

THE GATHERER.

A Hydrogen Lamp.

The well-known fact that a stream of pure hydrogen impinging on spongy platinum makes it red-hot has



been utilised in constructing the lamp we illustrate. The lamp consists of an outer jar, A, containing acidulated water, and hanging from the brass top, B, is a bell-shaped glass jar, F, without bottom, and closed at the top by a stop-cock, D. A small nozzle is attached to the stop-cock, and opposite is fixed a brass cap, C, containing a piece of spongy platinum. Inside the glass bell is a wire, on which is hung a piece of zinc, Z. The glass vessel, A, is filled to a depth of four inches with a mixture of one part pure sulphuric

acid to fourteen parts water. When the brass top is on, the bell-glass is full of air; but by pressing the lever, E, the air is let out, and the acid rises to the zinc, decomposing it and producing hydrogen. This gas is retained in the jar under pressure of the water, but on pressing down the lever it is projected on the platinum, which becomes white-hot for a time. The flame may be used to light candles, lamps, and so on.

A Steam Fishing Fleet.

A Yarmouth company have recently acquired two new specially-built steamers, to act as rapid carriers between the trawling fleet in the North Sea and the London Billingsgate Fish Market. The vessels are 128 feet long, 21 feet in beam, 11 feet 7 inches in hold, and have engines of 50 horse-power. They can travel at the rate of 11 knots per hour, average speed. The fish-hold is lined with a non-conductor of heat to keep it cool. Ice is taken out to the trawlers, and packed along with the fish in boxes, which are packed on board the steamers. Five iron trawling-boats have also been built for the same company, each 72 feet long by 19 feet broad, and 19 feet deep in the hold. They are fitted with steam capstans and winches for working the trawling-ropes.

Manganese in Plants.

Experiments of M. Maumené show that the metal manganese exists in wheat, rice, and a great variety of vegetables. Wheat contains $\frac{1}{10000}$ to $\frac{1}{15000}$ of its weight of the metal, which exists in it as a salt of an organic acid. It is also found in potatoes, beet-root, carrots, beans, peas, asparagus, apples, grapes, &c. The leaves of the young vine are very rich in it; so are the stones of apricots. The proportion in cacao is very great, as it is in coffee, tobacco, and tea. In fifty grammes of ash left from incinerating a kilogramme of tea, M. Maumené found five grammes of manganese.

Oranges, lemons, onions, &c., are vegetables containing no manganese. Many medicinal plants contain it: for example, cinchona (the source of quinine), white mustard, and the lichen *Roccella tinctoria*. Animal blood does not always contain it, but it is found in milk, bones, and hair. The blood, indeed, rejects it; and M. Maumené thinks that manganese and iron should not be administered together in medicine, as the iron is useful to the blood and the manganese is not wanted. Tea, coffee, and some other plants require abundance of manganese in the soil, and the failure of some plantations is attributable to a lack of it.

An Electric Chicken-Hatcher.

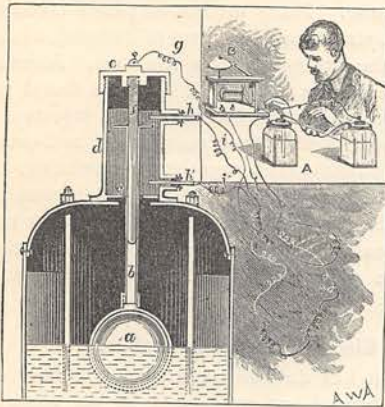
A Frenchman has devised an artificial hatcher of eggs, which is heated and controlled by the electric current. The heating is effected by a series of bare platinum wires made incandescent by the electric current. The heat of these burners keeps the temperature of the box or hatcher containing the eggs constant, for by means of a regulating thermometer the current can be cut off when the temperature becomes too high. Such a mercury thermometer can be made by making the rise of mercury "short circuit" or cross-connect the poles of the battery supplying the current when the column rises to a particular height. The short circuiting shunts the current off the platinum wires through the mercury. The application is a very interesting one, and presents no practical difficulties.

A Colour-Combiner.

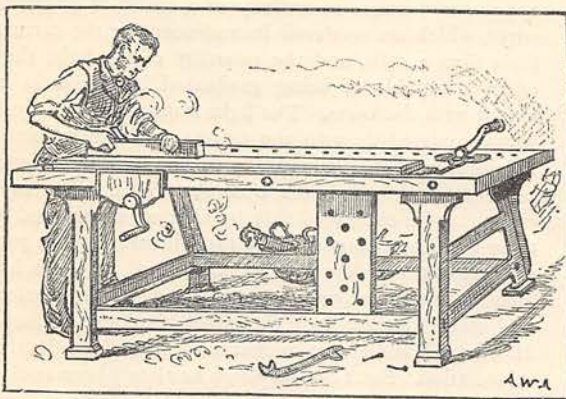
At a recent meeting of the Physical Society, Mr. Hoffert exhibited an ingenious apparatus for colour-synthesis and the study of colour-blindness. The apparatus consists essentially of a series of platinum wires, which are rendered incandescent by the current from Grove cells, and the intensity of the light they emit is capable of being graduated by rheostats in circuit with the wires. The light from several of these wires is passed through the prisms, and the refracted rays of a certain colour can be transmitted to the eyepiece through which the observer looks. The rays can either be compared side by side, or superposed so as to give compound colours, thus illustrating the production of tints. We may add that Lord Rayleigh has also invented a colour apparatus founded on refraction, and useful for measuring the extent of colour-blindness. It was exhibited at a recent meeting of the British Association. But Lord Rayleigh has lately been testing the eyes of his friends, and finds that many of them are more sensitive to red than himself, while others are abnormally sensitive to it. Ordinary colour-blindness consists in a total want of sensitiveness to red, but there have been cases in which the eye was insensitive to green. These new apparatus will probably lead to that scientific study of Daltonism which is much to be desired.

An Electric Water-Alarm.

Our illustration represents an electrical arrangement for ringing a bell whenever the water in a boiler rises too high or falls too low. It consists of a voltaic battery, A, and an electric bell, B, fixed in any convenient place, and a float, *a*, in the boiler connected to a metal tube, *b*, which rises perpendicularly through an aperture, *c*, in the shell of the boiler.



Over this aperture is a vertical chamber, *d*, having a rod, *f*, connected to the cap, *e*. The rod, *f*, passes down the tube, *b*, and the cap, *e*, is connected by a wire, *g*, to the bell B. On the float rising and falling, the tube, *b*, slides up and down over the rod *f*. Through the sides of the chamber, *d*, are introduced two contact-pieces, *h h'*, connected by a branching wire, *i i'*, to the battery A, thus helping to form the electric circuit. The lower piece, *h'*, is for low water; the upper, *h*, for high water. Now, when the water in the boiler rises, the float and tube, *b*, are carried up, and a flange of the tube, *b*, makes contact with the upper piece, *h*, when the level is too high. This completes the electric circuit and the bell rings. In the same way, when the level falls too low, the circuit is completed and the bell rung by the flange of *b* coming in contact with the piece *h'*.



A Portable Work-Bench.

Our engraving illustrates a neat and portable work-bench, specially designed for amateurs and practical mechanics. Every part of it can be disconnected and re-connected with the aid of an ordinary spanner. Being on metal supports and firmly bolted, it cannot

rack and get loose at the joints, as ordinary benches are apt to do. A bench-knife, shown in the figure, is added for holding wood during the process of planing or rebating, and it can be removed to any distance, or taken off the bench altogether.

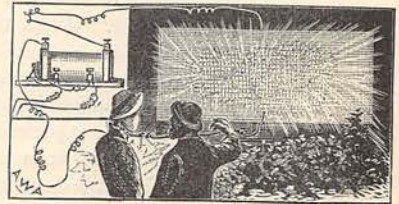
A Light-Reflecting Ventilator.

In a recent GATHERER we gave an account of a simple ventilating frame for flowers, and we have now to mention the light-reflecting ventilators of Mr. H. Gruenbaum, which are applicable to conservatories, railway or other coaches, as well as dwellings. In these, as in the frame before described, the in-coming air is so directed that no draught is possible, while the sides of the ventilator serve to reflect light into the interior.

Artificial Lightning.

A very simple way of getting long electric sparks, or mimic lightning, is due to Mr. Reynold Janney, of Wilmington, Ohio. Dry boards were fastened together to make a plane surface four feet long and three feet wide.

One side of this was varnished, and before it was dry Mr. Janney pressed over its entire surface sheets of tinfoil.



After letting it stand over-night to dry slightly, he cut with a sharp knife and ruler a series of lines across the foil about a quarter of an inch apart. Allowing it to dry some time longer, he cut another series of lines across these, thus cutting the interior squares. Connecting the poles of his coil to opposite ends of the board, a phenomenon of dazzling beauty was produced. Each time the circuit was broken, from six to twenty lines of sparks were seen traversing the foil between the poles of the coil, as shown in the figure. With a coil giving $4\frac{1}{2}$ -inch sparks in air, Mr. Janney obtained flashes ten feet long in the way described, and he considers it possible to obtain them from fifteen to twenty feet if the tinfoil were placed in a narrow strip along a wooden bar.

Vultures and Telephone Wires.

In Rio Janeiro, the beautiful and flourishing capital of Brazil, there is a scavenger bird of the vulture species which is permitted to infest the town by law because of its sanitary usefulness. This "aasgier," as it is called in Portuguese, has a habit of flying low over the house-tops, and, being a heavy bird, it causes much havoc among the telephone wires, either breaking them or becoming entangled and snared in them. The result is that a large staff of assistants is required by the telephone company to keep the lines in good working order.

There seems no remedy for the disorder except biding until the official birds learn that it is better to fly a little higher and over the wires, or until the wires can be carried underground.

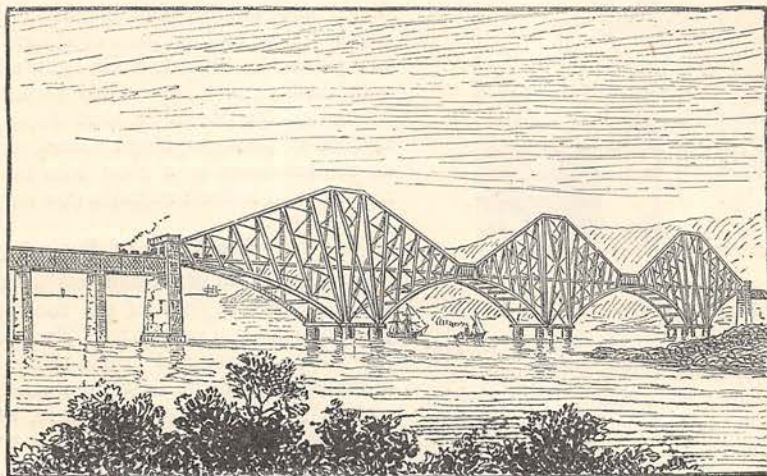
The Forth Bridge.

Our engraving will give a better idea than mere description of the general character of the great bridge now being erected over the Firth of Forth, between North and South Queensferry, on the Fife and Lothian shores. The works are proceeding rapidly, and are engaging a staff of from 900 to 1,200 men. The

at £100,000, and it is expected that six more years will be required to finish it, although the works are carried on day and night.

Self-Lighting Beacons.

In America a system of self-acting beacon-lights has been introduced. Each beacon is furnished with a reservoir of sheet-iron containing gas under a pressure of fifteen atmospheres, and in quantity sufficient to light the beacon for three months, at the end of which fresh supplies are delivered to the beacon. A clock-work mechanism installed in the beacon turns on and



THE FORTH BRIDGE.

works are being carried out at both shores, and on the intermediate island of Inchgarvie. On the north side, there will be a girder viaduct on stone piers 130 feet high; but the girders will be placed in position when the piers are only 30 feet high, and the masonry of the piers will be carried up 100 feet higher with the girders resting on the top. On the south side there will be a similar viaduct on nine piers, besides a great pier at the edge of the deep channel for the intermediate cantilever arches to rest upon as shown. Each cantilever arch will spring from four stone piers; and for the foundation of each of these, an immense caisson or hollow tower 61½ feet in diameter will be sunk in the bed of the estuary and filled in with concrete. Each cantilever will rise to a height of 350 feet above the piers, and stretch out an arm 650 feet long right and left of the centre, and support the framework of iron carrying the permanent way. The cantilevers are steel tubes, and the base part of one is now in course of construction at the workshops at South Queensferry. It is 150 feet long and 12 feet in diameter; there being ten steel plates 1¼ inch thick in its circumference. So large are the tubes composing the cantilevers, that as they are built up, the workshop is shifted along them. The cost of the construction is estimated

lights the gas at the hour fixed for the purpose. Several months' experience has shown the advantage of the plan, the only attendance being a watchman on the shore to see if the beacons are properly lighted.

Preserved Eggs.

Eggs, it is stated, may be preserved for a long time by rubbing over the shell with tallow or oil, in order to fill all the pores and so exclude the air, the presence of which would in due course make them go "wrong." Further, if the contents of an egg be placed on a plate and thoroughly dried in an oven, the whole will become hard and horny, and may be kept in this condition for years without showing any signs of badness, moisture as well as air being essential to the process of putrefaction. Eggs thus dried, having been soaked in cold water and then boiled, will hardly differ, it is said, in flavour and taste from an ordinary boiled egg.

Velocity of Sound in Air.

Mr. Blaikley, an English physicist, has made some further experiments on the velocity of sound in tubes of small bore. He finds that the velocity decreases with the bore in a fairly regular manner: thus, with a

tube of 11.4 millimetres in diameter, the velocity was only 324.28 metres per second; whereas, with a tube 88.2 millimetres in diameter, the velocity was 330.13 metres, or nearly that of free air. Mr. Blaikley finds that the best pipes or tubes to use for his purpose are those in which the upper proper tones are in harmonic order, or, better still, those in which they are far removed from the harmonic order—that is to say, dissonant.

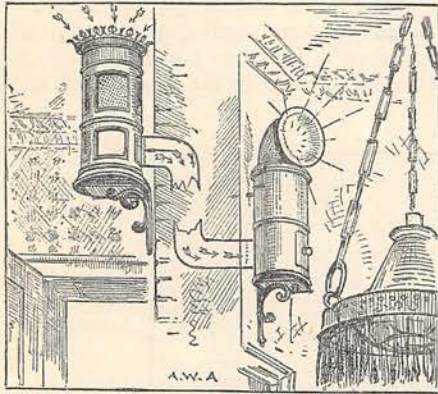


FIG. 1.

The Aërophor.

The "Aërophor," exhibited at the Health Exhibition, consists, as shown in the above figure, of a light iron casing or cylinder, communicating by an open mouth with the room to be ventilated or supplied with air, and by a wide pipe with the outer air or quarter from which the fresh supply is drawn. The air current is maintained by a revolving screw inside the cylinder. This screw is revolved by a small turbine, acted on by three jets of water, steam, or compressed air. These three jets are shown in Fig. 2, at C C C, acting upon small buckets or catchers on the periphery of the turbine. Moisture or disinfectants can be added to the air in the form of spray by means of a special supplementary apparatus. The Aërophor works silently, and such is its capacity that a million cubic feet of fresh air can be supplied by it with an expenditure of one horse-power.

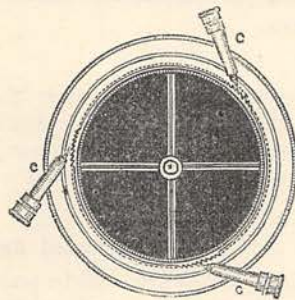


FIG. 2.

Colours Photographed in Natural Shades.

Professor H. W. Vogel has been making some fairly successful experiments on photographing objects in their natural shades, as an engraving would reproduce a coloured picture. The fact that the ordinary sensitive plates used in photography are chiefly affected by the more refrangible or blue rays, makes blue come

out white, and red or yellow appear as black, in an ordinary photograph. Dr. Vogel, thinking that sensitive collodion is affected only by the rays absorbed by it, succeeded in rendering his plates sensitive to yellow rays by alloying the silver coating with a substance capable of absorbing these rays. Though he succeeded in photographing the yellow of the solar spectrum at first, he failed in getting the fainter yellow of pigments until he tried eosine and its derivatives mixed in due proportion in conjunction with dry gelatine plates. Though the yellow of an object came out clearly on the photograph, the blue was still unnaturally bright. He corrected this, however, by interposing a yellow glass between the camera and the object, so as to tone down the blue without affecting the yellow. Dr. Vogel now obtains photographs in which the blue, green, yellow, and red parts of objects are imitated in the picture as regards their light and shade effect with fidelity; and some of his plates have been exhibited to the Berlin Physical Society. This direct method of photographing coloured pictures or objects as monochromes is a great step in advance of the artificial and indirect methods now employed.

The Value of Sweepings.

An American gentleman has estimated that the value of the sweepings of the floor of a goldsmith's workshop become worth about £30 per square foot in ten years. A tub, used in one of these workshops as a receptacle for the dust from one polishing lathe, yielded £10 in a year. Of course, where such valuable prizes are to be got from "dust," tricks are not wanting to secure them. It is said that the workmen sometimes oil their hair, and then run their dusty fingers through it, and that the gold-dust which then adheres to the hair is afterwards washed out. One man carried off in a few weeks, on the moistened tip of his finger, £6 worth of gold-filings.

Electricity and Vine-Growing.

Vine-growers in France have adopted the practice of protecting their vines on cold nights by fires of brushwood, which give off clouds of warm smoke. The suggestion has been made that these fires should be lighted by an electric current as mines are now exploded. The proper time could then be chosen for lighting them all at once, when the temperature required it; and watchers in the fields would be unnecessary.

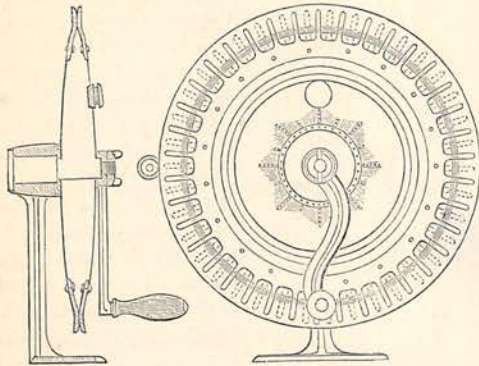
Soldering Aluminium.

Aluminium is a very useful metal, partly because of its lightness; but it has seldom been employed in the mechanic and electric arts, because it could not be soldered. M. Bourbonze, a French engineer, has, however, found a way of soldering it. His plan is to use a solder of tin, bismuth, and aluminium. For parts to be hammered and fashioned afterwards, the best proportions are forty-five parts of tin and ten parts of aluminium. No bismuth is required. For work requiring no shaping by heat, less aluminium will suffice. The solder can be applied with a hot iron or

a flame. No flux or prior preparation of the surfaces to be joined is necessary, and it is sufficient to spread the solder with the iron. When aluminium has to be soldered to another sort of metal, it is best to coat the part of the other metal to be soldered with pure tin, then solder with the alloy in the ordinary way.

A New Knife-Cleaner.

The figures represent an elevation and section of a new knife-cleaner, called by its inventors the "Sun"



cleaner. The section explains the working of the machine, the knife-blade being inserted between the leather jaws of the edge, and the handle turned. The disk or cleaner is supported on a light cast-iron standard. The polishing powder is applied to the leather through a hole in the face of the front spring. Any portion of the blade particularly soiled can be cleaned by itself. Examples of the machine are exhibited in the Health Exhibition.

Bed Railway Carriages.

The Great Southern and Western Railway Company of Ireland have introduced some new first-class carriages, with lavatories, and seats convertible into beds, for the night mails between Dublin and Cork. The convertible seats occupy about three-fourths of the width of the whole compartment, and, when turned completely over, disclose soft woollen mattresses and pillow, together with a comfortable rug.

A Pneumatic Light.

A new system of lighting has been installed for some time past at the Café de Paris, of the Avenue de l'Opéra. The inventor is M. Victor Popp, and the plan consists in burning a mixture of gas forced by pneumatic pressure against a gauze basket or cap of platinum wire. The figure illustrates the burner adopted, N being the platinum basket and D the pipe conveying the gaseous mixture. The platinum wire glows white-hot, and is exceedingly brilliant. We have already referred in the GATHERER to a similar process of M. Clammond; but Mr. Popp's system includes some improvements, which make it very practicable.



Paper Pails.

A paper factory in Syracuse, N. Y., United States, is now manufacturing paper pails at the rate of 500 a day. They are made by steaming rags and paper waste in vats for a few hours, then "beating" them in troughs with revolving knives, which reduce the rags to pulp. Paper pulp is then run in and blended with the rag pulp, and the mixture formed into pails on wooden moulds covered with zinc, and pressed on a machine like a silk-hat shaper. The pails are dried in a room kept at a temperature of 150° Fahr., and afterwards "ironed" to smooth the sides. The bottom and handle are then added, and a waterproof composition painted over.

An Earthquake Recorder.

Professor J. A. Ewing, of Dundee, has devised the apparatus illustrated below for measuring earthquake shocks, and it has been applied to this purpose in Japan. It consists of a light steel triangle, *a*, supported at *b* and *c* by two steel points working in an agate V-groove and a conical hole. The triangle carries a metal mass, pivoted at *d* on a vertical axis which passes through the "centre of percussion" of the frame. The tracer—which serves to magnify as well as to record the motion—is a straw tipped with steel, and attached to the pendulum by a horizontal joint at *e*, which allows it to accommodate itself to any slight inequalities in the surface of a glass plate on which its distant end rests. A portion of its weight is borne by a spring, adjustable by a clamp, by which the pressure of the tracer on the glass plate is reduced until it is just sufficient to scratch off the lamp-black or soot with which the glass is coated. The line traced by the point on the sooty surface is a record of the earth-tremor. In a country like Japan, where nearly a hundred earthquakes take place annually, such an instrument enables the engineer and architect to measure the extent of oscillation their structures are likely to suffer.



Manganese-Steel.

Manganese has long been used in the manufacture of steel, but until the researches of Messrs. Hadfield, of Sheffield, not more than 1 per cent. was admitted. Indeed, it was believed that a higher percentage would impair the steel; but this has been shown to be an error. Messrs. Hadfield now make steel containing 10 or 12 per cent. of manganese, the former being used for armour-plating, the latter for steel tools and toys, while 11 per cent. is the proportion preferred for railway steel. The alloy is added by pouring rich ferro-manganese into the molten steel, and mixing the

two together, before running off into ingots. The steel thus formed is harder, stronger, denser, and tougher than most steel now made, even after it is forged and rolled. The last-mentioned processes are not essential to the preparation of the new steel, and thus much time and expense are saved. Nevertheless, manganese-steel can be so treated if desired. It is peculiarly tough and hard; the castings are remarkably free from flaws; it is said not to tarnish easily; and, curiously enough, not to be attracted by the magnet. Moreover, it is found that heating it to white heat, and quenching it in water, makes it soft, instead of harder as in the case of ordinary steel.

A Shooting-Screen.

The commanding officers of volunteer regiments very frequently complain that their men have insufficient facilities for rifle practice, owing to the difficulty of getting to and from proper shooting-ranges. The Morris shooting-screen introduced at Wimbledon this year will do much to overcome the difficulty, since it enables volunteers to practise in any drill-yard. The marksman stands a few paces from the screen and fires at the target, which is seen through a loophole in the screen. If the shot passes through the loophole, it will strike the target somewhere; but if not it strikes against the metal screen, and is deflected on to an iron curtain or the ground. There are tiers of such holes in each screen, to allow for different modes of shooting—standing up, kneeling, or lying down. With such a contrivance, rifle-ranges may be placed in very limited areas, and a large number of men trained to shoot well, at least at 200 yards. Mr. Morris has also invented a "shooting-tube," which fires a miniature projectile with a diminished charge of powder, thus training the novice at a saving of materials.

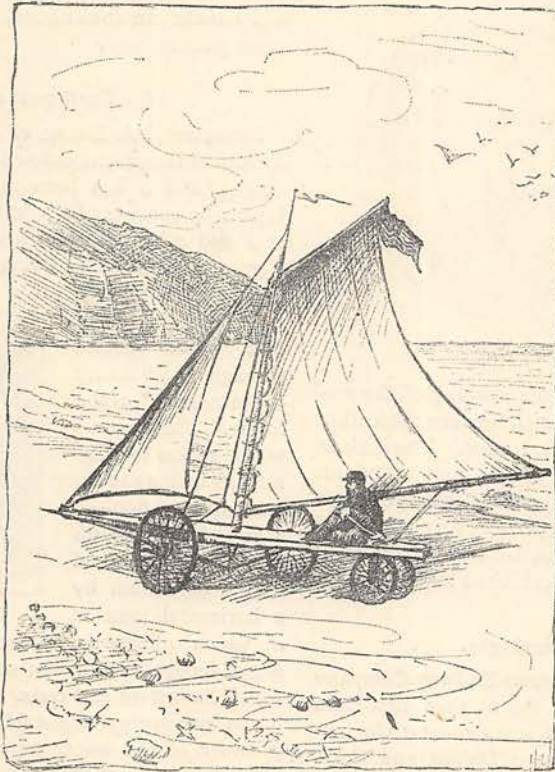
A Smokeless Engine.

A new kind of locomotive, the invention of M. Honigmann, is to be introduced on the St. Gothard Railway instead of those at present in use. The passage through the St. Gothard Tunnel occupies twenty minutes, and the smoke and steam given off by the locomotive are not always pleasant to travellers. Honigmann's engine gives off neither smoke nor steam.

It is provided with steam and boiling water from a stationary boiler at the end of the tunnel, and the steam thus taken in is sufficient to draw the train through the tunnel, while the waste steam is absorbed by an alkaline liquid in a special chamber.

A Sail-Waggon.

The engraving illustrates an American waggon propelled by sails like a ship, and in great part explains



A SAIL-WAGGON.

itself. The short axle of the rear wheels is pivoted by a king-bolt to the narrow end of the frame. To the short axle is attached a gear wheel, into which meshes a smaller wheel, secured to the lower end of a vertical shaft, and journaled in bearings fastened to the frame. Upon the upper end of this shaft is a hand-tiller, to guide the waggon. The speed is regulated by brakes on the front wheels, connected with an upright lever pivoted in the middle part of the frame, and provided at its upper end with a cross-head, so that it can be worked with hands or feet. The vehicle runs on an open plain, road, or sandy beach with considerable velocity.

A New Butter-Worker.

At the International Health Exhibition an ingenious butter-worker is shown, consisting of parts of two wooden cylinders, which are mounted in a frame, and by means of levers are made to move face to face through segments of circles. The butter is placed between these faces, and receives that squeezing motion which is so desirable, in preference to any grinding or tearing motion, tending to make the butter soft and greasy, and to destroy the firmness which is a sign of good quality. The "Springfield" butter-worker, also shown at the Exhibition, consists of a fluted roller working on a circular tray, or table. Both roller and tray revolve, thereby breaking up the butter between them and expressing the milk.

STORY COMPETITION.

Intending Competitors are reminded that September 1st, 1884, is the latest date for receiving MSS. The regulations for this and other Competitions were published in the June number.