THE GATHERER.

A New Tap for Effervescing Liquids.

It frequently happens that aërated water, champagne, and other effervescing beverages are prescribed in small quantities in illness. As the doses, though small, have often to be repeated, it would become a matter of unnecessary expense to open a bottle each time, for, as a rule, a bottle once opened, the liquid which it contains speedily becomes flat. To meet a requirement of the kind here roughly indicated is the object of the very ingenious apparatus represented in the woodcut. A hollow corkscrew, mounted on a small stand, is so contrived that a little outflow-tube may readily be opened on applying a slight pressure to a lever. The corkscrew passes through the cork of the inverted bottle; the gas in the bottle presses out the liquid when the lever is pushed down, but the delivery ceases the moment the lever is released. At the same time the gas cannot escape until all the liquid has been drawn off, so that the beverage retains its effervescent qualities till the last, no matter how slowly it may be used. This appliance is also handy, inasmuch as it saves the trouble and waste that often attend the uncorking of bottled liquids in the ordinary manner. Some kind of light frame to prevent the bottle from toppling over seems to us the only thing the device wants to make it practically perfect.

Electricity and Wool-Spinning.

Owing to the large quantities of frictional electricity generated by the rubbing of wool upon itself or the machinery while it is being manufactured, the spinning is attended with difficulty, especially in dry weather, for the electricity causes the yarn to become frowsy and catch at the machine, thereby tending to break the threads. In fact, so serious is this impediment that a wool-mill sent out to America a few years ago from Bradford could not be got to work satisfactorily except during the spring thaws. Experience has taught our wool-spinners that moistening the bobbins of wool relieves them of their electric charge, and hence there are large damp cellars attached to factories, where the bobbins are stored for months. This plan, however, represents a waste of time and a locking-up of capital, so that the new method introduced by Mr. E. Bright has much to recommend it. This consists in putting the bobbins into a chamber exhausted of air, till the rare atmosphere there becomes conducting and allows the electricity to discharge itself from the bobbins. The bobbins are run in on a truck, and the chamber, which is of iron, is connected to the earth, so that the discharged electricity may dissipate itself in the ground. The rarefaction of the air is effected by an air-pump, and a few minutes of exposure to it is equivalent to several months' exposure to damp air in a cellar at the ordinary atmospheric pressure. A modification of the apparatus can be also applied to the carding of wool.

A Growing Industry.

In Montserrat, a small island of the Antilles group, one may any day see a pleasant picture that helps one to realise what a blessing emancipation was to the poor creatures who by its beneficent operations were freed from slavery. During the greater part of last century, sugar was the staple production of the island, and the labour employed on the plantations was slave-labour. In the height of the then prosperity of Montserrat the number of slaves was as enormous as 10,000, and the annual yield of sugar 2,700 hogsheads. The conquest of Trinidad and Demarara, however, brought these countries into effective competition with Montserrat to such an extent, that the sugar cultivation gradually dwindled into comparative insignificance. But of late years an entirely new industry has been created in this beautiful and salubrious island, an industry that has been developed with giant strides. We refer to the lime-tree plantations, from which the lime-fruit juice and cordials are now prepared in such immense quantities for use in the navy, in the sick-room, and as refreshing beverages. Though the first lime orchards were planted so recently as 1852, the plantations cover more than 600 acres, and contain upwards of 120,000 trees. These are planted fifteen feet apart, and the high road passes through them for a distance of over two miles. The lime harvest is heaviest from January to September, but a yield may be had all the year round. The fruit is taken to the factories, where it is sliced by water-power, and afterwards squeezed until all the juice has been expressed. The juice of the finest fruit is at once "headed up" in casks so that it may not be exposed to the air; that of inferior fruit is boiled down for the citric acid makers. The negroes are the chief labourers and are in a very flourishing condition. They most of them own land, cattle, sheep; many of them grow the sugar-cane and vegetables on their own account; and they are more independent than many European peasants. They will not work more than nine hours a day, or do more than a certain amount in a day, or do another man's work. They are light-hearted and good-tempered, and are so fond of working in gangs, so

strongly imbued with the sociable spirit, that it is difficult to get them to do anything alone. This is the pleasant picture we spoke of at the beginning; and it is impossible to find a stronger contrast than that of the utterly heartless and degraded misery of the wretched beings who existed in the bad old days of slavery, and that bright, sunny, industrious life among the lime plantations of Montserrat.

A Magnetic Thermometer.

Sir William Thomson, the distinguished physicist, has invented a very delicate thermometer, or rather, thermoscope, based on the property possessed by magnets of losing their strength when warmed. A tiny astatic magnet or needle, weighing a few grains, is delicately suspended by a silk fibre at right angles to the similar poles of two other magnets placed one on each side of it along the magnetic meridian, and a very light mirror, about the size of a sixpence, is attached to it. A beam of light is then reflected from this mirror to a graduated scale placed about a yard from the mirror, on which it makes a round patch of light, illuminating the degree of the scale on which it falls. The magnets are arranged to cause the needle to take up a position which throws the light-spot on the zero of the scale when the temperature is zero, and any rise of temperature above or below that is indicated by a divergence of the light-spot from zero along the scale in one direction or the other. If there is an increase of temperature the needle will be less powerfully attracted by the fixed magnets than before, and move away from them slightly; if a decrease, it will move towards them.

New Telephones.

Probably the greatest feat in telephony yet accomplished is the recent transmission of speech by the Herz telephone over a French telegraph line 800 miles long. The new apparatus of Dr. Cornelius Herz consists of a microphone transmitter with contacts of iron pyrites instead of carbon, and a speaking condenser of the kind described in the last number of the GATHERER. This instrument, it will be remembered, consists of sheets of tinfoil insulated from each other, and connected alternately to two separate poles or terminals, T T, after the manner shown in Fig. 1.

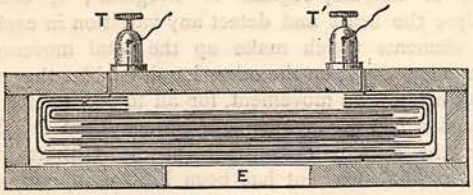


FIG. 1.

These terminals are connected in circuit with the line, and the telephonic currents in charging the condenser cause it to emit articulate speech, which is plainly heard on holding the ear at the orifice E. Fig. 2 shows the actual form of the receiver. Another kind of telephone receiver, recently invented by Mr. W. H. Preece, chief electrician of the Postal Telegraphs, is illustrated by Fig. 3, where P is a spiral of platinum wire, connected in circuit with a voltaic battery, B, and a wheel-break or revolving current interrupter, W. The spiral is enclosed in a box, *a*, *b*, *c*, *d*, blackened in the inside so as to absorb and give out heat. Now when the break is rotated, pulses of current are sent through the spiral P, which is therefore subjected to heats and colds, and the air surrounding it in the box to expansions and contractions, which are heard as sound. If the number of breaks be sufficiently great per second, the air gives out a musical tone; and, moreover, if the wheel-break be replaced by a speaking microphone, and four bichromate of potash

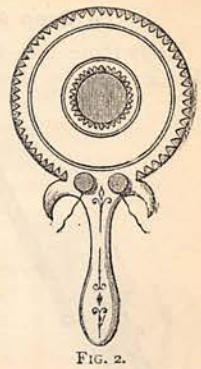


FIG. 2.

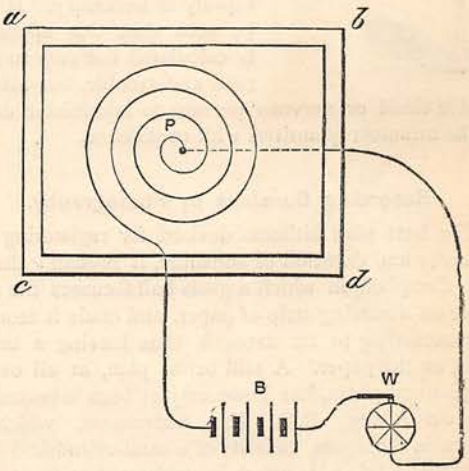


FIG. 3.

cells be employed to yield the current, distinct articulation will be delivered by the vibrating air. This contrivance of Mr. Preece is undoubtedly the simplest form of telephone yet invented.

Liquid Ozone.

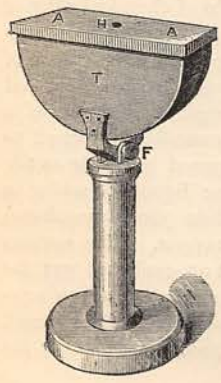
One of the most recent triumphs of chemical science is the liquefaction of ozone, that peculiar form of oxygen. A reservoir containing oxygen at a temperature of 9·4° below zero (Fahr.) was charged with ozone, and subjected to hydraulic pressure applied by means of a column of mercury. The gas immediately turned to an azure-blue colour, which deepened in shade as the pressure increased. The ozone liquefied under a pressure of 75 atmospheres, while 300 atmospheres are necessary to liquefy pure oxygen. The curious fact also came out that ozone is an explosive gas, for unless carefully and slowly compressed at a low temperature it explodes with a yellow flame. Its ethereal blue tint is very beautiful, and probably accounts for the colour of the sky.

A Drop Attachment for Bottles.

Only those who have tried to get liquid out of a bottle drop by drop, and have failed to do so, or succeeding after several efforts, have lost temper or patience, or both, can appreciate fully the usefulness of the ingenious device represented in the annexed woodcut. It consists of a tube secured in the stopper and furnished with a rubber air-bulb for blowing air into the bottle, and another tube likewise inserted in the stopper, through which the liquid is delivered. By pressing the bulb more or less strongly, the liquid is made to run either by the drop or more rapidly if necessary. It will be seen that this appliance is calculated not only to save time and trouble, but also to enable timid or nervous persons to administer drugs in the minutest quantities with confidence.

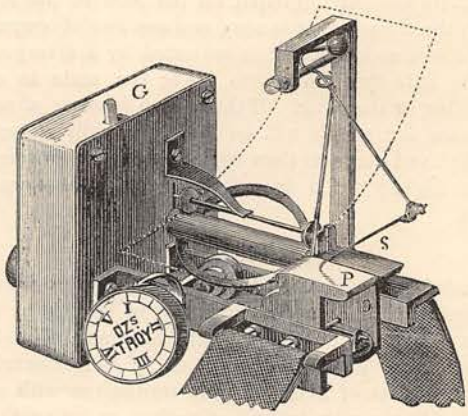
Recording Sunshine by Photography.

The best plan hitherto devised for registering the intensity and duration of sunshine, is probably that of Mr. Campbell, in which a glass ball focusses the sunshine on a moving strip of paper, and chars it more or less according to its strength, thus leaving a brown track on the paper. A still better plan, at all events for photographers, has however just been invented by Captain Abney, R.E. The instrument, which is shown in the figure, consists of a semi-cylindrical box, T, having a lid, A, A, which is perforated at its centre with a hole, H, one-tenth of an inch in diameter. A band of sensitive photographic paper is made to line the curve of the box in the interior, the centre of the paper being under the hole in the cover. The instrument is then ready for work, and it has merely to be placed on a window-sill or other convenient site facing the south, with the length of the lid lying east and west, as determined by sun-dial or compass. Once ascertained, this position can be marked to save time in future. Another adjustment is to make the plane passing through the hole in the lid and the centre line of the paper to pass through the path of the sun. To effect this, the box should be caused to throw a shadow on a piece of white paper placed behind it, and gradually inclined on the hinge, F, till the shadow of the lid is just cut off by the box itself. When this takes place, the sun, the hole, and the central line of the paper inside will be in the same plane, and the sun will print its track along the middle of the sensitive paper. A small lens, of not more than $\frac{1}{5}$-inch aperture, helps the action of the instrument by giving a finer line on the paper; and such a lens need not cost more than sixpence. By using two holes, the sunshine of the morning and evening can be observed apart from that during the day. The proper kind of paper to use is the ready-sensitised, which will keep for months, and if a little discoloured will answer the purpose just as well. It has only to be fixed by hyposulphite and washed. A scale of hours may also be added to the paper, by taking a sheet of glass coated with non-actinic varnish, scratching the scale upon it, and then photographing it on the paper by means of diffused light.



A Pocket Pulse-Writer.

The condition of the pulse has from the earliest times been held as a valuable aid to the diagnosis of disease; but until the sphygmograph, or pulse-writer, was invented, the pulse was only read by the finger of the doctor, which varies in sense with different men and at different times. Moreover, it can at best only tell whether the pulse be soft or hard, quick or slow, jerky or languid, regular or irregular; it cannot analyse the beats and detect any variation in each of the elements which make up the total movement. The pulse-writer, on the other hand, enables the pulse to record its own movement, for all to see, so that the physician can distinguish at a glance where it differs from the healthy or normal pulse. Hitherto this most useful instrument has been little used, except in hospitals, owing to its cumbrous nature. The same objection does not apply to the pocket sphygmograph of Dr. Dudgeon, which we illustrate herewith. This apparatus is only two and a half inches long by two inches wide; it weighs only four ounces, and is therefore well adapted for private practice. The movement of the pulse is taken up by an adjustable spring pressed upon it, and communicated by a system of



delicate levers to the stylus S, which traces a line upon a band of smoked paper, P, kept running by a small clockwork, G. A dial indicates the pressure put upon the spring, which may amount to five ounces. The smoked paper runs through the instrument in ten seconds, so that the number of pulse-beats per minute can be reckoned by multiplying the number on the tracing by six. The patient's name, and disease, the date, and so on, may also be scratched upon the paper, which, on being dipped in a quick-drying varnish, can be kept for reference and comparison. This little apparatus magnifies the movement of the artery no less than fifty times. It can be applied to the patient in any posture, and gives its autograph of the pulse almost as quickly as a physician can feel it with his finger.

Safe Gigs and Carts.

A new way of mounting two-wheeled carriages has recently been designed, which will be interesting to farmers and other owners of horses. This consists in dispensing with the common axle running under the bottom of the vehicle from one side to the other, and making each wheel turn round a short axle of its own, between two parallel bars, as shown at *a a* in Fig. 1, which represents a ground-plan of a spring-cart. The

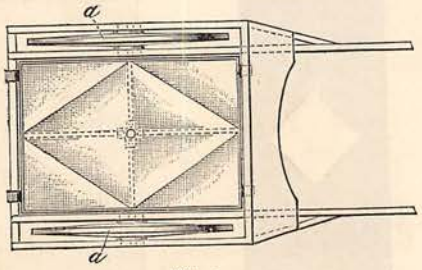


FIG. 1.

chief advantage of this construction is that the body of the vehicle can be swung on the springs much lower than is usual, and the centre of gravity being thus depressed to near the middle of the wheels, there

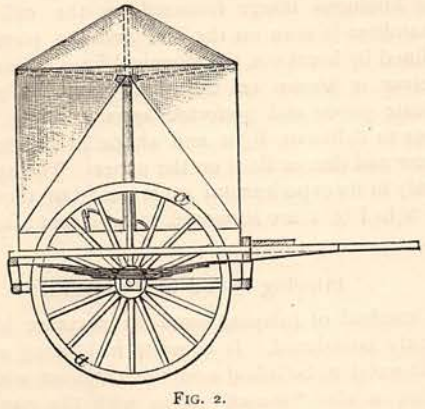
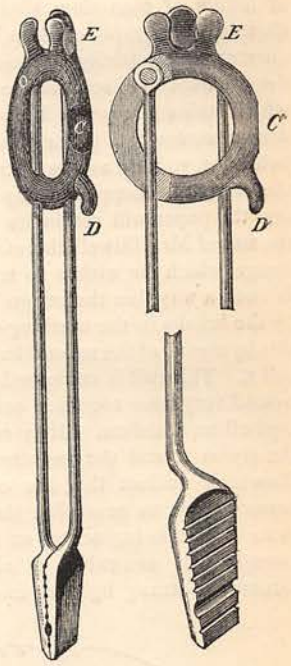


FIG. 2.

is less danger of an upset. Moreover, this arrangement, shown in Fig. 2, is not so trying to the horse in going up or down a hill, and at the same time a low seat and large wheels are obtainable. The outer shaft is also contrived to fend aside the wheels of other vehicles in an accidental collision, and the inventor has added a novel shade for rain and sunshine.

An Ingenious Pair of Tongs.

The tongs are usually devoted to one kind of work, but it has occurred to a recent inventor that there is no reason why they should not be made still further serviceable for household purposes, and he has accordingly devised a pair which combine several useful features. A reference to the accompanying engraving will show in what the various improvements consist. It will be seen that a ring forms the head of the tongs, and that it receives the fixed and the movable leg. It has besides two projections, of which the one at the top, E, is employed as a plate-lifter, and that towards the bottom, D, for lifting pots, kettles, stove-covers. In addition to these features, there is on one side a flattened surface, C, which is to be used as a hammer-face. The inner surface of each jaw is grooved so as to secure a tighter grip upon the article to be lifted, and being of an angular and oblong shape, either may be used to lift stove-covers and the like.



The Telephotograph.

Another step towards the solution of the problem, how to send a picture or an image of an object to a distant place by means of electricity, has just been made by Mr. Shellford Bidwell. This apparatus is a combination of the Bakewell copying telegraph and the selenium cell which Professor Graham Bell has so ingeniously applied to the transmission of speech by telephone along a beam of light. A reference to Fig. 1 will help to explain the process. In this figure, P is a marking stylus of platinum, with its point resting on a sheet of paper laid on a metal tablet, M. The stylus is connected through a set of electric resistance coils to the positive pole of a voltaic battery, B; and the tablet is connected through a galvanometer, G, to the negative pole of the same battery. There is thus a complete circuit for the current, which flows from the stylus through the paper to the tablet and galvanometer. Now the paper is soaked in a solution

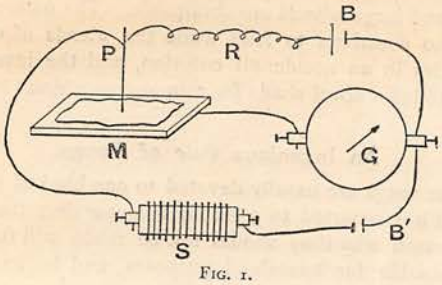


FIG. 1.

of iodide of potassium similar to that used in the chemical telegraph of Bain, and the result is that the current of electricity in passing through the paper decomposes the solution and liberates the iodine, which stains the paper brown. If then the stylus is drawn across the paper it will leave a brown trail behind it, so long as the current passes. But should the current be stopped by any cause, this trail will cease and the paper will retain its original whiteness. It is the aim of Mr. Bidwell, therefore, to make the luminous image which he wishes to transmit stop the current in such a way that the image itself will be delineated by the breaks in the marking of the stylus, and he does this by means of the second battery B′, and the selenium cell S. This cell is composed of two fine spiral wires, wound very near together, and filled in between with crystalline selenium. It is connected in circuit with the stylus P, and the negative pole of the battery B′. Now it is evident that the current from the second battery tends to neutralise the current from the first in its decomposing action on the paper, and if strong enough will neutralise it altogether. Mr. Bidwell focusses a strong light or image on the cell S, then

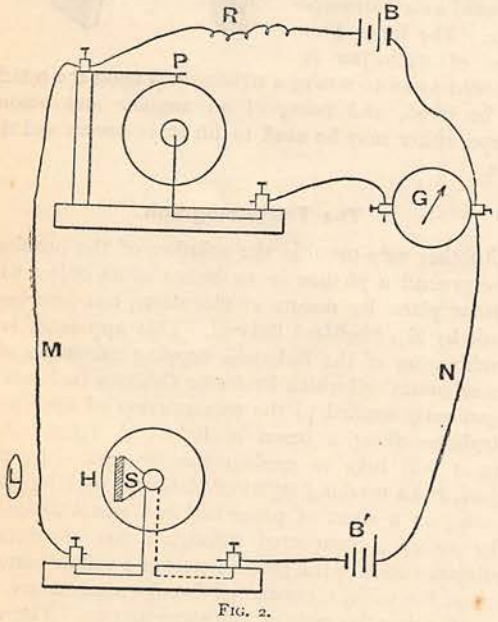


FIG. 2.

adjusts the resistance R, until the two currents exactly neutralise one another. Under these conditions the stylus will make no marks, but if the intensity of the light on the selenium diminishes, the resistance of the cell will increase, the current from B′ will therefore be weakened, and the consequence will be that the current from B will predominate in the stylus and make a mark on the paper. The galvanometer serves to indicate the adjustment of the currents. In the telephotograph this principle is carried out according to Fig. 2, where P is the stylus, as before, tracing a screw-line on a revolving barrel wrapped with prepared paper, and connected to the marking battery B, through the galvanometer G. The transmitter consists of a barrel, H, enclosing a selenium cell, S, connected to the battery B′, and stylus P. A fine pin-hole is drilled in the side of the barrel, which is revolved synchronously with the barrel of the receiver carrying the paper, and at every revolution the pin-hole crosses the surface of the cell in a spiral path. If now a luminous image of an object be focussed by the lens L, on the barrel, just opposite the selenium cell, the pin-hole crossing the cell will let in a ray of light every time it crosses the image. In this way the pin-hole will trace out the shape of the image in parallel lines on the cell. But if the two batteries are so adjusted that when the ray of light falls on the cell the stylus will cease to mark, it follows that the shape of the image will be delineated

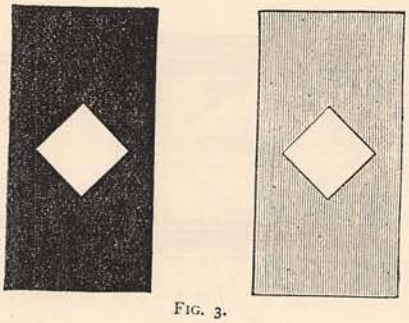


FIG. 3.

by the breaks in the parallel lines drawn on the paper by the stylus. Fig. 3 represents a diamond pattern actually sent by the telephotograph of Mr. Bidwell. The luminous image focussed on the cell of the transmitter is seen on the left, and the picture of it outlined by breaks in the chemical lines drawn on the receiver is shown on the right hand. With more delicate paper and perfected apparatus, Mr. Bidwell hopes to delineate light and shade in the image by fainter and deeper lines on the paper. The apparatus is only in its experimental stage yet; but the wires M and N in Fig. 2 are supposed to represent a telegraph line.

Inlaying Wood by Pressure.

A method of inlaying wood by pressure has been recently introduced. It consists in glueing a veneer of the wood to be inlaid over the common wood, and placing a zinc "stencil" plate with the pattern cut out of it over the veneer, then subjecting the whole to the softening action of steam and the pressure of two powerful cast-iron rollers. These rollers crush the zinc stencil into the veneer, and the underlying veneer

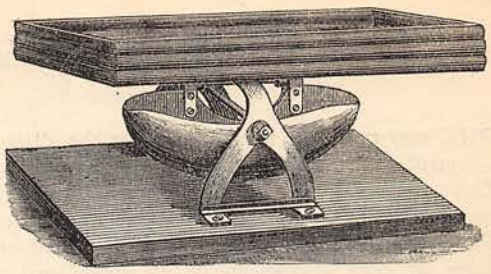
into the common wood. The stencil is then withdrawn, and the embedded portion of the veneer is planed down till the inlaid surface is perfectly smooth and even.

The Tide-Predictor.

Sir William Thomson has in recent years turned his inventive genius and great scientific knowledge to the improvement of the instruments of navigation. As Sir George Nares said recently, he has bettered all the "three L's" of the sailor—namely, the lead, the log, and the look-out. His patent compass is now recognised to be the compass of the future, his pressure lead and sounding apparatus by pianoforte wire is being introduced into many mail steamers and men-of-war, while his mode of making light-houses flash their distinctive names according to the Morse telegraphic code is also proving its superior worth. But Sir William has besides turned his attention to the measurement of the tides, an important matter for an insular and seafaring nation like ours, and has invented three most ingenious apparatus for the purpose. These are the Tide-gauge, the Tidal Harmonic Analyser, and the Tide-predictor. The Tide-gauge registers the actual height of the sea-level, by means of a float actuating a pencil marking a running band of paper; the Harmonic Analyser substitutes brass-work for human brains in calculating out the different elements which compose the whole tidal rise and fall; while the Tide-predictor, as its name implies, does nothing less than predict for any particular port, and for any future year, not merely the times of high and low water, but the position of the water-level at any instant of any day of the year. The action of the instrument is to draw curves of the tides at that port; one year's tides being, in the latest form devised, run off in twenty-four minutes. The elements of the tide at the port in question furnished by the Harmonic Analyser are the data upon which the Predictor operates. The details of the apparatus are too complicated for description here; but we may mention that the different elements of the tide are combined by means of a fine steel wire or cord passing round several pulleys corresponding to these elements. One of these Predictors has already done good service in predicting the tides for the Indian ports as given in the volume of Tide Tables for 1881.

A Self-adjusting Berth.

Among the multitudes who now-a-days "go down to the sea in ships" and "do business in great waters," there are comparatively few who do not in some shape or form suffer considerable discomfort, while there are many who look forward to a sea-voyage with absolute misgiving and dread. It is the object of the apparatus represented in the woodcut to make this kind of travelling less unpleasant than it is. It consists of a berth so constructed as to adjust itself easily to the pitching or rolling of the vessel. The berth is of the same size as the ordinary berth now in use, and is counterbalanced by a crescent-shaped weight rigidly



secured to the under-side, the whole being so swung on a universal joint as to preserve a level surface throughout the various motions to which the ship may be subjected. As the action of the berth is further regulated by rubber bands, sudden or jerky movements and their consequences (frequently of the most disagreeable kind) are avoided. Invalids and those who suffer from sea-sickness will appreciate the value of an appliance that enables them to lie at ease in the roughest weather. Of course this contrivance is only effective against sea-sickness while the traveller is in a recumbent position, but even to this extent the invention appears to offer a relief for which many would be grateful.

Private Time-Signals.

A simple device has been introduced by a firm of telegraph engineers for enabling all the telegraph offices, and the offices of private firms in connection with these offices, to hear the Greenwich time-signal. Hitherto, the passage of this signal along the wires could only be noted by keeping a sharp look-out on the telegraph instruments to see the deflection of the needle which it caused; but the inventors have made the signal announce itself by the ringing of an electric bell. This is effected by adding a metal contact to the "stops" of the needle in such a manner that when the needle strikes the stops it completes a local or special circuit, in which are included a battery and electric bell. The result is that the signal causes the electric bell to ring. The arrangement is designed so that it can readily be disconnected when not required for the indication of the time-signal.

Prize Answers to Acrostics.

We are now able to announce that the Prize of TWO GUINEAS *offered for the best rhymed verse solutions of the Six Prize Acrostics recently given in our pages, has been awarded to* CHARLOTTE P. MITCHELL, *Worcester. The following are specially commended:—W. Maddison, Bedlington, Northumberland; Cornelius Down, Brighton; Jean Macmillan Brown, St. Andrews, N.B.; and Albert Jarrett, Manchester. We hope to place the Prize Solutions before our readers, space permitting, in the course of the present volume.*

The Regulations and other particulars of the New Series of Prize Competitions open to Readers of this Magazine will be found on the next page.