

THE GATHERER: AN ILLUSTRATED RECORD OF INVENTION AND DISCOVERY.

Correspondents are requested, when applying to the Editor for the names and addresses of the persons from whom further particulars respecting the articles in the GATHERER may be obtained, to forward a stamped and addressed envelope for reply, and in the case of inventors submitting specimens for notice, to prepay the carriage. The Editor cannot in any case guarantee absolute certainty of information, nor can he pledge himself to notice every article submitted.

The Physiograph.

The physiograph is an instrument which enables a draughtsman to see at the same time on the paper the object to be drawn and the pencil. It replaces the ordinary camera lucida, and is much less expensive. The apparatus is represented in the accompanying illustration, and consists of three pieces—a foot-piece, a vertical rod, in which slides another thinner rod, terminating in a T-piece; and a horizontal rod carrying a button at one end, and an optical instrument protected by a capsule at the other. All these parts are in nickelled tin.

The instrument is placed before the draughtsman on a table or drawing-board, and the horizontal rod turned until the eye-hole in it is over the paper. The observer then looks through this to the paper, and he will see reproduced on the latter the landscape or any other object he desires to copy, and he can then follow its outlines with the pencil. By lengthening the vertical rod the size of the drawing may be regulated. Smoked glass is added to the physiograph to reduce the light in certain cases, and enable the eye to see the pencil.

A Train Communicator.

A new means of communication between the passengers of a train and the guard has been brought out. Fixed to the roof of each carriage is an iron box with a hinged lid containing a powerful detonating signal and a red disc. The detonator is exploded, and the disc raised to a conspicuous position by pulling a cord extending from end to end of the carriage. This cord is always taut, and out of the way of the passengers under ordinary circumstances. The detonator is exploded by a hammer, and the red disc being at the same time liberated, springs up and shows itself to the guard above the roof of the carriage. The inventor, Mr. Hall, also combines with this a powerful red light, which is produced by chemical means, from a composition contained in a tube secured to the signal disc.

A Safety Bracelet.

Great annoyance has frequently been caused by the loss of a bracelet, owing to its clasp having been accidentally opened. Wherever the clasp is such that the two edges of the bracelet are widely separated, this must often occur, but a new mode of fastening

has recently been patented, by which the risk of loss from accidental unfastening is entirely removed. In this new fastener the clasp is extended in the form of a flexible telescopic band, which slides round the inner edge of the bracelet, and thus provides that, even when the bracelet is opened to its fullest extent, there shall be a metal band all round the wrist. Under these circumstances it is impossible for the bracelet to slip off except by passing over the hand of the wearer, who must certainly notice it.

Peat Fuel for Locomotives.

Peat is now used for fuel in the locomotives of the Northern Railway in Russia. The saving over coal is estimated at one-half. The peat is cut by hand machines which go eight feet deep, and by steam cutters which penetrate twenty feet. These machines turn out no less than 35,000 to 40,000 bricks of peat a day. The Moscow district is at present the chief seat of this industry. A horse cutting machine is, it is stated, a desideratum, to take a place between hand and steam cutters.

A Steering Propeller.

A plan has been devised for steering large and small vessels without a rudder, and by means of a drum or cylinder open at the ends, and encircling the screw propeller in a vertical plane. The cylinder (A in the

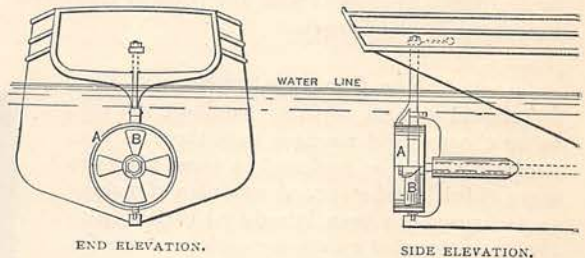


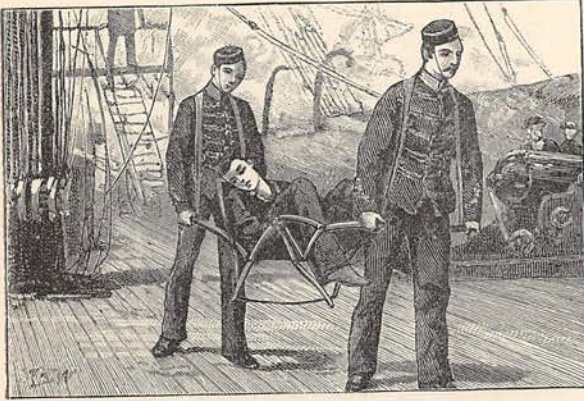
figure) is attached to an upright shaft or helm, which carries a tiller at the top. It encircles the propeller B as shown, and can be turned through any angle for steering purposes. Recent experiments at Barrow-in-Furness on a steam launch demonstrated the practical success of the invention.

A Cure for Hydrophobia.

M. Pasteur, the famous French investigator, has succeeded in curing persons bitten by rabid dogs. His first patient was a boy from Alsace, who seemed certain to become hydrophobic and die in any case, so M. Pasteur resolved to treat him. The treatment consisted of a series of inoculations with virus prepared

according to a system invented by M. Pasteur, and previously tried on dogs. It was found to be successful; at all events, the boy is now at home and well. Several other persons have been under treatment since; and while there are one or two who, perhaps, entertain doubts of the efficacy of the process, public and scientific confidence in M. Pasteur is so great, that there are good grounds for hoping he has found a remedy and preventative for this alarming disease.

brought out. It consists in employing a mixture of "bull-dog" cinder and ordinary rich ore of the kind known as "blue billy." These are ground and mixed with a little hydrochloric acid and hot water, which is allowed to act on the mass for a few days. Ground lime and salt are then added; the lime being proportioned to the phosphorus in the iron to be puddled, and ranging from twenty to thirty per cent. The whole is then blended into a paste with water and plastered over the lumps of ore or "bull-dog" usually placed in the furnace. Over this are thrown some shovelfuls of a dry mixture of ground ore and hammer slag. For puddling pig-iron, containing two to four per cent. of phosphorus, neither salt nor lime is added, and the paste is simply spread on the bottom of the furnace. In all cases, when the iron is fairly melted, the puddler throws a quantity of iron rust on the molten mass, a substance which plays an important part in the purification. The bars produced by this process are free from red-shortness, and of a very fibrous quality. Tests for tensile strength show an average breaking strain of twenty-four tons per square inch. The cost of producing a ton of metal is also much less than by the old method.



A SHIP AMBULANCE.—FIG. 1.

A Ship Ambulance.

A new chair for ambulance purposes on board ship is shown in our engraving, and has been in use on board H.M.S. *Inflexible*. It consists of a light, strong iron frame supporting tanned canvas, which forms a comfortable seat or lounge. Straps are attached for supporting wounded limbs, and a breast-band to hold the patient in if required. Carrying-straps and tackle for hoisting the chair are also provided. The ambulance appears to promise well, and is under consideration at the Haslar Hospital.

New Concrete Buildings.

Portland cement concrete buildings are said to be cheaper and stronger than those of lime concrete, and to be preferred in some places to those of brick and stone. A new plan of making these houses has been introduced of late, with the advantage that no wooden casings or moulds are required to pour the concrete into until it becomes hard. Moreover, the face of the wall is of finer material than formerly, and composed of Portland cement and sand. The plan consists in substituting for the wood-casings, concrete slabs which dovetail and fit into each other by means of grooves and niches. The filling of concrete is poured in between the facing slabs, and forms a solid wall when it sets. The system offers scope for considerable ornamentation, and also for the ventilation and sanitation of buildings.

A New Dephosphorising Process.

A process of producing superior metal from common cinder iron in the puddling furnace has been recently

New Distance Measurers.

A new apparatus for estimating the distance of an observer from an object, or that between two distant objects, was recently tried on the Thames Embankment, and is said to be under the consideration of the War Department, as it is likely to be useful in military operations, if not also in exploring and preliminary surveying. The action of the instrument is based on trigonometrical equations, and it consists of two telescopes placed apart on a tripod stand. Both of these are brought to bear accurately on the distant object or



A SHIP AMBULANCE.—FIG. 2.

objects, and a scale on the instrument gives a reading which, on being referred to a printed table, gives in turn the approximate distance of the object. By means of a sheet of paper and a drawing board, dis-

tances obtained in this way can be plotted down, and a rough plan of the country sketched out. Another distance measurer has been brought out by Lieut. von Ehrenberg, an officer in the Baden artillery, and improved upon by Major Montaudon. Its action depends on the time taken by sound to traverse a given distance, and it is chiefly intended to be used in military operations, where the flash of a cannon is seen by the eye before the report is heard by the ear. The instrument consists of a stop-watch, not too large for the pocket. By pressing a stud the moment the observer perceives the flash of a cannon or rifle, the hand of the watch begins to move; a second touch of the stud when the report is heard indicates the distance to within twenty-five metres. A third touch brings the hand back to zero, to be ready for use again. Sound, as is well known, travels at the rate of 1,100 feet per second, and light at a velocity of 192,000 miles per second, so that any practical error of the method will lie rather in the senses and movements than the theory. During recent experiments at Thun, the practical error in using the instrument was found, in calm weather, not to exceed fifty metres; and it is stated that Herr Krupp is so well satisfied with it that he has ordered a number of the telemeters to be made.

One-Hundred-Copy Ink.

A new copying ink has recently been brought out by a well-known London firm, for which its inventors claim that it will give from any writing made in it one hundred or more readable copies in an ordinary press. A special kind of copying paper for use with this ink has also been produced, which is much stouter than the ordinary "flimsy," though the latter works quite well with the new ink.

A Miner's Gas Detector.

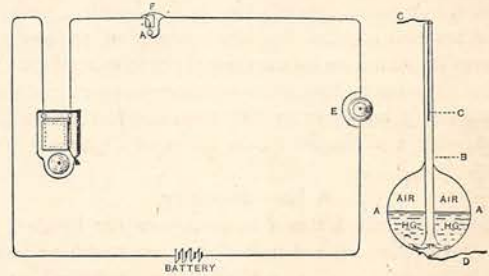
A new detector for gases accumulating in mines is shown in the figure. An oil lamp or gas burner is secured to the bottom



of a cylinder of wire netting, provided at its upper end with pins diametrically opposite and carried by angular pivoted levers, 11, which are connected in circuit with a battery and alarm bell. The upper ends of the lever where the wires are attached, are pulled together by springs, but the lower ends are united by a cord or highly fusible wire. The cylinder is held above a vessel containing water, and the gas passing through the netting is ignited by the flame, burns the cord or fusible plug, liberates the levers and

allows the contact pins to come together, thereby closing the circuit and ringing the alarm bell. The wire netting confines the explosion within the cylinder.

While upon the subject, we may mention the following modification of a well-known alarm, which has been sent to us by a correspondent, Mr. J. W. Smith.



A is a bulb of very thin copper into which is inserted a narrow tube of the same metal, B, nearly touching the bottom of the bulb, which is half filled with mercury. In this tube is placed an insulated wire, C; another, D, being in metallic connection with A. This arrangement may be connected to the ordinary electric bell-wires of a house, making a loop, or "shunt-circuit" with them, as at E, F, the current traversing the loop when the fire closes the circuit, and the bell when the button is pressed. When a fire breaks out, the heat expands the air in the bulb A and forces the mercury up the tube until contact is made with the wire C, thus completing the alarm circuit between C and D.

A Combined Knife, Saw, and Mincer.

An ingenious article has recently been patented, which combines in itself a knife, saw, and mincer. In appearance it resembles an ordinary chopper, with this difference, that while the bottom edge is still to be employed for mincing, the sides are also utilised. One of the latter is cut into teeth for the purpose of sawing bones and the like. The other side is specially ground into a sharp edge, and is intended to be used more particularly for cutting meat, suet, &c. This appliance is a well-finished article of the best Sheffield make, and we doubt not that cook would find it a handy addition to her kitchen plant.

Unmagnetisable Steel.

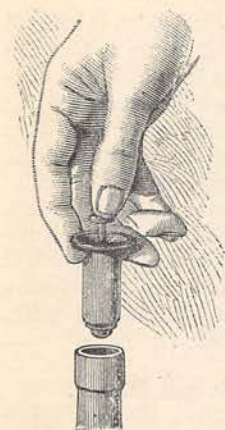
A piece of steel made at Sheffield, and containing fifteen per cent. of manganese, has been found by Mr. J. T. Bottomley to be proof against magnetisation. The steel is very hard, and has a tensile strength of forty-five tons per square inch. The bar was first experimented upon in the ordinary way by steel magnets, but these had no effect on it. It was then placed between the poles of a powerful electro-magnet excited by forty large Daniell cells, but no magnetism could be perceived in it. When put, however, under the test of a very delicate magnetometer, it showed a slight trace of magnetism. The magnetic power per gramme of the steel was found to be only .013 units of the centimetre-gramme system, whereas some pieces of steel take a magnetisation of 50 to 100 units per gramme.

A Pocket Thermometer.

An ingenious thermometer, resembling a metal sovereign purse, has been brought out, and can be worn in the pocket or at the watch-chain. It consists of a silver case, having on one side a dial-face divided into degrees, and provided with a finger pivoted in the centre. A small curved tube is filled with a mixture of ether and alcohol, and the change of temperature causes it to change its curvature, thereby actuating an index or pointer by means of intervening mechanism. A specially handy form has been devised for medical men, with a scale on which fifths of degrees can be read.

A New Stopper.

The figure illustrates a new stopper for bottles. A narrow wooden plug is partially covered with an india-rubber tube, attached at its lower end to the bottom of the plug, and at its upper end to a wooden disc. The plug moves through the disc, which, when the stopper is fixed, rests on the lip of the bottle. To insert the stopper, the disc is taken as shown, and on pressing the plug the rubber is stretched and becomes narrower. It is then inserted into the neck of the bottle, and the plug being released, the rubber fills the neck tightly. The stopper is removed in the same way.



Depositing Aluminium.

Aluminium is becoming more useful now, and it is satisfactory to know that a process for depositing it by electricity has been found. The liquid of the bath consists of a saturated solution of sulphate of aluminium in presence of a solution of chloride of sodium (common salt); the two liquids being separated from each other by a porous cup. A current of four amperes and six to seven volts electromotive force is employed to decompose it, and set free aluminium on the object forming the cathode, that is to say, the object connected to the negative pole of the battery employed. A plate of aluminium forms the anode connected to the positive pole of the battery.

Electric Light Wires and Thunder.

A somewhat alarming occurrence took place some time ago at St. Cuthbert's, the residence of Mr. Bedford Elwel, of Albrighton. St. Cuthbert's is connected by telephone wire with Wolverhampton, and has also a lightning-rod some twenty-five years old, which was very improperly used as the telephone earth connection. We say improperly, because if anything went wrong with the earth connection of the lightning-rod, it might be dangerous. During a thunder-storm, the telephone bell was heard to ring at every lightning-flash, and suddenly a report as of a rifle was heard, and an electric lamp burning in the dining-room

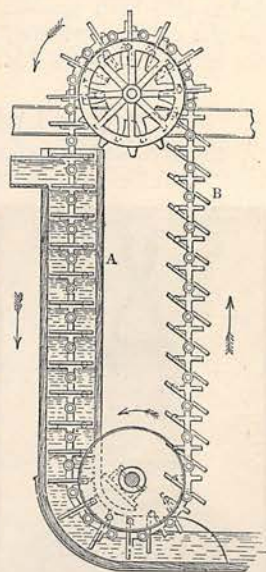
flashed up and went out. It was found on examination that the lightning currents had got into the electric light wires from the telephone wires, which were found to be fused. The occurrence shows how careful electric light and telephone engineers ought to be in fitting up their apparatus in households. If due attention is paid to the matter there need be no cause for alarm, but carelessness in electrical matters is sure to be visited with retribution of some kind. A separate "earth" should have been provided for the telephone wires, and this has now been done at St. Cuthbert's. The lightning had burnt up the fine carbon filament of the electric lamp, but did no serious damage to the electric light system.

Eucalyptus in Boilers.

It is stated that the leaves of the Australian gum tree, or eucalyptus, have the property of removing scale from the interior of boilers. A few of the leaves put into the water of the boiler are said to prevent the scale from forming, and to speedily remove it if already formed. Electricity and chemicals have been tried for this purpose, but the leaves of the eucalyptus, if really effective, are perhaps the simplest remedy of all. The same remedy ought to clean kettles of their "fur."

A New Water-Motor.

The illustration represents a novel and ingenious float water-motor invented by Mr. Sealy Allin. It consists of a chain carrying round a number of rectangular floats which descend through a gate and rise again, passing at top and bottom over two pitched wheels. The floats are pivoted at each end to brackets projecting from the chain, the brackets supporting the floats in their working position. The floats descend in a horizontal position through the water, which thus exerts all its propulsive force upon them, as shown at A; and they ascend through the air in an inclined position, thus opposing least resistance to their motion, as shown at B. The arrows indicate the direction of motion of the water, and the wheels which receive their motion from it. Trials of this motor show that an expenditure of water equal



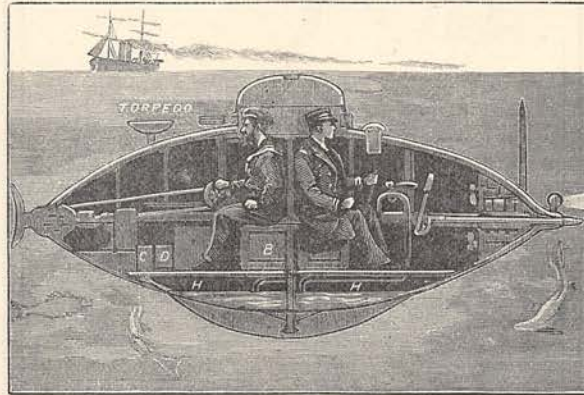
to $7\frac{1}{2}$ per cent. of the whole capacity of the machine is sufficient to run the motor unloaded at a speed of 150 feet a minute; and that the remaining $92\frac{3}{8}$ per cent. is available for outside work and the extra friction which would result from loading the machine. The motor is declared to have real merits, and to do effective service at a moderate first cost.

The Smallest Steam-Engine.

A curiosity of engineering, in the form of a tiny steam-engine, has been made by an ingenious clock-maker. It weighs only about fifteen grains, and is entirely covered by an ordinary thimble. The stroke of the piston is about two millimetres, or one-twelfth inch, and its diameter less than one and a half millimetres. The engine is built up of 140 distinct pieces, fastened together by fifty-two screws, and three drops of water suffice to fill the boiler and set the toy in motion.

Goubet's Submarine Boat.

The Goubet Submarine Boat, which we illustrate, has been adopted by the Russian Government. The torpedo is placed in the position shown, and attached to an electric wire wound on a drum, by which it can be fired when left in position. The interior of the boat contains the apparatus for propelling and steering, as well as the electric battery. A reservoir of compressed air, B, serves as a seat for the men; the boat is propelled by means of electric accumulators and a dynamo. When the boat has to rise, a pump, C, is employed to remove water from the reservoirs, H H; and the vitiated air is extracted by an air-pump, D. The reservoirs H H are divided into compartments, and thus preserve the water from surging backwards and forwards. The boat is first put in line with the hostile vessel, then submerged and propelled towards her. On reaching her the torpedo is placed against her, and the boat withdraws, paying out wire. When she has got away far enough the torpedo is exploded.



Goubet's SUBMARINE BOAT.

A Slag Pavement.

A new kind of pavement is now being tried at the corner of Catherine Street, Strand, London. It is composed of crushed furnace slag and granite, with Portland cement formed into a paste by an alkaline solution. The mass is laid down two or three inches thick on a substratum of rough ballast. It sets rapidly, and is ready for foot traffic in twelve hours or so. The stone is fire-proof as well as water-proof, and very resisting to pressure, it having successfully withstood a compression of twenty tons per square inch. Owing to the vitrified particles of slag in the mass the surface is not slippery, and can be made of various degrees of roughness. Several of the leading railway companies have adopted it for stables and station platforms, and

it has been adopted in some provincial towns, notably Lowestoft, for paving purposes. Pavings of the stone are also to be seen in Paddington Street and Jermyn Street.

Electricity in Dentistry.

An American dentist of Chicago has employed the electric current successfully for bleaching discoloured teeth by the liberation of nascent oxygen from acidulated water placed in the cavity of the tooth. His plan is to insert a fine platinum needle into the cavity, while holding another in contact with an out-of-the-way edge of the cavity. The needles are connected respectively to the positive and negative poles of a small battery, and the current passing through the acidulated water, with which the tooth is flooded, decomposes it, liberating oxygen, which attacks the colouring matter of the tooth and bleaches it. Aromatised acid is used because it has been found not to destroy the structure of the tooth. This dentist also employs the same means to disinfect the cavities of devitalised teeth by the production of nascent oxygen. The electric current is now further utilised in dentistry for making copper casts of the mouth by electrotyping. These casts are afterwards backed with plaster and serve as moulds for gelatinoid palates. Gold palates a little tarnished are also brought to a bright colour by coating them electrically with a layer of pure gold.

The Deepest Bore-Hole.

The deepest bore-hole believed to have yet been made is one at the village of Schladebach, near the railway between Leipsig and Corbetha. It was pierced with diamond drills for the purpose of ascertaining if there was coal below. The depth is 4,560 ft., and some 3½ years have been occupied in boring it. The cost of the work, which was instituted by the Prussian Government, has been £5,000. The temperature at the bottom of the bore is 48° C., a fact which tends to confirm the observation that the temperature rises as we descend into the earth.

Steel-Toothed Belting.

A novelty in the way of belting for transmitting power by means of pulleys was shown at the International Inventions Exhibition by a firm of engineers. It consists of steel belting of a corrugated cross-section; and to insure a grip between the belt and

pulley a ring of the corrugated steel is fastened round the driving surface of the pulley. There is said to be less slackness and slipping of the belt by the new plan, which was shown in connection with a Pilsen dynamo and a Griffin gas-engine; but it is applicable to a variety of apparatus, including foot-lathes, sewing machines, and so on.

Transmission of Power by Electricity.

A very important trial in transmitting mechanical power by the electric current has recently been made by M. Marcel Deprez, between Paris and Creil, over a distance of no less than 56 kilometres (about 30 miles). The machinery consisted of a generating dynamo, stationed at Creil, and a receiving dynamo, also stationed there for convenience, the wire connecting the two running all the way to Paris and back, a distance of 122 kilometres, and conveying the current all that distance from the generating to the receiving machine, which it set in motion. The mere fact that both machines were together has nothing to do with the success of the experiment, because one might just as well have been at Creil and the other at Paris, only for the sake of making the necessary measurement it was found easiest to have both

machines together. The wire was a copper strand equivalent to a single copper wire of five millimetres in diameter, and it had a resistance of 100 ohms at a temperature of 150° Centigrade. The generating dynamo had two armatures revolving in two distinct magnetic fields, each armature having an external diameter of 0.78 metres, and a resistance of 16½ ohms. The receiving dynamo was of similar make, each armature having an external diameter of 0.58 metres, and a resistance of 18 ohms. It turned out that the proportion of mechanical power transmitted by wire was from 47.7 to 53.4 per cent., or roughly one-half, so that half the steam or water power supplied at Creil might have been available for working machinery at Paris. There was little or no heating of the machines, and the experiment may be regarded as very satisfactory.

New Communications with West Africa.

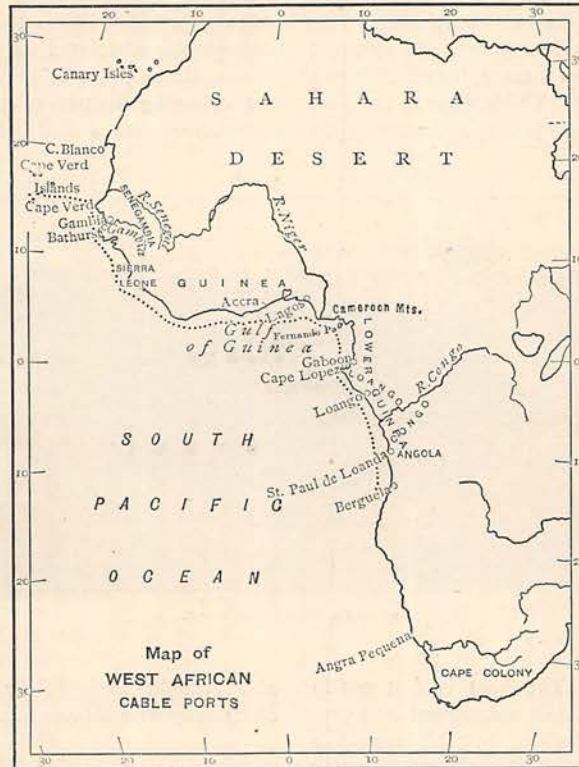
Before the end of the present year the coast of Western Africa will be well served by the electric cable, which will then—if all the proposed schemes be carried out—extend completely round the Dark Continent. The first important step in the new undertaking has been taken at the Cape Verd Islands, where the cable from Europe is already in working order. There is also a line viâ Cadiz to Senegal, north of Cape Verd. The new schemes include the project of uniting the Cape Verd Islands with the Senegal cable, and continuing the latter down the coast.

As will be perceived from the accompanying sketch-map, this extension is a very important one. The cable will be available at Sierra Leone, Accra, Lagos, Niger, Gaboon, Loanda, and the Congo. Besides these chief stations, the French settlements near Sierra Leone will be united with Europe by telegraph, as well as the Cameroons and Fernando Po. From St. Paul de Loanda it is also in contemplation to continue the line farther south; and the Cape Government intend to unite the Colony with the Portuguese West African possessions at Benguela. So an electric girdle will surround Africa, a most desirable chain for all the settlements, and particularly for our Cape

Colonies, which will be in communication with the mother country quite independently of Egypt, her disturbances and complications. In about sixteen months the West African lines will, it is believed, be completed.

A New Hygrometer.

A dew-point hygrometer has recently been devised, which depends on the observation that a coloured halo, like that sometimes seen round the moon, is noticeable on a plate-glass held between the eye and a light when the dew condenses on the plate. The apparatus consists of a tube closed by panes of glass, and the observer looks through the glass at a source of light. A thermometer records the temperature at which the halo forms.



NEW COMMUNICATIONS WITH WEST AFRICA.