THE GATHERER.

Asbestos Paint.

The calamitous burning of the Ring Theatre at Vienna has turned universal attention to the prevention of fire in theatres; and a new paint, held to be fireproof, has been the subject of public experiments in London. The paint is mixed with asbestos, which is an incombustible material, and when woodwork or canvas is coated with it they are rendered uninflammable. It was demonstrated at these trials that flames died out on arriving at the painted surfaces, and pieces of gauze such as is used for theatrical dresses, and curtains, when treated with the paint were thrown on a hot fire without sustaining damage. The invention is likely to be valuable for theatres and public buildings. Moreover, asbestos being a non-conductor of electricity as well as heat, it is likely to be used in the insulation of electric lighting wires, to prevent accidental fires.

The Rain-band.

When a good pocket spectroscope is turned to the sky, say at a point 13° above the horizon, the spectrum of daylight obtained frequently shows a dark shading, or set of fine lines on the red side of the "double D" lines. This is known to spectroscopists as the "rain-band," for it indicates the presence of an excess of moisture in the atmosphere, and hence Professor Piazzi Smythe, Astronomer-Royal for Scotland, has found in it a means of foretelling rain. A great number of observations on the rain-band have been made recently by Mr. J. Rand Capron, F.R.A.S., with a McClean's star spectroscope, and the following are some of his results, which may prove useful to amateur meteorologists. The rain-band presages the approach of rain, and the darker it is, the sooner the rain is likely to come, and the greater the downpour. When the rain comes the band frequently becomes very faint. In summer, during a warm wind, the rain will be accompanied by a pronounced rain-band; in winter, during a cold wind, a moderate band will accompany the rain. A long-lasting faint band is pretty sure to be followed by rain; but a faint band seen upon fog does not necessarily presage rain. The ozone test and rain-band are usually in accord, both being weak during cold winds and dry fogs, and both strong during warm winds and warm mists.

An Electric Power Meter.

An exceedingly ingenious and beautiful invention, in the form of a meter for measuring electric power—that is to say, the energy of an electric current—has been invented by Mr. C. Vernon Boys, of South Kensington Museum; and as it is likely to prove highly useful in connection with electric lighting, and the distribution of motive-power by means of electricity, a company is about to be formed to manufacture it. The invention is really a new "integrating machine" for summing up small quantities which may vary continually, and giving the total result at the end of any desired time. Mr. Boys' mechanical integrator belongs to the class known as "tangent" machines, and consists essentially of a small wheel or disc running along the surface of a drum or cylinder. When the wheel runs straight along the drum parallel to its axis there is no rotation of the latter, but when the wheel is inclined to the axis the drum rotates, and the integral or sum for a given time is represented by the amount of rotation. Continuous action of the apparatus is secured by giving the drum a to-and-fro motion along its axis, so that when the wheel has travelled to one end of the cylinder it can travel back again. The new integrator is specially adapted for measuring forces which are either delicate or variable, such as the energy of an electric current. Mr. Boys adapts the apparatus for this purpose by causing the electric current to incline the wheel to the drum. This is done by passing the current through a coil of wire which is hung between two other fixed coils or solenoids, in such a way that the current causes an attraction between the fixed and movable coils. The latter is thus moved up and down according to the strength of the current, and this movement is in turn caused to incline the wheel on the drum. The total motion of the drum measures the energy of the current, and it can either be indicated by a dial or a diagram.

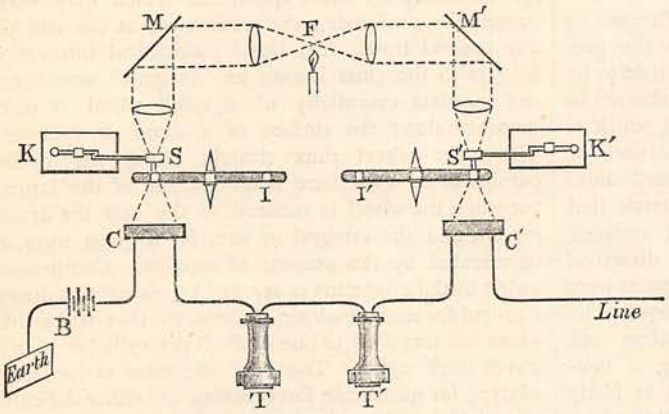
A New Musical Instrument.

A new musical instrument, styled the "Legnophone," has been brought out by Signor Lasina, of Rome. It resembles the *Madera y paya* so common in Spain, and is shaped like a triangle, but consists of forty-five small rods of white poplar-wood, each lying on six short straws standing on a deal plank or board. The performer strikes these rods with two sticks, as if they composed the key-board of a piano, and can, it is said, execute the most difficult piece of music.

The Teleradiophone.

The principle of the photophone has been ingeniously applied by M. Mercadier, the eminent French electrician, to furnish a means of telegraphing several messages along a single wire at once; and the apparatus he has devised is called by him the teleradiophone. The meaning of this name will be obvious when it is remembered that the principle of the photophone consists in allowing a ray of light to fall on a sensitive "selenium cell" in circuit with a voltaic battery and a speaking telephone, and eclipsing the ray at regular short intervals by means of a perforated disc or screen, interposed in the path of the ray, and rotated by a handle. The action of the light on the selenium cell is to increase the electric current flowing through the telephone, and hence if the light

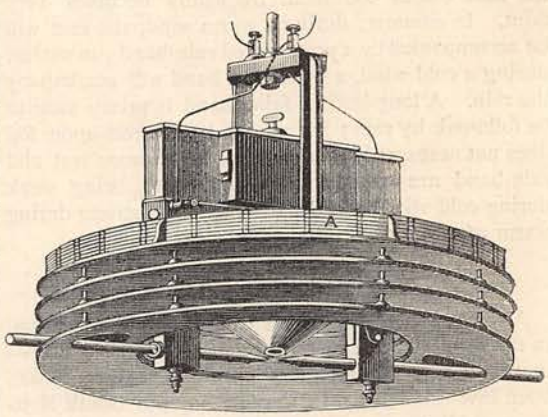
be eclipsed very often per second, the result will be that a pulsating current will flow through the telephone, and cause it to give out a musical note. The pitch of this note will depend on the number of times



per second the ray is interrupted, or in other words, on the speed at which the perforated disc is rotated. This is the photophone, or as M. Mercadier prefers to call it, the radiophone, because the heat-rays also play an important part in affecting sensitive substances like selenium. Now it is clear that the pulsating current set up in the selenium cell can be sent along a telegraph line to a distant place and there received on a telephone, and also that if the intermittent ray be again broken up by a second screen into periods of eclipse and shine, according to the Morse code of "dot and dash" signals, a telegraphic message can be sent along the wire; for in this way the receiving telephone can be made to give out long and short sounds, in the order of the code. These "dot and dash" sounds are interpreted by the clerk, as letters and words, just as the long and short clicks of the ordinary telegraphic "sounder" are thus understood. M. Mercadier's apparatus is represented in the figure, where C is a selenium cell, having one pole joined to the ground through a battery, B, and the other to a telephone, T. A ray of light from a candle or gas flame, F, is passed through a lens and reflected from a mirror, M, through another lens upon the selenium cell, C. In the path of this ray, however, there is interposed a pierced wheel or disc, I, rapidly rotated round an axle; and whenever a hole in the disc passes across the path of the ray, the light falls on the cell, and a pulse of current goes through the telephone into the telegraph "line." The wheel being constantly rotated, a series of rapid pulsations will thus enter the line and flow to the telephone at the distant station, and cause it to emit a note. But when the screen or shutter, S, is also interposed in the track of the ray by the operator sending a message in manipulating the key, K, according to the Morse code, the ray will be shut off altogether, and the note will cease in the telephone. Thus by working the key, K, in the ordinary way a clerk can send a teleradiophonic message. It is clear that there is no advantage in this plan over the ordinary and simpler telegraphs now in use, when it is used for a single message; but it lends itself to multiple telegraphy very easily, that is to say, it enables us to send a number of messages over the same wire simultaneously. For if we add a second mirror, M′, with a signalling key, K′, an eclipsing screen, I′, and a selenium cell, S′, with its telephone, T′, we shall be able to send another succession of pulses into the line, and these may be made to produce a note of different pitch to the other in a second receiving telephone at the distant stations. Thus several radiophonic transmitters may be employed to send separate messages into the line, and these can all be received on separate telephones. There is no fear of the messages confounding one another, for each telephone can be fitted with a resonating-box, which will enhance that particular note for which it is pitched, and no other. Moreover, messages can be sent in opposite directions by the same plan; each end of the line being fitted up with both radiophonic senders and telephonic receivers, as shown in the figure. The resonators sift the sounds, and give to the ear of each clerk the particular notes which form his message.

De Mersanne's Electric Lamp.

The electric lamp of M. de Mersanne, exhibited at the recent Paris Exhibition, and now being tried in the courts of the Tuileries, consists, as shown in the illustration, of two horizontal carbon rods carried by vertical holders. One of these holders is movable, and when the current is too weak in the "arc," and the light too feeble, owing to the points of the carbons being too far apart, the holder is moved so as to bring the carbon it carries nearer to the other. On the other hand, when the light is too strong, owing to the



carbons being too close, the same holder is caused to withdraw the movable carbon a little. This regulating action is effected by means of two electromagnets, one in circuit with the arc, and the other in a

"by-path" circuit derived from that again. The chief novelty in the De Mersanne lamp, however, is the diffusion of the light by means of ring-lenses of glass surrounding the arc. Besides these encircling refractors there is a conical reflector just over the arc, and a very uniform light is the result.

The Melograph.

Musical pieces of great beauty may sometimes be lost to the world for want of being recorded, and those who have a faculty for improvising, but lack the

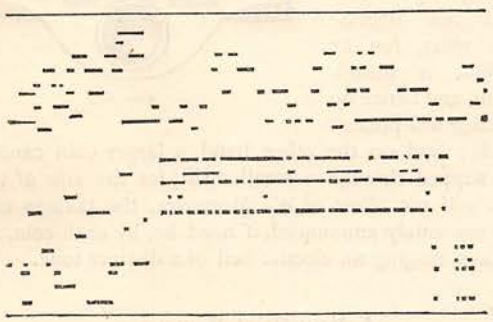


FIG. 1.

power of remembering or of writing their creations may find a desideratum in the "Melograph" or recording piano of M. Charpentier, a young French engineer. It consists of two parts—the piano or harmonium on which the piece is played, and the recording apparatus, which may be placed at any distance from the instrument. The key-board of the piano is made so that on depressing a key an electrical contact is made, and a current sent through a wire to the recorder, where it passes through an electro-magnet, and by attracting an iron armature works a lever, which presses a travelling band of paper against a plate with holes in it, in such a manner that a small revolving knife cuts a slot in the paper, whose length depends on the time the key is held down. There are fifty keys on the key-board, and fifty corresponding electro-magnets with their cutters, so that fifty different notes can be recorded. Fig. 1 is a specimen of the record thus obtained from a melograph exhibited in the recent Paris Electrical Exhibition. It resembles the card of a Jacquard loom, and just as the pattern of a web of cloth is produced from the card, so is the harmony of a piece of music or, in other words, the sound-pattern produced from the melographic roll. This is done by causing the roll to pass over a silver plate, while its upper surface is being traversed by a set of fifty silver brushes in circuit with a battery. When any brush passes a slot in the paper, it makes

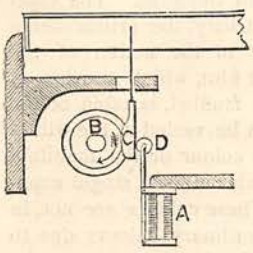


FIG. 2.

contact with the plate beneath and sends an electric current. This current goes to the corresponding one of fifty small electro-magnets placed under the keys of the piano, and by attracting the armature of the magnet, pulls down the key. This is done by means of the device shown in Fig. 2, where A is the small electro-magnet, and D is a little roller carried by one end of the armature. This roller presses against a wooden block, C, fixed under each key, and the block fits into a groove in a long steel cylinder, B, which rotates under the key-board. When the armature is attracted the roller presses the block into the groove, and the rotating cylinder draws it downwards, bringing the key with it, and if the instrument is a harmonium, producing the corresponding note as long as the contact lasts. It will be remembered that there are fifty of these blocks, and grooves in the cylinder, one to every key, and hence the whole of the piece of music on the roll can be played. Ordinary music, also, can be printed in the form of a "melogram," where the different kinds of note can be shown

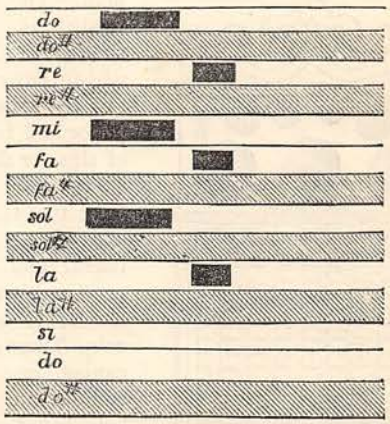


FIG. 3.

in tinted strips, and the melogram holes in black, as shown in Fig. 3, which will be recognised as the two chords, *do, mi, sol : re, fa, la*, of which the second would be represented by three black, and the first by three white.

Electricity and Porcelain-making.

The whiter sorts of porcelain are often spoiled by coloured spots due to traces of iron in the clay, and attempts have been made from time to time to extract these deleterious particles by means of magnetism, but somehow or other they have hitherto failed. Quite recently, however, MM. Pillivuyt and Co., of Mehun-sur-Yèvre, have adopted a plan which has proved successful at their works and also at the Faïencerie of Creil. This consists in employing two powerful electro-magnets excited by the current from a small Gramme dynamo-electric machine driven by a steam-engine. A thin box is placed between the poles of these powerful magnets, and the porcelain paste in a very fluid state is caused to flow past the sides of

the box, when the magnetic attraction separates out the iron particles, and causes them to adhere to the sides of the box, from which they are washed off twice a day by a jet of water. About a gramme of iron is thus extracted from 12 kilogrammes of paste, and from 500 to 600 kilogrammes of paste may be passed through a box in a day. While upon this subject we may add that porous porcelain is now manufactured by Herr Bucholz, of Charlottenburg, by mixing the clay with matters which burn up when the article is being baked, and leave the spaces they previously filled as empty pores. For this purpose grains of poor corn and thin rods of willow, birch, or hazel, cut up and pounded in a mill, are utilised.

A Check-Till.

A till which is a check upon the errors of cash-takers in a large shop, or store, has been devised by Mr. Hawkins. Fig. 1 is a general view of the till, which is in the form of a cabinet some 22 inches wide by 15 deep, and 5 feet high. The money-table is better shown in Fig. 2, which represents two open bowls for pence and two rows of slits for dropping silver into. The front row is for receiving moneys taken, and underneath each slit is a drawer to hold the coin. These drawers cannot be opened without an electric bell being rung in the manager's room, and hence any attempt to break the till is at once announced. The back row of slits are for receiving coins that have to be changed. The change is contained in small drawers placed in vertical rows above the slits, as shown in Fig. 1, and each drawer in a vertical row contains the required change for the coin it stands over. A narrow plate-glass front covers each vertical tier of drawers, and when the proper coin is dropped into the slit below this front slips down sufficiently to expose one drawer, which the cash-taker opens and relieves of its change. If a second coin of the same sort is dropped into the slit, the front slips down past another drawer, which can in turn be emptied of its change. In this way a complete check is got on the receipts and exchange of the day. If a clerk blunders by putting a smaller coin into the slit of a larger one in order to change it, the coin will not operate the glass, for its weight is insufficient, and hence no change will present itself; and, on the other hand, a larger coin cannot be slipped through a smaller slit, for the size of the slit will not allow of it. Moreover, the takings can be separately announced, if need be, by each coin, as it falls, ringing an electric bell of a distinct tone.

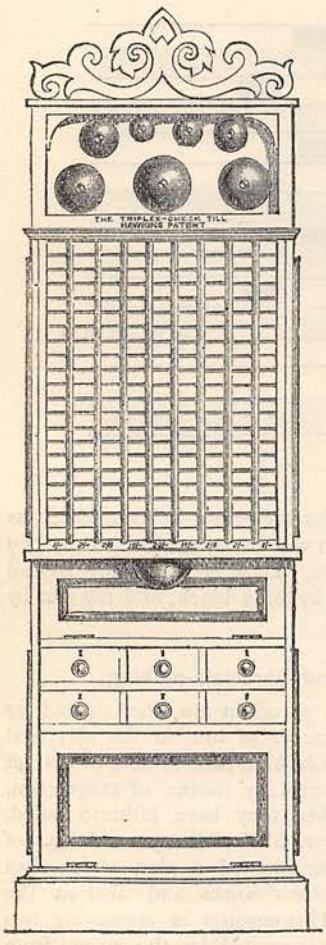


FIG. 1.

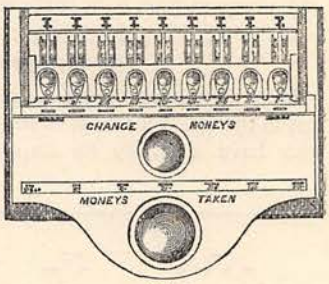


FIG. 2.

A New Paint Remover.

A new caustic preparation, made from potash and soda, for the purpose of removing paint from walls, woodwork, and metal, has been introduced. It is creamy in its nature, and when spread upon the paint saponifies it so rapidly that in a quarter of an hour all trace of the paint is gone. For delicate carvings the compound will prove highly useful, as there is nothing injurious in it. Weaker compositions of the same kind are prepared for simple cleaning purposes, and their cleansing power on greasy cloth is very striking. For cleaning cushions, railway carriages, and stuff seats, these soaps will be convenient, as they do not change the natural colour.

Making Metals Iridescent.

A process for coating all kinds of metal with thin iridescent films of copper has been brought out by M. Weil, who recently exhibited several specimens of his craft at the French Academy of Sciences. The coating is done by means of electricity, the article being exposed for an instant only to the action of the chemical bath. The adherent film, which consists of suboxides of copper, not yet studied, is often of the most beautiful tints, which can be varied at the will of the operator. Either a single colour or the manifold hues of iridescence can be produced by a single exposure to the electric action. These colours are not, in the opinion of M. Weil, the ordinary colours due to "thin plates" as discovered by Newton, but to the molecular texture of the suboxides of copper forming the coat, just as the colours of a bird's plumage may be due to the texture of the feathers. While on this subject we may also state that an excellent method of rendering tin plate crystalline in look is to slightly heat it and place it over a tub of water, then rub its surface

with a sponge which has been dipped in a solution of four parts of aquafortis, and two parts of distilled water holding one part of sal-ammoniac in solution. When the crystalline foliage is clearly brought out, the plate is to be plunged in cold water and gently washed with a feather or soft cotton, so as not to blemish the figures. If, instead of being wholly plunged in water, the plate is sprinkled with water-drops, finely variegated figures will be superposed upon the crystals.

Transporting Frozen Fish.

Tinned salmon is by no means so palatable as the fresh fish, and it is interesting to learn that a ship-load of this delicacy has been brought to London from Hudson's Bay without deterioration of quality. The vessel was the steam-yacht *Diana*, belonging to the Hudson's Bay Company, and she was fitted up with a patent dry-air refrigerator, designed by Mr. J. J. Coleman. The hold is air-tight and contains when full some 35 tons of fish, kept at a temperature of 22° Fahr., or 10° below the freezing point. The fish were caught in Hudson's Bay, near the Fur Trading Factory of the Hudson's Bay Company, at the rate of three tons daily, and placed in the cold-air chamber on arriving at the vessel. On opening the hold, after the ship reached the West India Docks, the salmon is stated to have been found in as good condition as when taken out of the water. The success of this trial-trip will probably open up a new trade between Billingsgate and North America, as well as other parts.

A Regenerative Street-Lamp.

Competition with the electric light has caused gas engineers to improve their street-lamps, and the latest novelty of this kind is the Regenerative gas-lamp of Dr. C. W. Siemens and Herr F. Siemens, of Dresden. Several of these fine lamps are now planted in Holborn, where they give a rich and brilliant light. The improvement consists in heating the gas and air draught before it passes to the flame, and this is done by bringing the heated products of combustion into a chamber in the middle of the flame, which is of a cylindrical form like that of an argand burner. The Siemens burner is shown in Fig. 1, where C is a hollow ring of porcelain surrounded by a circle of holes, from which the gas escapes in jets. These being lighted, the jets curve round the porcelain ring, and bend over its edge, producing an apple-shaped body of flame very pleasant to see. The jets are caused to bend over the edge of the ring by the draught created by the chimney, A, which communicates by a tube, B, with a chamber, D, leading to the ring. The fumes of the flame being led into this chamber, D, heat it up to a temperature of 900° Fahr., and the result is that the fresh gas and air going to supply the flame are heated as they pass outside it. Fig. 2 represents the lamps as erected in Holborn, and C is the burner, surrounded by a glass screen, E, to keep off draughts, and surmounted by the chimney, A. Such a lamp consumes from 22 to 26 cubic feet of gas per hour, and gives a light of from 110 to 130 candle-power. The Regenerative burner can, however, be made of any useful size.

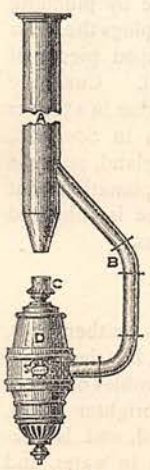


FIG. 1.

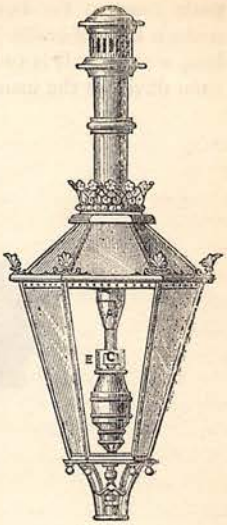


FIG. 2.

Painted Tapestry.

The recent Paris Electrical Exhibition was decorated with numerous objects of art which had nothing to do with electricity, and among them the painted tapestries of M. Letorey elicited much admiration. The ordinary tapestries, such as those of Gobelins, are very expensive owing to the colours being laboriously woven in the fabric, from designs supplied by artists. The new process consists in painting on a cloth or canvas of silk, cotton, or linen yarn with colours of a solid and enduring sort, each mixed with its particular mordant. The colours are fixed by first exposing the tapestry in a damp cellar, in order to give the colours a certain dampness, then they are dried in a stove. This process causes the pigments to permeate the tissues more than they would otherwise do. The tapestry allows of scope for artistic talent, and its price varies with the value of the painting.

Another New Life-Raft.

Though we are unable to offer any opinion upon the practical value of the new life-raft designed by Mr. T. Hall, of Newton, Mass., its construction would seem

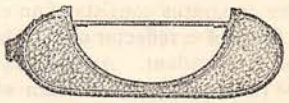


FIG. 1.

to indicate that it would be a very useful addition to the equipment of all vessels. It consists of a double float or raft made of cork or other buoyant material, and of such a shape that it may be fitted to the outside of the ordinary ship's boat. The raft is made in two parts, one being fastened on each side of the boat to which it is secured by fixtures and lashings, as shown in Fig. 1, which gives a sectional view of a boat with the raft attached. The curved ends of the

parts meet at the bow and stem, and when united make a kind of cradle on which the boat rests. The boat with its raft is to be carried on deck or suspended from davits in the usual manner, and when lowered it will enter the water without capsizing. Besides its own crew, the boat being surrounded with life-lines, it will support a large number of people in the water. Moreover, by cutting the lashings the floats may be detached, and the boat with its human cargo may be rowed to some safe spot—should such be at hand—and having landed the passengers, may then return to the rescue of those who are clinging to the life-lines and floats.

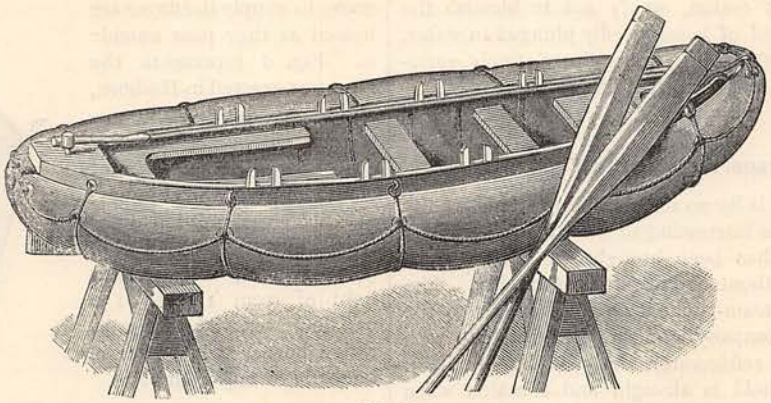


FIG. 2.

The Electric Light Course Indicator.

An ingenious plan for enabling one ship to indicate its course to another by means of the electric light, and thus diminishing the chances of collision at sea, has been invented by Mr. J. H. A. Macdonald, Q.C., late Solicitor-General for Scotland. With the present system of lights on board ship, the great drawback is that although a ship has altered its course, the fact may not be known to an approaching vessel, and thus they may be running into one another without being aware of it until very close. Mr. Macdonald's device prevents this by means of an electric lamp, which projects a beam from the fore-part of the ship to port or starboard according as the helm directs the ship that way. The apparatus consists of an electric lamp placed in the focus of a reflector or "Holophote," and is in charge of an attendant. As long as the helm is amidships, the reflector throws a beam of light from the lamp straight ahead, and an arm attached to the reflector is held fast by means of two pegs or detents, which are themselves operated on by an electric connection with the wheel. When the helm is ported, an electric current frees one of the detents, and allows the attendant to sweep the holophote to starboard, thus directing the beam to the right side of the vessel; and, on the other hand, when the helm is starboarded the other detent is released, and the attendant can sweep the light to port. The sweeping action is repeated several times to indicate the change of course better, and may be afterwards resorted to as often as necessary. Neglect of the attendant is guarded against by the ringing of an electric bell beside the officer on duty whenever the reflector returns to midships. The holophote also answers the purpose of showing those on board whether the sea is clear or not, for the beam can sweep the water for a space of fifteen miles round; and, moreover, it is likely to prove useful in times of fog.

A Preventative for Hay Fever.

A few years ago, Professor Helmholtz, the eminent German physicist, published an account of a remedy which he had found for true hay fever. This was simply to apply to the lining of the nose a solution of sulphate of quinine by means of a small pipette, or pointed glass tube, while lying with the chin held in the air. Since then a preventative has been discovered by Dr. Blakely, and independently by Mr. Hannay, of Cove Castle, Lochhong, N.B. This consists in preventing the hay pollen entering the nose by pinching it with a spring-clip. Mr. Hannay also plugs the ducts of the eyes by means of dumb-bell-shaped pieces of glass, which can be readily removed. Curiously enough, hay fever, which appears to be due to a tender lining of the nostrils, is almost unknown in Scotland, although common in the South of England, and the observation has elicited the curious explanation that the more callous membrane of the Scot is inherited from a long line of snuff-taking ancestors.

A New Glass.

A new variety of glass, containing neither flint, borax, lime, lead, nor soda and potash, has been discovered by a Viennese chemist. It resembles ordinary glass in appearance, but possesses a brighter lustre. It is equally hard, can be finely polished, and is perfectly transparent, while it is insoluble in water, and even in hydrofluoric acid, which is now used to engrave on common glass. This last fact will doubtless render it useful for many technical purposes, as also will its property of being fused to the metals zinc, brass, and iron.