élégantes; they lie wrinkled and loose on the arm, and do not certainly fulfil the tradition of fitting "like a glove."

The third figure in the group shows a young lady attired for a garden party in pink broché gauze and foulard; printed Cora and sateen would also look well in this dress. The hat is of the new lace-like Tuscan straw, and the rich full feather that sweeps round its crown matches the Tuscan in hue. The small girl of three or four (Fig. 2 in the group) is clad in a cream white embroidered frock, made with a yoke bodice and collar, while a wide soft pink silk sash is tied below her waist. The other little damsel, her senior by two or three summers, is more soberly dressed in a costume made with three simulated basques and a flot of ribbon in front. The material may be either cambric, foulard, or cashmere.

There are four other illustrations, but these represent costumes for more generally useful wear. Fig. 1 in the group is a good example of how broché silk can be introduced in the slashed openings of a basque and in the flounces of a skirt of plain material, and by what simple devices effective patches of bright colouring can be made to peep out in unexpected places. The fichu on the bodice, too, is also broché satin. On Fig. 4 in the group will be found the hood with a coloured silk lining—a fashion that is a *furore* at present—for are not all the most sombre jackets and mantles enlivened with bright striped broché and spotted foulard lined hoods? and to be strictly *en règle* the toque or hat worn at the time should be cut from the same piece as this hood-lining. The skirt with this jacket is a combination of Pompadour foulard and Merveilleux satin. A Jersey bodice made of dark green stockingette worn with a skirt of plain and striped material will be found on Fig. 3 in outline; for the Jersey is still an institution and likely to remain so. Fig. 1 in outline is a young lady attired in a neat morning costume of Pompadour cambric and self-coloured sateen. The skirt is bordered with clusters of plaits of the flowered cambric, which occur at regular intervals while the revers on both the top and bottom of the jacket as well as those on the sleeves are of plain sateen.

Thus it will be seen that a costume, however plain, to be fashionable must be a combination of two or three materials, which must either harmonise in tone or be a strong contrast, else the effect will be a failure.

THE GATHERER.

Nickel Bronze.

The silvery lustre of nickel, and its power of resisting the oxidation of the air, have brought it into general use for electro-typing iron implements, metal fittings, and the bright parts of machines. Nickel plating is, however, liable to wear or peel off, it does not entirely prevent oxidation of iron or steel, and moreover it is injurious to the workman employed in the process. A French company, La Société Française Anonyme de Nickel, has therefore been formed to supersede the nickelisation of baser metals by the use of solid nickel bronze. The metal is manufactured by roasting the *garnierite* or nickel ore from New Caledonia, and smelting the residue into ingots containing about 99½ per cent. of pure nickel and ¼ per cent. of utilisable metallic substances. This nickel "pig" can now be supplied at one-half the price it fetched a year ago. For a long time past, efforts have been made to work nickel with the hammer, but without success, until the present year, owing to its inherent brittleness. Now, however, it can be forged and rolled, or turned into cups, knives, and other articles. This has been effected by mixing the nickel with various proportions of copper, zinc, and tin to form "nickel bronze." At least 20 per cent. of nickel is required to secure inoxidisability, and give the requisite tint.

All articles now made of brass or copper nickelised may be produced in solid white nickel bronze at practically the same cost, and as they are some 20 per cent. stronger, they can in many cases be made lighter in the new material. Its great strength and immunity from rust, as well as its fine appearance, render this new alloy highly suitable for mathematical and musical instruments. A small proportion of nickel added to steel increases its hardness, and renders it inoxidisable, and therefore well adapted for edge tools; and moreover a nickel bell-metal is found to give good results.

A New Milk Cooler.

A new form of milk cooler lately devised consists of two cylinders of unequal diameter, and communicating with each other at the top and bottom. Into a receptacle in the smaller cylinder is placed the cooling material, which may be ordinary cold or iced water. Into the other cylinder, which contains a tap, the warm milk is poured, and thereupon rises in both cylinders to the same level. But the milk in the cylinder containing the cooling material soon loses its temperature, and becoming denser, sinks to the bottom, and flows through the passage into the other cylinder. Simultaneously a like quantity of warm milk flows through the top passage from the warmer cylinder into the cooler one. Thus a circulation of the milk is set up, and it is rapidly cooled down.

A Simple Burglar Alarm.

Electric bells, gongs, and other appliances are now in use for giving notice of the entry of burglars into houses by the doors or windows. These devices are, however, beyond the means of a great number of people. The simple contrivance which we illustrate is

the invention of Mr. Thomas Powell, of Philadelphia, America, and is based on the detonating principle. Fig. 1 represents the alarm set ready for action on a door. The apparatus consists of three plates, A, B,

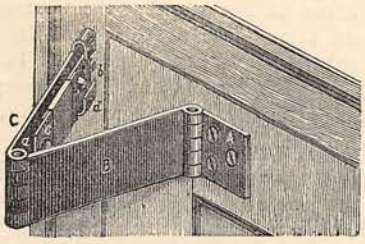


FIG. 1.

and C, hinged together. A is screwed to the back of the door, B is merely a link permitting the door to open freely when pushed by the burglar, and C carries the detonating lock which sounds the alarm. This consists of two strips of stout paper, *a* and *b*, overlapping,

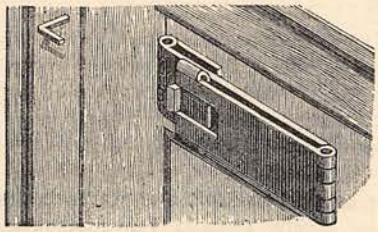


FIG. 2.

and having a fulminating compound between. These two strips are bound together so that when they are pulled apart the compound is exploded by the friction, after the manner of Christmas "crackers." Now the strip *a* is attached to a plug *c*, projecting from the plate

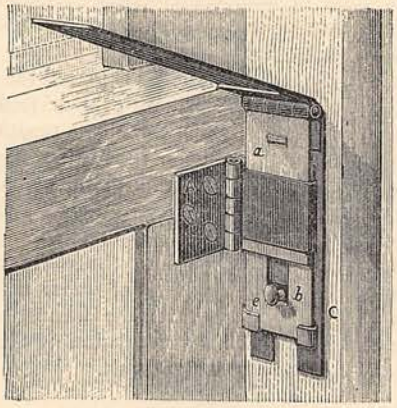


FIG. 3.

C; and *b*, on the other hand, is fixed to a hook *d*, which is screwed to the door-post or lintel, so that when the door is opened the two strips are drawn asunder, and the result is a loud report, sufficient to awaken the inmates of the house. Fig. 2 represents this mechanical watch-dog folded up against the door when not in use; and Fig. 3 shows a modified form of it fitted to a window-sash. Here there is no need of the intermediate link B, and the plate C is simply hinged to the plate A. Further, instead of the hook *d*, a pin *e* is driven into the window-frame. When the lower sash is raised or the upper one lowered, the strips are separated as in the other example, and the fulminate exploded.

Seeing by Wire.

Rumours of a new invention for transmitting light by means of electricity, and seeing by telegraph, or rather "telephote"—just as the telephone enables us now to hear—have been rife enough of late in America; but these have only been the false alarms which are common enough in that country. There is, however, some foundation for the rumours in the fact that Professor Graham Bell, the distinguished inventor of the first speaking telephone, has deposited a sealed packet with the Franklin Institute, U.S., describing an invention relating, we believe, to the transmission of light, which he conceived while in England two years ago. This information has induced two English physicists, Professors Perry and Ayrton, to publish a plan originated by them some years ago—a plan which, however, has never been tried, and moreover has suggested itself to many electricians. It is known that when a ray of light falls on a piece of crystalline selenium a current of electricity is set up in the selenium; and the plan in question consists in forming a mirror made up of a mosaic of small pieces of selenium, and connecting each of these pieces to a wire running to the place to which the image is to be sent. An image of the object to be "telephoted" was then to be focussed by a lens on the selenium mosaic, and separate currents would be set up in the separate pieces of metal, which would travel by separate wires to the receiving station. There these currents would be made, by means of magnetic needles, to open small apertures allowing rays of light to fall on the back of a pane of frosted glass, and thus reproduce an imitation of the image. This would be a very crude and unpractical apparatus, and it is probable that Professor Bell's invention is something much more simple and satisfactory.

Other plans have also been proposed, notably one by Mr. Middleton, of Cambridge, in which the image is allowed to fall on a "thermo-pile," where it generates currents by its heating effect, and these currents are received on a second pile placed in a camera according to a method not yet published. We may add further that Professor Michin is attempting to solve the problem by photography, and has thus far succeeded in constructing a sensitive plate, which generates electricity when light falls on it, and conversely produces a chemical decomposition, or "negative" effect, under the action of electricity. These plates are of silver, coated with chloride or bromide of silver, and form part of a small voltaic cell.

Thread from Wood.

A new development of the timber industries has recently been made near the town of Norkoping, in Middle Sweden. It consists in manufacturing thread for crochet and sewing purposes from pine timber. The process is not made public, but the products are said to be fine in quality, and the price is low. The thread is wound on balls by machinery, and packed in boxes for export. The new business is likely to be a successful one, for the orders from all parts of the country are so numerous already that the new factory is unable to fulfil them.

A New Anæsthetic.

At a recent meeting of the Edinburgh Odonto-Chirurgical Society, Mr. W. Bowman Maclene called the notice of the members to a new anæsthetic, which he has used for some time with excellent effect in dentistry. Mr. Maclene administers ethylen-dichloride along with nitrous oxide gas, and this is done by allowing the nitrous oxide gas to pass over a sponge soaked with a small quantity of the ethylen, so as to taint itself with the latter as it passes to the respiratory organs of the patient. For a human being only about half a drachm of the ethylen-dichloride is required. The time of inhalation necessary to produce anæsthesia is from sixty to ninety seconds, and the time of complete anæsthesia, during which the sensation is believed to be more agreeable than that resulting from the use of nitrous oxide gas alone, is from one and a half to two and a half minutes, a period of time sufficient for most dental operations. It does not produce sickness, and is very rarely attended by stertorous breathing. The pulse is usually a little accelerated by its use, though full and healthy, and there is an absence of that lividity of the face which is a repulsive feature of the anæsthesia by means of nitrous oxide alone.

An Electrical Alarm for Level Crossings.

At most level crossings, where a roadway crosses a railway at the ground level, a watchman is placed to

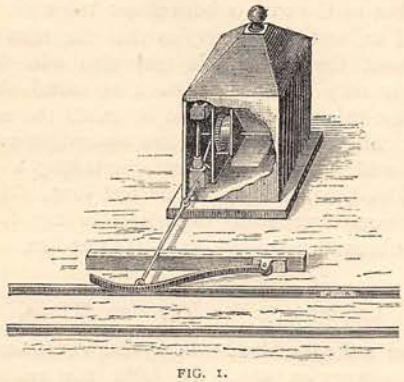


FIG. 1.

close the gates and forbid the passage of vehicles or persons when a train is coming. This plan is subject to accidents, owing, for example, to negligence of the watchman, or fogs preventing the signals of the approaching train being seen. Messrs. Leblanc and Loiseau have therefore devised an automatic advertiser of the train's vicinity. Fig. 1 shows the mechanism that actuates the advertiser or notice-board, which is erected conspicuously on an ornamental post, as shown in Fig. 2. The apparatus (Fig. 1) is attached to the rails at a distance of two or three kilomètres from the crossing, so that the train in passing will work it in time to notify its arrival at the crossing a few minutes beforehand. The first wheel of the locomotive rolling along the rail pushes in the lever of the mechanism (Fig. 1), and, by means of an escapement, completes an electric circuit, and rings a loud bell at the signal-post (Fig. 2). At the same time the current also draws back a blank shutter, and displays a notice on the front of the signal-box (Fig. 2) with the words "Défense de Passer" (No Thoroughfare) on it. By day these letters appear in blue or black on a white glass ground: by night the ground is rendered luminous by a lamp or gas-jet placed within the box. The notice remains up, and the bell continues to sound, till the train has passed the crossing, when the first wheel of the train again actuates the lever of a similar apparatus, and, by breaking the electric circuit, stops the bell from ringing, and replaces the blank shutter over the notice as before, when the apparatus is again ready for use.

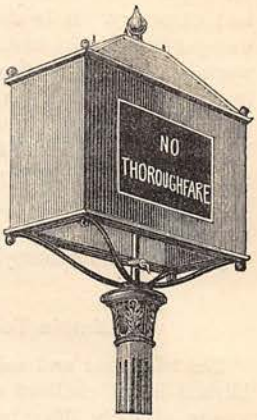


FIG. 2.

There is, nevertheless, a certain element of uncertainty in the use of electric batteries and apparatus for safety purposes, and though such a contrivance is theoretically perfect, it would be necessary to test the condition of the apparatus very frequently.

Steaming Fiery Mines.

An ingenious plan, which however requires to be more widely tested, has been patented in London, for preventing explosions in fiery mines. It is nothing else than the steaming of the mine by blowing steam from the pit-head into the underground galleries where the dangerous gas escapes. The virtue claimed for the steam-bath is that it neutralises the explosive power of the gas; and, moreover, it is held that by steaming the mine in this way at intervals the coal-dust floating in the air, which is now proved to materially assist explosions, will be precipitated, owing to the increased weight of the moistened particles.

Deadening the Noise of Workshops.

Amateur craftsmen may be interested to hear of a plan for deadening the noise of tools in smith's work

and carpentry. It is simple enough, and consists in using india-rubber cushions under the legs of the work-bench. Kegs of sand or sawdust may be used in the same fashion. A few inches of sand or sawdust is first poured into each keg, on this is laid a block for the particular foot to rest upon, and around the block, foot, and leg, is poured fine dry sand or sawdust. Noise and jars are thus prevented, and an ordinary anvil so mounted may be used in a dwelling-house without annoying the other inmates.

A Simple Telephone Receiver.

The telephone and microphone are now fairly established in all civilised countries as practical instruments of daily life; but men of science have not therefore lost all interest in them, and the researches of M. Ader and Count du Moncel, two eminent French *savants*, have recently led them to construct a receiving telephone solely out of a piece of fine copper wire. The vocal currents from a microphone transmitter are passed through a copper wire, which may be advantageously curved into a kind of spiral gong; and on listening to the wire, the speech sent by means of the microphone is distinctly though feebly audible.

Electricity and Gardening.

Dr. C. W. Siemens is still prosecuting his experiments on this interesting subject, and at a recent meeting of the scientific committee of the Royal Horticultural Society, some further specimens of plants forced by means of the electric light were exhibited—for example, two buds of Countess of Oxford rose, one which had been exposed to the electric light for forty-eight hours, and one grown as usual, the bud stimulated by the electric light being considerably fuller and more mature than the other. A more striking difference was, however, seen in the case of two spathes of *Calla Æthiopica*, one of which had been grown in the ordinary manner, while the other had been subjected for forty-eight hours to the electric radiance. Pots of carrot seedlings were also shown, some of which had been grown under daylight, others under electric light. There was very little difference between these; but similar seedlings grown under a combination of daylight and the electric arc were very manifestly more vigorous. At a recent meeting of the Royal Society, Dr. Siemens also exhibited two pots of strawberries which had been grown in the usual way until the fruit-buds appeared, when one of the pots was exposed to continuous light—that is, daylight throughout the day and electric light during the night—the other being left to the influence of ordinary daylight. The contrast between the two pots, as exhibited at the meeting, was very striking, that which had been kept under the continual stimulus of light bearing a cluster of large, red, fragrant strawberries, while the bunch of fruit on the other was yet small and green, with the exception of a reddish spot on one berry. The ripe strawberries were tasted by Mr. Spottiswoode, the president, and pronounced very good.

How to Clean a Toilet Sponge.

A correspondent writes:—"Toilet sponges are very liable from use to become slimy and offensive. I have tried several experiments in order to cleanse my sponge, but all to no purpose; at last I thought I would try what effect an acid would have in expelling the grease from the sponge. I bought two-pennyworth of hydrochloric acid (spirit of salt) and poured it into about one gallon of warm water, taking care that the solution was not too strong. I then put my sponge in and kept squeezing it with my hand. In a short time it was perfectly free from all grease. I afterwards rinsed the sponge in clean water. This is a certain remedy for dirty sponges. I have known persons throw away first-class and valuable sponges, simply on account of not being able to clean them. Be sure the solution of acid and water is not too strong, or it will destroy the fibre of the sponge.—J. MARSDEN, Blackpool."

A Water-Ballast Yacht.

A magnificent yacht, believed to be the longest in the world except the *Czarevna* belonging to the Czarewitch of Russia, is now upon the stocks of Messrs. R. Duncan and Co., of Port Glasgow. She is being built for Mr. J. Galbraith, of Beach House, Wemyss Bay, and among many excellencies of construction her most novel feature is a double-bottomed hull four feet deep for holding water-ballast. The great desideratum for speed under steam is *lightness*, and under canvas *stiffness*. The new yacht being designed to take advantage of both modes of propulsion, it is necessary that she should possess both of these properties at need, and hence the adoption of water-ballast, for when she is under canvas the water-tanks are filled and the vessel is stiffened, and when she is under steam the tanks are pumped empty, and she becomes as light as possible. Another advantage of water-ballast is the facility it gives for regulating the trim of the yacht while the coals are being consumed. A hundred tons of dead-weight ballast and a like quantity of coal would together make a serious difference in the draught of water and comfort of the yacht, but as the coal is burned out the water can be pumped in, and *vice versâ*, so that the trim can be kept about the same. We may also add that the vessel is only two-masted, as it is found that the mainmast in such a rig would be much too near the funnel. She is divided into five watertight compartments, and carries five boats, including a steam-launch, life-boat, and gig, all 28 feet long. Her total length from figurehead to taffrail is 210 feet, her greatest breadth is 25 feet, and depth 21 feet.

Ladder-tape for Venetian Blinds.

In the ordinary "ladder-tape" for Venetian blinds, the cross-tapes on which the laths rest are stitched on to the longitudinal tapes; but in a new variety we have lately inspected they are *woven* into the latter, and hence are not only more convenient, but considerably stronger and more durable.

Spence's Metal.

Although called Spence's *metal* after its discoverer, Mr. J. Berger Spence, this substance is not a real metal, but a new metallic compound. Mr. Spence, in fact, found that the sulphides of the metals combine with molten sulphur to form a liquid which on cooling became a solid homogeneous mass, very tenacious, and almost black in colour. Nearly every metallic sulphide known combines in this way with sulphur, and curiously enough nearly all these combinations have the same properties. A typical specimen is got by heating iron pyrites (sulphide of iron) with excess of sulphur. The "metal" belongs to the class known as "thiates," or sulphur sulphides. It melts at 340° Fahr., or rather more than 100° above the boiling point of water, and this low melting point is very convenient. Instead of contracting on cooling like most other metals, it expands like type-metal and bismuth, hence it is adapted for joining gas and water-pipes. It claims to resist atmospheric or climatic influences better than bronze or marble, hence it may be preferable for ornamental castings and statuary exposed to deleterious climates. As compared with other metals or metallic compounds, its resistance to acids used commercially, to alkalies, and to water is certainly superior, and in addition it will take a very high polish.

The practical applications of Spence's metal will probably be numerous. Experiments have shown that it is well suited for casting in a mould, and reproducing the standard works of plastic art in their original colours. Already the green rust of bronze, the dark blue of steel, and the lustre of gold and silver have been successfully imitated in the new material. The adaptability of the metal for printing and stereotyping is also being tested. It melts at such a low temperature, and cools so rapidly, that it does not injure very delicate moulds, such as those of plaster or gelatine; and besides its resistance to weather, and its facility of working, it is comparatively cheap, being only £15 per ton, whereas lead is £18, and a ton of Spence's metal, owing to its lightness, is three times the bulk of a ton of lead, and therefore available for three times the amount of work.

The industrial uses of the metal are various. It has been tried successfully at the South Metropolitan Gas-works, instead of lead in the joining of water-pipes. Being less corroded by acids than other metals, it will probably be useful in chemical manufactures—for example, in forming the tanks and conduits for storing sulphuric acid. For joining railings to stone sockets it would answer as well as lead; for coating the holds of ships, and taking the place of pitch in covering the walls of houses with a damp-resisting layer, it is likely to be useful. It is also well worthy of being tried in sealing bottles hermetically, covering cloth, or parcels to be sent to hot climates, and in preserving fruit or other perishable produce.

Electric Lighting.

Of 200 lamps constructed by Mr. Edison for experimental purposes at Menlo Park only two have stood the test of time. Most of the failures have been due to a cracking of the glass bulb enclosing the glowing carbon loop, and consequent ingress of air. The average duration of each lamp has only been 700 hours, but one has now endured for 1,700 hours. Even this lamp, however, has acquired a thin coating of lamp-black on the inner surface of the bulb from that disintegration of the carbon, a result which we anticipated. Mr. Edison is now trying carbonised woods and grasses of various kinds instead of cardboard, and the best material he has yet found of this nature is manilla fibre charred, which gives a higher resistance than cardboard and is more tough and elastic. We fear, however, that unless Mr. Edison can prevent the molecular disintegration of the carbon, he will, notwithstanding his extraordinary perseverance, be disappointed in producing a domestic light.

A new electric lamp on the "arc" principle has been brought out by Mr. Charles Stewart, M.A. It consists of a number of square carbon rods placed radially round a hemispherical cup of copper. On the current entering the lamp an electro-magnet establishes the luminous arc between the radial carbon points and the copper cup, which is kept cool by a circulation of water inside. This lamp gives a very powerful light, a small electric sun in fact, and throws no shadows from its own mechanism.

A very cheap and simple, therefore serviceable, lamp is that of Mr. Brockie. It is not regulated by magnets placed in the circuit of the current like most lamps of the kind, but by means of an automatic commutator, which adjusts the carbons by bringing them at regular intervals for an instant together, then withdrawing them to their proper distance apart. It might be expected that such a plan would cause a series of blinks in the light, but no flickering is practically noticeable.

Sugar from Corn.

The latest development of the marvellous grain resources of the Western States of America takes the somewhat novel form of the manufacture of glucose (grape-sugar) from corn. Already many extensive factories have been erected for working this new industry, and one in Chicago is stated to be capable of dealing with 20,000 bushels a day. One bushel of corn yields thirty pounds of glucose, or three gallons of syrup; the sugar costing one penny per pound, while the corn sells at one shilling and eightpence a bushel. It will, of course, be as well to wait for more definite results of a practical character before attempting to consider the prospects of this fresh channel for the utilisation of a portion of the immense grain supplies of the "far West."

A New Flower-sprinkler.

Lovers of plants and flowers may find the watering syringe shown in the engraving to be very handy and efficient. It is a flexible bulb, provided with a sprinkling nozzle, a couple of valves, and a suction tube of

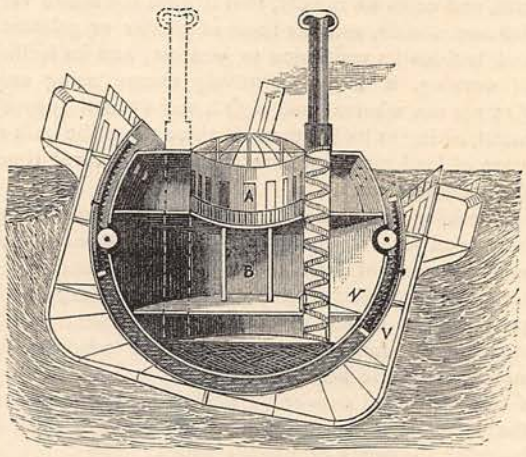
india-rubber. The tube is placed in a bucket of water or other vessel, and the bulb is actuated by hand, so that the showering can be better controlled and directed than by means of the ordinary watering-pot, and therefore the contrivance is all the more suitable for small conservatories or window plants.

The Eye as a Photometer.

In a recent article in our pages on the rise of artificial illumination from gas to electricity, mention was made of the principal devices now in use for measuring the intensity of light, such as the photometers of Bunsen and Rumford. It is interesting to learn that the eye itself can be made a singularly delicate photometer. This application of the visual organ is due to Mr. W. Ackroyd, and was lately described by him at a meeting of the Physical Society of London. It is not easy for the uninitiated to see how the unassisted eye can possibly give an accurate measurement of the intensity of two lights, but a little explanation will make it plain. Mr. Ackroyd, in fact, takes advantage of the stimulating effect of light on the iris. It is well known that the iris, or circular curtain fringing the pupil of the eye, expands or contracts according to the light falling on the eye. When the intensity increases the iris contracts, when it decreases the iris expands ; and, what is not so generally known, the irises of both eyes expand and contract in sympathy, and quite independently of the will of the person to whom the eyes belong. This property, then, is utilised by Mr. Ackroyd in gauging the relative intensities of two lights presented one after another to the eye. But it may be asked, how does the observer know when the irises of his eyes are influenced by the lights to be tested ? Is a second person necessary to watch his eyes ? No second person is necessary ; the observer detects the change in his irises in this way : on looking at an artificial star, or small point of light (such as can be got by putting a steady bull's-eye lamp behind a small hole bored in a shutter) it is, as is well known, brilliant with rays shooting out in all directions from it. This optical effect is due to the radiate structure of the crystalline lens, and to the lachrymal fluid on the surface of the cornea of the eye. Now, when the iris expands or contracts, the length of these rays is perceptibly shortened or lengthened, so that the movement of the iris becomes self-evident. It is this fact, then, that Mr. Ackroyd uses to advertise the observer of a change in the size of his pupillary apertures on looking at the lights to be compared. While gazing at an artificial star, one of the two lights to be tested is placed beside the star, and the observer advances or recedes until he finds a position at which the addition of the fresh light just perceptibly affects his irises, as seen by the shortening of the rays round the star. The distance of this point from the light is then measured. The first light is then replaced by the second light to be tested, and a second position found, at which the addition of the second light to that of the star perceptibly affects his irises. The distance of this position from the second light is also measured ; and the relative intensities of the lights are theoretically proportional to the squares of these distances. Mr. Ackroyd is still engaged in perfecting his ingenious method.

A Safety-Ship.

The accompanying engraving illustrates a novel plan for the prevention of sea-sickness, and for saving life from fire or wreck at sea. It is the invention of Mr. Edward Smith, of Bradford, and consists in attaching by movable fastenings to the hull of the ship a spherical vessel, V, within which a second similar chamber, *v*, is floated on water or oil—its position being regulated, however, by a system of wheels and racks. This inner vessel contains the saloon and cabins of the passengers, A, and also a space for storage, B. The idea, of course, is that, while the hull rolls about among the waves, the floating chamber will maintain



its upright position, and keep the equilibrium of the inmates unaffected. In case of fire in the ship, or wreck, the safety-chamber, together with the outer vessel, V, can be liberated from the hull, with all souls in it, and the ship allowed to settle down beneath it, leaving it floating on the surface of the sea. Such is Mr. Smith's plan, and we trust it may be fairly tried in practice