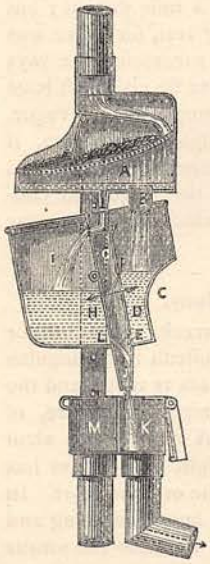
THE GATHERER.

Rain-Water Percolator.



The importance of rain-water for domestic purposes has recently been referred to in the "Gatherer," and a very useful apparatus for the purpose of rejecting the foul water which comes away from a roof at the beginning of a shower of rain, and allowing the pure water which flows off later to be stored in the tank, is that known as Buck's Patent Percolator, which directs the firstlings of the supply into a waste-pipe or separate tank for a certain time, then cants and turns the pure water into the storage-tank. This apparatus is represented in section in the accompanying figure, where A is the straining chamber, in which the rain-water coming from the inlet-pipe is strained through a perforated plate, which keeps back rubbish; and B is a pipe through which the strained water falls into the percolator or canting chamber C, which is hung on a pivot. This chamber is divided into two compartments—one, D, into which the rain-water first falls, and escapes from it by an orifice, E, into the waste-tank by the pipe M; another discharge-hole, F, is also provided, to prevent a too rapid filling of the chamber; and an overflow-pipe, G, is added, in case of storms. Now, when the rainfall exceeds the discharging capacity of the first orifice E, and rises in the compartment D, it is permitted to escape by an orifice, H, at the back of the overflow-pipe G, into the second compartment I, where it collects until its weight overbalances the percolator, and cants it from a vertical into an inclined position. The rain-water from the roof is by this time coming off pure, and this, together with that in the compartment I, which escapes by the orifice L, is directed into the storage-pipe K by the spout J. If the rain should, however, now increase to a storm, the percolator is canted back again to its old position by the filling up of the compartment D, and the water, which will again have become turbid, is directed as before into the waste-tank.

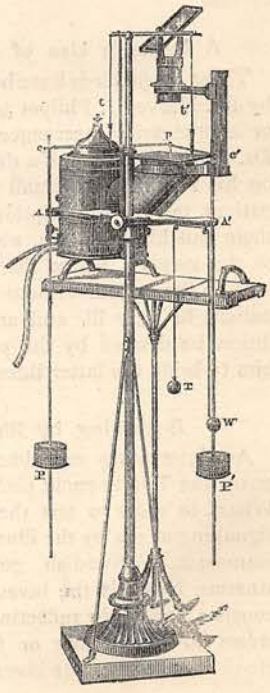
Novelties in Lighting.

An ingenious New Englander, Mr. Francis Maguire, of Cambridge, Mass., has conceived a "notion" which may be welcomed by those who have occasion to employ tall spectacular candles. Some of these are nearly three feet long, and as they are never burned continuously to an end, but are lighted from time to time, they grow shorter and shorter, whereas for purposes of display it is desirable to have them always of the full length each time they are used. To effect this, Mr. Maguire forms the main length of the stem of the candle solely of wax, that is without any wick, and into this he fits a tip of candle provided with a wick, by means of a tapering pin cast into the wax of the stem. The wasted tip can be easily replaced by a fresh one, for into the butt of each is cast a conical socket to fit the wooden pin. The annexed illustration shows the construction of the candle.

We had occasion lately to call attention to the invention of lamp-wicks made of spun glass, and we have now to describe their manufacture out of felt, by Mr. Aarkrog, of Copenhagen. The felt is first freed from all fat and other impurities by repeated boiling in water, then hung up until nearly dry, on which it is steeped in size. After this treatment it is completely dried under heavy smoothing-irons, roughened on the surface by the application of a very stiff brush, and finally cut up into strips for use. The advantages claimed for this new wicking are better light with less consumption of oil.

Tisley's Harmonograph.

The object of this fine instrument is to trace in permanent ink upon paper the elegant curves corresponding to sonorous vibrations, so well known under the name of Lissajou's figures. Its action is not limited to certain figures or classes of figures, for it will trace with equal ease the curves representing the musical intervals, and an endless variety of other curiously complex curves, corresponding to the gradual changes between unison and octave, octave and fifth, and, generally speaking, between the fundamental and its harmonies; while it also gives some changing phases which have no equivalent in music at all. The harmonograph was originally invented by Mr. Tisley, the London optician; but the improved form we illustrate is due to Mr. Queen, of Philadelphia. It consists of two pendulums, P P′, which are balanced on knife-edges, A A′, and continued



above their pivots to the points *c c'*, from which two brass arms project, and meet, when the pendulums are quiescent, at right angles in the point *p*, where

a glass pen filled with aniline ink is fixed over a sheet of cardboard or paper. Freedom of motion in all directions is given to the arms which grasp the pen by fitting them to the pendulums by ball-and-socket joints at *c c'*. Two threads, *t t'*, are fastened at their upper ends to delicate springs attached to the brass arms, and at their lower ends to an adjustable screw, by means of which the tracing-point *p* may be raised or lowered without disturbing the vibrations of the pendulums. Brass pans sliding upon the pendulums are intended to receive the weights or bobs P P', which can thus be placed at different heights, so that the relative rate of vibration of the two pendulums can be altered at will; W is a weight sliding upon its pendulum, counterpoised by a weight, T, and its function is to enable the manipulator to slightly change the relative rates of vibration, by a known amount, while the pendulums are in motion. The movements of the pendulums acting conjointly on the pen produce very intricate and beautiful curves, of which the above are a specimen. As in music the simplest harmony is the most agreeable to the ear, so with these figures the simpler the proportions between the vibrations of the pendulums, the more pleasing are the resultant curves.

A Doctor's Use of the Carrier Pigeon.

These useful birds have been employed for some time by Dr. Harvey J. Philpot as "unqualified assistants," or apothecaries' messengers. While out on practice Dr. Harvey takes half a dozen birds along with him on his rounds in a small basket, and after seeing a patient, ties the prescription round the neck of one of them and liberates him, when he flies straight home to the surgery, where the medicine is prepared and sent to the patient without loss of time. Should any patient be very ill, and an early report of his condition be desired by the physician, a bird is left with him to bring the latter tidings.

Signalling by Illuminated Steam.

An interesting experiment was tried recently on board the Trinity yacht *Galatea*, while lying off Trinity Wharf, in order to test the efficacy of a new mode of signalling at sea by the illumination of steam. Colonel Ramstedt, a Swedish gentleman formerly of the Russian Navy, is the inventor of this process, which consists merely in reflecting light from the escaping steam of the engine or from a specially-prepared cloud of vapour. The inventor employs a tinned iron dish, in which he burns the metal strontium, and directs the brilliant light upon the volumes of steam by means of a reflector. The steam of course appears as a glowing mass, whose tinge varies with the nature of the substance yielding the light. In this experiment the beam was distinctly seen from the pier at Blackwall Railway Station, a quarter of a mile distant; but it was considered hardly a trying test, for there was little steam at command. To be successful, the rays from the illuminated steam ought to be visible at least as far as the rays of signalling-lamps now in vogue. Were the electric light turned upon the steam, it would doubtless become more intensely luminous, and there would be an advantage in the large and conspicuous volume of the steam, which would appear like a veritable pillar of fire.

The Whistling Buoy.

Buoys anchored over sunken wrecks, or shoals, or submarine cables are often very difficult to distinguish by day, even with glasses, if the sea is rough and the weather thick; while on dark nights they are, of course, quite indistinguishable. A buoy which shall announce its whereabouts by a light or a sound has therefore a great advantage over the ordinary sort. In the Courtenay automatic whistling buoy, the rising and sinking of the buoy on the waves is made the means of compressing air and blowing a whistle which can be heard for miles. These buoys have recently been tested by the French Lighthouse Board, and recommended to the Ministry of Marine for adoption in France. The Chamber of Commerce, and the pilots and captains consulted, all agreed that they are of great service; but some natural opposition to them has been forthcoming from people living within the range of the whistles. The mechanism of the whistle is very simple; and as it is liable to damage from collision with ships and boats, the inventor has enclosed it in a protective gallery. Wind, ground-sweils, and moisture in the air, all increase the penetrative power of the whistle, provided they are not excessive, owing probably to increased compression of the air in the sounding chamber. The intervals of silence between the successive whistles can be graduated in length as easily as the intervals between the flashes of revolving lights, so that each buoy may have its distinctive call, and no confusion may be occasioned among mariners or boatmen when a number of buoys are moored in the same neighbourhood. In fact, if need were, each buoy could be made to sound a distinctive letter or word, according to the Morse telegraphic alphabet of signals. We understand that one of these buoys is to be tried on the north-east corner of the Goodwin Sands.

Fireless Locomotives.

For underground railways and tramways through cities, where the smoke from the furnace of ordinary locomotives is very objectionable, the old device of fireless locomotives offers obvious advantages, and it is being at present revived and tested on a practicable scale. A fireless locomotive is one which depends

for its supply of steam upon a store of hot water carried in a suitable reservoir, and heated at the commencement of each journey to the temperature which corresponds to that of steam of a pressure of about 200 lbs. on the square inch. According to a recent improvement of M. Léon Francq, the water is not renewed in the reservoir of the locomotive before starting on each trip, but is simply re-heated by injecting steam at high pressure. M. Francq's locomotives have been for some years at work on the tramway from St. Augustin to Neuilly, at Paris ; but a more perfect engine of its kind has recently been introduced on the railway between Rueil and Marly-le-Roi. For this purpose there is a fixed boiler at the intermediate station of Port Marly, and the engine is charged from it every quarter of an hour by means of a flexible pipe. Four engines can be charged in this way in an hour. The weight of the train is nineteen tons, and the distance from Rueil to Port Marly is nearly five miles, so that the longest journey performed by the engine without replenishment is about ten miles.

A Practical Calculating Machine.

As a means of saving mental fatigue in laborious computations, the calculating machine is a useful contrivance which deserves to be better known and more often resorted to. One of the best is the arithmometer of M. Thomas, of Colmar, which has recently been so improved that the product of the number 99,999,999 by itself can be obtained from it in twenty-four seconds, while the product of the number formed of ten nines by itself is given in twenty-eight seconds. The machine in question is well adapted for such complex calculations as cubages, trigonometrical formulæ, estimates, &c., and dispenses with the use of logarithms, whilst for the construction of tables and ready reckoners it is invaluable. Its employment is rapidly extending, not only in France, but in other countries, and among other establishments which now use it may be mentioned the Magasins du Louvre, the offices of the Artillery Service, the Observatory, the Ecole Polytechnique, and various assurance and railway companies.

An Automatic Ventilator.

One useful device shown at the Croydon Sanitary Congress was Symond's automatic ventilator for churches, hospitals, halls, offices, dwelling-houses, and vineries, in which it is desired to maintain a uniform temperature. By means of a mercury thermometer, which closes an electric circuit when the mercury mounts to a particular degree of temperature, the ventilator is opened, and the out-rush of heated air cools the room until the mercury falls below the required degree, when the electric circuit is again broken and the ventilator opens as before. The action is quite regular as long as the apparatus—which is very simple—is kept in good order. Both when opened and closed the ventilator is locked, and it is only influenced by a definite small variation of temperature.

A Little-known Test for Health.

A distinguished German *savan*, Professor Jäger, has recently published the results of his highly original studies on what constitutes sound health, and how best it may be attained and preserved. Increase in the proportion of water in the tissues and humours of the body he considers to be one of the chief factors in liability to illness. When as much water as possible is given off by the lungs and skin, and when its accumulation is, as far as may be, provided against, tendency to disease has been greatly diminished. Hence we see at a glance why it is better to wear close-fitting woollen clothing, why gymnastic exercises exciting free perspiration are beneficial, why it is wise to use hot drinks and highly-seasoned food in illness, and why thorough ventilation of sitting and bed-rooms, by preventing moisture from being present in any great quantity in the air, is one of the most valuable of sanitary laws. A man's specific gravity, Professor Jäger maintains, is a good criterion of his strength of constitution, his capacity for work, and his power of resisting disease.

A New Method of Raising Sunken Ships.

An Austrian engineer has made a successful trial of an invention which might be adopted with advantage on our coasts. In an empty balloon, a bottle containing sulphuric acid, surrounded by Bulluch's salt, is firmly fixed. This balloon is then fixed to the object to be raised from the depths of the sea. By turning a stop-cock the sulphuric acid is liberated, and mingling with the salt, produces carbonic acid gas, which ascends into the balloon. The machine rises, and it is evident that by increasing the volume of gas the balloon (or balloons) will raise very heavy objects. In the experiment lately made near Berlin—on the Plötzen Lake—a small vessel was thus brought to the surface. In a second experiment five heavy sacks were let down ; a diver attached the balloon tackle to them, turned the tap, and the buoyancy of the gas was sufficient to bring the sacks to the surface together. So far the invention may be pronounced a success. It yet remains to be proved with weightier objects at greater depths before an absolutely favourable verdict can be recorded.

A Steam-Sledge.

The engraving on the next page represents a small steam-engine which has been designed by Mr. J. W. Cayser, of 50, Lansdowne Gardens, Clapham Road, for running on ice or frozen ground in Canada or other cold countries where sledges and ice-boats are the usual means of transport during the winter season. It is simply a locomotive with its leading and trailing wheels replaced by skids or skates of iron, as shown. The driving wheels are in their usual position, and have projections on their tyres to enable them to grip the ice ; and the engine is guided by a steering wheel in the driver's cabin, which directs the leading skids. The boiler is thickly mantled in felt and wood to exclude the cold. Cast iron is avoided as much as

possible in its construction, so as to lessen the chances of fracture by brittleness due to the low temperature. The drivers are completely sheltered, and their cabin is fitted with revolving shutter-doors. Such an engine, if made thoroughly practicable, would of course do many times the work of the ordinary horse conveyances now in vogue.

An Invulnerable Ship.

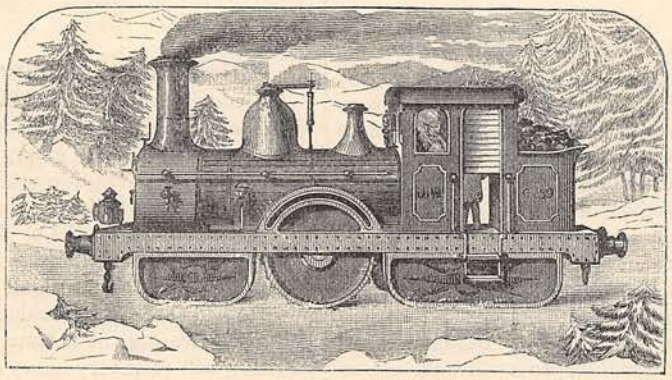
It is said that there is in process of construction a a vessel of war that is to be proof against all attacks of enemies, excepting only the assaults of torpedoes. The ship will have an armoured deck shaped like the back of a tortoise, with sharp edges all round so as to present an effectual guard from the onslaught of the ram. Owing to the particular sloping form of the above and below water surface, shot would glance off without doing any harm, vertical fire or battering from above at close quarters being the only kind of attack which would require to be dealt with seriously. This new and mysterious war-ship is to be armed with 100-ton guns mounted upon the disappearing system, and with apparatus for discharging torpedoes, so she will be equally serviceable and formidable for offence or defence. To all appearance the vessel will be like an ordinary ship, except in breadth of beam, the tortoise-shaped back being covered by a temporary deck, containing the cabins and other apartments, which would be abandoned in action, and might indeed be demolished without injuring the vital part of the ship. It remains, however, to be seen whether this unassailable war-ship will ever see the light of day.

A Salt Extractor.

The "salt extractor" is an ingenious application of science made use of by the navy for improving diet on board ship, and more especially the sailors' pea-soup. Much of the liquor that comes from boiling "salt junk" or "salt pork" has to be thrown away by the ship's cook, for unless sailors choose to eat very salt soup, nothing else can be done with the boilings, on account of the great amount of salt they contain. Mr. Baden Pritchard, F.C.S., of the Royal Arsenal, Woolwich, has suggested the construction of a "salt extractor," which is something in shape and action like the chemist's dialyser. The salt liquor is placed in a utensil having a membrane diaphragm, and this utensil is put into a pan of cold water. Gradually the salt passes through the membrane, by the law of diffusion, into the cold water, and thus the soup or boilings are deprived of their superfluous salt and become edible. The "salt extractor" is obviously as useful to the housewife as to the ship's cook, and recently a simple form of it has been made, specially adapted to the kitchen, a novelty that attracted much attention at the recent Dairy Show.

Can we see Sound?

It has been demonstrated on various occasions that sound-waves of different quality produce forms of various shapes, but this important fact is shown in a novel and interesting manner by a new instrument which has been invented, called the Phoneidoscope. The Phoneidoscope consists of a cylindrical L-shaped brass tube, to the horizontal portion of which is attached an india-rubber tube and a wooden mouthpiece. At the termination of the vertical part of the instrument is a blackened brass disc, in which is an aperture. If the disc be now covered with a thin coating of soap and water similar to the preparation used in blowing soap bubbles, and a voice or instrument be sounded close to the mouthpiece, a curious effect can be perceived in the soap film at the other end of the instrument. The vibration of the molecules of air in the tube is transferred to the film, and bands of rainbow-tinted colour become apparent, varying in form as the voice or instrument changes, and assuming an endless variety of patterns. Change of pitch produces a noticeable alteration in the forms, and the same notes on different instruments are marked by variations in the patterns on the soap solution, the colours in which, as the tenuity of the film increases, become marvellously beautiful.



STEAM-SLEDGE.

A New Disinfectant.

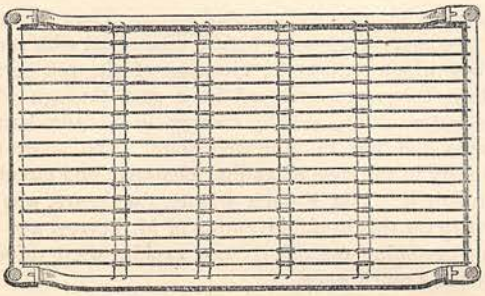
Dr. Kingsett has placed before the public a new disinfectant, which is said to be well suited for use in the household. Its preparation appears to be simple enough, though doubtless it requires to be carried out upon a somewhat extensive scale. Russian turpentine and water are placed in large earthenware jars surrounded by hot water. Air is next forced through the mixture for 300 hours continuously, with the result of decomposing the turpentine and forming a watery solution of the substance. After evaporation the material is packed in tin cans, and in this form it consists of a light brown powder of agreeable odour, non-poisonous, and possessed to a very high degree of the property of either stopping putrefactive changes or preventing them altogether.

Reading by Electric Light.

The penetrating power and splendour of the electric light has been strikingly illustrated at the fashionable American watering-place, Saratoga Springs, New York, where a single Maxim electric lamp generated a beam of light which was directed by reflectors to a place called Ballston Spa, seven and a half miles distant, and there enabled the spectators to read ordinary print and note their watches by its light.

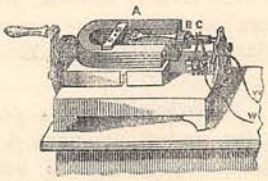
A New Spring Mattress.

The ordinary spring mattress has its advantages in point of health, cleanliness, and durability over the ordinary hair mattress ; but it has the uncomfortable defect of sinking in the middle when two persons sleep together. The form of mattress which we illustrate is, however, devoid of this fault, and from its simplicity of construction, variety of shape, and portability, it is perhaps the best of its kind. The framework may be of polished pitch-pine, or of iron, and may take a variety of shapes for camp, hospital, or home use, according to the requirements of the purchaser ; but the fundamental feature is the same in all. This is, of course, the mattress proper, or bed upon which the sleeper lies. It consists, as will be seen, of short lengths of galvanised iron chain, slung parallel to each other. These lengths or sections are divided from each other by strainers of coiled spring, which tighten the chains and preserve the elasticity of the bed. To fit it for use it requires only to be covered with a thin hair mattress.



Deprez's Electric Motor.

In electric lighting and electric engines the French are taking the lead just now, and, among other species of work, ploughing has been successfully accomplished at more than one place in that country during the past autumn by means of an electric current setting in motion the fly-wheel of an electric engine. The neatest and most economical of the new French electric engines is that of M. Marcel Deprez. Two sizes of this apparatus are made, a large and a small; but both are alike in shape and principle. It is the smaller type, suitable for driving a sewing-machine, coffee-mill, or other household appliance, which we illustrate, on a scale one-fourth of its natural size. The motor consists (as shown) of a thick steel horse-shoe magnet, A, built up of thinner magnets, and therefore very powerful; between the poles of the magnet a "Siemens armature," B, or cylinder of soft iron, nicked out longitudinally and coiled in the groove with silk-insulated



copper-wire, is mounted on an axle. The two ends of this coil of wire are connected to a "commutator," or current-changer, C, against which two upright wire brushes rub, as in the Gramme dynamo-electric machine, recently described in these pages. The wires W W' bring the propelling current from the generating battery to these wire brushes, from whence it flows through the coil of the armature, and in its passage magnetises the soft iron core of the latter. The attraction and repulsion of the opposite poles of the steel or permanent magnet on this electro-magnet thereupon cause the latter to rotate; and by adjusting the commutator this rotation can be kept up at a greater or less velocity by properly "making and breaking" the electric current. The normal velocity of the armature, in this pattern, is 3,000 turns per minute, and this corresponds to a velocity of the pulley which it drives of 100 turns per minute. With a battery of four Ruhmkorff cells joined up to give an intense current, this pigmy motor develops over a kilogramme of work.

An Electric Station-Sign for Railway Trains.

Those railway porters whose duty it is to announce the name of the station at which a train draws up are, as a rule, not conspicuous for the beauty and distinctness of their official articulation ; and railway passengers are often disturbed and alarmed lest they should fail to catch the call, and thereby miss their landing place. Some improvement in this particular is desirable, and the public will be disposed to welcome the contrivance of Mr. F. M. Rogers, engineer, Moorgate Station Buildings, London, by which he seeks to indicate the name of the station on a dial-plate in

every carriage of the train by means of electricity, so that the travellers may see for themselves where they are. A dial marked with the names of all the stations on the route is to be fitted up in each compartment in a conspicuous place, and a pointer like a clock-hand will move by the electric current round the dial, and stop at the proper station. The hand will be actuated by the train itself as it enters the station in the following manner:—Upon the under side of the step-board or tread of the first carriage of the train there will be a small pivoted arm connected with a battery or other source of electricity, and as the train enters the station this arm will strike against a peg inserted under the edge of the platform. The arm will by this be pressed back so as to complete an electric circuit, and a current will flow through all the indicating instruments in the train, shifting their pointers forward to the proper station on the dial. The arrangement is especially well adapted to the metropolitan underground lines, where little time is allowed passengers to get out, and where the carriages are permanently coupled up, and constantly travel the same road.

Artificial Onyx.

A process for converting common agate into the beautiful-banded onyx-stone has been recently invented in Germany. The agate is first coloured red by immersion for a week or more in a corrosive solution of iron in aquafortis. The places to be blanched are then impregnated for the same length of time with a corrosive solution of one part carbonate of potash and one part caustic potash dissolved in water. After that, the stones are dried for a week at a moderate warmth, and finally exposed in a closed earthenware vessel to the high temperature of a red-hot furnace.

A Resonant Tuning-Fork.

The ingenious Mr. Edison, who seems to improve every instrument he directs his attention to, has devised a tuning-fork which is self-resonant, and does not require a special box or tube to be attached. The new fork is made by splitting a thick bell-metal tube, which has one end closed, through the centre nearly to the closed end. This divides the tube into semi-cylindrical prongs, which enclose a column of resonant air between them.

A New Industry.

A discovery has lately been made which seems likely to render our peat-bogs much more valuable than they have yet been.

It has been found that by charring peat in superheated steam a very valuable product—charcoal—is obtained. In manufacturing peat-charcoal, the raw peat is made into square bricks, and in this convenient form can be utilised for many agricultural and sanitary purposes. It can be used with advantage for fertilising exhausted soils, and as it can already be produced at a moderate expense, a new manufacture of a most useful character will probably be shortly added to our industrial operations.

Ice made by means of Ether.

It is well known that ether can be made to vaporise so speedily as to produce intense cold, and if, when covered with water, its evaporation be assisted, it will escape so quickly as to lower the temperature of the water to freezing-point. Hence ether is often used in preparing freezing mixtures; and a machine has lately been constructed for making ice by means of the remarkable property to which we have briefly alluded. The apparatus consists of an engine and air-pump combined on the same bed-plate, a refrigerator, an ether condenser, a circulating pump, and one or more ice-boxes according to the quantity required—a steam-engine supplying the motive power. The two inlet passages of the air-pump are connected by a copper pipe, from which branches another copper pipe that places them in communication with the refrigerator, which is a felt-covered vessel of cylindrical shape, the tubes being made of copper and riveted to brass end-plates. The two outlet valves on the other side of the air-pump communicate with the ether condenser, which is similarly constructed to the refrigerator. The tubes communicate at each end with metal chambers, one of which serves as a receptacle for the air that enters the condenser. The whole is immersed in a wooden tank, through which a stream of water constantly passes for cooling and condensing the ether vapour. A vacuum is maintained by the air-pump in the refrigerator, vaporising the ether at a low temperature. This operation causes an absorption of heat, which reduces the temperature of the strong brine that is made to circulate through the tubes and ice-box. The ice-box is a tank of red deal, varnished inside, with partitions with holes in them to allow a slow circulation of the brine. Zinc moulds of different widths, according to the shapes of the blocks of ice required, are filled with pure water and suspended between the partitions.

Of Interest to English Mariners.

The French navy is at the present time enjoying the advantage of a valuable apparatus for use on board ship during sea-voyages. It is a distilling apparatus, the invention of M. Perroy, and supplies water which is at once fresh, inodorous, aërated, limpid, and potable. The contrivance is of three parts: No. 1 contains an aërator; No. 2 a refrigerator; No. 3 a case of animal charcoal. The steam passes through two cones of the aërator; the second cone encloses the first; air is drawn through the second and condenses the steam in an air-current, and thus supplies well-aërated water. The refrigerator is, of course, of a porous nature, connected with certain tubes which admit the cleaning of the refrigerator. These tubes are enclosed in a case through which sea-water flows, which, coming in at the bottom, leaves the top in a heated state. The water then appears in the case of animal charcoal, and circulates through it. The French frigate, *La Gloire*, was the first to try this useful invention of M. Perroy, and it is now becoming extensively and rapidly used throughout the French navy.