tonsils, and its advancing forward by removing the bridling of the tongue by division of the frænum, or preventing the titillation of the enlarged uvula, stimulating that ever-watchful sentinel, the epiglottis, to too vigorous exercise of its functions of guarding the entrance of the glottis from all impertinent intruders.

Mr. Yearsley, in a letter to the *Medical Gazette*, dated March 9, states that he had operated on upwards of forty persons, all of whom immediately felt themselves relieved of their impediment. Many seemed wild with joy, or shed tears of pleasure, at the instantaneous restoration. After the operation, the difficulty of speech which remains is referred by the patient to the lips; they express themselves entirely free from the original difficulty. Something must be allowed for the long misuse of the organ of the voice, and the existence of habit, in rendering the voice less perfect than in the natural state. Mr. Yearsley adds that the principle of his operation is quite different from that of M. Dieffenbach, practised, with success, in France, by MM. Amussat and Phillips, and in this country by Mr. Bennett Lucas. This operation appears to Mr. Y. to rest upon the principle that the tongue is chiefly concerned in the production of the voice; whereas, Mr. Y. inquires, does not

this organ rather serve to modulate the voice after it has issued from the pharynx, &c.; while in stammerers it is the fresh production of sound which creates the difficulty, rather than its subsequent modulation?

In the above Number of the *Medical Gazette* will also be found Prof. Dieffenbach's account of his own operation, communicated by Dr. Franz. The Professor proposed three methods, the superior of which, notwithstanding its severity, he has found to be "the horizontal transverse section of the root of the tongue, with incision of a portion in the form of a wedge;" "since by cutting out a transverse portion of the tongue, the alteration of the nervous action on the vocal organs must be more decided; the tongue likewise becomes shortened, and its tip turned upwards, which latter circumstance has always been considered as contributing materially to the removal of stammering."

For the *modus operandi* of each practitioner, with cases, &c., the reader is referred to the *Medical Gazette*, Nos. 25, 26, and 29; which contain papers from the above Correspondents upon this discovery; also, to No. 33 *et seq.* for a memoir on the several methods, by Edwin Lee, Esq. Prof. Dieffenbach will be remembered as the discoverer of a Cure for Strabismus, described in the *Year-book of Facts*, 1841, p. 188.

CURE OF CRETINISM.

To diminish the considerable number of Cretins in the narrow valleys of the Alps, an establishment has been formed for the education of children who, in their infancy, present indications of this condition. It has long been ascertained that all young Cretins might be cured by transferring them from their low valleys to the high mountains; and that at a distance of about 3000 feet above the level of the sea these unhappy creatures are no longer met with.

All the midwifes of the narrow valleys easily recognise Cretinism at the time of birth: they know that every child born with a stupid expression of face, uttering peculiar cries, and making strange movements, is sure to be a Cretin. When such an one is born, a report will, in future, be made to the civil authorities, that the child may be taken to the national institution, which is now founded on a mountain in Berner Oberland, and in which all the necessary arrangements are taken to secure the complete physical, intellectual, and moral development of the young children.—*Gazette Médicale*, Mai 8, 1841; from *Haeser's Archiv fur die Gesammte Medicin.*

EQUIVOCAL GENERATION AND CREATION.

It is, generally speaking, much safer to generally trust prevailing laws, than to confide in such of our observations as are contrary to them. This remark may be applied to the assertion that plants are formed of granite, distilled water, and oxygen, under the influence of solar light. It ought to be remembered, that sometimes, in common life, the appearance or disappearance of a body seems impossible, and still, somehow or other, is effected; and yet, in such cases, we do not

have recourse to Equivocal Generation. This remark frequently applies to the appearance of higher plants and animals in places where it is impossible to account for them; as after great conflagrations, or the draining of lakes and inlets of the sea, or of fishes in the lakes of volcanic islands. Such facts, however, instead of proving the existence of equivocal generation, ought only to teach us the difficulty of investigating the powers of nature, and demonstrate that we are incapable of accounting for the appearance of such plants and animals as could not be supposed to be produced by spontaneous generation without absurdity.

Creation is sometimes referred to in favour of equivocal generation; as in the following language: "It is certain a time existed when even the highest organisms were brought into existence without a progenitor; and hence such formations are not impossible. Creating power was then in its pristine vigour, now it is weaker; but that it should have totally ceased is improbable; on the contrary, it might be inferred, *à priori*, were it not proved by facts, that it still exists, at least as concerns the lowest plants and animals." But in referring to creation, the defenders of equivocal generation appeal to what may now be properly styled a *miracle*, that is to say, an act contrary to the established laws of nature; and this appeal is inadmissible, because the actual phenomena can be explained only by actually prevailing laws. Even were the appeal admitted, our decision would be against the appellants; for the analogy between equivocal generation and creation has ceased with the discovery that the Infusoria as well as the Entozoa form well-marked and distinct species. Once proved, then, that these animals, wherever they appear, belong to the species already known, it is also proved that their creation has ceased, as has that of other animals; for creation is not a *re*-production, but a first production, and from nothing.—From elaborate *Inquiries concerning the Origin of Intestinal Worms*, by Dr. Eschricht, communicated (in English) to *Jameson's Journal*, No. 62.

MERMAID OF 1822-3.

THE annexed details of an impudent hoax, which was played off in London some eighteen years since, are from a new work entitled *Manners and Customs of the Japanese*:—

A Japanese fisherman seems to have displayed ingenuity for the mere purpose of making money by his countrymen's passion for everything odd and strange. He contrived to unite the upper half of a monkey to the lower half of a fish, so neatly, as to defy ordinary inspection. He then gave out that he had caught the creature alive in his net, but that it had died shortly after being taken out of the water; and he derived considerable pecuniary profit from his cunning in more ways than one. The exhibition of the sea-monster to Japanese curiosity paid well; but yet more productive was the assertion that the half human fish, having spoken during the few minutes it existed out of its native element, had predicted a certain number of years of wonderful fertility, and a fatal epidemic, the only remedy for which would be possession of the marine

prophet's likeness. The sale of these pictured mermaids was immense. Either the composite animal, or another, the offspring of the success of the first, was sold to the Dutch factory, and transmitted to Batavia, where it fell into the hands of a speculating American, who brought it to Europe; and here, in the years 1822-3, exhibited his purchase, as a real Mermaid, at every capital, to the admiration of the ignorant, the perplexity of the learned, and the filling of his own purse.

THE ZOOLOGICAL SOCIETY.

At the Annual Meeting, held on April 29, the number of Fellows was stated at 2849, being a decrease of 274 within the previous year. The Report of the Council refers to the death of Mr. Vigors, the first secretary of the Society; and to whose zeal and activity it is indebted for a large portion of its early popularity, as it is to his liberality for an extensive Collection of Birds and Insects, besides numerous minor donations. The income of the Society during 1840, amounted to 12,732*l.* 1*s.* 5*d.*, and the expenditure to 11,838*l.* 1*s.* 11*d.*: the gross amount of receipts fell short of that of the previous year by the sum of 699*l.* 10*s.* 10*d.*; the greater portion of which deficit was from the reduced number of Garden Admissions. The corresponding decrease in the expenditure of the Society has been 1798*l.* 14*s.* The Museum Collection, valued at 10,965*l.*, has been removed from Leicester-square, *pro tempore*, to Broad-street, Golden-square: the number of visitors in 1840 was 3901, of whom 3330 were privileged. No works of magnitude have been undertaken in the Gardens. The Monkey-house had continued perfectly healthy, and there had not been, in twelve months, a single instance of phthisis, or tuberculated lungs. The Giraffes had enjoyed uninterrupted good health. The whole number of animals contained in the Menagerie was 894; of which 352 were Mammalia, 524 Birds, and 18 Reptiles. The donations had been very considerable; and that of rare and valuable Birds and Quadrupeds from the Philippine Islands, by H. Cuming, Esq., exceeds in interest any single collection which the Society has received for some years: among its specimens are an Argus Pheasant, believed to be the first living bird of that species ever seen in Europe; a fire-backed Pheasant, a Gibbon Ape, a Flying Squirrel, &c.: a living Babyreussa, the first ever seen in this country, has been received from Capt. E. Belcher, R.N. A Hornbill and Mocking-bird, (*Orpheus polyglottus,*) are also among the Mammals exhibited for the first time in the Menagerie. Among the other additions are a Boa Constrictor, 3 Protei, 2 Tiger Boa Constrictors, a Nutmeg-bird, a new Oriole, and 2 Mocking-birds. The number of visitors to the Gardens during the year 1840 was 141,009, of whom 49,320 were privileged, and 91,029 unprivileged; in the former a decrease of 9,029, and in the latter of 8,394, as compared with the visitors belonging to their respective classes in 1839. In August, two males and a female Chimpanzé were added to the Managerie. Five Orangs sent from Borneo, by Mr. Brooke, all died previous to their arrival in this country, and have been received at the Gardens, preserved

in spirits. The young Giraffe, born in June, was, at the above date, about eight feet high, to the tip of its head.

ORNITHOLOGICAL SOCIETY.

THIS Society, established in the metropolis in 1837, for forming and maintaining a complete collection of Water-fowl, proceeds well, with Prince Albert for its patron. The birds are kept as nearly as possible in a natural state, (the lake in St. James's Park forming a great natural cage,) and are open, of course, to the view of all classes. The Commissioners of Woods and Forests, in consideration of the increasing interest evinced by the public in the collection of Water-fowl, have, at the solicitation of the Council, appointed an efficient keeper for superintending the birds; and notwithstanding the severity of the winter of 1840-1, the Society sustained but a very trifling loss. The Lords of the Treasury have liberally granted the sum of 300*l.* for the erection of a cottage in St. James's Park, for the residence of the keeper, which has been completed under the sanction of the Commissioners of Woods and Forests. The following list of species enumerates those which have been turned out in the Park by the Society—viz.:—

Peacock, pheasant, purple heron, night-heron, bittern, white stork, spoonbill, coot, gallinule, Polish swan, sheldrake, golden eye garrot. *Geese.*—China (three varieties), bean, white-fronted, Canada, barnacle, Brent, Egyptian. *Ducks.*—Muscovy, common, hook-billed, Buenos Ayres, crested, call, gadwall, pintail, teal, garganey, shoveller, widgeon, summer. *Pochards.*—Red-headed, tufted.—Merganser Smew. *Grebe.*—Crested, little. Cormorant, gannet, gull, herring.

The greater part of the birds above enumerated are alive and thriving in St. James's Park; and the Council are most anxious to form and maintain their collection upon a scale far exceeding the means at present placed at their disposal. Gentlemen interested in ornithological pursuits, whether residing on their estates in the United Kingdom, or in foreign countries, are respectfully invited to contribute live specimens of aquatic or gallinaceous birds to a collection so productive of pleasure and instruction to all classes. All such donations will be gratefully received, recorded, and cherished.

Desiderata.

Swans.—Hooper, Bewick's, black, trumpeter, Polish. *Geese.*—Grey-lag, red-breasted, spur-winged, Hutchins' cereopsis, Sandwich island. *Ducks.*—Sheldrake, Eider, gadwall, ruddy, bimaculated, king, western, velvet, scoter, surf scoter, red-crested, castaneous or white-eyed, scaup, harlequin, long-tailed, summer, shoveller, red-billed whistling, black-billed whistling, buffel-headed, canvas-back, dusky, pied, Mandarin teal, Japanese teal. *Divers.*—Great northern, black-throated, red-throated. *Grebes.*—Crested glebe, eared, red-necked, little, Carolina or pied bill, horned; goosander, red-breasted merganser, hooded merganser. *Pheasants.*—Gold, silver, ring, pied; smew, wild turkey, Javanese pea fowl, jungle fowl, red grouse, black grouse, ibis, curlew, wimbrel, oyster catcher, red godwit, green shank, red shank, plovers.

The cottage for the Society, completed as above, occupies the eastern extremity of the Island in St. James's Park, nearly opposite the State Paper Office. The design, by Mr. J. B. Watson, presents a pleasing specimen of the Swiss style, or *cottage ornée*. It contains a

council-room; apartments for the resident keeper; a room fitted with steam-apparatus for hatching eggs, similar to that employed at the late Eccaleobion, in Pall Mall. Contiguous to the cottage are places for rearing the young birds, and feeding places and decoys for catching surplus birds for distribution among the members of the Society, and their friends. The various aquatic fowl likewise breed on the Island, making their own nest among the shrubs and grasses.

ZOOLOGY OF CORNWALL.

Mr. Couch has read to the British Association a Report on the Zoology of Cornwall. Amongst other interesting facts, he stated, that what might be called severely cold winters did not occur more frequently than in cycles of six or eight years. The appearance of bats might be witnessed in every week of an ordinary year; but if the thermometer fell below 40° Fahrenheit, it was a signal for their retreat, although a milder temperature restored them to activity, when it was not uncommon to see them the whole day. Another proof of the mildness of the climate was, that the long-tailed field mouse breeds at the beginning of January, forming its nest in the ricks of hay; the frog, also, was rarely later than this period in depositing spawn, and fishes then deposited their spawn. He stated Cornwall to contain 244 species of birds, and 173 fishes, and made an addition to the number of testaceous and molluscous animals and zoophytes. But these were not reported, as a second part of the Cornish Fauna was about to be published.

MAMMALIA IN SCOTLAND.

On April 3, were exhibited to the Wernerian Society, a very young Hyæna, recently cubbed at Edinburgh; a small Chili dog, nearly destitute of hair; a remarkable variety of the common Hare from the Rutland range; a male wild Cat from Perthshire, 3 ft. 8 in. long; specimens of the rough-legged Falcon and the Osprey, from the Pentlands; and a specimen of the Picus major from the neighbourhood of Inverness.

ANIMALS OF NEW HOLLAND.

Mr. J. E. Gray, F.R.S,, has read to the British Association, a Report on the Geographical Distribution of the Animals of New Holland. There are, it appears, 94 species of mammalia, belonging to 33 genera, of which 70 species belong to 21 marsupial genera. There are only 2 species and 2 genera of the feræ or carnivorous beasts, as the dog and seal. There is only one known beast in Norfolk Island, which is supposed to have been introduced from Sydney, especially as it is not known in Van Diemen's Land. Some of the genera are found in the old world, others in both hemispheres, and others in New Guinea. Of the above, 58 species inhabit New South Wales, 12 South Australia, 19 Western Australia, 5 the North-west coast, 2 the North coast, 21 Van Diemen's Land, and 1 only Norfolk Island.

THE DOG-HEADED OPOSSUM.

PROF. OWEN has described to the British Association, a *Thylacynus*, the great Dog-headed Opossum, and one of the rarest and largest of the marsupiate family of animals. At the present day, it exists only in Van Diemen's Land, though formerly it had a much more extensive geographical distribution. For his knowledge of the anatomy of this animal, Mr. Owen stated that he was indebted to Sir John Franklin, who had kindly preserved and sent him a specimen in spirit, and he believed this was the only specimen extant in Europe. In its habits it is carnivorous; holding about the same relation to the other marsupiata that the carnivora do to the whole of the mammalia. It is a great pest to the shepherd in its native districts; and in its low intellectual character, and its craft and cunning, very much resembles the wolf. In destroying sheep, it does not feed on them at once, but proceeds to worry, if possible, the whole flock, first tearing one and then another. Its smell is very powerful. It has a narrow head, a large number of incisor teeth, with the molars all alike. Its bony palate is very defective, thus presenting a lower organization than any of the carnivora of Europe. Its internal organization agrees with that of Dasyurus. Its external organization presents nothing remarkable. It has the pouch so remarkably characteristic of the whole order of these animals. The reason of the existence of this pouch might be to enable the animal to carry its young great distances more easily, as it is obliged to travel far in seasons of drought in search of water. Both male and female possess this pouch in the whole family, in the former less evident. In Thylacinus, the pouch is more developed in the male than any other genus.

NATURALIZATION OF THE ALPACA.

MR. W. WALTON has enlarged from a paper in the *Polytechnic Journal*, No. 18, "A Memoir addressed to the Proprietors of Mountains and other Waste Lands, and Agriculturists of the United Kingdom, on the Naturalization of the Alpaca: recommended by the Natural History Society of Liverpool, as a New Breeding Stock," calculated to supply the manufacturer with another raw material, of our own growth, applicable by its fine quality and glossiness to the purposes of silk, &c. The Memoir, extending to 42 closely-printed pages, has been printed for the Liverpool Society, to whom it is addressed. Mr. Walton appears, from an early age, to have made the naturalization of the Alpaca, and the domestication of the Vicugna, his favourite topics of inquiry: hence, his memoir evinces laborious research, and a valuable series of references to the best authorities upon this interesting branch of rural economy. It is illustrated with a portrait of the first Alpaca exhibited in London, which was imported from Lima, by the late Fermin de Tastet, Esq., who passed it to Mr. Thorpe, of Chippenham Park, Cambridgeshire, in exchange for a pair of coach-horses. It was the most beautiful specimen ever brought to this country, and was so considered at Lima, where it was a lady's pet, and had gold rings placed in its ears. Mr. Cross gave 100*l.* for it.

In a note to his memoir, dated April 26, 1841, Mr. Walton states the number of Alpacas, (or Peruvian Sheep,) in the kingdom, to be as follows:—the Earl of Derby, Knowsley Hall, Lancashire, 16; Marquis of Breadalbane, 7; Duke of Montrose, 3; Earl Fitzwilliam, 1; Zoological Gardens, Dublin, 6; ditto, Regent's Park, 2; J. J. Hegan, Esq., Harrow Hall, Cheshire, 7; C. Tayleure, Esq., Parkfield, Liverpool, 5; J. Edwards, Esq., Pye Nest, Halifax, 6; Mr. Stephenson, Oban, 6; W. Bennett, Esq., 12; Surrey Zoological Gardens, 1; Zoological Gardens, Liverpool, 3; in travelling caravans, 4; total 79; besides 6 just arrived in Liverpool. The existence of this number among us, and their healthy appearance, as reported to Mr. Walton, wherever he has been able to institute inquiries, is a better proof of the capacity of Andes sheep to adapt themselves to our climate, than any further elucidations or arguments which he could adduce.

GUANO IN AGRICULTURE.

Guano, *i. e.*, the dung of the Guano, a South American sea-bird, is likely to become a considerable article of commerce, as it is found in great quantities on the rocky coasts of the Pacific, and is said to be the most powerful and concentrated of all manures. Applied at the rate of about 2 cwt. an acre, it produces very fine crops of turnips and grasses, and is particularly suited for the light lands on which these crops are usually reared. The wonderful effects of sea fowls' dung are mentioned by Sir Humphry Davy, in his *Agricultural Chemistry*. Together with nitrate of soda, which is obtained from the same quarter of the world, it is likely to have a great effect on English agriculture.—*Liverpool Times.*

WILD CAT.

In October, Sir Pyers Mostyn, of Talacre, shot a Wild Cat, in a covert in the parish of Llanasa. The cat and a brace of foxes started from the same gorse-bush. A wild cat had not been seen in the country for fifty years: the tail is annulated with black, the body striped black; the dorsal stripes three longitudinal, those on the sides spiral. The length is 3 ft. 2 in., girth 16½ in., and the weight 13 lb. 2 oz. Sir Pyers Mostyn also shot a male hobby, a beautiful specimen of a small hawk, which was about to set out for his winter quarters in Western Asia. This bird was formerly used in hawking, and was, in early times, employed by the Welsh falconers, as testified by a bard of the 14th century.—*Carnarvon Herald.*

RESPIRATION OF THE HORSE.

The quantity of air necessary for the healthful Respiration of the Horse has been reported by a Committee of the Academy of Sciences, at Paris, to be from 25 to 30 cubic inches, in a building where the air is properly renewed by skilful ventilation.

CHANGE IN COLOUR OF THE LEPUS AMERICANUS.

Col. Smith relates that a number of specimens of the *Lepus Americanus* being shipped in America quite white, at the end of twenty days they had turned quite brown. The hairs were not shed, and the change must have taken place in the hairs themselves.—*Jameson's Journal, No.* 62.

NEW GLIRINE ANIMAL FROM MEXICO.

Mr. Gray has described to the British Association, an animal brought from Mexico by Mr. J. Phillips, and peculiar for having large cheek-pouches, which open externally on the sides of the cheek; a conformation hitherto only observed in four genera of Glirine animals, which exclusively inhabit the northern half of the American continent. These cheek-pouches are used by the animals to carry their food, as the monkeys of the Old World use their internal pouches, between the cheek and mouth. The first of these genera has been long known; and it has been believed that these cheek-pouches hung out of the cheek like pockets; but this does not appear to be the case with the genus under consideration, or with the *Anthomys*, so called because Mons. F. Cuvier found their cheek-pouches filled with flowers. If it were not for these cheek-pouches, the animal before us might be taken for a Gerboa; with which it perfectly agrees in the softness and colour of the fur, and in the length of the hind legs and tail, which has a brush at the end; so that it may be at once distinguished from the other American genera above enumerated, which either have an elongated scaly tail, like a rat, or a very short one, like a lemming. Mr. Gray is, therefore, inclined to consider this animal as the representative of the genus (Dipus) Gerboa, which is confined to the more temperate part of Africa, as the Harpalotis is representative of the same genus in Australia. The combination of the forms and colour of the Gerboa, with the external cheek-pouches of the pouched rat, at once marks this animal as a new genus, which Mr. Gray proposes to call Dipodomys, or Gerboa Rat, designating the species after its discoverer, *Dipodomys Phillipsii.*—*Athenæum, No.* 720.

PERIODICITY OF BIRDS.

M. E. de Selys Longchamp, of Liege, invites the naturalists of all the countries of Europe, to co-operate in endeavouring to ascertain how far the arrival of certain animals and the foliation and inflorescence of plants, are promoted or retarded by the condition of the atmosphere in each year. In this paper, he addresses himself exclusively to Ornithologists, showing them that of the annual route of swallows, cranes, and many other birds which migrate to great distances, we can only speak vaguely, from the want of comparative observations; and he recommends that, for the present, our observations should be chiefly directed to birds which spread over the whole, or nearly the whole of Europe. He also assigns his reasons for selecting terrestrial birds in preference to aquatic kinds, and proposes that the

precise dates of arrival and departure should be recorded from the beginning of the year 1842.—*Proceeedings of the British Association.*

FALCONS.

In October, a very fine specimen of the Osprey was shot in the neighbourhood of Clun, by one of the gamekeepers of the Earl of Powis. A superior specimen of the Peregrine Falcon, a female, was netted about the above time, on the Old Oak Farm, East Acton: she is well-proportioned, powerful, and will make a first-rate kind for rook-hawking.

THE BUSH TURKEY.

Mr. Gould has read to the Zoological Society the following notes on that most singular and anomalous bird, the Bush Turkey, (*Tulegella Lathami,*) of New South Wales. This bird does not hatch its own eggs, but employs for that purpose similar means to those now in use for artificial incubation. For weeks prior to the period of laying, it collects an immense mass of vegetable matter, varying from two to four cart-loads, with which it forms a pyramidal heap; in this it places its eggs, about 18 inches deep, and from 9 to 12 inches apart. The eggs, which are always placed with the large end upwards, being carefully covered, are then left to hatch by the heat engendered by the decomposition of the surrounding matter. The heaps are formed by the labours of several pairs of birds, and frequently contain as many eggs as would fill a basket. The eggs are white, about 3¾ inches long by 2½ in diameter; and having an excellent flavour, are eagerly sought after; the flesh is of a pale salmon colour, juicy, and tender. After all he has seen of the Bush Turkey in a state of nature, Mr. Gould has no hesitation in assigning it a place among the *Gallinaceæ*, among which it has a nearer alliance to *Cracidæ* than to any other group; at all events, it is in no way allied to the *Vulturidæ*, as Mr. Swainson maintains; and is equally distant from *Menura*, with which it has been classed by some writers.

RARE DIVER.

On March 14, a remarkably fine specimen of the Black-throated Diver, a bird rarely seen in England, was shot in the river Severn, near Tewkesbury. From the circumstance of this being a male bird, and a female of the same species having, a few days before, been shot at Worcester, it may be premised that the pair took their flight together from the more northern regions of the globe.—*Gloucestershire Chronicle.*

THE SMEW.

Early in July, a beautiful male adult specimen of the Smew, (*Mergus Abellus*, Linn.) was shot at Clungerford Pool, Shropshire, by J. Rocke, Esq. About the same time, an immature specimen of the same species was killed at Ticklerton, by W. Pinches, Esq. The males of this species, (as well as the rest of the genus Mergus,) are two

years before they attain that beautiful plumage of the bird killed by Mr. Rocke; consequently, it is of rare occurrence in these parts to obtain an adult specimen. Old birds of this species, as well as many other of our occasional visitors, are of much rarer occurrence than young, or birds of the year.—*Shrewsbury Chronicle.*

NEST OF THE SATIN-BIRD, &c.

MR. GOULD has described to the Zoological Society an extraordinary piece of bird-architecture, constructed by the Satin-bird, *Ptilonorhynchus holosericeus;* and another of similar structure, but still larger, by the *Chlamydera maculata.* These constructions, Mr. Gould states, are perfectly anomalous in the architecture of birds, and consist of a collection of pieces of stick and grass formed into a bower; or one of them, (that of the *Chlamydera,*) might be called an avenue, being about 3 feet in length, and 7 or 8 inches broad inside; a transverse section giving the figure of a horse-shoe, the round part downwards. These nests are used by the birds as playing-houses, or "runs," and by the males to attract the females. The run of the satin-bird is much smaller, being less than one foot in length; and, moreover, differs from that just described in being decorated with the highly-coloured feathers of the parrot tribe. The *Chlamydera,* on the other hand, collects around its "run" a quantity of stones, shells, bleached bones, &c., which are also strewed down the centre within. Mr. Gould has spent much time in observing the habits of these birds, and is fully satisfied that the "runs" are actually formed by them, and constructed for the purposes described.

RARE PARROQUET.

ON Februury 16, Mr. Gould exhibited to the Linnæan Society specimens of the *Nanodes undulatus* of Vigors, a kind of Parroquet from New South Wales, remarkable for the beautiful shot-like spots of rich purple on the throat; with them was the original nest in the hollow trunk of a gum-tree: they are the first living specimens that have been seen in Europe.

BIRDS OF KERGUELEN'S LAND.

THE Birds usually met with by Mr. M'Cormick, Surgeon H.M.S. *Erebus,* in Kerguelen's Island were petrels and penguins; two species of gull or duck, a shag, a tern, a small albatros, and a species of chionis; also, a remarkable nocturnal bird allied to the *Procellaria.*—*Proceedings of the Royal Society.*

SMELTS IN FRESH WATER.

THE circumstance of the Smelt passing six or seven months of the year in fresh water, has led to experiments to retain it in ponds. Colonel Meynell,' of Yarm, has kept smelts for four years in a fresh-water pond, having no communication with the sea; they were not affected by freezing, although the whole of the pond, which covers about three acres, was so frozen as to admit of skating; and when the

pond was drawn, some fishermen of the Tees admitted that they had never seen a finer lot of smelts; there was no loss of flavour or quality.—*Times, Dec.* 1; *abridged.*

BREEDING SALMON.

SIR F. MACKENZIE has succeeded in breeding Salmon in a pool upon his estate; the spawn was hatched in the manner described by Mr. Shaw, (see *Year-book of Facts*, 1841, p. 206,) and the *par* (the young fish) were numerous.—*Inverness Courier.*

HABITS OF THE EEL.

AT the late meeting of the British Association, some very interesting facts were elicited respecting the Habits of the Eel. Capt. Widdrington, in reply to a remark of Mr. Yarrell, in his work on British Fishes, ascribing the deficiency of eels in the Danube, to the excessive susceptibility of the eel to cold, stated that he had seen eels at Wurzburg on the Main, where the average degree of cold is quite as great as that of the Danube. They likewise exist in the Elbe, above Vienna, which would also be colder than the Danube. They exist, undoubtedly, in the higher branches of the Danube, but not in the Delta. This the author ascribes to the nature of many of the waters which fall into the Danube, which, and other alpine streams, being composed of melted snow or rain water, possess few constituents that will afford nutriment to fish. The same remarks apply to the Rhine, which is completely alpine in its character, till it reaches the Moselle. The author announced that Prof. Hechel was about to publish a work on the fresh-water fishes of Austria, which would contain some new genera and a large number of new species. Mr. Couch said he had studied very particularly the habits of the eel. Captain Widdington's explanation might be correct. The eel was remarkable for its tenacity of life, and existed almost everywhere, where other fish are found. The eel does not bury its spawn. He described the process of development of the eel. Directly the young are born, they ascend the rivers and get into almost every possible position. This takes place in March; after that month, migration ceases. If it could be accomplished, they would all go back to the sea after this period; but circumstances render this frequently impossible. To effect this object, they commonly pass over dry ground, ascend the sides of rocks, and overcome incredible difficulties. This is also the case with the opossum shrimps when ascending a river. The tail of the eel is prehensile; it can get out of boats by its action; for if it once gets it on to the edge of the boat, it is sure to get into the water. This is why fishermen always bruise these fishes on the tail, in preference to any other part, when they catch them. They hear better than many fishes, and this may account for their being disturbed during thunder or any great noise, when other fishes are quiet. Mr. Jerdan related the instance of the young being found in a stream near Maidstone in the month of August; and he had seen them feeding on weeds that were floating on the surface of a pond. A Member stated that in Jamaica the eel was a poisonous fish, and never

eaten. Mr. Couch thought that their food might, in some instances, render fishes poisonous. He thought eels were double-brooded, producing spawn in winter and summer. This would account for Mr. Jerdan having seen the young so late in the summer. Many fishes were double-brooded, as the shark, trout, &c. A phenomenon called *foul water* in the sea arose from the spawn of fish. It was deposited, then floated to the surface and formed a kind of mucous layer for many miles on the sea: when it began to decompose, it was called foul water.

The subject of the diseases of fish having been alluded to, several instances were related by members, in which particular species of fishes were attacked in ponds and rivers, and died off in great numbers. The causes of these phenomena were not satisfactorily made out.—*Athenæum, No.* 720.

THE SAW-FISH.

On lately examining the bottom of the *Enterprise* steamer, at Calcutta, the horn of a Saw-fish was found to have penetrated the copper (28 oz.) and the bottom planks, just above the bilge-keel, in a lateral direction; and then to have broken short off, remaining in the bottom, and acting as a stop-gap to the admission of water. The copper appears to have been completely shattered by the force of the thrust; and a leak would, doubtless, have ensued, had not the horn struck a piece of timber inside the planking, and then broken off at about 3½ or 4 inches from the point.—*Calcutta Englishman; abridged.*

SEA-SNAKE.

Lieut. Stokes, of H. M. S. *Beagle*, has sent to the British Museum a Sea-snake, of the genus *Hydra*, nearly 6 feet long, and about as thick as a man's thigh.

COLOSSAL SEPIADÆ.

Col. Smith has submitted to the British Association, a paper detailing all that was known at the present day of the existence of animals of enormous size inhabiting the ocean, belonging to the class of Cephalopods. However incredulous some naturalists might be with regard to the existence of these animals, the author had collected sufficient evidence to convince him that animals of a very large size belonging to this class now inhabited the waters of the ocean. The paper was illustrated by numerous drawings, and one was a sketch of the beak and other parts of an enormous Sepia, still preserved at the Museum of Haarlem, where they were seen by the author. There was one observed by Gen. Eden, when a passenger in the Modeste in 1807, which was 22 feet in length. Another instance was given of a squid, taken up at sea, with a horny bill and suckers, the flesh very soft, and the arm of which extended to no less than 36 feet. [One of these might be mistaken for a sea-serpent; or the polypus itself for a kraken.] On a voyage which he himself had made, the Colonel had seen one floating white on the blue ocean, and apparently of the length of half the top-

gallant; and which, upon closer examination, turned out to be but the arm of a sepia. A still more extraordinary specimen was absolutely taken for a sand-bank by Captain Blaney in a king's ship, who with sixty men landed on its back, and found the skin not slippery. It was, however, in a dying state, and the stench became intolerable. The colonel told the story of a tablet at St. Maloes, which seemed to confirm both the natural and legendary history of such prodigious phenomena.

Prof. Owen thought there could be little doubt of the existence of Cephalopods larger than were ordinarily caught. There were the parts of one in the Museum of the College of Surgeons, in London, of very large size, which was taken in the Pacific Ocean by Banks and Solander. The beak and lips were very like those of that drawn by Colonel Smith. The fins were of a rhomboidal form, enabling the animal to swim either backwards or forwards. Comparing the size of this animal, from the parts existing, with that of the smaller perfect animals, its body must have been at least 4 feet long, which, added to the tentacula, would make it 7 feet in length.

THE RED CRAB OF INDIA.

A CORRESPONDENT of the *Times*, (Dec. 9,) relates that within a short distance of Point Palmyra, on the Coromandel coast, and on the road leading by the sea-side to the famed Black Pagoda, is to be met with, at certain seasons, a peculiar species of crab, which it would appear has hitherto escaped the notice of naturalists. In the month of May, our informant has seen the sands assume an uniformly red hue, as if covered with scarlet cloth, extending as far nearly as the eye could reach. He found this singular appearance to be produced by minute crabs, which moved on as he approached, leaving the sand in its rude, natural state. With some difficulty, he turned one of these crabs from under the sand, and found it to differ materially from the common marine crab; inasmuch as the former was divested of the caudicle possessed by the latter, and in lieu of it was furnished with an acicular spike, which it seemed to possess the power of erecting or depressing at will, as a weapon of defence. The *scutum* also, instead of being hard and calcareous, was exceedingly soft and compressible, and was filled with a red fluid approaching the colour of vermilion. It feeds upon the root of an aquatic marine shrub, called the *Sal-Balu*, or *Sand-Saul*, which yields a crimson dye scarcely inferior to the well-known Turkey red.

NEW CRAB AND EGA.—BEES.

ON August 2, Mr. White exhibited to the Entomological Society a New Crab from the Colombia River, the natives of which use it as food. Also, of a new species of Ega, found upon the cod-fish, the eggs of which are used by the fishermen of Newfoundland as a bait, and also for a kind of salve. He likewise exhibited some very minute Bees, and portions of their cells, which had been imported into this country

with logwood from Campeachy, and which had lived for two years in the neighbourhood of Southampton.

SHOWER OF FISH AND FROGS.

On July 8, at Derby, during a heavy thunder-storm, the rain poured down in torrents, mixed with half-melted ice; and, incredible as it may appear, hundreds of small fishes and frogs descended with the rain. The fish were from half an inch to two inches long, and a few considerably larger, one weighing three ounces; some had sharp prickles on their backs, and were commonly called suttle-backs. Many were picked up alive. The frogs were from the size of a horse-bean to that of a garden-bean, and were mostly killed by the fall on the hard pavement.—*Sheffield Patriot.*

On the preceding day, also, during a heavy thunder-shower, a considerable number of small fishes fell from the clouds, at the Town-bill, about a mile north-east of Dumfermline: they were generally from two to three and a half inches in length.

THE WALL LIZARD.

This elegantly formed little animal is the domestic inmate of almost every bungalow throughout India. As soon as it is dark, it is to be heard answering its fellow in every direction, uttering a sharp note resembling the loud ticking of a watch, whence the natives call this lizard appropriately, "tickee-tickee." The rapidity with which it traverses the smooth stuccoed walls of dwelling-houses is surprising, while its "muscipacal" faculties are astonishing. Were it not for these lizards, the rooms in India, during the rains, would be intolerable; owing to the constant intrusion of moths, winged ants, mosquitoes, &c. attracted by the light of the candles. This *lacerta* possesses so acute an eye, that it appears impossible for the insect which it approaches to escape it: it advances slowly until within two inches of its prey, which it then darts at, with a snapping noise produced by its mandibles. During the day, it secretes itself behind furniture: it is regarded by the natives as one of their *penates.—Correspondent of the Times, Oct.* 28.

THE TOAD.

On July 5, Mr. Tulk communicated to the Entomological Society, a notice of the occurrence of many specimens of *Steropus madidus* in the stomach of a Toad confined in a small hole near Greenhithe; and Prof. Owen suggested that the examination of various copralites would possibly bring to light the remains of many antediluvian insects.

NEW INSECT.

Mr. Waterhouse has read to the Entomological Society, a memoir containing descriptions of new species of insects, brought from the Philippine islands by Mr. Cuming, who stated that the ladies in

Manilla make pets of the splendid *Agestrata luzonica*, which they feed on sugar-cane and keep in cages.

COCHINEAL IN INDIA.

WITHIN the last two or three years, the Cochineal Insect has spread itself over the whole of the Indian peninsula that falls within 42° of north latitude; and has destroyed almost every cactus shrub, upon which plant it wholly subsists. Still, the natives have never encouraged the insect as a feature of commerce: some European adventurers have attempted to do so, but have signally failed in producing cured samples of any size, so as to compete in the London market with the *grana fina* of Mexico and Oxaca; and as none of the parties had witnessed the management of the "nopaleries" in South America, they did not know how to treat the insect. Some conjectured it to be a wild species of the *Coccus coccinellifer;* whilst others considered it to be reared upon the wrong plant; and still others decided that the climate was ungenial to the insect, which, although it proved highly prolific, never attained any great size. It has, however, beeen found that the Indian Cochineal yields a stronger dye than that of New Spain. A resident on the Coromandel coast fed a small colony of these insects upon the *cactus inermis*, a species of the *cactus opuntia*, perfectly free from thorns, and which, it is said, the South American Coccus exclusively feeds upon; but it quickly perished under the bite of the insect; when he was led to imagine that the large acicular thorns which protrude from the lobes of the Cactus, would, if carefully removed, tend considerably to increase the growth of the insect. He also lopped the exuberant foliage of the plant, and diminished the larvæ on the leaves; in this experiment he succeeded, and observed that as the vigour of the plant was protected, so did the Cocci increase in size; nor were they enveloped so thickly in flocculent matter as those which were unattended to. Cochineal is now selling at the public sales at Calcutta for 11 and 12 rupees per seez of 12 lbs. avoirdupois, *i. e.* at the rate of 12*s.* per lb.; yet it abounds in India, and might, doubtless, soon be made to expel the Spanish insect from the market.—*Times, Sept.* 17.

THE WHITE ANT.

A RESIDENT of Ayrinchur, in the East Indies, has discovered that the bamboo poles which are used as *fulcra* in the construction of his outhouses, have not been visited by the White Ant, (*Termes*); and he can account for it only by the mud of which the above buildings are constructed having been chiefly collected from the *tumuli* raised by these emmets. Some of these *tumuli* rise nine feet above the level of the plain: the terrene matter of which they are constituted resembles a strong cement, produced by the stringent action of the formic juices mixed with the earth.—*Times, Sept.* 1; *abridged.*

PICTURE ATTACKED BY INSECTS.

ON Feb. 1, Mr. Westwood called the attention of the Entomological Society to the state of the great picture by Sebastian del Piombo, in

the National Gallery, as described by Dr. Waagen. The picture had been transferred to canvas, on which it was fixed with paste; this material is now attacked by insects, which were considered to be the *Anobium paniceum*, an insect well known to attack preparations of flour. The plans suggested at a former meeting for the destruction of insects which attack paintings on panels, or the stretching frames, would be inapplicable to the present case; and it would be dangerous to saturate the back of the picture with any solution which would affect the paste, so as to render it unpalatable to the insects, or sufficiently strong to destroy them. Mr. Gutch considered that it would be most advisable to reline the painting with fresh canvas, employing paste in which a little corrosive sublimate has been mixed; he had constantly used paste mixed with that material, and had always found it perfectly effectual in preventing the attacks of insects. Mr. Waterhouse, however, strongly objected to this, and proposed that an air-tight frame, or flat box, should be prepared to fit the back of the picture, leaving about an inch space, the air in which should be strongly impregnated with prussic acid.

EAST INDIAN SILK-WORM.

Mr. Westwood has read to the Entomological Society, an extract from a letter from Mr. James Duncan, giving an account of an East Indian Silkworm, which spins an oval cocoon at the extremity of a very long and slender footstalk; and suggesting the advantages which would result from the discovery of a chemical solvent which might be applied to several kinds of silk cocoons, the threads of which it had hitherto been found impossible to unwind, in consequence of the gum, which was secreted by the insect at the same time as the thread, having become dry and hard.

THE GAD-FLY.

Many persons have maintained that there is a true human *Œstrus* (Gad-fly); but Mr. Bracy Clark is entirely opposed to this view. Wherever cases of human *Œstri* occur, he believes them to be the result of accident. He refers to the case of an *Œstrus* found in the human subject by the late Mr. Howship; but from that gentleman's drawing and description, Mr. Clark believes his specimen to be nothing more than an elongated *Œstrus bovis*. Mr. Clark also refers to a prevalent opinion, that the *larvæ* of the *Œstri* will bore holes in the stomach and intestines; he has never met with an instance of this, and it seems quite impossible, as the animals possess no masticatory or other apparatus with which they can bore.

CURRANT INSECT.

On July 5, Mr. Stephens presented to the Entomological Society, specimens of *Nematus Ribesii*, an insect which had been extremely destructive to the currant and gooseberry trees during the season in the neighbourhood of London; and he observed the present to be the third

brood of the year, and that he had counted as many as 57 eggs laid on the veins of a single leaf.

THE WHEAT-MIDGE.

PROF. HENSLOW has invited the co-operation of the members of the Botanical Section of the British Association, in his attempts at perfecting the natural history of the Wheat-Midge (*Crecidomyia tritici*). In endeavouring to ascertain the nature of this injurious insect, in order to find a remedy for the evils of its propagation and presence as a disease in grain,* he stated that, notwithstanding all his efforts, he had not been able to breed a single fly from many hundred of the larvæ which he had procured from barns during the winter months, by sifting the chaff immediately after the corn had been dressed; and that Mr. Curtis had been equally unsuccessful. The inquiry to which he was anxious to direct the attention of naturalists was, whether the flies —which appear in myriads during the first week of June, and then deposit their eggs in the ears of wheat—have proceeded from those larvæ which had entered the soil, and lain dormant there during winter, or from other larvæ which are found in great profusion housed in the ears of the wheat? It was of considerable importance to ascertain this point correctly, as the possibility of materially checking the pest would depend upon the result.

[It is in the soil, from which, and from manures, we are of opinion, most of our perennial injuries to the produce of the earth are derived; the larvæ must be assailed there: if in the garnered grain, the operation must, of course, be altogether different.—*Ed. Literary Gazette.*]

Professor Henslow then exhibited specimens of mildew, (*Puccinia graminis,*) in connexion with rust, (*Uredo rubigo,*) and also of Aregma mucronata with Uredo rosæ, and Phragmidium obtusum with Uredo potentillæ, for the purpose of illustrating and confirming an opinion he had expressed in the *Journal of the Royal Agricultural Society*, that the uredines described by botanists were probably only incomplete states of fungi, which, when perfectly developed, were classed under Puccinia, or other allied genera.—*Literary Gazette, No.* 1281.

DISEASES OF CORN.

PROF. HENSLOW has read to the Royal Agricultural Society the following interesting paper on the Diseases of Corn. The Professor's object was to explain the nature of the maladies that corn is heir to, whether from the attacks of parasitical fungi or of insects. For this purpose, he selected Pepperbrand or Bunt, Smut, Rust, Mildew, and Ergot, as examples of injury produced by the first class; and the Ear-cockle and Wheat-midge as those of the second class. The nature of all these was illustrated by many admirable drawings. The Professor first adverted to the opinion that such productions as parasitical fungi are spontaneous, or accidental; and he proceeded to show that

* Agriculturists know that it is very dissimilar from the rusts, red gum or yellow, caused by various fungi, and which, in wet seasons, destroy so much corn.—*Ed. L. G.*

they are all too exactly organized to render such a supposition admissible; which, as he truly stated, involves much greater difficulty than any that is connected with the generally received theory, that all living creatures proceed from similarly organized parents, called into existence by the will of the Almighty. The Bunt fungus, (*Uredo caries*), called also Smutballs and Pepperbrand, was described as a powder occupying the interior of a grain of wheat, the only corn it attacks. The microscope shows it to consist of minute balls, 4,000,000 of which may be included in a grain of wheat; and each ball is filled with minute seeds or sporules, so that 10,000,000 times the first 4,000,000 may be stored up in a single grain. Hence the excessive minuteness of some parts, and the facility with which they are dispersed. The effects which alkaline substances, such as potash, lime, &c., produce in destroying the Smut, when seed-corn is dressed with those substances, was supposed to be owing to their forming a soapy compound with the oil of the fungi, which is then more easily detached from the surface of the corn, to which its natural greasiness makes it adhere. The Smut, or Dust-brand, (*Uredo segetum*), differs from the last in wanting its disgusting odour, and in escaping through the sides of the infected grain, in the form of a sooty powder. It rarely attacks wheat, but is a common enemy of oats and barley. The usual palliative of this evil is steeping, as in the case of the last. Mr. Henslow advised, however, that many new experiments should be made upon this subject, and he suggested the modes of carrying them into execution. He, in particular, recommended the practice of raising seed-corn apart from the general crop, as one of the most probable means of securing perfectly clean and healthy seed. Rust, (*Uredo rubigo*,) was described as an orange powder exuding from the inner chaff-scales, and forming yellow or brown spots and blotches on various parts of corn-plants. In itself it is a pest of comparatively small importance; but he (Professor Henslow) has made the very curious discovery that it is the young of the Mildew, the *Puccinia graminum* of botanists, which is so destructive when it attacks the straw. He stated that these fungi are at first spherical, or nearly so, and then constitute the Uredo, or rust; but by degrees the spheres lengthen, acquire a stalk, contract in the middle, and so form the head of the Puccinia; so that two supposed genera of botanists are undoubtedly the same species, in different states of development. Ergot was regarded as a monstrous state of the grain of rye, produced by the external action of a minute fungus, which causes the grain to lengthen into a horn something like a cockspur: it is so exceedingly oily, that it will burn like an almond in the flame of a candle. The action of ergotized corn has been ascertained to be highly deleterious, both to man and animals; the latter, indeed, preferred starvation to feeding upon it, even when mixed with good flour. A duck, which had been fed with ergot mixed with flour, in the proportion (say) of 1 in 17, died in ten days, after having had the end of its tongue rotted off, and drops of blackish blood oozing from its nostrils. A pig was poisoned in like manner in twenty-three days; the ears and the flesh of the tail having rotted away, and the legs having

mortified. Fortunately, we know little of this pest in England; for it is equally fatal in its horrible effects upon man, as has been amply proved in France. A case, however, was mentioned as being recorded in the parish register of Wattisham, a place in Suffolk, which occurred in 1762; when, as it was thought, in consequence of witchcraft, a poor family were lamentably poisoned, their legs and feet rotting off. A girl of sixteen lost both her legs, and died; of the mother, both the feet came off at the ankles, and the flesh decayed from the leg-bones; a girl of fourteen lost one foot at the ankle, and the other leg at the knee; a child of ten years old lost a foot; of two boys, one lost his feet, and the other his legs. This dreadful calamity was referred by the Professor, with great probability, to the action of ergot, which he finds attacks the Revet-wheat of the neighbourhood of Wattisham, a kind of grain on which this ill-fated family was fed. Draining was mentioned as the only known preventive of ergot. Ear-cockles are produced by an animalcule called the *Vibrio Tritici*, which may be compared to the eels in paste on a small scale. They form a cottony mass in the interior of the grain, which, when the latter is ground, will not pass through the cloth, but remains behind in the bran. Although this creature is microscopically small when young, it is a giant at its full growth, becoming a quarter of an inch long. Nevertheless, Mr. Bauer had calculated that 50,000 of the young *might* be contained in one grain of wheat. Scalding water was mentioned as the most obvious remedy for those creatures. Finally, an insect called the Wheat-midge (*Cecidomyia Tritici*) was described. The lecture terminated by an exhibition of the *Vibrio Tritici*, as shown by the oxyhydrogen microscope.—*Gardener's Chronicle, No.* 1.

NEW HIRUDINA (?)

On August 5, a letter was read, from Mr. Bergin, to the Microscopical Society of Dublin, detailing the beautiful though complicated organization of a small animal, believed to be a *Hirudina;* though Mr. B. was unable to give it a name, or to say to what species it belonged. He had found it in some water taken from a ditch in the Phœnix Park. One of the most striking peculiarities of this animal was the mode of its carrying its young: they were ten or twelve in number, and were attached by one extremity to the lower surface of the posterior third of the body of the parent animal; each possessed considerable extensile and retractile powers, and the whole presented much the appearance of a cluster of the tentaculæ of a polyp. The author describes minutely the internal organization, mode of progression, and other peculiarities of the animal, and strongly recommended the members of the Society to make search for additional specimens, assuring them that they would be amply repaid by an inspection of this very curious and interesting creature.—*Microscopic Journal,* No. 8.

REPRODUCTION OF LEECHES.

The following "Direct Experiments to determine whether portions cut off from Leeches are Reproduced," are by Stephano Grandoni. Bose,

by whom Buffon's *Natural History* was continued, positively asserts the reproduction of divided leeches; in the *Dictionnaire des Sciences Naturelles* the contrary is stated. This contradiction, with other circumstances, induced the author to submit the question to the test of experiment. He divided twenty leeches between the fifth and sixth segments of their bodies, and placed half of them in glasses containing water with little stones at the bottom, and the other half in glasses containing a thin stratum of clay moistened with water. All possible care was taken to maintain them in health. After three weeks, one of those that lived in the clay exhibited on its truncated extremity two white and somewhat convex gelatinous corpuscles, in the centre of which there was a more vividly coloured and transparent point; the rest of the section was somewhat rounded, and covered by a very delicate membrane. These signs seemed to render it probable that the experiment was about to succeed; but a month after the leech died, and apparently from the disease of the truncated extremity. Three months after being divided, the sections of the other leeches were found covered by a dense rounded gelatinous mass, which after some time became a very fine and transparent investment, and made the surface of the divided part quite smooth. After about six months, the leeches in the water with the pebbles all died one after the other, without any regeneration of the part that had been cut away. Their weight was neither diminished nor increased. At this time, six of the remaining leeches were taken from the clay, in which they had till lately constantly lain buried, and put in water. These, as well as the three that were left in the clay, were then looked at several times every day; the condition of their trunks was from time to time examined with the aid of powerful lenses, and the number of their segments was counted, but no increase was observed. At the tenth month from the commencement of the experiment, only the three leeches in the clay remained alive; these also died four months afterwards, but without the reproduction of even the most minute ring. It was thus decided that divided leeches are not regenerated.—*Brit. and For. Med. Review.*

NEW SPONGE.

M. Duvernoy has read to the Academy of Sciences, at Paris, a paper, "On the species of Sponge which lodges itself in the shell of *Ostrea Hippopus*, Lam., by forming Canals in the substance of its valves." After stating that several Mollusca have the singular faculty of piercing and forming a retreat in the hardest stones, and that naturalists are not as yet satisfactorily agreed on this point, M. Duvernoy states, that he observed something analogous at Dieppe, where he saw several *Patellæ* attached to rocks, and in the substance of which they had formed a pit of some millimetres in depth. The form of the pit was exactly modelled to that of the shell. He considers that the Mollusca excavate these holes by the same means as *Lithodoma*, *Petricola*, and *Pholades*, and that it can only be effected by means of an acid excretion, which softens or dissolves the stone.

After these considerations, the learned Professor announced, that he

had found *Ostrea Hippopus*, the valves of which were perforated with holes or orifices of canals, varying in diameter from a quarter to two millimetres. He found in these canals a spongy cylindrical body, exactly filling their cavity, like a cork, and furnished with an external opercular appendage, which is distinguished from that in the interior of the canal, by its being of a deeper colour. After having given a description and good figures of this little sponge, M. Duvernoy proposed to place it in the genus *Calceponge* of M. De Blainville, and gave it the name of *Spongia terebrans*. Its characters are as follows:—"Cylindrical, branched, brown or pale yellow, externally lighter coloured in the rest of its length; filled or nearly so, in this first part, and more fibrous than membranous; hollow, of the form of intestine in the rest of its extent, and more membranous than fibrous.—*Comptes Rendus; Microscopic Journal*, No. 3.

SPONGES.

On Jan. 27, Mr. Bowerbank read to the Microscopical Society, a paper "On the Keratose or Horny Sponges of Commerce." The author, after noticing the labours of Drs. Grant and Fleming, who have described these bodies as animals which are "porous, with skeletons consisting of cartilaginous tubes destitute of earthy spicula," proceeds to state that many true Keratose Sponges, upon close examination, with a high microscopic power, he had discovered to be abundantly furnished with siliceous spicula; as well as in the Keratose Sponges of commerce. The Mediterranean Sponge, the *Spongia officinalis* of Lamarck, when examined before it had been cleaned and bleached by the dealers, with a power of 500 linear, presents from the exterior the appearance of a smooth light amber-coloured thread; but when taken from the interior, it is seen to be coated with a thin and somewhat rugous film, containing minute granules, which the author believes to be the incipient germinals of the sponge, by which the sponge is propagated in the manner described by Dr. Grant as occurring in other divisions of this class. This portion of the tissue is destitute of spicula; but there frequently occur, dispersed among this form of tissue, large flattened fibres running in a straight direction, and it is in these that spicula are found imbedded in the centre of the tissue. They are best obtained for examination, by burning small pieces of sponge to a white ash, and washing this with dilute muriatic acid. In the other sponges of commerce, spicula are found in equal abundance. All the writers who have treated of *Spongia officinalis*, have described it as consisting of horny tubes; but the author states this to be an error, and proves the thread, in all the species of the sponges of commerce, to be a solid horny fibre. The second species of Mediterranean Sponge is described as being very similar in its external characters, and in the size, form, and arrangement of its fibres, to *S. officinalis*, but is distinguished from it by the possession of a beautiful vascular tissue, which surrounds in great abundance nearly every fibre of its structure, frequently anastomosing and running in every possible direction over its surface. This tissue is not imbedded in the horny mass of the fibre, but is contained

in a sheath which closely embraces it. In one of these vessels, the author observed numerous minute globules, exhibiting every appearance of being globules of circulation analogous to those found in the blood of the higher classes of animals. These molecules were extremely minute, the largest being $\frac{1}{18000}$ of an inch in diameter; the smallest $\frac{1}{30000}$. A similar vascular tissue is stated to exist in a considerable number of the Keratose Sponges of Australia. The author endeavours to prove that the spicula of sponges bear no relation to the naphides of vegetable bodies, but are truly of animal origin, having their internal surfaces lined with an animal membrane, which becomes converted into a thin film of carbon, when the spicula are exposed to the action of the blow-pipe.—*Athenæum*, No. 693.

CAUSE OF THE GREEN COLOUR OF CERTAIN OYSTERS.

THE reasons given for the cause just cited are very various, and leave much room for investigation. Some authors attribute their green colour to their feeding on certain *Ulvæ*; others consider it to depend on the absorption of microscopical animalcules which have received the name of *Vibrio Ostrearius*. After investigating the subject experimentally, M. A. Valenciennes considers that the green colour of oysters is due to animal matter, which is different from all other green organic substances hitherto noticed. As it is found in the intestinal canal, is it not reasonable to suppose that it is due to a particular state of the bile, thus furnishing a coloured substance which is fixed by assimilation on the parenchyma of the two lamellæ of the oyster, on its branchiæ or labial palpæ, by a physiological phenomenon analogous to that which M. Flourens has observed connected with the assimilation of madder, which colours only the bones of animals, whilst the cartilages, ligaments, and tendons, remain white? This green-coloured substance above noticed, when submitted to microscopic examination, offers nothing remarkable, but possesses other properties given in detail in the communication.—*Comptes Rendus; Microscopic Journal*, No. 3.

EXISTENCE OF ANIMALS AT GREAT DEPTHS OF THE SEA.

M. SIAN has made an interesting series of observations "On the Action of Waves at Great Depths," made on a bottom of madreporic white sand, and basaltic black sand, at St. Gilles, where there is a natural passage pierced in the coral bank which prevails along the coast.

M. E. de Beaumont considers that M. Sian's result, in attempting to trace to their last limit in regard to depth the indication of the agitation of waves, becomes of greater interest when we compare it with the ascertained facts, relatively to the greatest depths in the sea at which we find animals *fixed*, and consequently compelled to wait for their nourishment approaching them. It would appear that the two limits come very near each other, and do not, in general, much exceed the depth of 200 metres, (about 650 feet).

From a table drawn up by Mr. Broderip, the shells which can endure the greatest depths are the *terebratulæ*, which have been found adhering to rocks at a depth of 90 fathoms, or 540 feet.

From the remarks of MM. Quoy and Gamard, Ehrenberg, Darwin, and many other modern voyagers, it would seem that the greater part of the *fixed* polypiers live only at small depths. The coral on the coast of Algiers is, perhaps, the species of adherent polypiers, whose existence at the most considerable depths has been ascertained. M. Milne Edwards has sometimes dredged coral near Bonne, from the depth of 531.4 feet, (162 metres); but the coral divers do not think that it exists below 800 feet, or 244 metres.

A madrepore is mentioned, obtained by Ellis in the Greenland Seas, from a depth of about 1377 feet, or 420 metres; but it was an unattached madrepore, with a corneous support. — *Comptes Rendus; Jameson's Journal*, No. 62.

INFUSORIA.

THE following is a Summary of Conclusions drawn from Facts observed by Ehrenberg, on Infusoria:—

1. The greater number of microscopic animalcules are endowed with a complicated organization.
2. They form, according to their structure, two distinct classes.
3. Their geographical distribution follows the same laws as that of other animals.
4. They give to large masses of water particular colours, and are the cause, by the light they emit, of a peculiar phosphorescence in the sea.
5. They form often, by accumulation in the living state, a kind of earthy animated mass; and as 41,000,000 can be counted in a square inch of matter, their absolute number is, doubtless, greater than that of all other animals put together: perhaps even they exceed in collective volume that of all other animated beings.
6. They possess the most considerable generative power in organic nature, a single individual being able in a few hours to produce several millions of beings like itself.
7. The animalcules, by reason of their silicious coverings, constitute earths, stones, and rocks; their material serves to make glass, floating bricks, as prepared by the ancients, polishing earths (whiting, ochre, &c.), compost, alimentary earths, as the farinaceous fossil of the north, which is taken into the stomach harmlessly. They are hurtful sometimes, rendering water impure, killing fish in ponds, and causing miasma; it is not however shown, although pretended, that to them plague, cholera, and other contagious diseases, may be attributed.
8. Animalcules never appear to sleep; so far, at least, as it is possible to determine.
9. They exist in man and animals.
10. They are themselves tormented with parasites, and with smaller animalcules which live in their interior; and these again with other parasites, which have been observed.
11. They are in general affected by external agents almost as animals of a higher order.
12. Microscopic animalcules are extremely light, they are taken up by the least current of air, and are conveyed in the atmosphere.
13. It is possible to refer to precise organic laws the constant and remarkable changes of form some of the animalcules present.
14. Their organisation is comparatively powerful: for example, the strength of their teeth and masticatory process; they have also the faculty of feeling like other animals.
15. The examination of these microscopic beings has defined most accurately the distinction between animals and plants, by making better known the organic systems which are wanting in the latter.

16. The complicate organisation of microscopic animalcules is alone sufficient to overturn the speculations, or badly-made observations, which have attributed them to the spontaneous generation of rude matter.—*Translated from the German* in the *Bibliothèque Universelle de Genève; Literary Gazette*, No. 1261.

EXISTENCE OF INFUSORIA IN PLANTS.

ROPER has shown, that the cells of *Sphagnum obtusifolium*, (Bog-moss,) contain little openings into which the animalcule, *Rotifer vulgaris*, under favourable circumstances, might enter. Morren has recently observed, with the aid of high magnifying power, that in specimens of *Vaucheria clavata*, found at Everghem, he distinctly detected the same animalcule, with its ciliæ imitating the wheel, &c. Morren one day opened one of these cells, and waited to see the animalcule spring out and enjoy the liberty so dear to all creatures, even to infusorial animals; but no—he preferred to bury himself in his prison, descending into the tubes of the plant, and to nestle himself in the middle of a mass of green matter,—rather than swim about fresh in the neighbourhood of his dwelling.—*Abridged from Morren's Paper, in Ann. Nat. Hist. Jan.*

HARBOURS CHOKED UP, AND MUD FORMED BY INFUSORIA.

IN 1839, M. Ehrenberg examined the mud-banks in the harbour of Wismar, in the Baltic, and ascertained that from 1-20th to 1-4th of the mass of mud deposited consisted partly of living Infusoria, and partly of empty shells of siliceously enveloped and dead Infusoria; and, in 1840, M. Ehrenberg obtained a precisely similar result. From official documents, it appears that in the above harbour, there is an annual deposit of this mud, amounting to 1080 lasts, or 32,000 metrical cwt., or 6480 cubic metres. Thus, uninterruptedly, have matters proceeded for a century or more; so that, during the last hundred years, there have been deposited by the running waters at Wismar 108,000 lasts, equal to 3,240,000 cwt., or 648,000 cubic metres of this mud. Hence then, supposing what is nearly correct, that one-tenth of this mass consists of visible organic matter, there have been deposited at Wismar, during the last century, of these microscopic siliceous organisms, 64,800 cubic metres, or annually 648 cubic metres, which, when dry, cannot constitute more than one-tenth, and probably, not more than one-fortieth, or even less, of the total weight. M. Hagen has made similar experiments upon the mud-deposits at Pillau, and found them to be still richer in organized beings than those of Wismar. At both places are found some forms which are entirely new, and others which belong to the waters of the ocean.

M. Ehrenberg also alludes to the researches he made concerning the muds of the river Elbe at Cuxhaven, in 1839; which he found to be composed, to the extent of nearly half their volume, partly of Infusoria with siliceous heads, and partly of Polythalames with calcareous heads.

To these observations, M. Ehrenberg now adds the results of his recent investigation of the Nile, which he has compared with African

deposits from Daebbe and Ambukohl, in Dongola; from Tangeur, in Nubia; from Thebes and Gyzeh, in Upper Egypt; from Boulak, near Cahira; and from Damietta, in Lower Egypt. He has also in his possession specimens of the ancient deposits of the Nile. In all these specimens, he has found that the sponges, the siliceous Infusoria, and, especially, from the neighbourhood of Damietta, the calcareous Polythalames of the arable districts, on the margin of the Nile, exist in such vast abundance, that, without asserting that they absolutely predominate, still, it is a fact, that there is not a particle of this soil of the size of half a pin's head in which, making no allowance for the chemical changes which may have taken place, there was not one and frequently many of these animals.

We may now, therefore, safely affirm, that the deposits in harbours, and even the accumulation and the extraordinary fertility of the mud of the Nile, and probably, of all other river deposits, proceed not solely from the gradual destruction and mechanical transport of one portion of solid soil to the formation of another, any more than that they are solely the product of the vegetation of plants; but, on the contrary, that they result from the immensely rapid agency, hitherto scarcely recognised as vital, of animal organisms, which are undiscernible to the naked eye; but their quantitative and natural limits must henceforth be inquired into, and from this time be considered as possessing a very important influence upon these natural phenomena.—Abridged from the Report of a Memoir read to the Berlin Academy of Sciences, in March, 1841; entire in *Jameson's Jonrnal, No.* 62.

Dr. Lankester, at the recent meeting of the British Association, illustrated this interesting subject by observing that the process of depositing these animals is constantly going on. They frequently possessed hard external shells, which resisted decay; and most of them were very short-lived. They were best observed where the deposits are coloured. In chalybeate springs, a deposit of a yellow ferruginous colour was always observed existing first in mucus-like masses at the bottom of the water. This was formed by an animal called the *Gallionella ferruginea*. On the banks of the Annan, when the waters were low in autumn, the stones looked as if they were white-washed, from a deposit on them: the author had found this to arise from the presence of a minute animalcule, the *Lynedra ulna* of Ehrenberg. Around the sides and at the bottoms of the sulphureous wells of Harrowgate there existed a beautiful rose-coloured sediment; also a pink sediment in the waters at Moffat. The author had found these to depend on the presence of two new species of animalcules. There was every reason to believe, that red snow depended on animalcules, and not on plants, as heretofore supposed. Green deposits arose from the presence of *Ceicaria viridis*. Several other animalcules were referred to, occurring in large numbers, and producing copious deposits: many of them coloured the waters previous to being deposited. In most instances where water assumed suddenly a different colour, it might be traced to the existence of infusoria.

CAUSES OF THE RINGS IN TREES.

THEORY leads to the presumption that in countries uniformly warm and moist, we should not be able to calculate the ages of trees by the same rule as in our temperate climes, *i. e.* by the number of concentric ligneous rings, or layers. In fact, the arrangement of the wood of our forest-trees in layers had always been considered as produced by an interruption in the formation of their tissue, caused by the winter of these colder countries. It is probable that the excessive droughts which lead to the fall of the leaf in some countries, such as the interior of Brazil, in Senegal and Egypt, produce a somewhat analogous effect. But, on the other hand, in the forests of inter-tropical regions, where heat and humidity invariably predominate, the growth of trees ought to be sensibly regular throughout the whole of the year. This has been observed in the *Cæsalpinia*, and other dye-woods. It is desirable that individuals who are favourably circumstanced for making observations of this nature, would take the trouble of verifying the facts which occur in each species of tree in particular, and examine if there be any amongst them in which a suspension of the growth common in the species does not produce layers irrespective of the climate, as happens in cold or very arid countries by a cause external to the tree. Certain observations made by M. A. Ladne, at Galega, and transmitted to M. De Candolle, at Geneva, manifest that in the *Casuarina*, the number of concentric layers does not at all correspond with the years of the tree's age; and that in a tree, whose growth is only of 8 years, not fewer than 47 concentric layers may be counted. Further details may be found in the *Bibl. Univ. de Genève*, No. 65, 1841; *Jameson's Journal*, No. 62.

MORPHOLOGY.

DR. LANKESTER exhibited at the recent meeting of the British Association, a drawing of a monstrous rose he had received from Mr. Henry, of Leeds. The pistil had become a perfect branch. Mr. Littleton, of Saltash, also exhibited a common pear, in which a smaller pear had grown from its apex. Prof. Henslow observed that all these specimens proved the correctness of the doctrines of Morphology. It was now generally admitted, that all the parts of a plant are modifications of the leaf, and consequently may revert to that state. He had seen a branch formed from the pistils of *Digitalis purpurea*.

STOMATA OF PLANTS.

ON July 21, Mr. Bowerbank read to the Microscopical Society, a paper "On the Process of Charring Vegetable Tissue as applied to the Examination of the Stomata in the Epidermis of Garden Rhubarb." The author, after mentioning the great advantages derivable from charring objects for the microscope, which he first suggested, goes on to state that it is peculiarly advantageous for exhibiting delicate membranes, which cannot from their transparency be well seen, by the ordinary method of viewing objects, in water between glasses.

It having long been a disputed point with Botanists whether the Stomata in plants were open or closed by a membrane, the author was led to examine the subject, and for this purpose took the cuticle of the common garden Rhubarb, which he obtained by macerating the sheaths investing the flower stalks for a few days in water, and then charring it; from his observations he arrives at the following conclusions: that the application of the process of the charring proves beyond a doubt that the Stomata in this tissue of the Rhubarb are distinct openings into the hollow chambers of the parenchyma of the leaf; that the perforation is the rule, and not the exception, in the structure; and that the exception, where it exists, *i. e.* where the Stomata are closed, proves the existence of the overlying membrane discovered and described by Dr. Brown.

ELECTRO-METALLIC HORTUS SICCUS.

A PRETTY application of the art of coppering, is suitable to horticulturists; as, by its means, fruit, vegetables, leaves, seeds, and various other specimens, may be coated with copper, either for ornament, or for the purpose of illustrating the size, form, and other peculiarities of the object. Apples and pears may be very readily coppered. They are to be brushed over with black lead, and then a small pin is to be thrust in at the stalk; to this a wire should be attached, which is connected with the zinc of the battery. It may then be placed in the solution, and the whole arrangement completed by a piece of copper, which is to be connected with the silver of the battery. In a similar manner, cucumbers, gourds, potatoes, carrots, and a hundred other vegetables, seeds, and roots, may be covered. The form after the process is so characteristic, as to mark strongly the individual characters of each. The condition in which the copper is thrown down can of course be varied according to the laws set forth in electro-metallurgy. For ornamental purposes, the crystalline copper is the most beautiful; but for a specimen intended to illustrate the form of the object the smooth copper is best adapted. After the objects are completely covered the pin is to be withdrawn, which will leave a little hole, and that enables the evaporating juices of the vegetable to pass freely out, and thus promotes the complete drying of the encased object. A cucumber during the past summer appears now to contain scarcely any thing inside the copper; and the pears, apples, &c. consist of little but the metallic coat. The botanist will readily perceive in what way this process may be used to his advantage.—*Smee's Elements of Electro-Metallurgy.*

BOTANY OF NEW SOUTH WALES.

ON May 7, was read to the Botanical Society, a paper "On the Character, botanical and general, of the great Plains of New South Wales," by Dr. Lhotsky. Dr. L. observed that the aspect of these plains is much varied in different seasons. It is in the months of October and November, (the spring of the southern hemisphere,) that they present the most pleasing appearance, the vegetation,

amongst which are the genera Craspedia, Cotula, Prunella, Thymus, Calotis, and Elichymum, begins to be most vigorous. This state of vegetation lasts with certain gradations until February or March, by which time it has become dried up and scorched by the continual rays of a semi-tropical sun; and at the end of summer these plains present a most repulsive and barren aspect. There is scarcely a forest to be found in Australia, the trees of which are not burnt or singed to a considerable degree, apparently from the heat of the sun, the thermometer frequently rising to 120 degrees, and from that cause it is stated that they ignite spontaneously. The large plains of New Holland are entirely destitute of timber—the vegetation consisting almost wholly of small shrubs and briars.

NEW SWAN-RIVER PLANT.

THAT very curious and interesting plant, the *Marianthus cæruleo-punctatus*, flowered in the stove of Mr. Cunningham's nursery, Cornely Bank, in March, 1841; Dr. Graham believes, for the first time in Britain, and very soon after it flowered in the green-house of the Royal Botanical Garden. These were, however, weak specimens; but that figured in Sir W. Hooker's *Herbarium*, shows how very ornamental the plant will be as soon as the best mode of cultivating it shall be ascertained. Both the above specimens were obtained from Mr. Low, of Clapton, who raised them in 1839, "from seed received from Mr. W. Morrison, of the Swan River settlement, and marked *Sollya or Ballardiera*, sp. from the Darling Range of Mountains."—*Jameson's Journal*, No. 62.

EUCALYPTUS OF NEW HOLLAND.

ON April 2, Dr. Lhotsky read to the Botanical Society a paper "On the Genus *Eucalyptus*, and its Connexion with the Vegetation and the Physical Features of New Holland;" in which he described the character of Australian forests, derived as it is from the characteristic of its predominant vegetation. It is not only by the preponderant number of individuals, and the mass of vegetation, that the *Eucalyptus* characterise the flora of New Holland; it is by the nature of their foliage, and still more by the structure of their ligneous fibre, that they exercise a vast influence upon the vegetation and other grand features of the country. The wood of most of the *Eucalyptus* is short, brittle, and full of a resinous matter, deficient in tannin, one of the chief ingredients of decomposed vegetable matter fit to produce *humus*. The leaves, also, are very resinous, stiff, and brittle; neither do they nor the decayed wood produce *humus* sufficient for the growth of dense underwood, and hence the open aspect of Australian forests likened to that of the parks of England. The stems, moreover, are at times to a height of forty feet bare of branches, and the foliage is altogether scanty and poor; and, therefore, Australian forests are destitute of shade, and the little rain which falls during the summer is almost utterly evaporated, and this assists their sterile character. In consequence of the constitution of the woody fibre admitting an easy and

speedy decay, the trees are hollow even to the higher branches; and if fire be set near to the root of most of them, it will soon communicate through the whole interior, and burst forth from the boughs at a considerable height, sometimes from the topmost. The Australian quadrupeds, (with the exception of the kangaroo,) inhabit the countries of the *Eucalyptus* in the day time; and it is by thus setting fire to the trees, and by watching in the branches, that the natives procure part of their food. The opossum, and other animals, driven upwards by the fire and smoke, become an easy prey: they are nocturnal in their habits, and because of the trees, from their hollowness affording them hiding-places, the Australian forests in the day-time appear untenanted by quadrupeds, although they are most abundant.

THE DOUBLE-SEA COCOA-NUT.

On June 19, was read to the Royal Asiatic Society an interesting botanical "Description of the *Lodoicea Sechellarum*," by M. Bernard, President of the Committee of Natural History of the Sechelles Islands. This production, which has been long known under the appellation of the Double-sea Cocoa-nut, grows only on two small islands of the Sechelles group, lying nearly under the equator. Many centuries before the place of its growth was known, portions of this nut have been frequently carried by the oceanic currents to the Maldive Islands and the Malabar coast; and the most absurd fables were credited respecting its origin and virtues. It was generally supposed to grow at the bottom of the sea; and the votaries of Vishnu devoutly believed that when that deity was churning the ocean, he broke off several of the branches from the tree, that they might float upon the surface, and be a specific for all the ills that afflict mankind. The lodoicea attains a height of eighty or ninety feet, and is surmounted by a beautiful crown of winged and palmated leaves. The diameter of the stem varies from twelve to fifteen inches, and the whole is so flexible, that the tops of those trees which stand in each other's vicinity strike against and chafe each other in a strong breeze, making an extraordinary noise. The leaves open like a fan; they are of large size, often attaining to a length of twenty feet, with a breadth of ten or twelve, and, in some cases, to thirty feet in length, including the petiole, which is of sufficient strength to support the weight of a man. The fruit is generally double, sometimes triple, and even quadruple; and, with its enclosing drupe, attains a length of fifteen inches, with a circumference of three feet, and sometimes weighs from 40lb. to 50lb. The immature fruit, called by the colonists "Coco tendre," is easily cut with a knife, and then sweet and nourishing. When the fruit is ripe, it drops on the ground, and is no longer fit for food. In a few months, if not buried in the earth, nor exposed to the rays of the sun, the fallen nut begins to germinate, and a new plant is formed. This tree takes a remarkably long time to mature its fruit, and lasts long in bloom. It bears only one spadix in each year, and yet has often above ten in bloom at once; it has flowers and fruit of all ages at one time. It is to be regretted that the tree is not cultivated, and that it is commonly cut down to get at the fruit

and tender leaves. Its young fruit is refreshing, and when ripe furnishes oil. Its germ, when developed, is a sweet dish. The hard shell is made into vessels for water; and the whole nut is used in India as a medicine. The wood is used for building, and split for water-channels and palisades. The leaves are employed for thatch, and platted into hats, bonnets, baskets, and fans; for making which, the ladies of the Sechelles are celebrated.—*Abridged from the Literary Gazette*, No. 1275.

ANCIENT WHEAT.

At a late meeting of the East Suffolk Agricultural Association at Saxmundham, by far the most interesting object shown was a sample of wheat grown from seeds taken from an Egyptian mummy, supposed to have been encased 3,500 years! and exhibited by W. Long, Esq. of Hurts Hall. It was white wheat, the ears of which were considerably larger and broader than the ears of English wheat, appearing to grow double upon one stem, and the straw was long and stout. The practice of the ancient Egyptians was to enclose grains of wheat in the mummy-cases, before being deposited in their resting places; but that the wheat should retain its vital principle through so many ages, was regarded as one of those great wonders in the economy of nature which have baffled the skill of man.—*Leamington Spa Chronicle.*

The Editor of *Chambers's Edinburgh Journal* supposes the above wheat to be "of modern date, as mummies are occasionally made up in Egypt at the present day for special purposes of imposition." The Editor's inference may be correct; but wheat and barley were found by Sir G. Wilkinson, during his recent travels in the Thebaid, inclosed in alabaster vases, within an ancient tomb, supposed to have been unvisited by man for nearly 3,000 years; some of which grains, on being sown, were found to germinate.—See *Year-book of Facts*, 1841, p. 218.

SAGO.

At Singapore, is a Sago Manufactory, supposed to be the largest in the world, the economy of which is thus detailed in an American work, entitled *Around the World*:—"There is but one tree in Singapore of the anoo palm, which yields the sago; and the factory is supplied entirely by Malay proas, which bring annually about 18,000 piculs, mostly from the swampy lands of Sumatra. The tree, called in the Moluccas the libley, but by Malays *rumbiga*, will grow from the bases of the leaves, in ten years, to a height of thirty feet, with a girth greater than a man can clasp; and each tree will produce of crude sago, which is the pith of the tree, about 500 pounds. The sago from old trees, however, is always coarse and unsaleable; and it is found, that the farinaceous matter is better, and greater in quantity in a given time, if the trees be cut down every two or three months, when the pith is four or five inches thick. It is taken out of its ligneous trunk, and closely packed in leaves of the same tree, in which state it arrives

at the factory. There we saw on the beach, in front of the large bamboo shed, where it is refined, large piles of the pure white fecula, in cubes, set out to dry, which resembled very much the little forts and other structures of snow, made by northern schoolboys in their winter term. It it taken from these piles into the shed, and, being broken into small parts, is placed in a large trough, into which a clear stream is rapidly admitted for a while, when the sago dissolves, and afterwards settles, with the dirt and heavy matter beneath it, and the fibres and scum above. It is again dried as before, and then rebroken, and sifted until it granulates into small regular particles. These are thrown into shallow pans, placed over portable furnaces, and kept in constant motion, by a stirrer, until they become like hard, polished, beautiful pearls, and are ready for packing. By this process, the Singapore factory manufactures out of its 18,000 piculs of raw sago, about 6,000 piculs of clear pearl sago for exportation."—*Quoted in the Athenæum*, No. 693.

ASSAMESE TEA.

A WRITER in the *Calcutta Journal of Natural History* impugns the accuracy of Mr. Bruce's Reports* of the Growth and Manufacture of Tea in Assam, which he considers calculated to mislead the public, and occasion disappointment, instead of being likely to clear up those difficulties that are as yet to be overcome before the Assam Tea Company can expect to reap any return for the outlay of capital. The writer then shows the 120 localities referred to by Mr. Bruce, reduced to 5. The succession of tea-tracts proves to be patches of straggling plants; the wild plants are of little use, except for seed, and, instead of finding Assam one extensive tea-garden, the soil remains to be chosen, and the plantation to be made, and "every thing is yet to be effected." The details of the manufacture also, being derived entirely from Chinamen, are to be suspected.

BURNING FORESTS OF INDIA.

DURING the hot months of April and May, the thick jungle forests of the interior of Bengal frequently take fire, and present, in the darkness of the night, an awful spectacle. These outbreaks are occasioned by the long and successive friction of the branches of bamboos, and other arundinaceous timber, which abound in the above localities, and which, when once ignited, spread with terrific desolation. The wood of the bamboo, from its siliceous coating, in the dry weather, is easily ignited by friction; but, for a long time, these conflagrations were attributed, by the native peasantry, to a supernatural agency. The wild beasts, on these occasions, descend into the plains beneath, and frequently carry off the cattle and herdsmen.

* For Notices of the Culture of Assamese Tea, see Year-Book of Facts, 1839, p. 217; Year-Book, 1841, p. 247; and Mr. Bruce's Second Report, in Year Book, 1846, pp. 228—233.

ANCIENT CYPRESSES.

DR. JAMES MACAULAY, who has lately returned from Spain, states that the two Cypresses, celebrated even in the times of Moorish kings, still exist in the gardens of the Generalife near the Alhambra. Their immense size and venerable appearance at once denote their antiquity. "They are called the 'Cypresses of the Sultana,' from an ancient tale relating to the queen of Boabdil, the last Moorish prince of Granada. At the least, the trees are five centuries old; and as the hill was clothed with wood at the time that the ground was laid out, it is probable that their age is far greater than this. Besides the cypresses, there are other trees of great antiquity. One large and venerable vine was pointed out, which has also a traditionary tale attached to it. The villa of Generalife, which signifies in Arabic 'the house of pleasure,' was the summer residence of the kings of Granada. It stands in a most picturesque situation on the side of a steep hill, opposite to that on which is built the celebrated fortress and palace of the Alhambra. Immediately behind it rises the ridge of the Sierra Nevada, 13,000 feet in elevation, crowned with perpetual snows, which ever send down fertilizing streams, and scatter cool and salubrious breezes through the country below. The garden, which lies round the villa on the slope of the mountain, is irrigated by numerous streams, which, after being made to form fountains and rivulets in the courts and halls and flower-beds of the palace, lose themselves among the flowering shrubs, which they maintain in perennial verdure. Even in the present day, although the rich ornaments of the villa are defaced and time-worn, many of the fountains and water-courses dried up, and an air of melancholy pervades the garden, enough appears to convince the traveller, that in the time of the Western caliphs it must have been a scene of surpassing beauty."—*Gardener's Chronicle.*

ANCIENT SPANISH CHESTNUT-TREES.

ALTHOUGH certainly not a native of this country, England produces some exceedingly remarkable specimens of this valuable tree. In Betchworth Park, near Dorking, there are some Spanish Chestnut trees, of extraordinary size and great age, certainly the largest and oldest in that part of the country. There are about eighty trees, all of large dimensions: the subjoined table exhibits the circumference of some of the largest, taken about three feet from the ground:

	ft.	*in.*		*ft.*	*in.*
No. 1	17	2	No. 8	18	0
2	20	6	9	21	4
3	17	10	10	18	5
4	17	0	11	19	3
5	17	2	12	20	2
6	18	0	13	18	0
7	19	2	14	23	0

No certain record, it is believed, exists of the age of these trees; but they are probably coeval with the first Betchworth Castle,

founded in 1377, when "John Fitzalan, second son to Richard, Earl of Arundel, had license to embattle his manor-house here."—*Gardener's Chronicle, No.* 1.

THE PITCHER-PLANT.

PROF. DON has noticed some curious organs in the Pitchers of the Nepenthes, which, from their lattice-like appearance, he proposes to name Clathrophares; they are supposed to be the mouths through which the fluid is poured into the pitchers, as, in a young state, the fluid does not rise higher than these pores.—*Proceedings of the Linnæan Society.*

Prof. Don's observations tend to confirm the views of Prof. Morren as to the nature and origin of *Ascidia;* but are opposed to the opinion advanced by De Candolle, who regards them as tubular petioles, and the operculum as alone representing the lamina of the leaf.

AGED CAMPHOR-TREE.

A CAMPHOR-TREE, in Japan, mentioned by Kæmpfer, A.D. 1691, as already celebrated for its size, hollow from age, and supposed to measure six fathoms in circumference, though from its standing on a hill it was not then actually measured, was visited by Siebold in 1826. He found it still healthy, and rich in foliage, though 135 years older. He and his pupils measured it, and he gives 16·884 metres, (about fifty feet), as its circumference; adding, in confirmation of this enormous size, that fifteen men can stand in its inside.

NEW PINE.

CAPT. WADDRINGTON has observed to the British Association, that, in a recent tour in Germany, he made some observations on the pine, which have enabled him to add several species to those of which he treated at the Newcastle Meeting. On the Alpine confines, between Austria and Bavaria, he had found two, the *Pinus Austriaca* and the *Pinus pumilis*, which grew to the very summit of these mountains, and which were well calculated for plantations in this country. The former was a good timber, and the latter would form a fine cover for game. In the course of remarks made on this short communication, it was mentioned that neither the Scotch fir nor the pinaster withstood the prevalent south-west winds of Devon; and that, consequently, the introduction of these novelties would be of much value to the county, and to other districts similarly situated. This subject is of great practical utility, and of much interest to landowners and farmers in certain localities, exposed to sea-breezes which affect the growth of wood, as on the coast of Devonshire.

LOCALITY FOR CRATERIUM PYRIFORME.

THIS beautiful microscopic Fungus, which was first noticed by Mr. C. G. White, on flint-stones in an old gravel-pit at Old Ford, near Bow, Middlesex, is now (June,) to be found most abundantly on the

gravel pebbles on the banks of the South West-India Dock, and no doubt in other localities at this season. They are not restricted to pebbles only, nor found on every stone, but appear chiefly on the South Western aspect.—*Microscopic Journal*, No. 5.

ERGOT IN GRASSES.

Mr. Quekett, F.L.S., has resumed his researches, commenced in 1839,* on the anatomical structure of the Ergot, with a view to the discovery of the cause of its formation; and which, from numerous observations, he attributes to the grain becoming infested with a parasitic fungus: "the method by which this singular formation probably originates, (for at present all respecting this part is uncertain,) being that the sporidia of this fungus are by some means introduced into the interior of the plant, and ultimately arrive at the grain, which they find the most suitable matrix for their development."

Mr. Quekett's new Experiments were as follow:—

Twelve healthy grains of rye, of wheat and of barley, (all grown in neighbouring fields in Surrey), were selected, and placed in a plate which contained a little water; some ergots of wheat were then immersed in the water of the plate, and with a camel's hair pencil brush the sporidia of the fungus adhering to the exterior were detached in numbers, as the microscope proved, and the ergots were then removed.

A similar experiment was performed with the same number and variety of grains, but with the fungus obtained from the exterior of an ergot of a large grass—*elymus sabulosus*;† a glass shade covered each set of grains so prepared.

In a few days, germination commenced, and was allowed to progress until the grains were beginning to appear wrinkled, from the appropriation of the albumen; and by this time those that had perfectly germinated possessed green leaves from two to three inches in length. In this state, the whole of the young plants were taken into the country, and planted close together in the third week of March.

The greater number of grains, of both experiments, failed in becoming perfect plants; so that, when they were matured, there were but four of rye, (one infested with the fungus from the elymus, and three from wheat), three of barley, and four of wheat. On every plant of the rye there were some ears possessing ergots, (nine having been obtained from the four plants), some containing one specimen, others as many as six; but in the barley was only one imperfect ergot, and in the wheat not any have been detected.‡

* See Year-book of Facts, 1840, p. 222.

† The fungus on the exterior of the ergot of rye was not used, in order to ascertain if the ergot of one grass could produce an ergot of the same kind in another.

‡ Mr. Quekett regrets that some grains of the several grasses were not sown at the same period, quite separated, and not made to germinate amid the sporules of the external fungus, as it would have determined the point more satisfactorily; but this is intended to be done, as Mr. Quekett possesses more grains from the same sample whence the first were taken.

It was remarked, that, in the rye, there was only one ear that possessed a few healthy grains and no ergot; in the others, some had ergots without any healthy grains, and the rest possessed neither ergot nor grains of any kind; showing how the fungus, probably, influences the formation of healthy grains in this plant; whereas, in the wheat and barley, the sound condition did not appear to have been departed from.

If the cause of the ergots, in this instance, had an external origin, it is singular that, as the plants grew intermixed, and in a very small space, the barley and the wheat should have escaped under the circumstances: but the reason imagined is, that the latter two possessed no ergots, though treated as the rye, and that they are not so susceptible of the infection; for it is well known that the rye is particularly liable to this disease—more so, perhaps, than any other grass; and that it becomes so, arises either from constitutional properties or its anatomical peculiarities.

Mr. Quekett conceives from these experiments, that the production of ergot from the absorption of the sporules of the previously described fungus, by the fibres of the root of the germinating grains, will be found to be the true cause of this singular production; and that, when they arrive at the grain, they convert it into the body known as the ergot; for it appears too much to admit, in these experiments, that the many ergots on every plant could be the result of accidental circumstances, when it is well known that their presence is very rare in this country on the same grass.—*Medical Gazette.*

KYANIZED WOOD FOR HORTICULTURAL PURPOSES.

On Feb. 16, was read to the Horticultural Society, a Report of some experiments made at the Gardens on the effects of wood prepared with a solution of corrosive sublimate, when employed in hot-houses or drains; the results of which proved that such wood was totally unfit for horticultural purposes, unless painted or used in low temperatures. Many interesting experiments were adduced, proving, that under the influence of mercurial exhalations, the plants soon faded and died, whilst they were immediately renovated when removed into an atmosphere of muriatic acid gas.

Geology and Physical Geography.

GEOLOGICAL MODELS.

On Jan. 6, Mr. Sopwith introduced to the Geological Society, "the Illustration of Geological Phenomena by means of Models." He first stated that drawings cannot convey to the mind a correct notion of geological phenomena where more places than one are required; and that few persons are aware of the extraordinary changes which are produced in the combinations of strata by viewing them on different planes, especially if the strata are dislocated; or in undisturbed and parallel strata, of the totally different apparent forms which are exhibited on an undulating surface and in any plane section of the interior. This difference is of great importance in mining places, where the surface only is, in the first instance, accessible to examination, and the observer is too apt to infer from it, the subterranean relations of the strata. To convey clear notions of these differences, Mr. Sopwith has prepared a series of hand models, about two inches square, formed of layers of differently coloured wood, and capable of being dissected, to a certain extent, vertically, obliquely, or horizontally. They are also so shaped on the upper surface as to exhibit the undulations of the ground. It is not possible to convey verbally a clear notion of the many curious combinations exhibited by these models. In 1838, Professors Buckland and Sedgwick bore testimony to the accuracy and beauty of Mr. Sopwith's improvement.—(See *Year-book of Facts*, 1839, p. 219.)

CHANGES ON THE EARTH'S SURFACE.

M. Rozet, in a memoir, read to the Philosophical Society of Paris, draws attention to the fact, that the causes which have produced irregularities in the structure of the globe have not yet ceased to act, as is proved by earthquakes, volcanic eruptions, slow and continuous movements of the crust of the globe in certain regions, &c. We may, therefore, yet see repeated the great catastrophes which the surface of the earth has undergone anteriorly to the historical period.—*L'Institut; Jameson's Journal, No.* 61.

THE GLACIAL THEORY.—GENERAL CONGELATION.

The new Geological Theory respecting the Agency of Ice in the formation of the upper crust of the earth we now inhabit, has received some illustration during the past year. In *Jameson's Journal*, No. 61, are two contributions:—

1. A paper by Dr. Black "On some Appearances connected with the Antediluvian Congelation of the Water of Rocks," concluding thus:—"If the facts and observations stated in the foregoing paper be more generally corroborated by other observers, and their deductions

be added to my own, we may feel satisfied that we have new and independent data, apart from all glacial phenomena, to support the doctrine of a general congelation having obtained over a great part of the surface of the earth in these latitudes. By what means, meteoric or mundane, this general refrigeration was occasioned, is quite a subject of conjecture. Whether it arose from a greater distribution of land towards the north pole, or from a greater inclination of the polar axis of the earth in relation to the plane of the ecliptic, or whether from a temporary juxta eccentricity of the earth's orbit, or from any other equally conjectural cause, it is quite futile to speculate upon. The simple facts and arguments deduced on the more precise subject of the fragmentary beds of the superficial sandstone rocks, and explanatory of their present nature and configuration," form the author's inducement thus to attempt to throw light on the formation and chronology of our superficial deposits.

2. A paper by M. Renoir, " On the Traces of Ancient Glaciers in the Valleys of the Alps of Dauphiny, and in Northern Russia," concludes as follows:—" It will be found, on a close examination, that everything in the present state of the surface of the globe concurs in demonstrating to us the ancient existence of general ice. It is of great importance to science to establish this grand truth. It affords us at once, and in the most natural and complete manner, an explanation of all the phenomena termed *diluvian*, the cause of which has remained unknown up to the present time, and which had been vaguely referred to an universal inundation. The latter did not in other respects answer the conditions of the problem, and its physical impossibility is clearly ascertained*."—*Bulletin de la Société Geologique de France.*

GEOLOGY OF SPITZBERGEN.

In Spitzbergen, the geognostic constitution of the country does not clearly show any portion of the primordial crust, or exterior coating; although it is likewise, as in Norway, very hilly and irregular. But what is remarkable, it presents us with six distinct kinds of secondary formations, some of them belonging to the most ancient geological periods, and others to the most recent. Thus, we ascertain that this extremity of the globe, so near the pole, has been subjected, at many epochs, and particularly at the most ancient epochs, to the same secondary deposits, and the same causes of dislocation, as the equatorial or temperate regions.—*Report on the Collections and Geological Observations made in* 1838 *and* 1839, *during the French Northern Expedition.* By M. Eugene Robert; *L'Institut, No.* 384; *Jameson's Journal, No.* 62.

GEOLOGY OF KERGUELEN'S LAND.

The most remarkable geological feature in this island is the occurrence of fossil wood and coal; and, still more extraordinary, these are

* See a *précis* of the Facts contributed in 1840, by Agassiz, Renoir, and others, in Year-book of Facts, 1841, pp. 233—236.

imbedded in the igneous rocks. The wood, which is for the most part highly silicified, is found enclosed in the basalt; whilst the coal crops out in ravines, in close contact with the overlying porphyritic amygdaloidal greenstone.—*Mr. M'Cormick, R.N.*; *Proc. Royal Society.*

GEOLOGY OF RUSSIA.

In the *Year-book of Facts*, 1841, pp. 243—246, will be found an abstract of the result of a journey through the Northern and Central Governments of Russia in Europe, made during the summer of 1840, by MM. Murchison and Verneuil, and communicated in outline to the British Association in that year. A memoir of this journey has since been read to the Geological Society, with the following

Conclusion.—In recapitulating the chief points of the first and practical part of their memoir, wherein they establish, they trust on a sound basis, the general classification of the palæozoic rocks of Russia in Europe, the authors, MM. Murchison and Verneuil, remark, that the fact of some of the deposits of such high antiquity being found to stretch in horizontal and almost unbroken sheets over spaces of 1000 miles in length, in a very slightly solidified or lapidified state, is the more interesting when coupled with the absence, throughout the same regions, of all plutonic or igneous rocks. This phenomenon must, it is conceived, exercise considerable influence upon geological theory; it being now apparent, that the lithological nature of the most ancient subsoil of Russia in Europe is such as to compel geologists to reject the conclusion, that, in proportion to their antiquity, the strata have been hardened or crystallized by any general radiation of central heat; for in these wide tracts such crystalline and hardened strata are clearly seen to be purely metamorphic, and dependent exclusively on the vicinity of rocks of igneous protrusion, in receding from which to the south all the strata described are at once found in their normal soft condition.

Mr. Murchison subsequently received from his friends and fellow-travellers, the Baron A. de Meyendorf and Count A. Keyserling, important additions to the above results, particularly in regard to the extension and development of the carboniferous system.—See *Jameson's Journal, No.* 61, p. 139.

Mr. Murchison has, during the past summer, been following up in Russia the geological investigations which he commenced so auspiciously in the previous year. In company with a small party of geological friends, he has traced out the relations of the formations of European Russia as far as Orenburg and the Ural Mountains, and penetrated into the bordering tracts of Asiatic Russia.

GEOLOGY OF SURREY.

Dr. Mantell, in a Memoir in Brayley's *History of Surrey*, thus lucidly takes a retrospect of the geology of this county* :—" From a

* We do not hesitate to characterize Dr. Mantell's Memoir, both in subject and treatment, as the most valuable section of the above work.

review of the strata and organic remains of this county, the sequence of the physical changes which it has undergone may be easily determined; and it may be stated, not as an hypothesis, but as a legitimate deduction from the facts before us, that the portion of the earth's surface which now forms the county of Surrey has within the period embraced by our researches, experienced the following mutations, First.—It was the delta of a vast river, that flowed through a country which enjoyed a tropical climate, and was inhabited by various reptiles, and clothed with palms and arborescent ferns. *During this epoch the Wealden strata were deposited.* Secondly.—This delta subsided to a great depth, and was covered by an ocean, and formed the bottom of the sea for a period of sufficient duration to admit of the deposition of several thousand feet of strata, inclosing myriads of extinct species of marine fishes, shells, and corals. *This era comprises the formation of the chalk.* Thirdly.—The bed of this ocean was broken up; and some parts were elevated above the waves, and formed groups of islands; while the depressions, or basins, were filled with the waters of a sea teeming with marine fishes and shells, wholly distinct from those of the preceding ocean; and fed by streams which brought down from the land the remains of terrestrial mammalia, and of trees and plants, also of extinct species and genera. *These sedimentary deposits constitute the tertiary formations.* Fourthly.—A farther elevation of some parts of the solid strata, and the depression of other portions, took place; and the dry land was peopled by elephants, rhinoceroses, gigantic elks, and other mammalia, whose remains became embedded in the mud and gravel of the lakes and estuaries. *The Post tertiary deposits.* Lastly.—Man appeared and took possession of the country; and such of the pachydermata as remained, were either extirpated, (as the Irish elk, &c.), or reduced to a domestic state. At the present time, the metropolis of England is situated on the deposits which contain the remains of the elephant and the elk, and the accumulated spoils of the tertiary seas; the huntsman courses, and the shepherd tends his flocks, on the elevated and rounded masses of the bottom of the ancient ocean of the chalk; the farmer reaps his harvest in the weald, upon the soil of the cultivated delta of the country of the iguanodon; and the geologist gathers together from the strata the relics of beings which have lived and died, and whose very forms are obliterated from the face of the earth, and endeavours from these natural memorials to trace the succession of the physical events which have preceded all human history and tradition."

SUBSIDENCE OF THE COAST NEAR PUZZUOLI.

In 1813, Mr. Hullmandel resided during four months in the Capuchin Convent, which is situate in the entrance of Puzzuoli, and on the seaward side of the road towards Naples. The oldest friar, styled *il molto reverende*, then 90 years of age, informed Mr. Hullmandel, that when he was a young man, the road towards Naples passed between the convent and the sea, but that from the gradual subsiding of the soil it had been necessarily changed to its present course. During Mr. Hull-

mandel's residence, the refectory and the entrance-gate were from six to twelve inches under water, whenever strong westerly winds prevailed. Thirty years previously, such an occurrence never took place. The small wharf at Puzzuoli was also constantly under water during westerly winds. Mr. Hullmandel, therefore, infers, that as it is not probable the architect of the convent would have so placed the ground floor as to expose it to inundations, or the builder of the wharf would have so constructed a landing-place as to render it liable to be overflown, a gradual subsidence of the soil has been going on for many years, and that this change tends to corroborate the opinion respecting the differences of level which have taken place in the Temple of Jupiter Serapis*.—*Proceedings of the Geological Society.*

On March 1, Sir John S. Forbes, Bart., read to the Royal Society of Edinburgh an account of the more recent researches of the Italian antiquaries and geologists connected with the Temple of Jupiter Serapis, at Puzzuoli; which the author has generally verified by personal inspection, and extended to other parts of the western coasts of Italy, where traces of marine lithophagi have been found, according to Niccolini, at a height of even 250 feet above the present sea-level. The most interesting recent observations are those of Niccolini on the actual change of relative level of sea and land, ascertained by a fixed gauge which he frequently observed between 1823 and 1838. In that interval, the land appears to have risen 112 millimetres, or $4\frac{1}{2}$ inches, progressively and not suddenly

AUSTRALIAN AND POLYNESIAN ISLANDS.

At the meeting of the Academy of Sciences on the 27th Sept., M. Serres presented a Report on the observations and collections of Admiral Dumont d'Urville, on the inhabitants of the islands in the Southern and Eastern Oceans. The Admiral was of opinion that the inhabitants of New Holland, New Zealand, and others of the Australian and Polynesian groups, belonged to the Ethiopic family, (one of the three great primitive divisions of the human race—viz., the Caucasian, or white division—the Mongolian, or yellow division—the Ethiopic, or black division). The Malays, and other people of the islands more properly Asiatic, belonged to the Mongolian division, or to crosses between this and the Ethiopic. The fifty casts of heads, which the Admiral had brought home from different points, were observed by M. Serres to be of the utmost value in determining the true character of these tribes; and were the more important in a scientific point of view, since the aborigines were fast disappearing before the increase of the white and mixed races. Thus, there are now only forty individuals subsisting of the aboriginal population of Van Diemen's Land, and only one birth took place among them in 1839; so that there is no doubt but that they will ultimately become extinct. It was true that the natives of

* See an hypothesis on this phenomenon, by Russager, in the Year-book of Facts, 1841, p. 238.

other islands were of tribes very nearly allied to them. The Admiral considered that the various languages spoken in the Polynesian and Australian groups were only the remnants of dialects of a primitive tongue, common perhaps to them all, but now totally lost. He observed that the superior races of the human species were at all points gaining rapidly on the inferior, and that the physical improvement of the human race was in progress.—*Athenæum, No.* 728.

SOURCE OF THE RIVER OXUS.

Lieut. Wood, the first European who, in later times, has reached the source of the Oxus, describes it as a fine lake in the form of a crescent, about fourteen miles long from east to west, by an average breadth of one mile. On three sides it is bordered by swelling hills, about 500 feet high, whilst along its southern bank, they rise to mountains 3500 feet above the lake, or 19,000 above the sea, and covered with perpetual snow; from which never-failing source the lake is supplied. From the western end issues the infant river Oxus; Lat. 37° 27′ north by mer. alt. of the sun, and Long. 73° 40′ east by protraction from Langer Kish, where the last set of chronometric observations had been obtained, its elevation, measured by the temperature of boiling water, is 15,600 feet, as Lieut. Wood's thermometer marked 184° Fahrenheit. The temperature of the water below the ice, (for the lake was frozen,) was 32°. This then is the position of the sources of this celebrated river, which after a course of upwards of 1000 miles in a direction generally south-west, falls into the southern end of the Sea of Aral. The description of the banks of the lake, as given by that good old traveller Marco Polo, nearly six centuries ago, is correct in all its leading points.

At the foot of Khawak, 29 miles from Indorab, Lieut. Wood found, in the upper part of the Oxus, two thermal springs of the temperatures respectively, 108° and 124° Fahr.

DISINTEGRATION OF THE DOLOMITIC ROCKS OF THE TYROL.

Prof. Daubeny has read to the British Association a paper attempting to explain, without resorting to volcanic agency, the abrupt form, extraordinary height, naked outline, and fissured surface, of the Dolomitic Rocks of the Tyrol. He attributes the above circumstances to the slow rate at which decomposition proceeds in rocks consisting of pure dolomite, and the strength of the cohesion which binds together the particles of this rock; owing to which, even those portions which stand prominent, in consequence of the removal by the agents of destruction of their contiguous parts, often remain unaffected by those mechanical forces, which would cause the projecting portions of a rock less unyielding in its nature to become detached. The cause, therefore, of the greater height maintained by the dolomites of the Tyrol than by the pyroxenic rocks which accompany them seems to be the inferior rate at which decomposition has proceeded in the former; whilst the

bold and jagged outline they display may have been produced by the tenacity with which their parts cohere. The sterile character of these same rocks, even in parts which are not precipitous, appears to be owing to the slowness with which they decompose, as well as, perhaps, to the absence of organic remains. The Professor concluded with some suggestions as to the means of fertilising rocks containing magnesia, where, from the slowness of their decomposition, they continue sterile; and proposed, in such cases, to accelerate the rate of disintegration, by pouring upon the subsoil diluted sulphuric acid.—*Literary Gazette, No.* 1283.

SUBMARINE GEOLOGICAL CHANGES PRODUCED BY THE PHOLAS.

Mr. Walker, the harbour-master of Plymouth, has read to the British Association, a very important paper "On the Deposits of the Sound and Harbour." It related, also, particularly to the ravages made in the lime-stone rocks, below the low-water level, by the *Saxicava rugusa*, which pierces and drills the most solid piece of rock into holes, till, by the continued ravages of the animal, and the action of the water, the mass is worn away. He produced specimens of lime-stone taken up from the Breakwater, and other parts of the harbour, which were eaten through in the manner described, the shell remaining fixed in the destructive creature's self-excavated gallery. He stated that the sea-wall of the Dock-yard, which was built of Portland stone, had been perforated and fretted away in all directions; and the cliff at Devil's Point, which was limestone, was completely undermined from the same cause. The tidal stream was more rapid here than in any part of the harbour, and the bottom was thus kept clear of mud. He inferred, therefore, from the greater depth of the water here, and over the limestone, generally, compared with the depth above those kinds of rocks which the creature did not appear to attack, that the destruction was imputable to the *Saxicava*. He stated that it was a question of great importance for engineers to consider, whether limestone ought to be employed at all in submarine constructions. Mr. Walker stated that the formation of the Breakwater had allowed the deposition of a bed of mud, which had already accumulated; the force of the waves rushing from the open sea into the harbour, and breaking violently against the rocks of the Citadel, formerly swept the bed of the harbour clear; but now a deposit was taking place, and an anchorage was being formed where there was previously only bare rocky bottom. The paper concluded with some further remarks on the share the *Saxicava* was supposed to have in deepening the water over limestone rock. Dr. Buckland observed that in some period of time, geologically speaking it mattered not whether two hundred years or two thousand, it appeared that the *Saxicava* would eat up the Breakwater itself. He stated that in one point he differed from Mr. Walker, who had exhibited a piece of lime-stone procured from a height of eighty-two feet above mean water mark, and which was perforated in the same manner as the specimens taken

from under water; and this Mr. Walker had ascribed to the same cause, when the present cliffs were under the sea level. He had met the same perforations in limestone on high land in other places, and ascribed them to the common snail. He pointed out the difference between the perforation of this specimen, and that undoubtedly made by the *Saxicava*. He did not think that the former was made by the action of any specific organ, but by the motion of some very slowly acting acid, secreted by the snail. He had found snails in large numbers in these cavities. One locality he mentioned was a high spot, about six miles inland from the coast of Boulogne. Professor Owen stated, as an objection to this theory, that such an acid would probably act on the substance of the shell of the animal as well as on the rock. He referred the perforating powers of the pholas chiefly to the vibratile cilia, invisible to the naked eye, which kept up a constant motion night and day, quite independently of the will of the animal, and which continued as long as it had life. When lodged in the rock, by means thereof a perpetual and strong current of water was continually pouring in and out, and it might be conceived, from the well-known effect of running water on stone, that this constant action might produce the perforation. To this he thought might be added the friction of the shell itself. Professor Henslow mentioned the curious fact, that pieces of limestone which he had seen, and which had been brought from Barnstaple, where they had formed part of the church-tower, presented precisely the same cavities as those which had been attributed by Dr. Buckland to the agency of snails. These, however, there was no doubt were due to the chemical action of spray and marine vapour; for therein had been found quantities of carbonate of soda, one of the results of the consequent double decomposition of the limestone and sea-water.

The general opinion appeared to be against Dr. Buckland's theory with regard to the perforation being produced by the snail, though he supported his argument very strongly.—*Abridged from the Literary Gazette*, No. 1281.

AGENCY OF ANIMALCULES IN THE FORMATION OF LIMESTONE.

On March 2, Prof. Buckland read to the Ashmolean Society a paper on this interesting inquiry. He commenced with exhibiting specimens of Stonesfield slate and Derbyshire limestone, in which microscopic shells have been discovered in great abundance: he next inquired how far the frequent occurrence of such remains in the carboniferous and oolitic limestones, as well as in the chalk and tertiary formations, justifies the revival of the old but exploded vermicular theory, "*omnis calx e vermibus, omnis silex e vermibus, omne ferrum e vermibus.*" He then exhibited the plates of Ehrenberg's work on the animalcular constitution of chalk, (1839,) in which specimens from twelve very different localities are figured, all of which are crowded with foraminiferous and other minute chambered shells, varying from $\frac{1}{77}$th to $\frac{1}{300}$th of a line. The specimens from the north of Europe contain a greater

quantity of organic earthy chalk than of organic substances; whilst those from the south of Europe exhibit a larger proportion of animal remains. The chalk from the south of Europe contains an abundance of siliceous infusoria, but no flints; whilst that from the north of Europe is full of flinty nodules, but has no siliceous infusoria, excepting within the nodules themselves, as if they had been attracted to the nascent nodules from the fluid in which they were floating. Dr. Buckland, admitting with Prof. Ehrenberg and Mr. Bowerbank, (who has discovered what he conceives to be parasitic sponges in the black substance of chalk flints,) that animal remains have contributed much to the substance both of chalk and flint, felt disposed to refer the earthy portions of the chalk and the inorganic substance of the flint to segregation from the water, in which both the lime and flint were held in solution. He then pointed out the relation of the recent nautilus and sepia to the minute molluscous constructors of recent as well as of fossil foraminiferous microscopic shells; and showed how much had been added to the amount of animal remains known to have contributed to the formation of limestone, by the modern discovery of microscopic shells and infusoria. He illustrated the extent to which molluscous animals occur in our present seas, by Capt. Beaver's discovery, that two shoals between the Cape of Good Hope and the island of Mauritius, marked in the charts as sand-banks, are masses of medusæ, floating 150 fathoms beneath the sea; and by Capt. Scoresby's calculation of the enormous number of medusæ in the water of the Greenland seas. Dr. Buckland then alluded to the microscopic animalcules that fill stagnant ditches and pools of fresh water, and which frequently give a red or green colour to the water; and to the fact of the sediments of fresh-water lakes, such as Neufchatel, being composed of infusoria. These infusoria, frequently when the mud becomes dry in summer, are taken up by the wind, and carried about in the atmosphere, till they fall again into water, or some other fluid, and are resuscitated. The general presence of these desiccated infusoria in dry ponds accounts for a stratum of polishing stone found near Berlin, composed entirely of siliceous shells, or shields, of infusoria. Recent discoveries of marine infusoria in the sea-water, lead us to infer that such animalcules most probably abounded in the ancient seas; and that the application of the microscope to thin slices of siliceous and calcareous sedimentary rocks, will disclose the presence of marine and fresh-water remains; and thus introduce a new era in palæontology, by demonstrating the very extensive, though not exclusive agency of animalcules in the formation of limestone. In the case of crystallized marble, it is not improbable that intense heat has obliterated all trace of organic remains, if they ever existed.

RECEDING OF THE SEA.

The *Phare de Rochelle* states, that the sea is receding so rapidly from the Bay of Bourg Neuf, that the remains of an English ship-of-war, mounting sixty-four guns, which was lost on an oyster-bank,

called Les Retraits des Œuvres, whilst in pursuit of a French ship, in 1752, is now to be found in the midst of a cultivated plain. On comparing the depth of the water where this vessel struck with its present level, it will be found that the depth of the sea has diminished at least fifteen feet.

SEA-LEVEL OF THE MAURITIUS.

THE island of Mauritius presents indications of the sea having formerly occupied a higher level than at present. It is vested by an enormous coral reef throughout its whole circumference, extending for ten miles of the broadest and extreme southern side, or from Point Souffleur to Souillac, or Port Savanne. Along that part of the island, the coast is bold, and consists of a basaltic rock.

Near the Rivère des Galets, between Savanne and the Baie du Cap, the sea foams against a barrier of coral from five to fifteen feet in height, and wears it into the most fantastic shapes. At a considerable distance inland, and almost concealed by trees and shrubs, are two remarkable points or headlands of coral, from twenty to twenty-five feet above the present level of the sea. They present the same marks of abrasion at the lower reef, now undergoing the action of the waves. The observatory, Port Louis, is built also on a stratum, ten feet above high-water mark, of very hard coral, which requires blasting. There are besides in several parts of the island, and at considerable distances inland, enormous blocks of coral surrounded with the debris of oyster and other shells and broken corals. Appended to this information, communicated by Capt. Lloyd to the Geological Society, are two letters from agents employed by him to collect information respecting inland blocks of coral. One contains the following data respecting two blocks near Souillac :—

	1st Block.	2d Block.
Distance from the sea	610 feet,	1356 feet
Probable height above high-water	50 —	
Length	12 —	30 —
Breadth	10 —	12 —
Height	7½ —	14 —
Girth round the largest projections	40 —	77 —

If the first of these blocks had been transported by the sea, Capt. Lloyd says it could have attained its present position only by passing over the almost perpendicular coast.

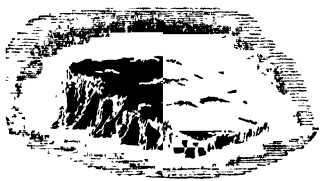
The other letter gives the following measurements of two blocks on the Black River :—

	Height.	Circumference.	Width.	
First Block	13 feet,	30 to 40 feet,	121 feet,	350 feet
Second Block	10 —	25 feet	41 —	840 —

There is no coral in the interior, except a small bed on the habitation, Le Geutele.

ICEBERGS ON THE BANK OF NEWFOUNDLAND.

CAPT. VEITCH, F.G.S., relates the following facts, as witnessed by himself, of the great constancy of the stream of Icebergs which now passes southward along the east margin of the Bank of Newfoundland. The Captain believes these bodies are generally or almost always to be seen in the months of March and April, in or about Lat. 42° N. and Long. 50° W. of Greenwich.



(Iceberg.)

Ship *Corinthian*, Capt. Davis, 1824, 10th April, Lat. 43° 22′ N., Long. 46° W. Saw an iceberg to the south.

April 11. Lat. 42° 20′ N., Long. 50° W. Saw a large iceberg three leagues to northward.

Ship *Ontario*, Capt. Seabore, March 24. Lat. 42° 25′ N., Long. 50° W. Saw two icebergs, one to the southward, distant, appearing like a ship under sail; the other to the north, distant about six miles. This last, as near as we could estimate, was about one mile square, the edge nearest the ship being only 10 feet high, and the more distant edge about 100 feet high, presenting a wedge-form above water; slightly undulated, covered with snow a foot or two deep, the edge or cliff worn into all kinds of gullies and fissures by the waves which broke against it with great force. (See Wood-cut.)

In the season and locality just stated, Capt. Veitch believes, vessels sailing between England and New York will cross the great stream of icebergs; and, consequently, the navigation must be there very dangerous. When the steam-boats were introduced between this country and North America, Capt. Veitch always feared some fatality would arise in the season of March or April, in dark weather, owing to the velocity of the boats. That we have not heard of losses of sailing-vessels striking on ice in the locality named, will be explained by the fact that it can hardly ever happen that a soul escapes to tell the melancholy tale!

Subsequently to the date of these remarks, the public journals announced, among other facts, the following, strongly confirmatory of the great danger to which shipping is exposed by the occurrence of icebergs off the south-east margin of the Bank of Newfoundland.

Ship *William Brown*, of Philadelphia, G. C. Harris, master, 1841, April 19. N. Lat. 43° 30′, Long. 49° 39′ W. Vessel going ten knots, struck on an iceberg at 9 P. M. and a little after struck again; at midnight the ship went down, with thirty three souls on board.

Great Western steam-ship, of Bristol, James Hosken, master, 1841, April 18. First iceberg seen in Lat. 43° N., and Long. 48° 30′ W. April 19. Last iceberg seen in Lat. 42° 20′ N., and Long. 50° W. Between these localities, the sea was covered with ice.

It is singular that in six localities where icebergs have been seen, as above enumerated, two of these are identical both in latitude and longitude; and this locality is on the edge of the bank, where some charts only record twenty-four fathoms water; and where, consequently, great icebergs must inevitably strike the bottom.

Capt. Veitch has communicated these facts to *Jameson's Journal*, No. 61; and they acquire a melancholy interest from the missing *President* steam-ship being, by many persons familiar with the navigation of the Atlantic, supposed to have struck on the ice.

POLISHED ROCKS OF FONTAINBLEAU.

In the *Comptes Rendus de l'Academie des Sciences*, for July 12, is "a Notice on the traces of polishing which the diluvium has left on the sandstones of Fontainbleau," by M. Durochez. A translation of the entire paper will be found in the *Philosophical Magazine*, No. 125, concluding thus: "As M. Elie de Beaumont has so judiciously observed, these bands take the direction of W.N.W., which the Seine follows before receiving the Loing at Saint Manvert, and which it again takes beyond Melun. It is probable that at the diluvian epoch, the current followed the same line from the E.S.E. to the W.N.W., that it must have covered the whole extent now occupied by the forest, and that it hollowed out those broad furrows, the ridges of which are crowned by blocks. The sandstone of Fontainbleau being formed of friable and more cohering layers, the former were, doubtless, undermined by degrees by the action of the waters; and then the solid layers, being no longer upheld at their base, must have been broken up, and have produced those vast heaps which give such wild and picturesque aspects to this forest."

"EATABLE EARTH."

M. Stanislas Julien has sent to the Academy of Sciences, at Paris, specimens of a peculiar mineral substance, from the province of Kiang-si, in China, on which, in times of famine, the inhabitants have been said to be able to support themselves as a nutriment. It has a disagreeable taste, and produces dryness in the mouth: the idea of its being, in reality, nutritious, is altogether a mistake; it produces disease, and ultimately death; but is, nevertheless, used by the natives, mixed with flour, and is even esteemed by them.

In the analysis which he has made of this earth, M. Payen has found 50 per cent. of silex, and a certain quantity of magnesia and alumina. It contains also a little organic matter, which has a remarkable aromatic odour, and a slight taste like pepper: this yielded, on analysis, a very small quantity of azote. M. Payen thinks this earth might be useful for manure; and that, in this respect, it would be interesting to study its composition.—*Gazette Médicale*, Sept. 25.

ANALYSIS OF BERGMEAL.

Prof. Traill has reported to the Royal Society of Edinburgh, an account of the composition of Berg-Meal, brought from Swedish Lapland, by Mr. Lang, in 1838. It was found just under a bed of decayed

mosses, forty miles above Degersfors, in Umea Lapmark. The microscope showed it to consist of several species of minute organic remains, which Ehrenberg has considered to be the siliceous skeletons of minute infusoria; the largest measuring from 0.006 to 0.0005 of an inch. On analysis, Prof. T. obtained 22 per cent. of organic matter, entirely destructible by a red heat; and he found the snow-white residue, which still retained the microscopic forms, to consist of 17.13 of silica, 5.31 alumina, and 0.15 oxide of iron. He considers the organic matter and the silica as the essential ingredients, and the others, probably, as accidental. As a mixture with food, the quantity of organic matter in the Berg-Meal gives it an advantage over the steatites and clays used for a similar purpose by some rude tribes.—*Jameson's Journal, No.* 59.

NITRATE OF SODA QUARRIES, AND ANHYDROUS SULPHATE OF SODA, IN PERU.

At Tarrapaca, in Western Peru, are Nitre-quarries and clarifying works: the nitre is found upon a small portion of the plain, extending along where the latter and high grounds between it and the sea blend together for a distance, in a north and south bearing, of 150 miles; but nitre-works are only as yet established upon a small portion of this line. It is combined with the soil to the depth of three feet, the two forming so hard a mass as to require boring and blasting; after which it is pounded, dissolved, clarified, and crystallized, and packed off on donkeys to Squique, where it sells for 3½ dollars per 100lbs., duty included. The residuum, after the extraction of the nitre, both from taste and appearance, cannot be mistaken; while its being a deadly poison, and clothes once wetted with it never drying, clearly point it out as the muriate of lime. This nitre, as it is called, is not the proper nitre, which is the nitrate of potash, but simply the nitrate of soda. It is, however, used as a substitute for the former in manufacturing fireworks, and as manure, and it furnishes a profitable ballast for ships returning to England.

Among many other mineral substances on this coast is the Anhydrous Glauber Salt, of which there is an inexhaustible supply in the valley of Atacama, and other contiguous places. The sulphate of soda, or Glauber salt, is now extensively used in England in the manufacture of soda: in these Peruvian mines it is to be got for the digging, and as it has no water of crystallization, (about half the weight,) this Peruvian sulphate must be double the value, as relates to weight, to that of England; while only half the freight is paid in its transmission, from this 50 per cent. absence of water in its composition.—*Abridged from the Literary Gazette*, No. 1279.

WITHERITE, OR CARBONATE OF BARYTA.

Prof. Traill has exhibited to the Wernerian Society specimens of Witherite, or Carbonate of Baryta, from a new locality in Wales. This mine is close to the right side of the public road from St. Asaph to Holywell, about three miles from the former town, among the clay-slate mountains that form the eastern boundary of the fertile valley of

Clwyd, and near the junction of the slate with the mountain limestone. It is in the mining district of Rhualt, and is named *the Pennant Mine*. The carbonate is found in veins along the adit, and descending below it, and is mixed with sulphate of baryta, and some galena; but the principal product of this part of the workings is the carbonate. It is sold, like the sulphate of the same earth raised in the upper part of the vale of the Clwyd, the Isle of Arran, and Renfrewshire, for the avowed purpose of adulterating white paint, and is more difficult of distinction than the other adulterations, because it effervesces with, and is soluble in, muriatic or hydrochloric acid. It is also sold on a more limited scale for chemical purposes. We have now, therefore, in Southern Britain, five great localities of Carbonate of Baryta—Anglezark in Lancashire, Aldstone Moor in Cumberland, Arkingarthdale or Arkindale in Yorkshire, Snailbeach in Shropshire, and Rhualt in Flintshire. —*Jameson's Journal*, No. 59.

MOSS-AGATES.

Mr. Bowerbank has read to the Geological Society, a paper "On Moss-Agates, and other Siliceous Bodies;" in which he gives the results of his microscopic examination of the animal remains contained in siliceous minerals. During this series of investigations, he examined a great number of specimens of moss-agates from Oberstein, and other parts of Germany, as well as from Sicily, and about seventy specimens of green jaspar from India. The following are the conclusions at which he has arrived:—In every specimen of agate and jaspar, he found the remains of tubular spongeous texture very often nearly obliterated, and exhibiting only the red pigment which had filled the tubes, but frequently in a perfect state of preservation: he detected also numerous small globular bodies, which he is of opinion were the gemmules of the sponge; and he discovered instances of vascular structure, both on the exterior of the tubes, and within their cavities. Mr. Bowerbank has examined also numerous specimens of Egyptian agates, but could not detect in them any traces of spongeous remains. He ascertained that they consisted of small, irregular, light-coloured grains, imbedded in a banded siliceous matrix, and that they contained vast numbers of foraminifera unequally distributed through the layers composing the agate. He also describes the structure of several Mocha stones, and shows that their moss-like appearance is not of organic origin, but due to metallic infiltrations. A specimen of Herefordshire pudding-stone was found to exhibit, in its larger pebbles, all the spongeous characters of chalk flints.

THE DIAMOND.

On March 4 was read to the Royal Society, a paper entitled, "On a remarkable property of the Diamond," by Sir D. Brewster. On re-examining the phenomena of parallel bands of light and shade exhibited by reflection at the plane surface of a diamond, which the author noticed some years ago, he concludes that they result from the reflections of the edges of veins or laminæ, of which the visible terminations

are inclined at different angles, not exceeding two or three seconds, to the general surface. He gives an account of several analogous facts observable in other crystals, more especially those of carbonate of lime, artificially polished in surfaces inclined to the natural planes of cleavage.

DIAMOND-MINES OF BRAZIL.

M. CLAUSSEN, a geologist, who has resided for twenty years in the Minas Geraes of Brazil, relates the following details of the true mineralogical habitat of the Diamond. In 1839, diamonds were discovered in the psammite sandstone of the Serro do Santo Antonio de Grammagoa, a mountain of flexible sandstone, a variety of itacolumite; the highly inclined beds, reposing immediately upon Macigno, a rock of the transition series, leaves no room for doubt as to their identity with the psammetic sandstones of Abaite. The discoverers produced a great number of diamonds, because the rock was very soft; but, as they went deeper, it became harder, and consequently, more difficult to work. Upwards of 2000 persons laboured without order or place, and thus caused a portion of the mountain to crumble away before them, the debris of which still yields a profit by the extracting of diamonds after pounding. Specimens of the rock with imbedded diamonds are by no means rare: they are found imbedded in the psammite sandstone; in the itacolumite sandstone they are sometimes discovered between plates of talc, very much as garnets are in mica-slate. In the museum of Rio Janeiro, there is a roundish diamond of very considerable size, which very distinctly retains the grains of sand imprinted upon it.

M Claussen has seen a small piece of pseudomorphosed sandstone, very much like itacolumite, about 2 inches long and 1 broad, containing a diamond weighing about 2 grains, and crystallized in the shape of a roundish octahedron; for which the owner demands 125*l*.! Another remarkable specimen is at Rio Janeiro, and is a piece of yellowish sandstone, about the size of the fist, containing two diamonds, one weighing nearly a carat, and the other a grain; both crystallized in the form of perfect primitive octahedrons. M. Claussen was assured that all the diamonds found in the itacolumite sandstone have rounded angles and edges: whilst, on the contrary, those found in the psammite sandstone are perfect crystals. Were this fact verified, and found to be constant, we must needs suppose that the same cause which has changed the sandstone into itacolumite has also operated upon the diamonds.

The diamonds are never found enveloped in an earthy crust, as some authors have described. Their surface is sometimes rough, but generally smooth. The diamond may very easily be recognised by putting it in water, where it retains all its brilliancy, having the appearance of a bubble of air, while all other precious stones lose this singular appearance.

The Brazilian Government have strangely neglected this highly important discovery; which may eventually lead to more diamonds

being procured than formerly, and consequently may lessen their mercantile value.—*L'Institut, No.* 379; *Jameson's Journal, No.* 62; *abridged.*

DIAMOND-MINES OF GOLCONDA.

MR. J. T. NEWBOLD describes the process by which the Diamonds are obtained from the famed Golconda mines, to consist merely in digging out the rolled pebbles and gravel, and carrying them to small square reservoirs raised on mounds, having their bottom paved with stones, and then carefully washing them. Dry weather is selected to carry on these operations, in order to avoid the inconvenience and expense of draining. A description is then given of the mines of Banaganpully, Munimudgoo, Condapilly, Sumbhulpoor, and Poonah in Bundlekund.

DIAMOND-MINE IN SUMATRA.

A MINE has been discovered in the district of Dolandolo, which appears to be as rich as those of Borneo. The gold-mines of Bonjol and Kampong Kardi, which have been worked since 1837, appear to be more productive in proportion to the depth from the surface.—*Athenæum*, No. 700.

OCELLATED STONES OF EGYPT.

EHRENBERG has lately read a valuable paper to the Berlin Academy, on the nature of the stones resembling spectacles, which are found in the chalk marls of Upper Egypt, and analogous specimens of which have been detected in other parts of the world. Ehrenberg considers that, independently of crystalline forms, there exists a series of structures which is always reproduced in a similar manner: these spectacle stones afford the most striking example; they possess a regular form, and are often a foot in diameter.—*Athenæum, No.* 692; which see for the entire paper.

DURATION OF THE PRESENT SUPPLY OF COAL.

A FEW years ago, a Report was submitted to the House of Lords, by Mr. Taylor, stating that the coal-fields of Durham and Northumberland have consisted of 837 square miles, 105 of which have been worked, leaving yet available, in this district alone, 732 square miles. Mr. Taylor estimates the working coal strata at an average thickness of 12 feet, so that the contents of 1 square mile will be 12,390,000 tons, and of 732 square miles, 9,069,480,000 tons. For small coal, underground casualties, as dykes, &c., deduct one-third—

9,069,480,000
3,023,160,000
6,046,320,000

And this remainder, (continues the same Report,) is adequate to supply the current annual draught from Newcastle, Sunderland,

Blyth, Stockton, &c., of 3,500,000 tons, for a period of 1,727 years. With respect to Wales, the stores of coal and ironstone deposited there are as yet unopened. It has been stated that the Welsh coal-fields extend over 1,200 square miles, and that there are 23 beds of workable coal, having an average thickness of 95 feet. Each acre will yield 100,000 tons, being at the rate of 65,000 tons per square mile. If from this we deduct one-half for waste, and the minor extent of the upper beds, this will afford a supply of coal equal to 32,000,000 tons per square mile. Let it be conceded that 5,000,000 equal one-third of the total consumption in England, then each square mile of the Welsh coal-field will meet a proportionable consumption of a hundred years and as there are from 1,000 to 1,200 square miles in this coal district, it would supply England with coal for 2,000 years after all our English coal-mines were exhausted. It is, therefore, absurd to ground restrictions to this trade on the plea of an apprehended exhaustion of the supply.—*Polytechnic Journal, No.* 19.

COMPOSITION OF CHALK ROCKS AND CHALK MARL BY INVISIBLE ORGANIC BODIES.

THE reader is especially recommended to an elaborate analysis of Ehrenberg's great work, by Thomas Weaver, Esq.. F.R.S., F.G.S., &c., in Nos. 118 and 119 of the *Philosophical Magazine:* in which Mr. Weaver considers these new discoveries as naturally leading to the conclusion that we have no very definite boundary between secondary and tertiary tracts; and that the first dawn or eocene period of the present living organic creation, must be sought for deeper than the chalk formation; a view apparently confirmed by the occurrence of a living *Trochus* below the chalk, of the *Paludina vivipara* and *Cyclas cornea* in the Weald Clay, and of the *Terebratula caput serpentis* in the Upper Oolite.

Mr. Weaver's "Concluding Remarks" are as follow:—"The preceding extracts from the labours of Dr. Ehrenberg and M. A. d'Orbigny show that microscopic Polythalamia are found in all calcareous formations from the lias upward; but in England they have been lately discovered in still deeper strata. Mr. Tennant was, I understand, the first to announce their discovery, in 1839, in the mountain limestone of England. In 1840, they were also met with in the Kendal limestone, from which Mr. Lonsdale has prepared thin slices mounted on glass, which appear transparent under a strong light, exhibiting the crowded state of the microscopic Polythalamia in great perfection. Mr. Bowerbank has also been led to turn his attention to this subject by examining the siliceous bodies of the chalk, green sand, and oolites." Mr. Weaver then refers to Prof. Buckland's notices of the remarks of MM. Tennant and Darker on this subject, in his paper "On the Agency of Animalcules in the formation of Limestone;" and refers to the Professor's remark, that in the application of the microscope from the living to the fossil Infusoria and Foraminifers, we are commencing a new and important era in Palæontology.

VOLCANIC ASHES AT SEA.

THE following memorandum has been communicated to the *American Journal*, (? Silliman's) by the Rev. P. Parker, M.D., who was passenger in the *Niantic* from Canton to New York :—"Ship *Niantic*, L. F. Foty, master, April 5, 1840, being in lat. 7° 05′ north, long. 121° 10′ east, at 2 A. M., 60 miles from Mindanao, one of the Philippine Islands, came up a fine breeze from the north-east, which was attended with a shower of dust resembling that of ashes, so thick as to obscure the moon and stars, and by filling the sailors' eyes compel them to retreat below: it lasted about one hour, and cleared away. At daylight, the *Niantic* looked like an old furnace, being covered from the royal mast-head to the water's edge; the decks were a quarter of an inch thick with the ashes, and three or four bushels might have been collected. They fell in small quantities occasionally for two or three days after. On April 14, spoke the English whaler, *Margaret*; reported likewise, on April 5 had a similar shower of ashes, being then 300 miles north-east of us; the *Margaret*, on April 12, visited several villages on the island of Madura, entirely deserted by the people, from one of which the master had taken two brass cannon and other articles. This led us to think that some volcanic eruption had lately happened in that neighbourhood. After the 9th, perceived no more in proceeding northward."

VOLCANO AT HAWAII.

THE following is an extract from a letter forwarded to Prof. Silliman, giving some interesting particulars of a visit, in October, 1840, to the great Volcano at Hawaii, and an account of a late eruption :—It is an immense pit one thousand feet deep and six miles in circuit, with perpendicular walls, except at one point, where it is reached by a steep descent, and the whole of this vast cauldron, full of boiling, bubbling, and spouting lava. The surface at one moment black as ink, and the next exhibiting rivers and pools and jets of a hideous blood-red fluid, that was sometimes thrown up to a height of fifty or sixty feet, and fell back with a sullen plashing that was indescribably awful. The aspect of the whole was *hellish*—no other term can express it. By night it was grand beyond description. The frequent lightings up, the hissings and deep muttering explosions, reminded me of some great city in flames, where there were magazines of gunpowder or mines continually exploding. Vesuvius is a fool to it. Just previous to my visit, the lava had burst out at a new place, about six miles north-east of the crater, and flowed down to the sea in a stream of forty miles in length, by from one to seven in breadth. I saw the light one hundred miles off. It reached the sea in five days, threw up three hills of from one hundred and twenty to two hundred and fifty feet high, gained two thousand feet out seaward from old line of coast, by three-fourths of a mile in width, and heated the water for fifteen miles either side, to such an extent, that the fishes were heaped up in myriads on shore, scalded to death. Its falling into the sea was accompanied with tremendous

hissings, and detonations like constant discharges of heavy artillery, distinctly heard at Hilo, twenty minutes distant.—*Athenæum, No.* 727.

EARTHQUAKES.

SHOCKS of the Earth have been frequent during the past year; of which the following are the principal:—

Central America.—By a letter received from Central America, it appears that the entire city of Cartago, containing a population of 10,000 persons, was destroyed by an earthquake early in the morning of September 2; though, as nearly all the buildings were very low, and composed of wood, and as the inhabitants had generally risen, not more than 40 or 50 persons were killed or injured. This earthquake occurred without previous warning, and was connected with an eruption of the well-known volcano about three miles distant. A smart shock of the same earthquake was simultaneously felt in the town of San José, not far distant, at which place the earth trembled for several days subsequently, but not much damage was done there.—*Correspondent of the Times, Dec.* 8.

Sicily.—The soil has been shaken, during the past year, by the internal convulsions, of whose coming the signs had been so long apparent. There have been several shocks of earthquake at Naples, which have, however, done little damage: but Foggia has been visited by the calamity in a more fearful form, 46 bodies having been taken from the ruins which it has made.—*Athenæum, No.* 702.

Reggio.—Letters from Naples bring intelligence of the destruction, by an earthquake at Reggio, of the cathedral, four churches, three chapels, the palace of the provincial government, the police office, and a great number of houses; ten or eleven persons were killed and three hundred injured. The same shock was felt at Messina.

Terceira.—On June 12, at 4 P. M., a violent shock of earthquake was felt at Praya, situated on the bay of the same name, at the east end of the island of Terceira, and about 12 English miles from Augra, its capital; the shock extending with diminished force to the westward. At 5h. 25m., a second and more violent one was felt: and on the 13th the trembling continued with short intervals, but diminished violence, during the whole day. On the 14th, at 4 A. M., a perceptible undulation of the ground took place, destroying all those buildings which had been weakened by the former shocks. With the exception of occasional slight motions, the island was undisturbed during the remainder of the 14th; but on the 15th, at 3 A. M., a violent trembling and horizontal undulation of the ground commenced, and continued with intervals of ten minutes, and a duration of about ten seconds, until 3h. 30m. A. M., when a strong vibrating and distinctly visible rocking motion was communicated to the surface, which threw down the entire town of Praya, (562 houses,) and several chambers and houses in the adjacent villages; besides houses and public buildings in other parts of the island. The ground then remained comparatively at rest until 2h. 40m. A. M. on the 16th, when a violent shock of

earthquake did further damage. After this, although the island did not resume a permanently quiescent state until June 26, no further damage appears to have been done. The greatest motion was at Praya, where a rent has been left in the ground of about an English mile in length, from the edge of the water stretching westward; and every convulsion was preceded by a loud subterranean noise resembling thunder. The number of houses destroyed is stated at about 800; and the value of property 180,000*l.* In the narrative of this catastrophe, dated the "British Consulate, St. Michael," it is considered "by no means a great stretch of hypothesis to suppose, that the late earthquake has, like former ones, been accompanied by the ejection of submarine volcanic matter, which may have been thrown up within a short distance of the surface; so that, in fact, in that part of the sea where there were previously 200 fathoms of water, there may, at this moment, exist a most dangerous shoal."

Zante.—One of the consequences of the Earthquake at Zante, (see *Year-book of Facts*, 1841, p. 257,) was the disappearance of a small island in the harbour.

Coblentz.—A shock of earthquake has been felt at Coblentz, on the Rhine, accompanied by a loud noise, and in a direction from north-east to south-west. It was also felt on the Lahn and the Moselle. A bluish meteor was observed during the previous night over the volcanic mountains near Brohl; and on the same night, a ball of fire of unusual size was seen at Troyes, in France.

Ammerapoora.—This city is said to have been almost entirely destroyed by an earthquake, which happened on the night of the 23rd March, 1840; 300 persons were killed. The shock lasted two or three minutes, and extended from north to south. The cities of Ava and Tragain are also said to have been destroyed, with many neighbouring villages.—*Athenæum, No.* 780.

Isle Savary.—M. Arago has read a letter from Isle Savary, in the Indre, stating that recent shocks of earthquake were felt sharply there; and that a clock, which had not gone since May, 1840, had its pendulum set in motion by the vibrations, and continued to go. At the Observatory of Paris, the pendulums were not at all affected.

EARTHQUAKE AT MOUNT ARARAT IN 1840.

THE following is the official account:*—It was observed that numerous rents or fissures took place on the banks of the Araxes and the Karassu, from the source of the latter to its confluence with the Arpatchai, on all the spots where the banks of those rivers are somewhat elevated. These fissures were seen every moment to open and shut. There also occurred a great number of violent explosions from the bottoms of holes like little craters, which, opening and shutting in the same way as fissures, spouted out torrents of water, and cast up immense quantities of pebbles and gravel. The waters of the Araxes were so violently agitated, that they rose over both banks, now causing inun-

* See Year-book of Facts, 1840, p. 256.

dation, then sinking again into the centre of the bed, which thus appeared concave. Several parts of the river became dry, while at other parts the body of the stream rose to a great height, making a noise like the sound of boiling water. During these awful moments, terror and desolation reigned everywhere to a great distance around Mount Ararat. The Persian town of Maku, and Baiazeth, the chief town of a Turkish Pashalic, also suffered from the earthquake. Its successive shocks convulsed in a few minutes the earth as far as Shusa and Tabris on the one side, and to Tiflis on the other. But its ravages extended chiefly over the Russian territory. The ancient and venerable monument of St. James, and the village of Acorhi, with its 200 houses and 1,000 inhabitants, situate on the skirts of Mount Masis, at the foot of the Great Ararat, were entirely destroyed by the immense masses of rock which were detached from the summit of the mountain; and by the colossal glaciers accumulated during an incalculable series of ages in that region of eternal snow, which those rocks brought with them in their descent. In the cantons of Erivan, Sharur, Nakhichevan, and Ordubat, nearly all the houses have been entirely destroyed. In Nakhichevan, two Armenian churches, five mosques, 779 houses, and 25 shops were quite ruined. In the district of the same name, including the canton of Ordubat, the number of edifices destroyed has been found to amount to 2,436 houses, one church, two mosques, and 17 mills, leaving out of the account 1,095 houses, nine churches, five mosques, and 15 mills, which were more or less seriously damaged. In the canton of Sharur, the earthquake threw down 3,135 houses, and 75 mills. In the same canton, on the left of the river Araxes, where its banks are somewhat elevated, land-slips took place, which carried away several villages and the adjoining corn-fields. Most fortunately, the catastrophe occurred before sunset, which is doubtless the cause that the number of victims, the inhabitants of Acorhi excepted, was less considerable than might have been expected. With that exception, the number is limited to merely 49 individuals in the two districts of Erivan and Nakhichevan, exclusive of 17 seriously wounded.

The influence of the earthquake on all the wells within the two districts mentioned was very remarkable. In the canton of Nakhichevan, upwards of 30 springs were dried up for some time; some continued even several days after the catastrophe to yield only thick and whitish-coloured water; others, on the contrary, became more abundant than they had previously been; and in the vicinity of several of the latter new springs made their appearance. Thus, the volume of water from the springs of Karasau and Chapan, near the village of Sardarak, is more than double what it was; and a new current of water, which first issued forth at the time of the earthquake, still flows from a cleft in Mount Gindil. At Karagasanlu, a poor village situate at the confluence of the rivers Arpalchai and Araxes, the earthquake was observed in all its awful grandeur. Terrified by the first shock, and stunned by a noise like the rolling of thunder, the inhabitants had no sooner raised their eyes to the summit of the Ararat, and beheld the direction of the detached masses of rock, than a second shock over-

threw their clay huts. The whole village disappeared amidst an immense cloud of dust; at the same time the earth alternately opened and closed around them, and numerous columns of water spouting up in the air from the apertures, threw into the fields sand and pebbles which had been dislodged from the bottom of those frightful gulfs. The unfortunate inhabitants fled in dismay from the places of their birth. It is difficult to afford any idea of the scene which presented itself in the narrow valley of Acorhi. The masses of rock, ice, and snow, detached by the first shock from the summit of Ararat and its lateral points, were thrown, at one single bound, from a height of 6,000 feet to the bottom of the valley, where they lay scattered over an extent of seven versts. At first, not the slightest traces of the monastery or the village were perceptible; but gradually the snow and ice began to melt, and the mass of *débris*, losing its adhesion, separated and crumbled away in various directions. A portion was carried down by the slope of the valley as far as the banks of the Karassu, with such rapidity, that huge masses of ice preserved entire, and immense fragments of rock, were in the space of a few minutes hurled to a distance of 20 versts from the point where they had fallen. This happened at 9 in the morning of the 24th of June. Torrents of clayey mud, of a whitish colour, issued from the sides of the great mass of *débris*, which remained immoveable, inundating and devastating the fields and meadows from that point to the banks of the Karassu. These torrents were so great, that between the mountains bounding the valley of Acorhi and the banks of the river, the ground was inundated to the extent of 12 versts in width. One of these torrents of mud, falling into the Karassu, forced that river to alter its course. A vast number of mutilated human bodies, frightful evidences of the disaster of Acorhi, were hurled into the Karassu; so that the waters of the river were for a long time unfit for use in cooking or drinking. On the 5th of July, these torrents had entirely disappeared. On a piece of ground extending from the monastery to the village of Arcohi, where formerly were to be seen cultivated fields and gardens, there was found a labyrinth of hillocks of a conical form, composed of fragments of rock, and covering fragments of glaciers, which in consequence of being thus protected against the influence of the atmosphere were not melted. These hillocks are furrowed by numerous fissures, and have cavities full of water containing vitriol; they will probably disappear when the ice which they cover shall be dissolved. After the great concussion, the effects of which were so dreadful, distinctly felt shocks occurred at intervals until the 28th July; they afterwards diminished in force, but they did not entirely cease in the district of Sharur until the 1st of September; and, though very feeble towards the close of that period, they were still accompanied by a slight subterraneous noise.

EARTHQUAKE-SHOCKS IN GREAT BRITAIN.

In *Jameson's Journal*, Nos. 61, 62, and 63, will be found a valuable series of "Notices of Earthquake-shocks felt in Great Britain, and especially in Scotland, with Inferences suggested by these Notices as to the

causes of such Shocks," by D. Milne, Esq., F.R.S.E., &c.; including a register of the shocks from the year 1608 to 1841, with an abstract of the phenomena which accompanied them. The great extent of these papers prevents our doing more than directing the reader's attention to these valuable records. Among the author's inferences, apparently established by the register, as to the causes of these phenomena, are changes of atmospherical pressure, and the production and development of subterranean electricity. At the conclusion of the second portion, the author observes:—"It has long been known that electricity is generated in great abundance in the earth, and that it passes in various forms, though most frequently imperceptibly, into the atmosphere. Would it be an irrational conjecture, that the production of earthquake-shocks, at least in non-volcanic countries, is due to the states of the atmosphere relatively to each other? If, as there is reason to suppose, electricity is formed in the interior of the earth most abundantly during winter, does this circumstance not serve to explain the greater frequency of shocks in that season? And may the shocks not be caused by occasional *discharges* of electricity from the earth into the atmosphere — not unlike discharges from one cloud to another?"

EARTHQUAKES IN SCOTLAND.

At Stirling, and the adjacent country, shocks were felt on July 30, at about 2 P. M. The convulsion lasted a minute, and was accompanied by a hollow grumbling sound, like distant thunder. At Comrie, the shocks had been experienced during the week; but on this day, the most severe occurred, and shook the stones from a house, and threw down part of a stone dike. The inhabitants were so terrified that they all rushed into the street. At Pitlochry, Dunkeld, Aberfeldy, Auchterarder, Crieff, Dunira, St. Fillans, and Doune, and, indeed, throughout all the western district of Perthshire and Stirlingshire, the earthquake was distinctly felt, and seemed to be as powerful as that of 23d October, 1839. The day was boisterous, dark, gloomy, and cold.

Mr. Milne's Report "On the Comrie Earthquakes in Perthshire" has been submitted to the British Association. It stated that the pendulum in the instruments used for the observations had twice marked the index paper, and in both cases the oscillation was towards the west. From this he inferred that the motion of the earth was from a centre towards the east; and stated that the displacement in the first shock amounted to half an inch, and in the second to somewhat less. These were horizontal movements; but there were probably also vertical movements, which though evident to the sense of many of the inhabitants round about, were not susceptible of being recorded by the instruments employed. These instruments were, indeed, otherwise imperfect; as they only registered three shocks out of twenty-seven, which were distinctly felt. More sensitive machinery was recommended by Mr. Milne, and others, in the pursuit of the investigation of this interesting inquiry, which is also being carried on at Turin.

Professor Sedgwick concurred in these opinions. Dr. Buckland

stated that in certain places liable to earthquakes, their extent was measured by bowls of treacle, (the inclination of the treacle in the bowl showing the quantum of shock,) and elsewhere, (by a watchmaker in Scotland,) by placing a clock against each of the four walls of an apartment, and marking the centre of the disc of the pendulum with chalk: when the shock took place, the derangement caused the pendulum to strike against the back and front of the clock-case, and of course a mark would be left indicative of the phenomenon, though not of its amount.

Mr. Babbage has observed that the degree to which the shock of an earthquake was felt depends greatly on the strata or description of rock on which the observer is standing; and Dr. Buckland has stated that Chichester is more liable to earthquakes than any other place in the kingdom, in consequence of its being on the continuation of the Isle of Wight formation.

LANDSLIP IN THE ISLE OF WIGHT.

THE face of the cliff at Freshwater has been much shivered, and the sandstone terminus on the Alum Bay side, resting on a clay base, has slipped into the sea to the extent of several acres; but the Freshwater Cave remains, and presents a far greater facility of entrance than before, some parts of the arched entrance having fallen; and which, probably, gave rise to the report of its entire annihilation.—*Hampshire Independent.*

LANDSLIP IN DEVONSHIRE.

On July 11, about half-past 6 P. M., a Landslip of considerable extent took place at Sidmouth, Devon. It commenced like a distant peal of thunder; and at 7 o'clock part of the Peak Hill began to glide towards the sea, carrying every thing before it, and forming a rock out of the sea, (70 feet high, and 175 feet in circumference,) opposite to the town, and a quarter of a mile from the shore.—*Dorset Chronicle.*

FOSSIL ORGANIC REMAINS.

THE following are the principal discoveries, or illustrations, of the year, in this very interesting department of geology:—

Bird.—Impressions of birds have been found in America, but no bones have yet been discovered. M. Herman von Meyer has however lately received from M. Escher, of Zurich, the bones of a fossil bird, which were found imbedded in the slate of the canton of Glaris, in Switzerland. These slates which contain the *Chelonia Knorii*, were considered very ancient, until M. Agassiz showed from the fossil fishes, that they were of the same age as the chalk. The specimen described by M. von Meyer contained the skeleton of a bird, of which the wing and foot are distinctly visible. The bird appears to have belonged to the Passerine tribe.—*Athenæum*, No. 717.

Caterpillar. (?)—On Nov. 1, the Rev. Mr. Hope presented to the

saurus, or Wealden Lizard, (of which genus the author has discovered the remains of three individuals); and of several other reptiles, as the *Megalosaurus*, *Plesiosaurus*, and several specimens of *Steneosaurus*, *Pterodactylus*, and other Chelonia, as also one or more species of a bird allied to the Heron. All these specimens are now deposited in the British Museum.

The very fine specimen of *Plesiosaurus dolochodarus*, recently found at Whitby, has been sold to the Cambridge Museum for 230*l*.

Bone Cave in Morayshire.—In January, a Cave was discovered in the old red sandstone at Hopeman, near Elgin. From the quantity of calcined wood and burnt stone, which strewed the outer entrance, the cave appeared to have been used by man for cooking; subsequently, it had been taken possession of by foxes, or other predacious animals, which had hoarded bones of deer, dogs, hares, rabbits, seals, birds, and fishes: but the most interesting feature of the cave is, that it proves by its contents the upheavement of an ancient sea-beach, with its rolled pebbles, sea-sand, and shells, lying undisturbed; and above them a mass of brown mould, evidently derived from the decomposition of animal matter. Many of the shells, as the *turbo* and *patella*, may have been carried there for food; but the sand, besides being nearly half made up of the fragments of shells, contains many entire minute shells, which could not have been brought hither for any economical purpose, either by man or animals. Here, then, we have a portion of the sea-shore, or beach, elevated from 17 to 20 feet above high-water mark, with its sand, shells, and pebbles lying undisturbed, as they were seen on the beach, which is every day washed by the ocean-waves. When the bones were first collected and examined, some of them seemed to have belonged to animals too large for a fox to master, such as a deer's horn of large size, the tusk of a wild boar, &c.; but after the indications of fire having been used in the cave, it occurred to the explorers that these spoils of the chase had been brought there by man, who had used fire near the entrance to dress them for food, and that by this means the larger exuviæ had been brought to it.—*Mr. P. Duff, in the Elgin Courier; abridged.*

FOSSIL TREES FOUND NEAR MANCHESTER.

Mr. J. E. Bowman, F.G.S.. has communicated to *Jameson's Journal*, No. 61, a paper "On the Fossil Trees found on the Line of the Bolton Railway, at Dixon Fold, near Manchester; and the light they throw on several points still undecided among Geologists." The trees are six in number, and stand nearly erect on a seam of coal nine inches thick, which lies near the centre of the Lancashire coal-field, declining about 17° from the perpendicular, which corresponds with the dip of the strata of the horizontal plane, so that they are still perpendicular to the plane of the bed. They are in a stratum of argillaceous shale, which rests upon the coal, and gradually passes upwards

into an ordinary coal-measure sandstone; and of a similar sandstone the trees themselves chiefly consist.

The author then describes the prominent features of these trees, and from the evidence which they present, endeavours to show, in opposition to the general opinion of geologists,

1st. That they, and, of course, many others of the carboniferous epoch, were solid, hard-wooded, or timber trees.

2nd. That they originally grew and died upon the identical spots where they are now found interred, and have not been drifted from distant lands.

3rd. That they have become hollow owing to the decay of their wood by natural causes, and have been subsequently filled with foreign inorganic matter, precipitated as a sediment from water.

HUMAN BONES OF GREAT GEOLOGICAL ANTIQUITY.

Dr. Lund has communicated from Lagou Santa, in Brazil, that upon a late journey into the interior, he had, for the first time, met with Human Bones, in conjunction with the bones of acknowledged extinct animals, which must be of extraordinary antiquity, *perhaps the oldest bones that have ever been found;* for they are in part petrified, and in their present condition altogether correspond with those of the extinct animals, in connexion with which they were found! They will, he observes, throw a light on the nature of the inhabitants of this part of South America, in times far beyond our present knowledge of it. The formation of the cranium is extraordinary; inasmuch as the forehead does not rise in the same place with the face, but forms a considerable angle; by which peculiarity it differs from all crania of living races of men, and resembles the depressed head represented in the ancient drawings of the Mexicans. In connexion with these extraordinary bones, was found a hemispherically-shaped stone, quite polished on the under surface, which had evidently been used for rubbing.—*Athenæum, No.* 698.

FOSSIL WAX OF GALLICIA.

Mr. P. Walter has examined a Fossil Wax, discovered some years since, at Truskawietz, in Gallicia, or Austrian Poland, in beds of grit and bituminous clay, at a depth of two or three metres.

This fossil is of a brownish black colour: its smell is penetrating and bituminous; it is slightly soluble in alcohol and æther; it fuses at 156° Fahr. When heated in a retort by means of an oil-bath, it first fuses, and at 212° it loses a little water; at 572° nothing whatever distils; above this, ebullition begins to occur, and continues up to 662°: oils first appear, afterwards a yellow-coloured substance, which forms the greater portion of the distilled product. This matter, freed from the empyreumatic oils by pressure through cloth, and dissolved in boiling æther, precipitates on cooling in a state of a beautiful white pearly substance.

It yielded by an analysis:—carbon, 85·85—hydrogen, 14·28. This, therefore, is the composition of bicarburetted hydrogen and paraffin;

and the latter Mr. P. Walter believes, from sulphuric acid not appearing to exert any action upon it. The examination of oils, found by the distillation of fossil wax, may throw a great light upon the formation of naphtha and analogous compounds, which are probably derived from the decomposition of this kind of bodies*.—*Ann. de Chim. et de Phys.; Philos. Magazine, No.* 116.

FOSSIL INFUSORIA IN THE UNITED STATES.

SINCE the discovery of Ehrenberg, who showed, that in some parts of Germany deposits of infusoria existed to the extent of several miles, and in depth from 20 to 30 feet, the men of science of America have been actively engaged in inquiries respecting their existence in their own country. They were first detected in North America by Professor Bailey†. A small portion of the earth from West Point, New York, was sent to Ehrenberg; he discovered many species, the most predominant being *Gallionella distans*, *Navicula viridis*, and numerous fragments of needle-shaped spongiæ. Besides these, there was a considerable quantity of the fossil pollen of the pine. Six of the fossil American species are known as living species in Europe. Four others are known in Europe as fossils, of which three only have been observed in the mountain meal of Sweden and Finland. The Amphidiscus, which is described as a new genus, Ehrenberg thinks may possibly be only the inner portion of some peculiar spongia or tethya. Ehrenberg has not found this genus in Europe, but he has lately detected it among fossil infusoria from the banks of the Amazon. Ehrenberg, it is well known, has proved, from an examination of the finest powdered chalk used in trade, that in this fine state of division, it remains mixed with immense numbers of well-preserved forms of the minute shells of coral animalcules. He has even detected them in the walls of rooms washed with lime, and on glazed vellum paper, used for visiting cards.—*Athenæum, No.* 688.

DEVON AND CORNWALL FOSSILS.

PROF. PHILLIPS addressed the Geological Section of the British Association at the late meeting, on the character of the olden formations, and the value of organic remains in determining their age, for which purpose he did not consider them sufficient. He noticed the fact of some kinds of fossils being found in different strata: some of the ancient strata contained carnivorous mollusca, but they were not the same as in the modern. He stated the general characteristics of the Devonshire fossils to be that of high antiquity. From the organic remains, it appeared that these strata (of Devon) belonged to an intermediate period between that combination of life called the silurian, and the later one called the carboniferous period. He pointed out the

* See Fossil Wax found at Newcastle-upon-Tyne, Year-book of Facts, 1839, p. 235.

† See a description of these Specimens, with an Engraving, in Year-book of Facts, 1839, pp. 232-233.

difference between the strata of North and South Devon, and stated, that a greater similarity existed between those of North Devon and Cornwall. He showed that they had not been classed with sufficient precision; and anxiously wished the Section not to believe that they had solved the problem when they called them the Devonian series, or had given them a definition when they identified them with the old red sandstone.

At the recent meeting of the British Association, an interesting discussion took place between Mr. Austin, Professor Sedgwick, (who made some interesting remarks on the raised beaches of Devon and Cornwall, and their organic remains), and Dr. Buckland, who explained some osseous remains brought from the Limestone Cavern of Berry Head; among which he pointed out two human bones, a femur and tibia. Some of the bones, he thought, had dropped in, as cases of that kind often occurred; some caves, however, had also been inhabited, bones were afterwards carried in, and such places were also frequently used at sepulchres and places of burial. He explained the action of water in corroding the substance of the rock into hollows, and stated the various speculations that had been formed as to these osseous remains; whether they had been carried in, or more probably fallen in through lateral chasms, which were afterwards filled up by stalactites. He alluded to the animal remains found in the Oreston caverns, describing the appearance the excavation presented when he entered the cavern, where the bones of hyenas and other animals not now found in this hemisphere were deposited in great quantities. He inferred some of these appearances favoured the theory of a period of cold having at some time followed a period of heat, when these creatures were basking in warmth and sunshine. He thought it probable that the bones might have drifted down the valley of the Plym, and worked their way from the estuary into the cavern where they were found. In a subsequent part of the discussion, Dr. Buckland combated the notion that, because human remains were found among the bones of the geological period, it was to be supposed that those human beings were contemporary with them. He ascribed it to interment, stating that the bones of elephants and hyenas, and other animals, were frequently dug up in making graves in the churchyards of Dorsetshire and other localities. He also gave an amusing account of a cave in Wales, in which he had found the skeleton of a female who had been buried among fossil remains, and who had evidently kept a sort of suttler's shop, as appeared from the remains of Celtic implements of gambling, and other amusements of a camp.—*Literary Gazette, No.* 1282.

TEETH OF LABYRINTHODON.

On Jan. 20, was read to the Geological Society, a communication "On the Teeth of Species of Labyrinthodon, (*Mastodonsaurus* and *Phytosaurus* of Jaeger,) from the German Keuper and the Sandstone of Warwick and Leamington," by Prof. Owen. The true position of the Warwick sandstone, with reference to the Keuper and *Bunter sandstein* of the Germans, being considered by some geologists as not

definitely determined, Prof. Owen, in his preliminary remarks, expresses a hope that the discovering at Warwick and Leamington of reptilian remains generically agreeing with those found in the Keuper of Germany, may afford some assistance in deciding the question. The details of this paper, too numerous for quotation, will be found in the *Literary Gazette*.

FOSSIL REPTILES OF GREAT BRITAIN.

"THE great paper of the year," to quote the *Literary Gazette* Report of the late meeting of the British Association, is generally acknowledged to be Prof. Owen's Report "On the Fossil Reptilia of England;" of which it was observed at the meeting that the author had proved himself a worthy successor of Cuvier, and an honour to his country and its science. The above is the second portion of the Report; the first, "On the Marine Sauria," having been read at Birmingham, in 1839. This very elaborate paper, by the anatomical skill and great analogous knowledge displayed in it, produced such a sensation at the late Plymouth meeting of the British Association, that 250*l.* were unanimously voted from the funds towards its publication in a separate form. Meanwhile, a perfect analysis of the paper has appeared in the *Literary Gazette*, No. 1282; and in the *Athenæum*, No. 721, nearly as follows:—

The Enaliosauri formed the subject of the first part of this Report. The first section was devoted to a description of a large reptile, the type of a new genus, to which the name Pliosaurus was given; and which formed the link connecting the Plesiosaurus with the Crocodile family. The most conspicuous character of this genus consists in the cervical vertebræ, which are considerably shorter than those of the dorsal region: in this respect, it differs from all recent Saurians, the vertebræ of which are characterized by retaining the same length throughout. From this cause, the neck of the Pliosaurus is short, compared with that of the Plesiosaurus, and approaches the condition of that region in the Ichthyosaurus. The more Crocodilian proportions of the teeth also distinguish it from the Plesiosaurus, which in other respects it strikingly resembles. Remains of it have been found in the Kimmeridge clay of Market-Rasen, Weymouth, and Shotover. From differences in the relative proportions of these bones, Prof. Owen considers them to have belonged to two distinct species of Pliosaurus. The remains of the Saurians of the Crocodile family, which complete the transition from the Enaliosaurians to the terrestrial Lizards, were next noticed. The Report included descriptions of the fossil Crocodiles in the British formations below the eocene tertiary strata to the oolite inclusive; and it was observed, that the extinct species deviated from the organic type of the existing crocodiles in proportion as their remains occurred in strata geologically more remote from the present time. Not any of the species were identical with those now known to exist; and the modifications of structure in which they differed, were much more considerable than any which distinguish the skeletons of the existing species from each other. The extinct species, agreeing

with the present crocodiles in possessing the ball-and-socket articulation of the vertebræ, in which the cavity is on the fore part, were first described. Of these, the *Crocodilus Taliapicus* is found in the London clay of the Bracklesham, at Sheppey, and in beds of sand underlying the red crag at Kyson. The *Crocodilus cultridens* of the Wealden formation Prof. Owen now considered subgenerically different from the crocodiles, and proposed for it the name of Suchosaurus. *Goniopholis crassidens*, another species from the Wealden, was described by Prof. Owen as more completely mailed than any of the crocodile family; its remains occur in the Tilgate Forest and near Battle Abbey, and in the Purbeck limestone at Swanage. The next family of extinct Crocodilians considered by Prof. Owen, are characterized by the biconcave structure of the vertebræ. Remains of the first of these, *Telosaurus Chapmanni*, are abundant in the lias of the Yorkshire coast; and *T. Cadonensis*, which abounds in the oolite formations near Caen, in Normandy, also occurs in the oolite near Woodstock, and at Stonesfield. Remains of two other species were noticed. The second genus, Steneosaurus, distinguished from the last by the sub-terminal position of the nostril, is from the Kimmeridge clay at Shotover, and from the oolite of Stonesfield. One of the most interesting specimens exhibiting the form of the brain in a cast of that part, is in the Woodwardian collection at Cambridge. A third division was for the first time described as occurring in British strata, possessing the ball-and-socket articulation of the vertebræ, but with the position reversed, to which the name Streptospondylus has been given by Von Meyer. It has been found in the lias near Whitby, and the oolite near Chipping Norton.

Prof. Owen next proceeded to describe the remains of some gigantic Saurians, ranging from the greensand to the oolite, and rivalling the modern whales in bulk; which may be presumed to have been of strictly aquatic, and probably of marine habits. They possess the biconcave structure of the vertebræ, and the long bones show no trace of a medullary cavity. Of the first of these, named by Prof. Owen Cetiosaurus, the vertebra and other bones, found in the lower oolite of Chipping Norton, belonged probably to an individual forty feet in length. Mr. Owen has assigned to this species the name of *C. hypoolithicus*: and to another species the name of *C. epioolithicus*, remains of which, including a vertebra eight inches in length of body, and nine inches in transverse diameter, occur in the Yorkshire oolite at White Nab. The ninth section of the Report was devoted to the description of a large marine Saurian, teeth of which were frequent in the chalk of Barnwell, and in Sussex, in the Folkstone galt, and the lower greensand near Maidstone. From the structure of the teeth, Prof. Owen had assigned to it, in his *Odontography*, the name of Polyptychodon. Several bones of a gigantic Saurian, discovered by Mr. Mackeson in the green sand quarries near Hythe, were considered as probably belonging to the same genus. Mosasaurus—of this genus only a few vertebræ have been found in the English chalk formation. Teeth, resembling those

of the Mosasaurus, but differing in the elliptic form of the base of the crown in a transverse section, have been found in the chalk of Norfolk, and were described by the generic appellation Leiodon.

The Report next proceeded to the account of the extinct species, which manifested, in the enduring parts of the organization, an intimate relationship with the numerous and varied tribes of the smaller and lower organized Saurians of the present epoch, to which the terms Lacertians, or Squamate Sauria, were applied. And Prof. Owen observed, that in this as in the foregoing divisions of the Saurian order, the ancient world possessed very singular and also very gigantic species, which have now utterly perished, and have given place to carnivorous and herbivorous quadrupeds of more active habits and a higher organization. The first fossils noticed were referred to a small genus of Lacertians from the Chalk formation in Cambridge and Maidstone, to which Prof. Owen had given the name Raphiosaurus; a portion of the lower jaw, containing twenty-two awl-shaped teeth, and another specimen consisting of twenty dorsal, two lumbar, two sacral, and a few caudal vertebræ, with the pelvic bones, were described. Part of the lower jaw, with teeth, of another Lizard, about the size of the Iguana, was described as occurring in the eocene sand under the red crag of Kyson. Remains of a Lacertian were next described, from the celebrated oolite at Stonesfield. The structure of these bones indicates a close affinity to the Scincoid Lizards, the largest forms of which now exist in Australia, where they are associated with Araucariæ and Cycadeous Plants, with living Clavagellæ, Terebratulæ, and Trigoniæ, and with the peculiar marsupial quadrupeds, the remains of all which forms of organized beings characterize the same stratum and locality as does the present extinct Lacertian.

Prof. Owen next noticed the more remarkable and gigantic forms of terrestrial Saurians of the same period, from the eocene tertiary to the oolites. Of these, the Megalosaurus, Iguanodon, and Hylæosaurus, had been described by their original discoverer, Dr. Mantell, and by Dr. Buckland in his *Bridgewater Treatise*. Prof. Owen, after pointing out additional peculiarities of structure, discovered in specimens subsequently found, and the new localities from which these specimens were derived, observed that the name Iguanodon, by conveying the idea of a gigantic Iguana, created an erroneous idea of its affinities. No existing lizard differed more from the Iguana than did the Iguanodon, in the absence of the ball-and-socket joint of the vertebræ, and likewise in the structure of teeth, which is characterized in the gigantic extinct herbivorous reptile by numerous parallel and medullary canals. The femur of the Iguanodon, in the process continued from the inner side, near the upper third of the bone, deviates from all modern Lacertians, and approaches nearer the crocodiles, but surpasses them in the development of the ridge in question. A detailed description of the skeleton, founded upon nearly all the remains of the Iguanodon yet discovered, was next given; the form of the claw-bones of the Iguanodon, and especially of some enormous ones recently discovered with

other bones at Horsham, was described, and from a comparison of these with other specimens from the Isle of Wight, and with those preserved in the slab containing the Maidstone Iguanodon, Prof. Owen stated it to be his opinion, that the Iguanodon did not possess the peculiarity of having the fore legs provided with compressed, and the hind legs with depressed, claws; but that the narrow compressed curved claws occasionally found in the Wealden belonged to another extinct reptile. This section of the Report concluded with a notice of all the British localities, and the strata in which those remains had been discovered.

The anatomical peculiarities of the Hylæosaurus, another large extinct reptile of the Wealden clay, discovered by Dr. Mantell, were next described; and an account of the microscopical structure of the dermal bones was given. This remarkable reptile combines the subbiconcave structure of the vertebræ, with Crocodilian scutæ, and a plesiosauroid form of the scapular arch. The teeth not uncommonly found in the Wealden strata, formerly supposed to belong to the *Phytosaurus cylindricodon* of Jaeger, and more recently to the genus Rhopalodon, of Fischer de Waldheim, Mr. Owen showed to be quite distinct from both; and stated that if they were not the teeth of the Hylæosaurus, they must belong to some unknown genus of Lacertine Saurian. The remains of the genus Thecodon and Palæosan, from the magnesian conglomerates near Bristol, and of the genus Cladeiodon, from the Keuper sandstone of Warwickshire, were next described. These were the most ancient of the Saurians yet discovered in Great Britain; and although they differed from modern Lacertians in the implantation of their teeth in distinct sockets, agreed with them in the form and structure of the teeth. The last genus of Saurians described, (*Rhynchosaurus*, O.) was new to science; and the remarkable peculiarities of its cranial anatomy, together with its vertebral characters, and the structure of the ribs and some of the long bones, were given in detail. Characters of the crocodile, lizard, and tortoise, were combined in the forms and connexions of the bones of the skull, a nearly entire specimen of which had been transmitted by Dr. O. Ward, of Shrewsbury, to Prof. Owen, from the Grinsill Quarries of the new red sandstone; where the foot-prints of a reptile, agreeing in size with the Rhynchosaurus, were not uncommon. Reasons were adduced, showing the high probability that they were the foot-prints of the Rhynchosaurus; they differ in shape from those of the Chirotherium, which were shown, in the concluding part of the Report, to belong to Prof. Owen's new genus Labyrinthodon.

In the seventeenth section of the present Report, the remains of the Flying Reptiles, (*Pterodactylus macronyx*,) from Lyme Regis and the oolite of Stonesfield, were described. Some remains of undetermined Saurians, from the bone-bed at Aust Passage, and other localities, were noticed. The nineteenth section of the Report contained an account of the fossil Emydes, Trionyces, and Cheloniæ, hitherto discovered in British strata. The *Chelonia Harvicencis*, and two new species,

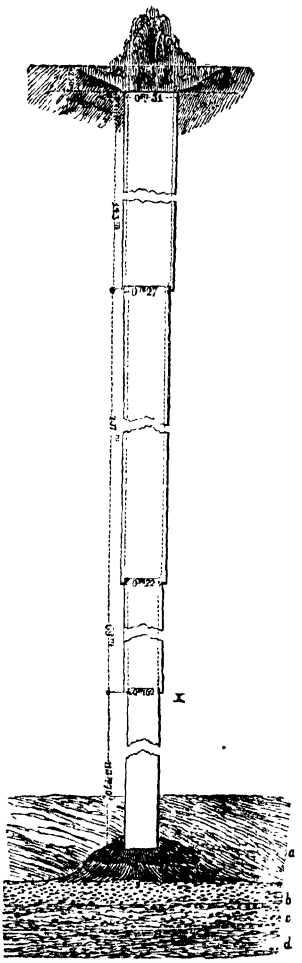
(*Chelonia breviceps*, and *Chel. acutirostris*,) from the eocene clay at Sheppey, were described; and the characters of a new genus, (Cimochelys,) the remains of which are found in the chalk near Maidstone, were given in detail. The indications of Chelonian reptiles in more ancient strata were then noticed; and the femur of a tortoise, from the new red sandstone near Elgin, was described. The fossil reptiles of the order Ophidia, discovered by Mr. Owen in the London clay at Sheppey, have already been noticed; to these were added descriptions of a smaller species of Palæophis, from the eocene sand at Kyson; and of a much larger species, not less than twenty feet in length, from the London clay at Bracklesham. The last section of the Report was principally devoted to the details of the determination of remains of the fossil Batrachians, identical with the so-called genera Mastodonsaurus and Salamandroides of the German Keuper, and on which the character of the genus Labprinthodon are based. Reasons were given, showing the high probability that the foot-prints referred to the Chirotherium were those of the Batrachian genus Lachyrinthodon.

ELECTROTYPE FOSSILS.

MR. T. B. JORDAN, of the Museum of Economical Geology, has communicated to the British Association, a letter "On Copying Fossils by a Galvanic Deposit." [Specimens of the electrotype copies of Trilobites and other fossils were exhibited.] In applying the method ordinarily used in electrotyping, some difficulty was experienced by the author, in consequence of the irregular form of the fossils, parts of which would not relieve from the wax or plaster matrix in which the copper is afterwards deposited. Mr. Jordan, therefore, adopted a compound of glue and treacle, (used by printers for their inking rollers,) as the material of the moulds, the elasticity of which admitted of its leaving the adherent portions without breaking. The mixture is applied hot, and allowed to harden for twenty-four hours, when it will come off without injuring the finest parts. The matrix thus prepared requires a strong varnish to protect the back and sides from the action of the liquid in which it is to be placed: only one copy can be made from each matrix, but the impressions have none of the defects so apparent in those produced in the ordinary moulds. Different lights and shades may be given to the copper impressions, by a galvanic process, which the author considers capable of improvement, and application to other purposes. For a dark object on a light ground, the surface is brushed over with the argento-cyanide of potassium, giving it a silver face, which may be removed to the desired extent from the portions requiring to be dark, by a dilute solution of nitro-muriate of platina. Other tints may be produced by using a solution of gold; and all may be considerably varied by changing the time during which such solution is allowed to act.—*Athenæum*, *No.* 720.

THE ARTESIAN WELL OF GRENELLE.

After seven years' continued exertion, M. Mulot, on Feb. 26, 1841, at half-past 2 o'clock, had the satisfaction of seeing burst forth from the depth of 548 metres, the water which he was in search of, in the green sand under the fault. The jet yielded no less than 4,000,000 of litres in the twenty-four hours. On Feb. 27, MM. Walferdin and Arago placed a bucket in the basin, which was immediately filled with the green sand brought up in abundance by the water; and after allowing the thermometer to remain thirty minutes in this basin, it indicated 27° 6′ Cent. (81° 68′ Fahr.) For this achievement, M. Mulot has been appointed knight of the Legion of Honour.



(Section of the Artesian Well of Grenelle, at Paris.)

Sir John Robison has communicated to *Jameson's Journal*, No. 61, the annexed section of the bore, with explanatory notes. It passed through strata of various kinds, such as alluvial matter, sands and gravels, clays and lignites, chalk, hard chalk, and chloritic chalk. At the lower part of the bore, the following strata have been found, viz. green and grey clays, (*a* in the section); a bed of fine sand, containing water (*b*); hard and rolled stones (*c*); and a calcareous and argillaceous bed (*d*.) The following dimensions of the bore are given in French metres:—

From the surface to the commencement of the first tube.	2.30 m.
Length of the first tube	148
— second	207
— third	69
— fourth	113.70
From the extremity of the tube to the bottom of the bore.	7
	547 m.

Or, 1794½ English feet.

The diameters of the different tubes are indicated in the figure, and are respectively, proceeding from above, 0.31 m.; 0.27 m.; 0.22 m.; and 0.162 m. It thus appears that the diameter of the highest tube is about a foot English, and of the lowest about 6 inches. The quantity of water thrown up is estimated at 4,000,000 litres per diem, or in round numbers nearly 880,000 imperial gallons. It appears from the analysis of M. Pelouze, member of the Institute, that the water is purer than that of the Seine. The expense, up to the time when the water first made its appearance, amounted to . 262,375 francs.

The copper tubes cost . . . 40,000

302,375 francs.

Or, upwards of £12,000 sterling.

The letter X marks the point where it was intended to commence the series of internal tinned copper tubes, to be isolated from the iron by means of rings of tow impregnated with bitumen; and fixed to the interior *en tole* by a screw, in which was to be applied an oily varnish as well as a band of caoutchouc. These lines are indicated by the inner dotted line. The tube which lines the bore is in strong sheet iron. The dome of the Invalides being about 100 metres, or 300 feet high, the boring instrument used by M. Mulot, and which is composed of iron bars as thick as the axletree of a carriage, is five and a half times higher than that edifice.

Vienna.—An Artesian well has been bored, with success, in the Corn Market, at Vienna; and at 98 Austrian fathoms depth, the water rushed up so abundantly as to yield upwards of 12,418 gallons per day.

Surrey.—An Artesian well, 347 feet deep, has been bored at the Surrey County Lunatic Asylum: the water rises from a bed of dark sand to within 30 feet of the surface; and a well, 190 feet deep, forms a never-failing reservoir.

Astronomical and Meteorological Phenomena.

BREMICKER'S COMET.

In May, were read to the Astronomical Society, some "Observations on Bremicker's Comet, as obtained, with the Equatorial, at Mr. Bishop's observatory, and an Account of the Methods employed in Deducing them;" by the Rev. W. R. Dawes. The extreme faintness of this comet rendering it observable only by persons possessing large telescopes, Mr. Dawes was induced to employ for the purpose Mr. Bishop's equatorially-mounted telescope of 7 inches clear aperture, and $10\frac{3}{4}$ feet focal length. The micrometer used has four thick wires, two of which are parallel to the screw, and, therefore, parallel to the webs, and fixed at an angular distance of 7″ between their adjacent edges; the other two being parallel to the webs, and moveable with them. By means of these four thick wires, a small square was formed, as nearly as possible in the centre of the field, and the nucleus of the comet placed in it for observation. The nucleus resembled a star of about the 10th or 11th magnitude, abruptly diffusing itself into the nebulosity around it. It was very decided, with powers 63 and 105, the latter of which was generally employed in the observations. The first day of observation of the comet was Nov. 14 last, when, as well as on Nov. 16, 19, and 24, the stellar nucleus was remarked as distinctly visible. On Nov. 19, it appeared rather eccentric on the north following side. After Dec. 3, a succession of cloudy evenings occurred, and the comet was not seen again till Dec. 22, when the stellar nucleus was again visible, and the apparent diameter of the comet was certainly larger. It must also have been brighter, since the observations of it were considered good, though the sky was so hazy that stars of the 4th magnitude were scarcely visible to the naked eye. The last night of observation was Dec. 29, when it still exhibited a decided stellar nucleus, and the nebulosity appeared more extended and dense. No observations were made to determine its diameter, but it was estimated at $1\frac{1}{4}'$. At no time has any appearance of a tail been suspected. The method of observation adopted by Mr. Dawes was that of transit-comparisons in right ascension; and of micrometrical comparisons in north polar distance with neighbouring stars, whenever it was practicable. Most of the comparison stars have been identified as contained in the Catalogue of Groombridge; and the author enters greatly into detail respecting the catalogue-places of all his observed stars, preferring the places given in Pond's Catalogue of 1112 stars, whenever they were found there.

SPOTS ON THE SUN.

Two pretty large clusters of spots were early in July seen traversing the sun's disc. There were about six spots connected with each clus-

ter; and one of these spots, which was nearly round, had a very dark nucleus, and a well-defined penumbra. Its diameter was about as large as that of the earth, or about 7000 or 8000 miles. On the 3rd instant, a third cluster, consisting of a number of smaller spots, appeared near the sun's eastern limb.—*Times, July 9th.*

KEW OBSERVATORY.

THE establishment of the Royal Observatory at Kew has been broken up, and the collection of mechanical models and apparatus in Natural and Experimental Philosophy and Astronomy, formed there by King George the Third, together with the cabinet of specimens in Natural History, has been presented to King's College. It is a condition of this grant, (made by the late Government), that the collection should form a separate museum in that Institution,—that it should remain unbroken, and have associated with it the name of the royal founder. The apparatus, independent of its intrinsic value, possesses, in some instances, a high degree of historic interest: it includes the original apparatus of Boyle,—a complete series of apparatus, made under the directions of Desaguliers, and described in his Lectures—a rude and early model of Watt's Steam Engine—a complete apparatus, made by Atwood, to illustrate his theory of the arch, including his celebrated model of a large elliptical arch of *polished brass* voussoirs, made by order of a Committee of the House of Commons. The apparatus has been for many years under the joint care of the Rev. Mr. Demainbray and the late Professor Rigaud, who held the appointment of Astronomers Royal at Kew. It has been delivered up by the former gentleman to the custody of Professor Wheatstone. The Observatory itself has, we believe, been granted to the Royal Society, to be used for magnetic observations; it was first erected by King George, to observe the transit of Venus over the Sun. The large Zenith Sector, and Transit Instrument, have been sent to the Observatory at Armagh.—*Athenæum, No. 728.*

ECLIPSES IN 1842.

THERE will be five eclipses this year—viz., three of the sun and two of the moon. On the 11th of January, there will be an annular eclipse of the sun, invisible at Greenwich; January 26, a partial eclipse of the moon, visible; July 8, a partial eclipse of the sun, visible; July 22, partial eclipse of the moon, invisible; and December 31, an annular eclipse of the sun, invisible.—*Times, Oct. 14.*

THE LUNAR CYCLE.

THE late Mr. Frend, as is well known, published for nineteen years in succession his *Evening Amusements*, intended to point out the phenomena of the heavens. This period of nineteen years was chosen as a metonic cycle, at the end of which the moon's orbit has so nearly attained the position which it had at the commencement, and an exact number of lunations is so nearly completed, that the phases of the moon take place on the same days of the month, and very nearly,

indeed, in the same parts of the heavens. Now, since 1804 was the first year of Mr. Frend's cycle of instructions, and since twice nineteen added to 1804 makes 1842, the latter year is the first of a new cycle; and those who have this work, or can obtain it, may begin to instruct themselves or their children by it, using 1804 in 1842, 1805 in 1843, and so on. Neither the eclipses, nor the places of the planets, will correspond to those described in the printed work; and the repetition of the cycle will enable those who read it now to take notice of the slight degree in which the orbit of the moon is not replaced in its old position,—an additional advantage. To justify what we have said of the work, we take the following:—January 21, 1804, the moon is said to be within a degree of a star in the Pleiades at 10 P. M., in the *Evening Amusements:* January 21, 1842, four stars in the Pleiades are predicted to be successively occulted by the moon between 12 P.M. and 2 A.M. of the 22nd. On the 26th, in both years, there is a full moon accompanied by an eclipse; but the eclipse now coming is longer and earlier by two or three hours than that of 1804. —*Athenaum, No.* 724.

LUNAR ECLIPSE.

THE hazy state of the atmosphere on the night of February 5 and 6 prevented a clear observation of the Lunar Eclipse, which commenced soon after midnight, and continued till nearly four o'clock, in the neighbourhood of the metropolis. The astronomers of Paris appear to have been more fortunate, and from one of the journals of that capital we copy the following particulars:—"The total eclipse of the moon was accompanied by another phenomenon, whose coincidence with a lunar observation is very rare. About twelve hours after its issue from the shadow of the earth, the moon eclipsed, in its turn, a small star in the constellation of the Lion. According to the calculations of the Paris Observatory, this star, situated in 6 minutes of southern latitude above the moon's centre, was lost behind the disc of the latter at 20 minutes past 6, on the evening of the 6th; re-appearing, also in the south, at 10 minutes past 7, after an obscuration of 50 minutes. Thus, those observers who did not shrink from a freezing watch, had the opportunity of witnessing a lunar and a stellar eclipse in the same day. This eclipse, which from 27 minutes past 1, to 4 minutes past 3, entirely hid the moon, was one of the longest which can ever be seen; nevertheless, the centres of the moon and of the earth's shadow did not exactly coincide."—*Athenæum, No.* 694.

LUNAR PHENOMENON.

ON September 25, at 5 minutes before 7, P.M., was perceived round the moon a broad pale circle, about 30° in diameter, the moon being 20° above the horizon; at the east end of the horizontal diameter of the circle was an indication of a mock moon; at 7 o'clock was seen another at the west end: both increased in brilliancy till 5 m. past 7, and they had a taper tail diverging from the circle, 2° in length. The east nebulosity showed the prismatic colours very brilliantly, but there

were none at the west. The zenith of the circle was now much brighter, and began to form into very pale rays, but they only lasted half a minute. At 10 m. past 7, a bright asteroid rose from the south-east, disappearing at 45° of altitude. From this time, both the moons gradually faded till 20 m. past 7, when they disappeared; and the clouds rising from the south-west, prevented further observation.—*Corresp. Times, Sept.* 28.

SIR JOHN HERSCHEL'S CATALOGUE OF NEBULÆ AND CLUSTERS OF STARS.

THE Royal Medal which the Council of the Royal Society proposed to give to the most important paper in Astronomy communicated to the Society within the last three years, has been awarded to Sir J. F. W. Herschel, for his Catalogue of Nebulæ and Clusters of Stars, published in the *Philosophical Transactions* for 1833. This catalogue contains a list of 2,500 nebulæ and clusters of stars, the same number which had been observed and catalogued by the father of Sir John Herschel, though only 2,000 of them are common to both catalogues: the right ascensions and declinations of all these objects are determined; the general character of their appearance recorded; and all those which present any very extraordinary character, shape, or constitution, of which there are nearly 100, are drawn with a delicacy and precision worthy of an accomplished artist. It presents a record of those objects so interesting as forming the basis of our speculations on the physical constitution of the heavens, which are observable in the hemisphere, which is sufficiently perfect to become a standard of reference for all future observers, and which will furnish the means of ascertaining the changes, whether periodical or not, which many of them are, probably, destined to undergo. The President concluded his address in delivering this Medal by observing that when Sir John Herschel shall have completed his catalogue of the Nebulæ of the Southern Hemisphere, he will "have fixed the monuments of an imperishable fame in every region of the heavens." The above is the second time that a Royal Medal has been adjudged to Sir John Herschel "for researches in a department of astronomy which has descended to him as an hereditary possession; and in no case has a noble inheritance been more carefully cultivated, or more enriched by new acquisitions."

THE PLANET MERCURY.

THIS Planet, which, on account of its vicinity to the Sun, is very seldom visible to the naked eye, even in the serene sky of Spain and Italy, might be seen on the 20th of December, in the morning, in the south-east, a little above the horizon, from 6 o'clock to half-past 7, when it began to disappear by the increasing light of day. It might be easily discovered on account of its nearness to the planet Venus, which was then about three or four times the breadth of the moon to the westward of N. Both these bodies exhibited, when viewed through a good achromatic telescope, the appearance of a slender crescent, resembling

the moon five or six days before her change. None of the other large planets belonging to our system were then visible. — *Times, Dec.* 21.

FALLING STARS.

SIR JOHN HERSCHEL, in a letter to the *Athenæum*, quotes the following incidental mention of "Falling Stars" from Sir William Hamilton's account of the Great Eruption of Vesuvius in August, 1779, printed in the *Transactions of the Royal Society*, vol. 70; which will be read with the more interest, the periodical nature of the phenomenon being then unknown, and its occurrence being ascribed by him to some local electrical agency, developed by the volcanic ejections.

"August 9, 1799," after describing the phenomena of the eruption during the day, till 7 o'clock at night, "when all was calm," Sir William Hamilton goes on to say, "it was universally remarked, that the air this night, for many hours after the eruption, was filled with meteors, such as are vulgarly called falling stars. They shot generally in a horizontal direction, leaving a luminous train behind them, but which quickly disappeared. The night was remarkably fine, star-light, and without a cloud. *This kind of electrical fire seemed to be harmless, and never to reach the ground;* whereas that with which the black volcanic cloud of last night was pregnant, appeared mischievous, like that which attends a severe thunder-storm." The meteors of August 9, 1840, in so far as I observed them, radiated almost without exception from a point in the heavens very near to the star Gamma, in the constellation Perseus, which is almost coincident with the point, (near the star Camelopardali,) from which Sir John observed them to emanate on August 10, 1839. Facts of this nature appear most decisive in favour of the opinion, that a zone or zones of these bodies revolve about the sun, and are intersected by the earth in its annual revolution.

M. Charles has made a catalogue of the Falling Stars recorded in history, from 538 to 1123; from which it appears that, during these six centuries, the smallest number fell in November, from which he concludes that the plane of the orbits of these asteroids must have undergone considerable change.—*Athenæum, No.* 707.

AURORA BOREALIS, AND TWINKLING OF THE FIXED STARS.

PROF. NECKER observes that in the Hebrides, the Orkneys, Shetland, the western coast of the north of Scotland, and the high regions of the Highlands, all the Fixed Stars sparkle and scintillate as brightly as during the beautiful evenings of France or Switzerland. But, in the lower part of Switzerland, and along the eastern and north-eastern side of the country, where towns, large villages, and manufactories abound, and coal is the ordinary fuel, the atmosphere is very smoky and foggy, and the fixed stars never twinkle; as near Edinburgh, *unless when an aurora borealis prevails;* which influence the Professor is at a loss to explain. Is it not by the great additional light of the aurora that the stars are seen to twinkle?

AURORA BOREALIS.

A VERY remarkable Aurora was visible, on the evening of March 22, at Durham, and in the neighbourhood. Appearances of aurora in the northern and north-western parts of the sky were visible soon after 8 o'clock; and occasional coruscations of light, as usual, shot up from the horizon towards the zenith. At half-past 8, a very bright beam rose from the western part of the sky; another soon after rose from the east and united with it, forming a brilliant arch of white auroral light, terminated on each side by the horizon; the point of its greatest elevation being at an altitude of about 70°, and at an azimuth of about 25° 30′ east of south. This is very nearly the point in the heavens to which the south pole of the dipping needle points. The luminous arch cut the horizon at points 25° east of south, and west of north, or nearly at the magnetic east and west. Hence its direction, at 9 o'clock in the evening, mean time at Durham, was very nearly, if not accurately, that of a great circle perpendicular to the magnetic meridian, and passing through the south magnetic pole. Its appearance at this time might be compared to that which the ring of Saturn would present to a spectator upon the surface of that planet. Its position was very definitely marked, as it then passed between the stars Castor and Pollux, and a little to the northward of Arcturus. Its breadth was variable; but, when least, fully equal to the distance between Castor and Pollux, which is about 5°, and at other times double that breadth. Its colour was a pure white, brighter on the northern side. There was but little flickering. The stars were seen distinctly through it; and, at a somewhat later period, even the nebulous appearance, presented to the naked eye by the small stars in the Præsepe, in the constellation of Cancer, was very slightly obscured by it. At 15 minutes past 9 o'clock, it passed to the southward of Pollux, and its southern edge passed over Arcturus. After having faded for a little time, especially at its extremities near the horizon, it again increased in brilliancy for about 20 minutes; a sensible curvature towards the zenith took place at its most elevated part, and the arch increased in breadth, till it gradually diffused itself over a considerable space; and before 10 o'clock all appearance of an arch had almost disappeared. The eastern branch remained the longest visible. The north-western part of the sky continued to be illuminated with a diffused light, and one or two occasional faint streams of light shot upwards from that part of the sky. The light at 10 o'clock, from that part of the heavens, was sufficiently strong to cast a sensible shadow upon a wall. The sky was perfectly clear during the whole time, with the exception of a few scattered clouds towards the west and north-west. The wind was about south-west, blowing rather freshly. The following was the position of the beam as referred to some of the fixed stars:—At 8h. 45m. it passed midway between Aldebaran and α Orionis, north of Castor, a little south of Ursa Major, and about 5° north of Arcturus. At 9h. it passed between Castor and Pollux, and still a little north of Arcturus. At 9h. 15m. it was south of Castor and Pollux, and its southern edge just

covered Arcturus. This beam, by its marked position and narrow limits, seems to offer a very favourable opportunity of ascertaining its height, by comparing simultaneous observations at different places, situated magnetically north and south of each other. For the purpose of such comparisons, it may be mentioned that the latitude of Durham is 54° 47′; and its longitude, in time, 6m. 16s. west.—*Durham Advertiser*.

METEORS IN FRANCE.

On June 9, a Meteor was observed at the same instant, at places wide apart—Toulouse, Angers, Bordeaux, and St. Rambert. M. Petit, the director of the Observatory at Toulouse, was enabled to determine the size, velocity, and distance of the body in question; and having carefully compared his own results with those obtained by observers at other places, he concludes that the observed meteor could not have been less than 67 English miles distant from the earth's surface.—*Athenæum*, No. 737.

On June 12, between 1 and 2 P.M. the sky being cloudless, an explosion was heard at Chateau Renard, in the Loiret, louder than several pieces of artillery firing together. M. Delavaux, on going to the spot where the noise had been loudest, found there the marks of an Aerolite having struck the earth; as well as several fragments of an Aerolite, one of which weighed 30lb. and another 6lb.

SHOWER OF METEORIC STONES IN HUNGARY.

On August 10, between 9 and 10 P.M., a shower of Meteoric Stones is described by several eye-witnesses to have fallen at Iwan, from west to east, at an angle of about 45 degrees. The circumstances of this meteoric shower are entirely different from any that are known to have taken place. Generally, they occur accompanied with fire and flames, thunder, &c.; and the stones fall hissing and smoking to the earth. Nothing of this kind took place at Iwan. On the contrary, it was densely dark; instead of warmth, the stones brought cold with them, and the temperature became quite frosty. As is well known, the 10th of August is one of the days celebrated for shooting stars, and this is considered to be in some way connected with the phenomenon. The weather at Iwan was very clear in the morning; at noon, fleecy clouds formed themselves; and between 4 and 5 P.M., a wind sprung up, which increased to a storm and whirlwind, which continued for some time, accompanied by violent rain. Between 8 and 9 o'clock, all again was tranquil; and the weather remained so till 10 o'clock, the hour at which the shower took place. Notwithstanding the air was quiet, the stones fell at a considerable angle, which shows some power, besides their gravity, must have worked on them. The well-known meteorite of Agram was driven many yards into the earth; this was not the case at Iwan, in consequence of the bodies being much smaller; but in some instances, they were, in moist soil,

driven half an inch deep. Their size is various; from that of a grain of millet, or a pea, to that of a hazel-nut, but mostly of the former, though many thousands were not so big as a poppy-seed. The colour is generally blackish-brown externally; the interior is grey-brown and blackish-blue, mixed with yellow and reddish substances, and between these are shining metallic traces; the superfices is, unlike that of meteorites in general, not of a droppy nature, which circumstance agrees with the fact of their having fallen without any of its accompaniments. Their form is spheroidal, but with many irregularities; a few are regular globules; most of them are blunted at the corners, and like hailstones. Their conformation is clearly in concentric layers around a nucleus; and so little firmness have they, that they can mostly be broken with a thumb-nail. Many of them have a slight stain, very few are hard, and scarcely any have a smooth surface; the specific gravity, in consequence of the many porosities in the interior, is irregular; they have no effect on the magnet. The chief ingredients are oxydate of iron, oxide of iron, and oxy-hydrate of iron, as well as flint, lime, and clay-earth; the oxy-hydrate was, probably, never before heard of in meteorites. It is supposed that on every half-inch of ground there was one of these stones, and computing the extent of the country covered, about 350,000 millions must have fallen; and 10,000 of these averaging a pound, the weight of all fallen must have been about 350,000 quintals. The enlightened Correspondent then goes into a lengthy speculation on the origin of this phenomenon: he considers the stones to be planetary bodies of the same age as Jupiter, Saturn, &c., and even thinks this phenomenon will prove an epoch in geological as well as astronomical observation.—*From the Allgemeine Zeitung; Times, Oct. 27; abridged.*

SPLENDID METEOR IN SCOTLAND.

On Tuesday, Dec. 21, a Meteor, of unusual size and splendour, was witnessed in Scotland. The evening was very clear, the sky being without a cloud, and the moon shining brightly. Suddenly, a dazzling blaze of light burst from the sky, illuminating Benlomond and the distant hills, the carse around Craigforth, and indeed the earth and air on every side as far as the eye could reach, with all the brilliancy of noon-day. The phenomenon appeared like a ball of fire, of an oblong shape, and apparently almost twice the size of the moon; having at the time somewhat of the same silvery appearance as that luminary, but flaming with a brilliancy so intense as almost to dazzle the eyes. A tail of fire, somewhat resembling that of a rocket, but composed of the most beautifully varied colours, streamed behind it for a short distance; adding much to its splendour, and giving the whole an appearance at once singularly magnificent and sublime. Before it disappeared, it assumed a red glowing appearance, and then burst, for an instant enveloping the earth and sky in a blaze as bright and dazzling as the most vivid lightning. It appeared to pass from the south to the north, inclining towards the earth. To the eye it seemed to burst and disap-

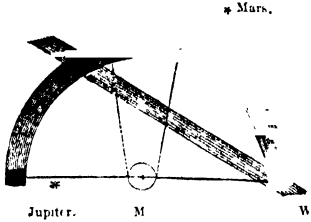
pear above Gargunnock. Another meteor of the same kind, but much less in size, brilliancy, and splendour, was observed falling in a quarter rather further to the south, a few minutes previously. A meteor of the same nature as the first described was seen at the same hour at Glasgow.

REMARKABLE SOLAR BOW.

On the afternoon of December 24, 1840, there was observed at Falmouth a Solar Arc in the west. Around the western horizon were broken masses of cumuli, between and above which the sky was deeply blue, and with the exception of a few light curri, quite free of clouds. The sun was not more than 10 degrees above the horizon; and at an angle of not more than 12 degrees, between the hills to the west of St. Day, appeared the limb of a solar bow, strongly painted, but deficient of the rays of greatest refrangibility; or rather from the singular crimson character of the portion occupied by the red ray, it appeared as if the spectrum was doubled on itself, and the violet mingled with the less refractive rays. Persons who saw the bow from Falmouth harbour described it as being nearly in a line with the sun. No rain was falling; the day was unusually fine for the season; and the temperature, which, during the day, had been above the freezing point, was then certainly below it. Over the hill on which the phenomenon appeared, was slowly spreading the lightest possible veil of vapour, so thin that a casual observer would have stated the rays were painted on the most transparent air. It has been suggested, that the phenomenon was produced by an image of the sun reflected from some of the clouds behind the orb itself, and this appears highy probable to have been the case; whilst, from its similarity to some of the phenomena observed in experiments on polarized light, the writer is almost inclined to look upon it as an instanceof atmospheric polarization.—*Mr. R. Hunt; Philosophical Magazine*, No. 115.

PARASELENE.

Mr. R. W. Birt has communicated to the *Philosophical Magazine*, No. 121, the details of a Paraselene witnessed on the night of May 6. The halo occurred in a modification of *cirro-stratus*, which he terms *nebula suspensa*, and believes to be the only variety that exhibits halos. One half only of the halo was visible, the moon being low at the time of observation; this half exhibited three portions, which were more strongly illuminated than the rest of the semicircle; of which the sketch conveys some idea. The semicircle was very distinct, the base or the diameter joining the two extremities, and passing through the moon, being parallel with the horizon. Both these extremities were strongly illuminated as compared with the semicircle generally, but faint as compared with the moon; these illuminated portions were not well defined; their appearance did not convey the idea of their being images of the moon, but merely portions of the halo more strongly illuminated than the rest.



(The darkened parts represent the illuminated portions of the semicircle.)

The illuminated portion at the summit of the semicircle was very interesting; it was fainter than the portions above mentioned, and filled a small segment of the halo, in the same manner as a pencil of rays, diverging from a luminous point. This illuminated portion appeared somewhat of a lozenge form, having the broad part immediately over the moon brightest and broadest; it became gradually fainter and narrower towards its eastern and western extremities. The difference between it and the illuminated extremities of the semicircle was very distinct.

Mr. Birt first saw this interesting phenomenon about a quarter past eleven; and as he continued to watch it, several appearances presented themselves, which may, probably, assist in determining some particulars relating to the clouds that were passing at the times of observation, the area they extended over, &c. Mr. Birt subjoins his observations until the disappearance of the paraselene.

PARHELIA.

A VERY interesting Parhelia was seen near Wisbeach, on Dec. 21, 1840, at a little before eleven in the morning. There had been a slight frost the night before; and although the air retained its sharpness, the ground was covered with a kind of sweat, as if a thaw had commenced. The sky was thinly covered with a pale mist, scarcely powerful enough to shade any of the sun's light; and which, towards the south, was gathered into gleaming clouds, dispersed over the blue in waves. At first, it was taken for a halo, but, on looking for an instant, it was one of those arctic parhelia so rarely seen in low latitudes. A semicircular arch of perhaps 40° diameter occupied the sky between the sun and the zenith, and though very faint, its prismatic colours were plainly distinguishable. Inverted upon this, at the zenith, at touching it appeared the segment of another arch, the colours of which were very strong—as strong, indeed, as those of a common rainbow. Within the larger of these arches, and, of course, much nearer the sun, was an uncoloured arch, beginning at the zenith, and terminating in the west, forming a quarter of a circle, at the extremes of which two very intense lights formed the elements of what, under more favourable circumstances, would, undoubtedly, have been mock suns. Had the phenomenon been a little more developed, this rare object would have given a very extraordinary character to the scene; but as it was, the whole was only bright enough to show its nature. From the lowermost of the mock suns a band of light streamed to the outer prismatic arch. This phenomenon is very similar to one described by Helvetius as having been seen by him in 1661 at Leipzig, and it has been very

often described by arctic travellers. The novelty of its appearance only rests, then, with the lowness of the latitude.—*Athenæum*, No. 688.

THE LAW OF STORMS.

Sir D. Brewster awards the honour of the discovery of the Rotatory character of Storms to the late Col. James Capper, of the East India Company's service; but, at the same time, to Mr. Redfield is due the greater honour of having fully investigated the subject, and, apparently, established the theory upon an impregnable basis.

WATER-SPOUT.

On July 6, Mr. Gasparin communicated to the Academy of Sciences, at Paris, an account of a Water-spout which did much damage in the neighbourhood of Orange, in Provence, on the 30th of May last. Trees were torn up by the roots, and parts of the *walls* of the town of Courthezon were undermined by the waters, and fell.—*Literary Gazette*, No. 1277.

FALL OF FISH.

On July 8, during a heavy thunder-storm at Derby, the Rain, mixed with pieces of half-melted ice, fell in floods, with multitudes of small Fish and Frogs. The fish are stated to have been from half an inch to two inches long, and a few considerably larger. (*Sheffield Patriot.*) Similar phenomena have frequently occurred, and been accounted for by the action of whirlwinds on waters inhabited by the animals so transported.

CORRESPONDING DEPRESSION OF THE BAROMETER IN 1840 AND 1821.

Mr. Luke Howard has shown to the Royal Society the close correspondence of the extraordinary depression of the Barometer in the months of October and November, 1840, and of the remarkably stormy weather which prevailed at the same period, with similar phenomena occurring in December, 1821, when the moon's place in declination underwent the same changes during those two periods, at an interval of 19 years.

WINDS, TEMPERATURE, AND RAIN IN LONDON.

Mr. Luke Howard has read to the Royal Society a paper "On the proportion of the prevailing winds, the mean temperature, and the depth of rain in the climate of London, computed through a cycle of eighteen years, or periods of the moon's declination." In this paper, the author investigates the periodical variations of the wind, rain, and temperature, corresponding to the period of the moon's declination, in a period of years, extending from 1815 to 1832 inclusive. He gives tables of the average quantities for each week, at the middle of which

the moon is in the equator, or else has either attained its maximum north or south declination. He thus finds that a north-east wind is most promoted by the constant solar influence which causes it, when the moon is about the equator, going from north to south; that a south-east wind, in like manner, prevails most when the moon is proceeding to acquire a southern declination; that winds from the south and west blow more when the moon is in her mean degree of declination, going either way, than with a full north or south declination; and that a north-west wind, the common summer and fair-weather wind of the climate, affects, in like manner, the mean declination, in either direction, in preference to the north or south, and most when the moon is coming forth.

He finds the average annual depth of rain, falling in the neighbourhood of London, is 25·17 inches.

From his observations on the temperature, he deduces the following conclusions:—1. That the pressure of an atmospheric tide, which attends the approach of the moon to these latitudes, raises the mean temperature 0·35 of a degree. 2. That the rarefaction under the moon in north declination lowers the temperature 0·13 of a degree. 3. That the northerly swell following the moon, as she recedes to the south, further cools the air 0·18 of a degree. 4. That this cold continues while the moon is away south, reducing the mean temperature yet lower by 0·04 of a degree.

See also a paper of analogous interest, read by the author of the above, to the Royal Society, and entitled "On a Cycle of Eighteen Years in the Mean Annual Height of the Barometer in the Climate of London; and on a Constant Variation of the Barometrical Mean, according to the Moon's Declination."

POSITION OF THE RAIN-GAUGE.

The Rev. W. Walton, F.R.S., shows that if the mouth of a Rain-Gauge be placed in any place which is not perfectly horizontal, the results will be liable to inaccuracy, whatever may be the direction in which the rain falls. He thinks that, on many occasions, the drops of rain diminish in their size during their descent on entering warmer regions of the atmosphere, so as finally to disappear.—*Proceedings of the Royal Society.*

WEATHER ON CHRISTMAS-DAY IN 1841.

It is a remarkable fact, and worthy of being recorded in the annals of meteorological science, that, with the exception of Saturday, December 25, there had not occurred a wet Christmas-day for at least 14 or 15 years, or indeed one during that period upon which even a shower of rain had fallen. Of 14 Christmas-days which have occurred since the year 1826, four (viz., those of 1827, 1831, 1832, and 1833) were, generally speaking, dull and gloomy, with, however, a mild temperature. Two Christmas-days (viz., those of 1834 and 1837) were excessively fine and mild, and the latter was more like an April than a December day, so warm and genial was the temperature. Two (viz.,

those of 1838 and 1839,) were dry and cold, without there, however, being any severe frost. On Christmas-day, 1836, there was a heavy snow-storm, which lasted several days. On the Christmas-day of the years 1828, 1829, 1830, 1835, and 1840, a hard frost prevailed, which was especially severe in the second-mentioned year. But we can with safety affirm that no rain fell on any one Christmas-day which occurred between the years 1836 and 1841 exclusive. Last Christmas-day, however, the morning was wet, and about 3 o'clock in the afternoon a heavy shower of rain fell. The last wet Christmas-day which we can recollect occurred in the year 1826.—*Correspondent of the Times, Dec.* 28.

INTENSE COLD.

M. A. DEMIDOFF, during his late travels in Southern Russia, observed the Thermometer to indicate 33° below zero of Réaumur, on one occasion; and the mean point was 14° below zero. Mercury was found quite frozen, and in this state was hammered out into plates.

EFFECT OF COLD ON OLD PERSONS.

THE Effect of Cold on the Aged is strikingly evinced by the tables of mortality for 1838, as the following statement will show, of deaths in the metropolis:—

	Winter.	Spring.	Summer.	Autumn.
Total deaths	15,611	13,109	13,379	12,581
Old age	1,383	969	778	981

HOAR-FROST.

IN March, was read to the Royal Society, a paper "On the Localities affected by the Hoar-frost, the peculiar currents of Air excited by it, and the Temperature during its occurrence at High Water and Low Stations;" by J. Farquharson, LL.D. The author has been accustomed, for the last forty years, to make observations on the occurrence of hoar-frost, and the circumstances under which it takes place. It is well known that the localities chiefly affected with hoar-frost are the bottoms of valleys, and land-locked places of all kinds, whether natural or artificial. The altitude to which its effects reach on the sides of the valleys is dependent on the mean temperature of the day and night at the time of its occurrence: when that temperature is high, the lower places only are affected by the frost; but when low, the frost extends to much higher grounds. Hoar-frost occurs only during a calm state of the air, and when the sky is clear; but the stillness of the air in the bottoms of the valley is invariably accompanied by downward currents of air along all the sloping sides of the valley; a fact first noticed by the author, affording a decisive proof of the correctness of the views he entertains, being in accordance with the theory of Dr. Wells. After sunset, in all seasons of the year, and at all mean temperatures of the air, and whether or not the ground be covered with snow, whenever the sky is clear, although there may be a dead calm at the bottom of the valleys, currents of air, more or less strong and steady, run downwards

on the inclined lands, whatever may be their aspect with reference to the points of the compass. These currents are the result of the sudden depression of temperature sustained by the surface of the earth in consequence of rapid radiation, by which the stratum of air in immediate contact with that surface, becoming specifically heavier by condensation, descends into the valley, and is replaced by air which has not been thus cooled, and which therefore prevents the formation of hoar-frost on the surface of these declivities.

SUPPOSED FORMS OF LIGHTNING.

PROF. FARADAY, in a letter to the *Philosophical Magazine*, No. 122, observes :—"When, after a serene sky, or one that is not overcast, thunder-clouds form in the distance, the observer sees the clouds and the illumination of the lightning displayed before him as a magnificent picture; and what he often takes to be forked lightning, (*i. e.* the actual flash, and not a reflection of it,) appears to run through the clouds in a most beautiful manner." This was the case on the evening of May 27, 1841, to those who, in London, observed the storm in the west, about 9 o'clock, when the clouds were at a distance of twenty miles, or more; and Prof. Faraday has very frequently observed the same effect from our southern coasts over the sea. On many of these cases, that which is thought to be the electric discharge is only the illuminated edge of a cloud, beyond and behind which the real discharge occurs. It is in its nature like the bright enlightened edge which a dark well-defined cloud often presents when between the sun and the observer; and even the moon also frequently produces similar appearances. In the case of its production by lightning and distant clouds, the line is so bright by comparison with the previous state of the clouds and sky, so sudden and brief in its existence, so perfectly defined, and of such a form, as to lead every one at the first moment to think it is the lightning itself which appears.

But the forms which this line assumes, being dependent on the forms of the clouds, vary much, and have led to many mistakes about the shape of the lightning flash. Often, when the lightning is supposed to be seen darting from one cloud to another, it is only this illuminated edge which the observer sees. On other occasions, when he is sure he sees it ascend, it is simply this line more brilliant at its upper than its lower part. Some writers have described curved flashes of lightning, the electric fluid having parted from the clouds, gone obliquely downwards to the sea, and then turned upwards to the clouds again; this effect Prof. Faraday has occasionally seen, and has always found it to be merely the illuminated edge of a cloud.

Prof. Faraday has seen cases of this kind in which the flash appeared to divide in its course, one stream separating into two; and when flashes seen at a distance are supposed to exhibit this rare condition, it is very important the observer should be aware of this very probable cause of deception.

The author has also frequently seen a flash having an apparently sensible duration, as if it were a momentary stream, rather than that

sudden brief flash which the electric spark always presents, whose duration even Wheatstone could not appreciate. This Prof. Faraday attributes to two or three flashes occurring very suddenly in succession at the same place, or nearly so, and illuminating the same edge of a cloud.

The effect here described can easily be traced to its cause. It often happens at the sea-side, that, after a fine day, clouds will, towards evening, collect over the sea on the horizon, and lightning will flash about and amongst them, recurring at intervals as short as two or three seconds, for an hour or more together. At such times, the observer may think he sees the lightning of a flash; but, if he wait till the next illumination, or some future one, take place, he will perceive that the flash appears a second time in the same place, and with the same form; or perhaps, it has travelled a little distance to the right or left, and yet has the same form as before. Sometimes, an apparent flash, having the same shape, has occurred three or four times in succession; and sometimes a certain shaped flash having appeared in a certain place, other flashes have reappeared in other places, then the first has reappeared in its place, and even the others again in their places. Now, in all these cases, it was simply the illuminated edges of the clouds that were seen, and not the real flashes of lightning. These forms frequently appear to be in the cloud, and yet are not distinguishable till the lightning occurs. It is easy, however, to understand why they are then only developed; for that which appears in the distance to be only dull mass of cloud, distinguishable in figure only at its principal outline, often consists of many subordinate and well-shaped masses, which, when the lightning occurs amongst or beyond them, present forms and lines before unperceived. The apparent duration, already referred to, is merely a case of very rapid recurrence, and may, by a careful observer, be easily connected with that which is here proposed as the best test of the nature of the phenomenon. The apparent thickness, sometimes, of the supposed flash, and its degree of illumination, will also help to distinguish the effect above described from the true appearance of the lightning flash.

METEOROLOGICAL SUMMARY FOR 1841.

(Communicated by DR. ARMSTRONG, *South Lambeth.)*

Months.	Temperature. Fahrenh. Max.	Fahrenh. Min	Mean. Reaumur.	Centigrade.	De Lale.	Atmospheric Variations. Mean Pressure in inches.	Prevailing Currents.	Solar Variation.	Hygrometer. Rain in inches.	Difference of Quantity compared with 1840	Modifications of Cloud. Cirrus.	Cirro-stratus.	Cumulus.	Cumulo-stratus.	Cirro-cumulus.	Nimbus.	Stratus.
Jan.	46	10	−2	−2·5	154	29·84	W. NE.	8·31	2·89	+0·34		*					
Feb.	25	19	−4·5	−6	159	29·39	NE. SW. NW.	8·11	0·780	−0·59		*					
March ..	70	30	+8	+10·5	135	30·275	S. W.	17·85	1·085	+0·768	:	*					
April ..	78	32	+10·25	+13	130	30·025	SW. W. NE.	16.65	1·810	+0·685	:	*	*				
May	82	43	+8	+10	135	30·18	SW. NE.	19·09	1·700	−0·305	:	*	:		*		
June....	78	38	+12·25	+16·75	128	30·075	SW. N.	17·86	1·760	−0·380	*	*	:		*		
July	78	45	+13·5	+16·5	125	30·450	W. SW. NW.	16·40	1·700	+0·000	:	*	:		*		
Aug.....	84	45	+14·5	+18	123	30·125	SW.	12·50	1·000	−0·030	:	*	*	*	*		
Sept.....	89	40	+15·5	+19	121	29·70	SW. SE.	16·82	3·265	+0·764	:	*	:	:	*		
Oct.	70	31	+8	+10	135	29·55	SW. NW.	11·30	5·320	+3·920	:	*	:	:	:	*	
Nov.....	40	27	+0·5	+6·5	140	29·80	SW.	10·50	3·750	+1·035		*			:	*	
Dec.	57	22	+3·5	+4	145	29 67	SW.	8·48	2·135	+1·720		*			:	*	

Number of Days for the greater part rainy ..... 36 | Number of Days fair throughout, but more or less cloudy 136
" fair ..... 72 | " cloudless, or nearly so, throughout..... 39

Lunar Halo with two Paraselené on Sept. 25. 3 Lunar coronæ, the inner two distinctly exhibiting the prismatic colours; with diameters as 4° 6° 8° on Dec. 27 about 9 o'clock.——An asteroid *from* the zenith slightly inclining to S.W. on June 21; others on Oct. 19.——Highest Tides on Jan. 8, 12, 23, 24; Feb. 5, 6, 7, 8; March 24, 26; April 5, 6, 24; May 3, 20, 21, 23, 24; June 6, 22, 23; July 22, 23, 24; Aug. 19; Sept. 3, 5, 15, 16, 17, 18; Oct. 1 very high, 2, 3, 4. 29, 30; Nov. 2, 15, 28, 29, 30; Dec. 1, 2.——Sudden thaw and disastrous inundations in the vicinity of London on Jan. 16.——Terrific storm of Thunder and Lightning early on Jan. 3; Thunder on May 2, 27; June 18; July 9, 15; Sept. 3, 23. With reference to the thunder-storm on Sept. 3, it may not be considered out of place here to state, that precisely at the moment of its occurrence here, Paris and its vicinity, Rouen, Magny, Lille, Evereux, and other parts of France, were visited by it simultaneously.——The clouds of most frequent appearance are indicated by asterisks.——The Max. and Min. of Temperature, as well as the mean Atmospheric pressure, are ascertained from instruments graduated by Ronketti, of Museum Street; and the Mean of Temperature from a comparative scale contrived by the same artisan.

Obituary

OF PERSONS EMINENT IN SCIENCE OR ART.

1841.

BARON BIGNON, Member of the Academy of Moral and Political Sciences, at Paris.

COUNT MIOT DE MELITO, Member of the Academy of Inscriptions, at Paris.

DR. OCTAVIUS GILCHRIST, the well-known Orientalist.

VON ROSCH, architect and archæologist.

DR. OLINTHUS GREGORY, late Professor of Mathematics at the Military Academy, at Woolwich.

FRANÇOIS NOEL, Inspector-General of Public Instruction, at Paris.

DANIEL ELLIS, F.R.S.E., writer on Vegetable Anatomy and Vegetable Physiology.

SIR ASTLEY COOPER, F.R.S., the most distinguished surgeon of his time.

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DR. GEORGE BIRKBECK, who died on the 1st of December,—the eighteenth anniversary of the establishment of the first Mechanics' Institution in London—to whom that and every other English institution of its class was largely indebted. He was born at Settle, in Yorkshire, in the year 1776—his father being a merchant and banker. Early in life, mechanical propensities developed themselves; but these being overruled, he was educated for the medical profession, and received his education, first at Leeds, next at London, and finally at Edinburgh. At the early age of one-and-twenty, he was appointed Professor of Natural History in the Andersonian Institution of Glasgow, and there founded a mechanics' class—the precursor of the more celebrated establishments with which his name throughout life was so closely connected. From Glasgow he removed to London, where the greater part of his life was spent in the exercise of his profession, and in efforts to assist and further the cause of popular instruction.—*Athenæum.*—The Frontispiece Portrait has been copied from a large mezzotint by Henry Dawe, from a picture by Samuel Lane.

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