THE GATHERER.

Photographing under Water.

The recent Tay Bridge disaster naturally turned the attention of photographers to ways and means of taking photographs of the submerged carriages and girders. If the water is clear enough for the eye of the diver to discern the wreckage lying on the bottom, it is also clear enough to allow of pictures forming within the camera. The idea of photographing under water is not a new one, and has been frequently discussed; but difficulties have arisen from the fact that photographers, being unaccustomed to diving, cannot accompany their instruments, and that the slightest agitation of the apparatus will blur and spoil the portrait. It is therefore necessary to construct a steady apparatus, which a skilful diver may be able to manipulate. Two Scotch photographers have devised apparatus answering the purpose, and one of them has taken several photographs in the Firth of Clyde, near Gourock. One view represents a sandy bottom, with a number of huge boulders shaggy with sea-weed strewed around, together with an old anchor. The camera is enclosed in a water-tight case, and fixed to a loaded tripod, which is lowered into the water. When the latter has reached its position on the bottom the camera-cover is withdrawn by means of a pull-cord; but electricity could be utilised for this manœuvre. Apart from its value in accurately portraying submerged structures, the new appliance would be very useful on deep-sea exploring expeditions, for taking pictures of coral reefs and other wonders of the deep.

Sugar from Rags.

To the eye of the chemist all things are clean; and there is now in Germany a manufactory which turns out daily 1,000 pounds of pure grape-sugar made from old linen. An understanding of the process helps somewhat to dispel the unpleasant feelings we experience on hearing of the fact. Clean old linen is pure vegetable fibrin, and when treated with sulphuric acid it is converted into dextrine. This is washed with lime-water, then treated with more acid, and it changes almost immediately and crystallises into glucose, or grape-sugar, which is so highly valued in the making of rich preserves and jellies. The process is said to be economical, and the sugar is found to be chemically the same as that of the grape; nevertheless, a popular outcry has, we believe, been raised against the rag-sugar factory in Germany, and it is in danger of being put down. Regarded in a scientific spirit there is, perhaps, little difference between the transmutation of rags into sugar in the laboratory, and of manure into grapes by the vine; but, unfortunately, the association of its origin will cling about the artificial product in spite of ourselves.

A New Road Locomotive.

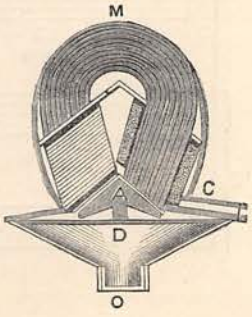
A locomotive engine intended, among other purposes, to supersede animal power on tramways, has just been tried with considerable success at Leeds. It is the invention of Col. Beaumont, M.P., and has attracted the attention of many leading scientific men as well as the authorities of the War Office, who are shortly to try a locomotive constructed on this principle in drawing the gunpowder waggons along the line of railway from the Royal Arsenal, where the explosive is made, to the magazines at Plumstead Marshes, where it is stored. The engine, being worked by means of compressed air, is quite safe for such employment, which is more than could be said for a steam-engine. It is calculated that the engine tried at Leeds would be able to draw a loaded tram-car ten miles without taking in a fresh supply of compressed air. When the latter process becomes necessary, it can be accomplished as readily as an ordinary engine can take in its supply of water for generating steam.

The Dust of the Street.

The dust of the street would seem a worthless thing to most people; but, nevertheless, the man of science detects something valuable even here. Signor Parnetti, a Florentine experimentalist, has for some time past been analysing the dust, not only of his native town but of Paris, and finds to his satisfaction that the *débris* of the Paris carriage-ways uniformly yields some 35 per cent. of iron abraded from the horses' shoes; while that of the foot-ways may be made to return a regular average of 30 per cent. of glue.

An Ear-fitting Telephone.

The accompanying illustrations represent an American form of Bell's telephone, which may prove convenient in certain cases where a lengthened conversation is to be carried on. It consists of a padded spring hoop which girdles the back of the head, and clasps two small telephones to the ears. These telephones are of a somewhat novel form, each consisting of a horse-shoe magnet, M, built up of thin steel rings to give greater magnetic power; a funnel-shaped ear-piece, O, having a nozzle which enters the orifice of the ear; and a drum or diaphragm of iron, D, to which is attached a spade-shaped soft iron armature, A, which fits into the niche between the chamfered poles of the magnet. These poles are encircled by coils of fine copper wire insulated with silk, and on the cur-



rent from the telegraph wire being passed through them the armature, A, is attracted and repelled so as to set the diaphragm, D, into audible vibration. The instrument may be arranged either to transmit speech or to receive it.

New Sapphire Mines.

A valuable discovery of sapphire mines has been made in Siam, and there is a "rush" to the new diggings. Many of the subordinate government officials have resigned their posts in order to be early on the spot, and it is expected that there will soon be an influx of South African diamond miners. Those sapphires which have reached Bangkok are said to be large and beautiful.

Metalline.

It is now some twelve years since Dr. Stuart Gwynn, an American, introduced into this country a metallic substance which should serve for the bearings of shafts, and dispense with the necessity of employing oil to lubricate the latter; but, owing to some failure at the time, little has been heard of it. Four years ago, however, a Dundee firm purchased his English patents, and they have now succeeded in establishing a lucrative trade in journal-boxes and "bushes" for shafts, lined with this material. The exact nature of the metalline as now made is preserved a strict secret by the Dundee manufacturers, but according to the patent it either consists of an intimate mixture of iron and tin in equal parts, ground to dust and compressed into blocks under a great pressure, the iron being first coated with paraffin to prevent oxidation, or a mixture of plumber's solder and graphite in certain proportions, intimately blended and pressed into a solid mass. In the Dundee factory the process of mixing is carried on in a closed room; the materials are ground continuously for some days at a high temperature, then moulded into small cakes under hydraulic pressure. These cakes are then broken and re-ground, the powder is re-heated and sifted, then moulded again into circular cakes, which are counter-sunk into the inner surface of the bearings, so as to present a continuous "greasy" surface to the rotating shaft.

A New Photographic Process.

The Japanese are now beginning to return in kind some of the scientific instruction which they have so diligently borrowed from Europe during several years past. One of the first-fruits of their Western culture is a new sort of photograph, something similar to the well-known English type-printing photograph. It had long been observed by the workmen engaged in making Japanese lacquer, that one of the substances has the singular property of becoming almost as hard as a stone when exposed to the action of sunlight; and a Japanese inventor has conceived the idea of applying it in the preparation of relief photographs. A slab covered with this material is exposed for twelve hours to daylight, which is allowed to pass through the "negative" plate placed in front of it. By this time the slab has become hardened to different degrees according to the intensity of the light falling on it, or in other words, according to the light and shade of the negative in front; and upon carefully scraping away the softer parts, a pictorial surface in low relief is obtained, similar to an engraver's block, and suitable for printing from.

A Geographical Game.

An amusing and instructive geographical game has just been invented by M. Levasseur, a well-known French geographer. It is called "Tour du Monde," and is played on a large terrestrial globe, richly illustrated, and divided into 232 spherical rectangles, each of which is marked with a number corresponding to a number on a list which indicates gains or losses in the game. A brass rib or meridian running from pole to pole of the globe, but raised above the latter, is perforated with a row of eighteen holes; and there are eighteen tiny flags provided for the purpose of being planted in the holes. Each flag corresponds to one of the principal states of the world, from China the most populous to Holland the least populous.

To play the game the globe is set revolving, and a player, commencing at the south pole, plants a flag into each hole one after another at each revolution of the globe and advances northwards. The score of the player, which may be either a gain or a loss, is determined by the nature of the facts indicated on the rectangular space above which a flag may stand when the globe stops revolving; and this is of course the interesting and humorous part of the game. London, for example, counts thirty, Paris twenty, and so on, according to population. A coal mine, a Manchester cotton factory, a grain mart, all are reckoned gains; but an encounter with a Zulu or a lion in Africa, a storm in the Atlantic, a polar iceberg, a crocodile on the Nile, naturally go for serious losses.

Captive Light.

In recent pages of the GATHERER we have had occasion to refer to various practical applications of certain phosphorescent substances to illuminating purposes, and especially to the "luminous paint" of Mr. W. H. Balmain. This material has of late been brought into greater prominence, and has been put to several important uses. It will be remembered that the paint is made by mixing a self-luminous sulphide or other salt of calcium with the materials of ordinary colourless paints. When exposed for some time to daylight, or to the powerful rays of the electric arc

or burning magnesium wire, the sensitive salt in the paint seems to acquire a molecular vibration which in darkness gives rise to waves of light, which are seen as a soft violet phosphorescence growing whiter as it is more intense. A piece of card-board two feet square, if coated with the paint, makes an excellent hand-lamp, and is now, we believe, being tried for this purpose in the dangerous spirit vaults of the West India Docks, and in the gunpowder magazines of one of Her Majesty's ironclads. The Admiralty have made experiments with the new illuminant in a darkened room at Whitehall, with a view to test its capability for use as a wall-paint to lighten the dark compartments of ironclads; and the dial indicators for showing the speed of the engines on board H.M.S. *Northampton* are to be faced with it, so as to show the index by night without the aid of a lamp. An exceedingly interesting parlour trick can be played with a piece of card-board painted with the luminous material in this way:—Expose the sensitive surface to daylight with a penny or other coin lying on it for such time as will allow the surface to take in a good supply of light; on removing the card then to a dark place, and abstracting the coin unobserved, its surface will be luminous with the exception of the round spot which had been covered by the coin. This part will in fact be a persistent shadow of the coin after the latter has been taken away, and it is easy to trick those not in the secret into believing that the coin is still lying on the card.

A New Remedy for Scurvy.

A most important discovery, and one which seems likely to prove of inestimable service—particularly to those engaged in Arctic exploration—has been made during Professor Nordenskjöld's recent successful voyage in the *Vega*, in search of the North-East Passage. Among the ailments to which sailors generally—and those voyaging in the North Polar regions especially—are subject, none is more dreaded than scurvy; and hitherto lime-juice and certain other anti-scorbutics have alone been relied upon to combat it. Another excellent remedy has, however, now been found by the naturalists who accompanied Professor Nordenskjöld, and this consists of a peculiar little berry, produced by a plant which is said to have a brief existence amid the snow and ice during the short Arctic summer. The plant seems to yield the berries in great abundance, the latter forming a fruit which is in great request among some of the natives of the coasts where it is found; and, except that it is rather more acid, its flavour is not unlike that of our own raspberry. When used on board the *Vega*, the berries were prepared by first being dried, then preserved in the milk of reindeer, and afterwards allowed to freeze—in which condition they can be kept for a very considerable time. As a proof of their efficacy, it is stated that there was not a single case of scurvy during the entire voyage of the *Vega*, though there were nearly thirty persons on board.

A Speaking Machine.

The phonograph of Mr. Edison is now tolerably familiar to most people, and its Punchinello utterances have been heard again and again by lovers of science. Nevertheless, there is something so extraordinary and fascinating about mechanical talking, that the recent exhibition of Herr Faber's new speaking machine before the Physical Society of London evoked a genuine burst of interest and amusement. In the phonograph, it will be remembered, the speech is recorded on a yielding sheet of tinfoil, and reproduced from it as a tune is reproduced from the barrel of a musical box; but in Faber's instrument the speech is actually manufactured by an operator manipulating certain levers. In short, the mechanism is designed to imitate the human organs of articulation. The apparatus is supported on an ornamental table, and consists of a pair of bellows of wood and india-rubber, representing the lungs; a windmill placed in front of the nozzle of the bellows to give the trilling sound, *r*; a larynx of a single membrane (not double as in the human throat) made of hippopotamus-hide and india-rubber, to give the "drone" or fundamental sound of the voice; a pair of hollowed india-rubber lips; a flexible tongue, and last of all a nose or proboscis, formed of rubber tubing, which instead of being placed over the mouth projects from under it, but curves up towards it. These artificial organs are manipulated by means of fourteen keys corresponding to as many distinct articulate sounds, and the inventor finds that by combining these elementary sounds, he can make his versatile contrivance pronounce any word in any language. Moreover, by adjusting the larnyx and other parts, he can raise or lower the pitch and loudness of the mechanical voice at will, and even cause it to speak in whispers, as well as to laugh, sigh, or groan. Such words as "Maria," "Mariana," "Eliza," "Philadelphia," "Constantinople," are pronounced by the machine with great distinctness; and Herr Faber, being a linguist himself, can make it speak in a variety of languages. In his native tongue, for instance, he made it at the meeting above-mentioned say to the audience, "Ich bin nur eine Machine, aber ich spreche alle Sprachen," and finally take its leave of the audience with the words, "Now I feel very tired; thank you, gentlemen, adieu!" Taken together with its operator, this ingenious machine is a crude but forcible illustration of the living apparatus of speech in the human frame, with the soul seated behind.

Phosphorescent Photographs.

One of the most curious and interesting of the applications of phosphorescent matter, which have lately been so rife, is that invented by Mr. Woodbury, the well-known photographer. It consists in exposing a plate, coated with a preparation of dextrine, honey, and bichromate of ammonia, to the action of light streaming through a negative, so that the coating is hardened at the places whereon the stronger lights fall, and left soft and sticky where the fainter lights or shadows come. The fine phosphorescent powder,

which is commonly a sulphide of barium, calcium, or strontium, is then dusted over the adhesive plate, and since it will accumulate and stick to the latter in proportion to the adhesiveness of the surface, an image of the phosphorescent dust is formed which, though almost invisible by daylight, on being submitted for a time to the action of sunlight, or a powerful artificial light, becomes luminous in the dark, and presents a kind of ghostly portrait of the scene figured on the negative.

A New Buoyant Life-saving Rocket.

A novel life-saving rocket has recently been manufactured at the Royal Arsenal, and approved for issue to the Department of the Board of Trade. The special property of it consists in its buoyancy, which is produced by sheathing the well-known Boxer Life-saving Rocket in cork. This enables the missible to float upon the surface of the water after it has been discharged over the sea. Such rockets are employed as a means of communication from lighthouses and wrecks during rough weather, when unapproachable by boats. The Boxer is that in ordinary use, and it is provided with two cavities, each containing inflammable material, which upon being ignited generates a large quantity of gas, which escaping by a vent behind, propels the rocket forward. The material in the second cavity is ignited after that in the first has burned out, and is intended to give a fresh impulse to the rocket; but it is found that this plan is no advantage, and in the new rocket we are describing there is only a single cavity. Still, the main difficulty hitherto experienced has been the liability of the rocket to sink to the bottom of the sea whenever it missed the wreck, lighthouse, or other object fired at. Owing to this circumstance they have frequently been lost among rocks, together with the life-lines which they carried, or at any rate it is almost always impracticable for the persons on a wreck to catch the lines when a bad shot has been made. The new buoyant rocket, however, is expected to prevent similar mishaps in future. It is capable of bearing a 1-inch coir line a distance of more than 100 yards, and has buoyancy sufficient to float itself and the attached line on the surface of the sea. Hence, should a false aim have been taken, and the rocket fall wide of its mark, it may easily be picked up again, and the line fired once more, or better still, grappled from the side of a vessel by means of a boat-hook.

A Recording Compass.

An ingenious apparatus for registering the movements of the needle of the mariner's compass has been invented by M. Frederic Alsnig, of Copenhagen, and adopted on board the steamer *Aurore*, plying between that city and Kiel. It is really a combination of compass and chronometer; a little pencil fixed upon the compass-card traces a line representing the deviations of the needle, and hence also the track of the ship, upon a ribbon of paper placed beneath it and drawn past its point by means of clockwork. Another pencil, connected with this clockwork, traces a second line, indicating intervals of time. Thus the same band of paper receives two lines, side by side, which on being compared furnish exactly the deviations from a right line of the ship's track, the precise moment at which they take place, and also the deviation of the ship during the whole voyage.

A Rapid Cure for Colds.

The eucalyptus-tree has been the source of a great many useful properties; but it would appear that its hidden virtues are not all exhausted yet. An Italian professor reports in the *Italian Medical Gazette* that, being seized recently with a severe catarrh, he happened to chew one or two of the twigs of the eucalyptus, at the same time swallowing the excreted saliva, which had a bitter aromatic flavour. Much to his surprise he found that in the course of an hour the cold had entirely disappeared. A subsequent attack experienced by himself was cured in the same way, and he administered the remedy to several of his friends with like success; he believes, however, that the treatment in question is only suitable in acute cases. The remedy is so simple that it is at least worthy of trial.

Signalling Lighthouses.

The advisability of making lighthouses flash a distinctive signal, instead of showing a steady coloured light or mere alternations of flash and eclipse, has again been publicly argued by Sir William Thomson. Coloured lights are necessarily weaker than white lights, and cannot be seen so far. Revolving lights, again, are subject to the defect that the time of eclipse is often too long compared with the brief flash, and their periods are by no means regular in practice. For example, during a cruise in the Channel last November, Sir William found that the Wolf Light, instead of being visible for thirty seconds and dark for thirty, was sometimes visible for forty seconds and dark for only twenty. "The distinctive value of a definite period," observes Sir William, "in a revolving light is almost annulled by such irregularities as these; and in fact a serious case of mistaking the Wolf for the St. Agnes or Bishop, upon the Scilly Islands, which is a minute light, has been reported." Sir William, it may be remembered by our readers, proposes to use only white lights in lighthouses, and to make each one distinguish itself from the rest by causing it to flash a distinctive signal. The signal would be, say, the initial letter of its name—"L" for Lizard, "W" for Wolf, "S" for Start, "E" for Eddystone, and so forth. This signal would be rendered by the light according to the code of signals now universally employed in telegraphy, and termed the "Morse Code," from its deviser, the famous Morse, inventor of the first recording telegraph. Following this code, each letter would be rendered by a succession of *eclipses* of the light, of shorter and longer duration. Eclipses are preferred to flashes because it is easier to define their terminations; and each short eclipse would last, say, half a second,

and each long one three half-seconds, while the intervening flash would be about half a second long. By this system, the letter "L," standing in the code-book of the mariner for "Lizard," would be rendered by the lighthouse by a set of short, long, short, short eclipses (. — . .); and "W," standing for "Wolf," would be rendered by short, long, long (. — —). Sir William's plan has been in successful operation since 1874 at the Holywood Bank Light, which is the chief beacon for ships entering Belfast Lough. Here, previous to that date, a red light was fixed, which could only be seen for five miles, and was constantly being mistaken for a vessel's port side-light; and for this has been substituted an eclipsing white light, which can be seen ten miles off, and cannot be mistaken for any other, as it signals the letter "V" by two "dots" and a "dash."

New Electric Lamps.

Another new electric lamp was recently announced by Mr. Edison. If certain reports from America are to be believed there is real merit in the new lamp, as far as has been seen; but being only a very recent invention, and not having yet been sufficiently tested, we would caution our readers against trusting too much to these accounts, which are commonly written by journalists entirely unversed in accurate science, and quite incapable of forming any opinion on the subject beyond what is told them by those interested.

It will be remembered that he had succeeded in tempering wires of platinum-iridium alloy *in vacuo*, so as to make them endure a very high white heat, and give out a brilliant electric light, without melting. His latest advance, however, enables him to dispense with such refractory wires for the electric wick or burner altogether, and put in their place a flexible slip of charred card-board. Edison is reported to have lighted upon the idea of employing flexible carbon instead of wire while musing one evening in his laboratory, and idly rolling a fibre of tarred lamp-black between his fingers. From lamp-black he passed by experiment to the burner he is now using, which is made by punching small horse-shoe patterns, one inch long by ⅛ inch wide, out of "Bristol" board. Several of these strips are then laid over one another, separated by tissue paper, and heated gradually in a closed iron mould to a temperature of 600° Fahr., so as to drive off the volatile gases. The mould is then heated to whiteness in a second furnace, then allowed to cool by degrees. When cold the charred remains of the horse-shoe are carefully lifted out and fixed in a standing position under a glass globe, from which the air is exhausted by a powerful Sprengel pump, and the globe sealed up. Fig. 2 shows the lamp complete; A is the glass bulb from which the air has been withdrawn, resting on the base B; F is the thin carbon loop (shown full-size in Fig. 1) connected by platinum wires, C C, to the copper wires E E, which lead first to the binding screws D, and thence to the machine which generates the current. The current from the latter flows round the carbon slip, and turns it into an arch of light. That the light is perfectly steady, and brilliant, we can readily believe; but it remains to be seen whether or not the frail carbon arch will disintegrate under the washing action of the air left in the bulb. The silica in card-board will no doubt add resistance as well as strength to the carbon; but all our experience hitherto is against the durability of such a burner. We may add that Mr. Edison is stated to be constructing a portable lamp of the kind which, with the voltaic battery to supply the current, will be contained within the dimensions of an ordinary moderator lamp. We should value Mr. Edison's inventions more if we knew a little less about them before they were forthcoming.

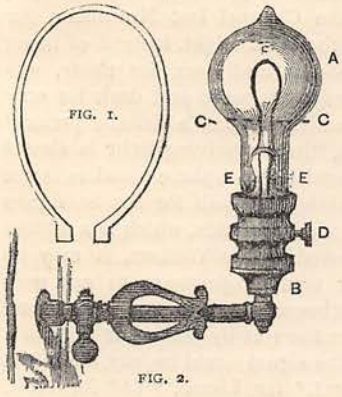


FIG. 2.

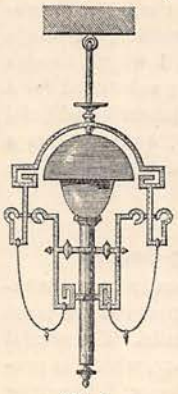


FIG. 3.

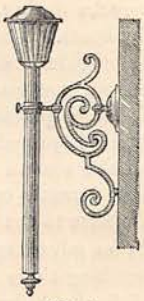


FIG. 4.

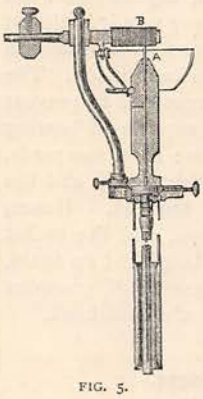


FIG. 5.

An electric lamp which has met with some practical success in Paris is that of Mr. Werdermann, illustrated in Fig. 5, where A is a finely-pointed rod of carbon impinging upon a superior disk of carbon, B. When the current is passed from the rod to the disk the point of the rod gets white-hot, and a small arc or bead of brilliant light is formed between the point and the surface of the disk. The rod is pressed up towards the disk by means of suspended weights. Figs. 3 and 4 represent the ornamental forms adopted.