pale primrose feathers. This costume is short, as all walking dresses now are, but the standing figure in the foreground wears a demi-train, as the lady has driven, and what are styled "carriage dresses" are usually long. In this instance the robe is black satin, and the trimming a delicate jonquil-yellow brocade, with a dash here and there of red in it. The black mantle is trimmed with a rich passementerie and fringe in which gold and red beads take a prominent part; the glazed Tuscan bonnet is ornamented with feathers of the same hue with red tips. Its wearer is a brune, consequently affects gay red and yellow, the favourite combination of the Spanish women and other dwellers in the sunny South. Blondes and brunes are both suited this season, as heliotrope is specially becoming to fair hair and complexions. The kilting edging the skirt is dark red satin, as all white balayeuses and lace frilling have disappeared and given place to gay borderings of colour, partially veiled with black lace.

The third figure has selected the favourite brown and bège as colouring, pheasant-brown being the chosen shade; under-dress of brown satin, and over-dress of broché, in which the two tints are blended with a dash of old gold. The dolman is embroidered and beaded with yellow tinted, brown, and gold beads. The black laçe bonnet has the design outlined with gold thread, and the lace on the strings is novel, being composed of gilt thread that will not tarnish, and as fine as lace made of linen thread.

The little girl of six wears a costume of two shades of the new crêpé linen, the paletôt being sleeveless.

Among the single figures will be found a young girl wearing an olive-green jersey, a broché scarf in which several shades of primrose and yellow appear, and a kilted skirt of dark olive-green camel's-hair. The jersey, which is made out of silk stockingette, is easy to put on and wear, for it is laced at the back instead of being seamless. The mystery of getting into it is therefore easily solved.

There is a youthful matron wearing a foulard cap and a morning robe made with a gathered plastron; and, lastly, there is a lady attired for a quiet dinner party in embossed velvet and satin, trimmed with Oriental or cashmere lace of many colours. Her gloves and shoes are both embellished with embroidery, for embroidery has found its way to almost every accessory of the toilette.

THE GATHERER.

Copying Drawings by Electric Light.

The Marion process, by which a drawing is reproduced in white lines on a blue ground, when the original is placed over a sheet of sensitised paper and exposed to the solar rays, is well known, especially in France, where it is much employed by engineers and architects. Unfortunately, however, even on the sunny shores of the Mediterranean, the solar rays are not always at command, and to make up for this deficiency, the Paris, Lyons, and Mediterranean Railway Company has applied the electric light for the purpose in view. Two Gramme machines of the workshop pattern, and two Serrin lamps, are used, and the replica is perfect after twenty minutes' exposure to the light.

The Audiphone for Deaf Ears.

The audiphone, as its name implies, is an instrument designed to assist the deaf in hearing, and it is another of those useful appliances which the projects of Mr. Edison have stimulated other inventors to produce. The invention is so simple that it can easily be home-made. The latest form imported from America is shown in Fig. 1, and consists of a thin, flexible sheet of ebonite (or hard india-rubber), something after the shape of a palm-leaf fan, and provided with a handle, and cords to tighten it at pleasure into a curve.

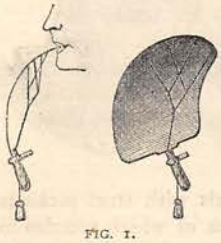


FIG. 1.

The edge of the sheet is pressed against the upper row of teeth, as shown, the convex surface being outwards, and directed towards the source of sound. The sound-waves impinging on the sheet are thus transmitted through the teeth and bones of the skull to the auditory nerve. Prof. Colladon, a Switzer, finds that the sheet of ebonite may be advantageously replaced by a sheet of fine elastic cardboard, the best kind being that smooth, dense variety known to the trade as *shalloon* or satin-board (*carton d'orties*). This card audiphone costs a mere fraction of the ebonite one, and is on all hands admitted to yield better results. Fig. 2 presents the shape which M. Colladon prefers, and Fig. 3 exhibits the manner of using it. Some experiments conducted in January by M. Colladon and M. Louis Sager upon deaf-mutes, leave no doubt of the existence of cases in which, while the ordinary ear-trumpet fails, the audiphone is successful. M. Colladon mentions the case of a professional singer who had been deaf for fourteen years, to whom the audiphone brought back once more the delightful power of hearing the music of a piano. Unfortunately, however, the accompaniment can only be heard by interfering with the singer's own vocal organs, since the audiphone requires as yet to be placed in the mouth. Perhaps a future improvement will obviate this difficulty.

FIG. 2.

Another interesting point in the observations

of M. Colladon is, that deaf-mutes from birth evinced emotions of pleasure on hearing music by its aid for the first time in their lives. The audiphone is so simple and inexpensive that it may be indulged in by the very poorest, and it is well worthy of a trial by all afflicted with deafness. Perhaps a thin sheet of resonant wood, such as the satin-wood, or maple, or fine American pine that is used in veneering, would answer the purpose as well as cardboard.

FIG. 3.

Improving the Auditorium.

The acoustical properties of a public hall, theatre, or concert-room are often enough defective, owing to a confusion of the sounds proceeding from the speaker with what may be called dumb echoes, reflected from the walls, pillars, and arches of the auditorium. Mr. A. G. Engert has, therefore, devised a means of improving the hearing qualities of such places, which recently was publicly exhibited at a hall in London. This plan consists in fixing to the platform near the source of sound—be it orchestra, orator, or singer—a series of steel plates free to vibrate on steel springs. These plates, by their resonant action, reinforce the original sound, and improve its penetrating power.

A Double-bladed Turnstile.

Turnstiles are usually made with three blades, which revolve one after another past the entrance-way so as to bar the passage; and since there are only two entrances there is always one blade too many. The advantage of a two-bladed turnstile is that it occupies less room and satisfies all requirements. Such a stile has been contrived by Mr. J. N. Maskelyne, and owing to the fact that the blades automatically shift their places as the shaft is revolved, it answers every purpose required.

An Electrical Test of Death.

Although cases of burying alive are very rare, they nevertheless happen now and again, and it is fortunate that there is a good test for the total absence of vitality in a corpse. Electricity, which is now being applied to so many useful purposes, also enables us to distinguish between life and death, because for two or three hours after the stoppage of the heart the whole of the muscles of the body have completely lost their excitability, that is to say, when stimulated by electricity they no longer contract. If, then, an electric shock be applied to the muscles of the limbs and trunk, say five or six hours after the supposed decease, and no contractile response ensue, it may be certified that death has occurred, for, says the *Medical Press and Circular*, "no faint, nor trance, nor coma, however deep, can prevent the manifestation of electrical muscular excitability." This is no new fact, but it has recently been brought forward again.

Narcotic Nutmegs.

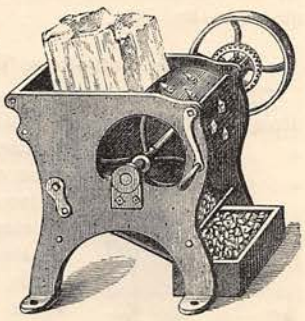
There is scarcely a single household in the kingdom in which nutmegs are not used, and the fact of their being so universally employed may, perhaps, account for our hearing so little of their noxious properties. It is, however, true that though a little nutmeg is not a dangerous thing, excessive use of that condiment is attended by very serious consequences. A case is on record where a patient was incautiously supplied by her nurse with tea made from one nutmeg and a half, which eventually threw her into a profound stupor. Fortunately the narcotic effects passed away after a few hours. The symptoms were somewhat similar to those produced by opium, and the remedy applied was the same. It is known that stupor and delirium have been produced by from two to three drachms of nutmeg, while in India death has resulted from its free use. Mace, the external covering of the nutmeg, has the same properties.

Substitute for Coffee.

Substitutes for tea, coffee, and tobacco are perhaps not sufficiently sought out and tried. It is not generally known that the seeds of the yellow lupin are a good substitute for coffee, and when roasted not only taste but smell like coffee. In the opinion of Dr. Hagar, a mixture of one part of lupin seeds and two parts of rye yields a very palatable draught, and one which is quite as nourishing and refreshing as coffee.

An Ice-breaking Machine.

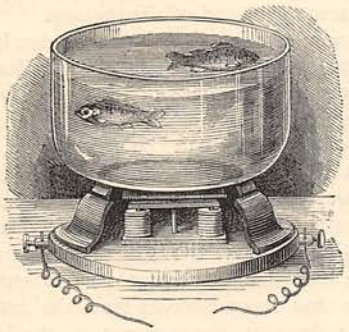
In hotels and other establishments where great quantities of ice in all shapes and sizes are used, some difficulty must be experienced in breaking up the huge blocks of ice—the form in which it is generally stored. But machinery can now be applied to work of this description, and the apparatus represented in the wood-cut has been devised for this special object. It is simple and effective in its operation, and does its work without crushing the ice. A revolving drum or cylinder armed at various intervals with steel picks is placed within a stand, the back of which recedes to allow of a large block of ice being laid down. The drum is "turned" by a handle, and as it revolves the picks operate upon the ice, the portions chipped off slip-



ping down behind the cylinder into a tray beneath. The block of ice is kept in its place by its own weight. Altogether this device is particularly serviceable, being effective and, it is stated, cheap.

Magnetic Fishes.

An ingenious aquatic toy, devised by M. Combettes, a civil engineer of Paris, is illustrated in the annexed engraving. As will readily be seen, it consists of a glass bowl full of water in which are floating a pair of tinned-iron fishes. Beneath the bowl there is concealed a small magneto-electric motor, and when the current from a voltaic cell or two is led to the motor by the two wires shown, the iron armature of the motor begins to revolve, and by magnetic attraction induces the fishes to follow it, so that a very good imitation of swimming is set up. By changing the direction of the current through the intermediary of a commutator, the direction of rotation of the armature, and consequently of the gyrations of the toy fish, can be changed at the will of the operator.



A Silver Fossil.

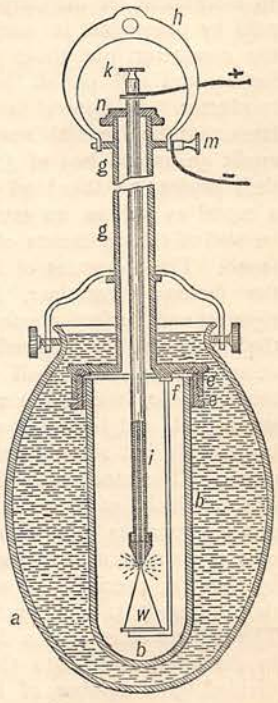
The silverised ammonite or fossil shell, recently found in a silver mine at Caracoles in South America, affords a curious instance of natural electro-typing. The calcareous substance of the shell in this specimen has been entirely replaced by chloride of silver which is partially reduced to the virgin metal. Light is also thrown by this discovery on the origin of the native silver found in the Caracoles mines.

Railway Alarm Signal.

To prevent the chance of a train running past the danger signal during a fog or snowstorm without the engine-driver seeing it, the Great Northern Railway Company of France have adopted the plan of having a steam whistle on the locomotive, worked by a current of electricity controlled by the signal. The whistle is connected with an insulated metallic brush placed under the engine; and between the rails, so as to be swept by the brush when the train passes, there is fixed a projecting contact faced with copper and seven feet long. This contact piece is connected to the positive pole of a voltaic battery, the negative pole of which is in communication with a commutator on the signal post, from which a wire leads direct to the ground. So long as the signal is at "line clear," the passage of the brush over the fixed contact produces no result; but when the signal is set to "danger," the commutator brings the negative pole of the battery in direct communication with the ground, and on the brush passing over the contact, completes the electric circuit and causes the whistle to be sounded, thereby alarming the driver.

The Electric Light in Mansions.

For mansions and dwelling-houses a powerful electric light would be out of place, and what is wanted is a steady but moderately brilliant light, which can be readily manipulated. The incandescent class of lamps, in which the light is produced by the white-heating of a pencil of carbon, is therefore better adapted for this purpose than the voltaic arc. The best incandescent lamp yet produced is, perhaps, that of Mr. André, which was recently employed in illuminating the grand staircase, banqueting-hall, picture gallery, and drawing-room of Stafford House, before the Prince of Wales, who expressed his great satisfaction at the display. Thirty-six lamps of twenty-candle power were on that occasion kept going by one small Gramme dynamo-electric machine of A type; and to aid the spectacular effect, which was very fine, coloured gauze was draped round some of the lamps. André's lamp is illustrated in the figure, and consists of a pencil of carbon, *i*, with its point resting on a copper cone, *w*, and its vertical stem guarded by two concentric tubes, the outer of which is marked *g*. The current is conducted to the carbon on the one hand, and led from the cone on the other, by means of these tubes, which are separated from each other by an insulator. The terminals by which the wires conveying the current are joined to the lamp are marked *k* and *m*; *h* is a hook to hang the lamp by; *n* is a vulcanite cap. The burning point of the carbon is enclosed in a glass chamber, *b*, rendered air-tight by immersing it in an outer glass globe, *a*, filled with water. The object of the air-tight chamber is to save the carbon from being consumed by rapid oxidation, for the air originally in the chamber is quickly turned into carbonic oxide, which has no burning effect on carbon. Such a lamp will burn 100 hours without renewal of carbons, and as it is simple,



it is also cheap. The plan of excluding the air by water is due to Mr. Brougham, and is very effective. The water tends to diffuse the light like an opal globe, and by tinting it different coloured lights can be obtained.

Perhaps the steadiest and most powerful electric lamp on the "voltaic arc" principle which has yet been invented is that of Mr. Crompton. In all other lamps of this kind—the Siemens, used at the British Museum ; the Jablochkoff, used at the Thames Embankment ; and the Rapieff, used near Blackfriars—there is a disagreeable flickering owing to an imperfect regulation of the supply of carbon to the arc ; but in Crompton's lamp there is no appreciable flickering whatever. This fact is due to the perfection of his regulating mechanism, in which the clockwork feeding the carbon is controlled by a delicate friction brake, applied by means of the attraction of the current forming the light, on a very light, soft, iron armature. So finely adjusted is this mechanism, that the least weakening of the current, due to a widening of the arc, is attended by a corresponding change in the velocity of the clockwork and the rate of supply of the carbon.

Another noteworthy advance in electric illumination has been made by Dr. Phipson, who encloses a phosphorescent substance, such as sulphide of barium, in one of those sealed glass vessels known as Geissler tubes, and on passing a current of electricity through it causes it to glow very brightly. This light, though very weak compared with other electric lights, is uniform and agreeable, and therefore fitted for domestic lighting.

Fare Tell-tale for Omnibuses.

Numerous attempts have been made to construct an instrument for the purpose of checking the fares paid by passengers in omnibuses and tram-cars to the conductor, but these are all more or less defective, and still permit the pilfering of a dishonest conductor. So general is the custom of purloining fares, that the General Omnibus Company of London credit an annual loss of £70,000, or ten per cent. on their profits, to this kind of petty larceny ; and in a moral as well as an economical respect, it would be well if certain means of eradicating it could be found. The apparatus of Mr. J. Neville Maskelyne, the famous entertainer, is adapted to impose a rigorous and perfect check upon the fares taken by the conductor, and, indeed, it is evidently the very thing required. Like all the other contrivances of this inventor, it is very simple, though it performs a great deal, and is therefore not only inexpensive to begin with, but slow to get out of order, and easy to repair. The machine, which is fixed over the door of the vehicle, consists of a ticket-box and an automatic apparatus which makes a complete register of the number of passengers which have travelled by the car, precisely at what part of the journey they entered it, and precisely where they left it. The register consists of a disc of paper twelve inches in diameter, ruled into three concentric zones, and divided by a number of lines radiating from the centre across the zones, so as to divide up the card into radial spaces. This card is mounted on an axle, which is regulated by clockwork to make one revolution in a little more time than is required by the car to make one journey. The card is slowly turning, therefore, all the while the car is making its round, and the number of radial lines is such as to divide it up into minute intervals. The ticket-box is divided into a series of compartments, corresponding to the stages of the journey, and a sufficient number of tickets, properly marked with the stage to which it belongs, and, happy thought! with the fares to the end of the journey.

Let us now suppose that the car begins its journey. In order to get at his tickets the conductor must move the first compartment of the ticket-box opposite a small aperture in the closed case of the apparatus, through which they can be withdrawn, and the movement of the box causes a lever to press upon the disc and perforate the paper in the central zone, thus indicating by means of the minute intervals or gradations of the disc the exact time at which the movement was made. Every person entering the vehicle on that stage receives from the conductor a ticket from the first compartment of the box. The ticket itself informs him of his fare, and when he leaves the car he delivers it up to the conductor, whose interest it is to recover it and return it by a special hole to a receptacle. When the first stage is ended, the conductor moves the box forward still further, so as to bring the second ticket compartment opposite the draw-hole, when the second stage is ended he moves the third, and so on. But how, it may be asked, does this *check* the fares? The checking is done by the persons themselves in entering and leaving the vehicle. There are two steps to the vehicle, and the tread of a person on these on entering actuates two levers, which, by a very simple but highly ingenious arrangement, causes a second marker to perforate the outer zone of the card ; while on leaving the car the steps of a person cause a third marker to perforate the inner zone of the card. Thus, the exact time at which every passenger entered and left the vehicle is faithfully registered on the card, which can be examined by the inspector at the end of every journey, when the number of tickets issued by the conductor and the money taken should be found to tally with the register. Such an automatic tell-tale leaves no room for dishonesty on the part of the conductor, or those in league with him, who would, therefore, be paid higher wages than they now receive. Mr. Maskelyne, we understand, also makes a registering card which will serve for an entire day instead of a single journey, and is further engaged in constructing an arrangement in which the mere pulling out of the passenger's ticket by the conductor and its return to the receptacle will record the entrances and exits of the former on the register. This variety of the apparatus will be especially useful in cases where there is an objection to alter the present rolling stock in order to add the double-step and lever arrangement.

An Earthquake Detector.

Professor Milne, of Tokio, Japan, has successfully applied the microphone to detect the least tremor of earthquake in that much-quaking isle. He buries his microphones (which are of special make) in pits dug round about his dwelling-house, and takes great care to keep out insects, otherwise the tramping of a beetle would register itself as no mean earthquake. These pits also must be dug at some distance from a road or path, for every step of a wayfarer will, even though he be six yards distant, be indicated by the detector. Excluding all beetles, thieves, and unexpected visitors, however, it would seem that for some time before the occurrence of a "shock," the microphone reveals that the earth is crackling as if under an increasing strain. It would also appear that the resistance of the earth before any sensible movement is felt is very considerable, but at last, like a bending stick, it suddenly gives way, and the consequent jar is what we term an earthquake. Before this takes place, however, the premonitory crackles can be detected by the microphone, and thus the latter instrument becomes a serviceable earthquake alarm to any one who accustoms himself to its indications.

Water-resisting Cement for Glass.

An admirable cement for glass, which resists the solvent action of water, is, according to Herr H. Schwarz, prepared as follows :—From 5 to 10 parts of pure, dry gelatine are dissolved in 100 parts of water. To the solution is added about 10 per cent. of a concentrated solution of bichromate of potash, and the liquid is then kept in the dark. When articles joined by this cement are exposed to the light, the gelatine film is acted upon by the chemical rays, the chromate is partially reduced, and the film of cement becomes extremely tough and durable.

A New Actinometer.

The actinometer is an instrument for measuring the actinic or chemical value of candle, gas, or other light possessing actinic power, and a very novel one has been designed by Mr. Leon Warnerke, of the Photographic Society. It consists of a disc of phosphorescent material such as sulphide of calcium, hermetically sealed between two glasses, and exposed to the light, which it absorbs and gives out again. Over this phosphorescent disc is revolved another disc with small holes in it, which are glazed with layers of coloured gelatine, painted with figures in such a manner that each succeeding hole is more opaque than the preceding one. In this way a scale of opacity to actinic rays is obtained, and the last figure seen before the phosphorescent light becomes invisible through the holes, indicates the light-intensity at the moment.

The Electric Light and Vegetation.

Dr. Siemens has been making a series of most interesting experiments as to the influence of the electric light upon quick-growing seeds and plants. Those chosen were mustard, carrots, swedes, beans, melons, and cucumbers, in pots, and were divided into four groups. One of these groups was kept entirely in the dark, one was exposed to daylight, a third was exposed to the influence of the electric light only and the fourth group to daylight and electric light in turn. The electric light was applied from 5 till 11 p.m. every evening; the plants were then left in darkness. The results were that the plants left in total darkness died very soon; those under the influence of the electric light only, and daylight only, throve in about equal ratio; but the fourth group throve much the best. Though only tentative, these experiments have established that electric light promotes the growth of plants; that they do not require rest during the twenty-four hours, but make more vigorous progress if exposed to sunlight by day and electric light by night; that by radiating electric heat, frosts can be counteracted, and it is likely to promote the ripening of fruit in the open air. There were other points touched upon, but these are the chief. Dr. Siemens proved his case to an audience by experiment. Some budding tulips were placed in the light of an electric lamp, and in about forty minutes they were in full bloom. It is interesting to note that these experiments by Dr. Siemens are the fulfilment of a prediction which we made in the GATHERER for March of last year. In an article on "Electricity and Gardening," we there anticipated the time as not far distant "when the electric light will be used for forcing rare fruits and flowers during our dark winters, as much as artificial heat is now." Dr. Siemens has entered into the practical cost of this mode of horticulture, and enterprising nurserymen will no doubt adopt it in due time.

The Pyrophone.

It is well known that flames of gas when enclosed in glass tubes emit notes of a pitch and quality dependent on the dimensions of the apparatus. An ingenious German inventor, M. Kastner, has devised a musical instrument on this principle. The tunes are played on a keyboard similar to that of a piano, and the notes are said to be extraordinarily sweet and sonorous.

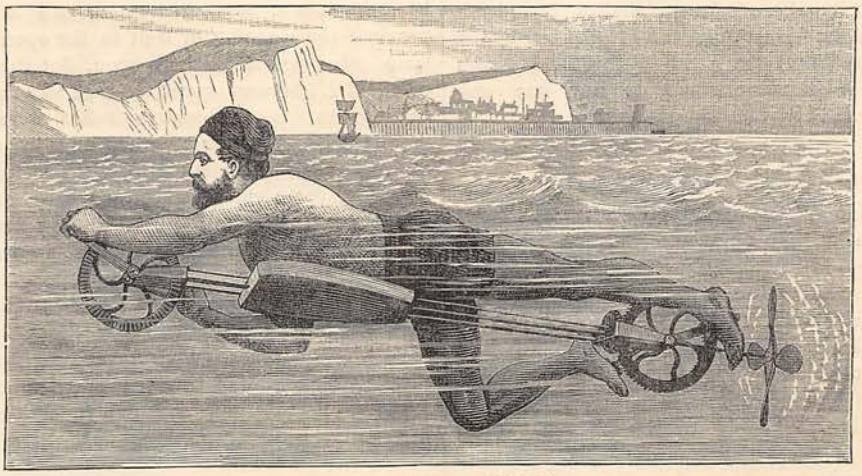
An Electric Post for Paris.

Telegrams are now sent by means of pneumatic tubes all over, or rather under, Paris; the electric telegraph having given place to the mechanical transmission of the messages in little carriers by means of compressed air. Electricity is, however, about to resume its sway, and an electric post, on the principle of Dr. Werner Siemens recently described in the GATHERER, is to be substituted for the pneumatic one. In underground tubes, small electric trains laden with the messages will be run on rails at the rate of fifteen miles an hour, a speed which very much exceeds that of the pneumatic post for long distances. Dr. Siemens' invention is also to be applied

to a new tramway in Berlin; and visitors to the Crystal Palace will have an opportunity of testing it during the ensuing summer. The success of the subterranean postal trains is enough to make us ask if the time is not at hand when electric railways shall be laid in submerged tubes, and people transported through narrow waters instead of under or over them as before. How would an electric tubular railway laid along on the bottom of the Channel be hailed by millions!

A Novel Swimming Machine.

The accompanying woodcut represents the use of a new swimming apparatus invented by Dr. Richardson, of Mobile, United States, and tried there with success. It is simply a cork float on which the swimmer rests his body, and a small screw propeller fixed on a longitudinal axle, which is turned by means of two handles and two pedals worked by the hands and feet of the operator. The speed attained is said to be very considerable, but we should judge that some practice was first necessary. There would also seem to be a risk of capsizing in the water; but this might be obviated by adding some sort of keel.



NOVEL SWIMMING MACHINE.

A New Diving Helmet.

A diving helmet which enables the diver to breathe under water without the aid of air-pipes to the surface has been invented by Mr. Fleuss. This remarkable convenience is effected by purifying the vitiated air exhaled by the diver from carbonic acid and restoring its full complement of oxygen. To this end, a close-fitting respirator, provided with inlet and outlet valves, is kept over the diver's mouth and nostrils by elastic fastenings. The exhaled breath passes by a flexible tube to the purifier, which is carried in front of the diver and under his dress. Within the purifier the air passes through india-rubber sponges soaked in caustic alkali, which rob it of all its carbonic acid. It is then passed through a second chamber contained within the diver's helmet, where it takes up oxygen which is stored there under a pressure of 200 lbs. per square inch, and thence passes to the diver's mouth. The amount of oxygen allowed to mingle with the purified breath is regulated by a valve worked by the diver, and there is a sufficient supply to last four hours.

Porpoise-Oil.

Like its bigger brethren in the whale class, the porpoise is useful in the industrial world, as well as affording profitable occupation for merchants. Its oil is largely employed in the United States by watchmakers, gunsmiths, and philosophical instrument makers, who have found it by experience much better adapted for their delicate machinery than olive or any other oil. It will not congeal with cold at zero, will not rust steel or corrode on brass, will not glue on the finest watch, and so long as it is kept scrupulously free from glutinous and acid matter, will retain its substance. So needful, however, is it that care should be observed in the refining process, that the presence of the slightest impurity, or the admixture of even a small portion of water, will deprive it of its most valuable lubricating properties. The oil is worth from £1 to £3 per gallon, and besides its technical name it is also familiarly known as "watch" or "clock" oil. The oil yielded by the blubber of the porpoise and grampus is not that most suited for delicate machinery; the fine qualities being extracted from the head. That part of the upper surface of the fish's head reaching from the "blow-hole" to the end of the nose, and from the top of the head down to the upper jaw, contains the most valuable and finest oil. When this portion of the animal is removed in one piece it resembles half a water-melon, from which circumstance this special oil has derived its name of melon oil. The "melon," which usually weighs about twenty-five pounds, yields six quarts.