THE GATHERER.

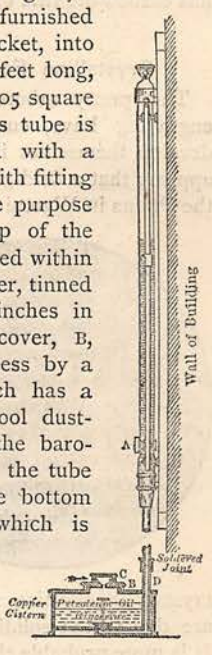
New Commercial Plants.

In his interesting *brochure* on commercial plants, Mr. Thomas Christy, F.L.S., urges upon residents in "foreign parts" the importance of observing the uses to which the various plants are put by natives. By acting upon this principle, travellers have been able to introduce into the British Pharmacopœia plants of extreme value; while science and manufactures have also benefited in the same way. Mr. Christy calls attention to a few plants, not generally known, which seem to be possessed of very considerable advantages, either of a medicinal or an industrial character. For instance, Japanese peppermint has powerful and peculiar properties not to be found in the English species. The camphor from this plant resembles Epsom salts, and is used in China and Japan, either by itself or mixed with oil of peppermint. It has been employed with marked success in cases of severe nervous headache, neuralgia, and toothache. Considering the prevalence of these scourges, it may be hoped that Japanese peppermint will soon be introduced into the English market on something like an extensive scale. Again, there is a plant largely used by the Indians of Peru and Bolivia as a nervous stimulant, to enable them to sustain hunger for long periods, and to undergo unusual labour without fatigue. This plant is called Coca, and the natives of these countries simply chew the leaves, which are of a slightly astringent and aromatic taste, producing smarting and a kind of numbness in the tongue, due to the alkaloid cocaina, which is evidently the medical principle. It has a gentle excitant effect, and, like tea and coffee, occasions indisposition to sleep, though it has a more decided influence on the heart, increasing its contractions and giving elasticity to its action. It also possesses a peculiar stimulating power over the digestive organs, giving almost instant relief to that feeling of depression after eating, due to indigestion. Taken in larger doses, it invigorates both muscle and intellect, and produces a remarkable sense of satisfaction. Truly, if coca safely stand the test to which it must be subjected in the face of recommendations like these, it will indeed be invaluable. The only other new commercial plant which we need notice here is the Maté or Paraguay tea. Though "new" as regards the British Isles, it has been used from time immemorial by the South American Indians, and its consumption throughout that continent generally is supposed to reach the enormous amount of 50,000,000 lbs. per annum. The infusion has a slightly bitter, but pleasant taste, acting as a tonic stimulant, and is less astringent than Chinese tea. It contains the same active principle as tea or coffee in a proportion intermediate between the two; also a volatile oil to which its peculiar flavour is due, and about 10 per cent. of nutritious gluten, only a small portion of which, however, dissolves in infusion. This tea is not drunk from cups, but sucked up through a tube furnished at the lower end with a perforated bulb or strainer. Its restorative powers are described as marvellous.

A Glycerine Barometer.

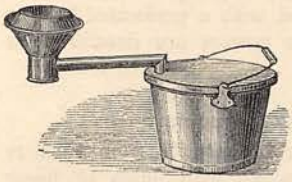
Various attempts have been made from time to time to construct barometers with fluids of lower density than mercury, in order to get a long column which would directly show minute changes in the pressure of the atmosphere without the aid of mechanical indicators. Such an instrument has been lately erected at the Kew Observatory, after the designs of Mr. James B. Jordan. Water, though otherwise convenient, is not well suited to the purpose in question because of the water-vapour which gets into the vacuum at the head of the barometer tube; and Mr. Jordan was led to prefer glycerine, which does not give off a vapour in a vacuum, and is much less sensitive to changes of temperature than water, besides keeping fluid under excessive cold. The height of the barometric column with this material is 27 feet, so that a variation in height of $\frac{1}{10}$ inch in the reservoir is shown by a variation of an inch in the column.

The apparatus, as shown in the figure, consists of a gas-pipe $\frac{5}{8}$ inch in diameter, and furnished at the top with a gun-metal socket, into which is cemented a glass tube 4 feet long, and having an inside area of 1·05 square inches. The upper end of this tube is formed like a cup, and fitted with a stopper. This tube is provided with fitting scales and verniers, and is for the purpose of reading the levels of the top of the glycerine column which is contained within the pipe. The cistern is of copper, tinned inside, 5 inches deep and 10½ inches in diameter. It is fitted with a cover, B, through which the air finds access by a small hole in the cap C, which has a recess in it to hold a cotton-wool dust-filter. The main tube, A, of the barometer is let into the cistern by the tube D, which enters the latter at the bottom by means of a screwed plug, which is withdrawn after filling the cistern. A layer of petroleum oil is spread over the glycerine in the cistern, so as to keep it from absorbing moisture; and the glycerine itself is tinted red by aniline dye, in order to be more easily seen. For storm stations, collieries, and observatories the glycerine barometer may prove very valuable; but it is too early yet to speak with confidence of its behaviour.



For the Benefit of the Milkmaid.

In our engraving is represented an ingenious and useful appliance, which has for its object the preventing of dust or dirt from entering milk as it is being taken from the cow. The pail, as will be seen, is furnished with a cover which not only protects the liquid, but serves as a seat to the milker. A tube running out of the cover supports at the other end a strainer, which receives the milk as it is drawn from the cow, and conveys it to the pail in a clean and wholesome condition. By employing this device the milkmaid need not fear any mischief from a restive cow, for even should the pail be kicked over the milk can hardly escape in the overturning.

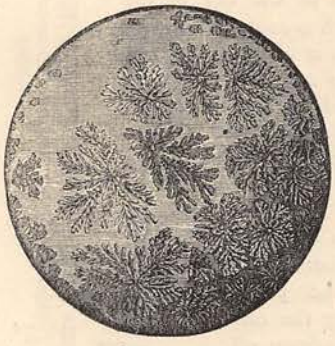


A Mechanical Watch-Dog.

An ingenious substitute for a watch-dog has, we are told, been devised by an inventor whose name is not given. It is neither a phonograph nor an electric alarm, but an application of the well-known singing flames. When a long, thin flame of gas is introduced into a tube of glass or metal, it can be made to roar and sing very loudly; moreover, the flame can be made to keep mute until the opening of a door or window creates a draught; and it is a contrivance of this sort which, by emitting a series of barking noises, has earned the title of a mechanical watch-dog.

Crystalline Forms in Canada Balsam.

The pretty arborescent forms portrayed in the engraving have, curiously enough, been found to develop themselves in a film of Canada balsam. It appears that a field-glass lost by a party of hunters on the Plains in Wyoming Territory, and found again by an Indian after an exposure to the weather of over three years, presented these branching figures in the balsam which had been used to join the two parts of its achromatic lens. Only one of the resins in Canada balsam is crystallisable, but as the crystals in question are hollow, it is doubtful if they are due to the solidification of this particular resin. It is more probable that the suggestion of Mr. George Hopkins, to the effect that they are due to permeation of air into the balsam, is the true one. In any case, the uniform transparency of Canada balsam is so important in optics that the cause of the phenomenon is well worth discovering.

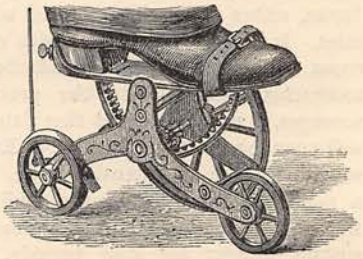


Coloured Photographs.

Photographs are now tinted by ladies at home, after what is called the "photo-Grecian painting" process. This consists in dipping the picture into boiling water, then pasting it with starch upon a piece of concave glass. When dry the photograph is rubbed with sandpaper until it appears almost transparent, when it is painted on the glass back with colours specially prepared. If well done, the resemblance to nature is very striking.

The Pedomotor.

A new device for the use of those who patronise the skating-rink has been invented in America, and the accompanying engraving gives a very clear idea of its construction. The frame-work stands upon three rubber-tired wheels, the two smaller of which support the apparatus, while the larger is mainly employed in driving, for which purpose it is attached to a shaft that carries a ratchet-wheel and a loose pinion with "pawl" for engaging the ratchet. To the upper part of the pedomotor there is pivoted a foot-pedal, provided with a segment rack for engaging the loose pinion on the drive-wheel shaft. When the toe of the pedal is depressed, the segment rack by engaging the pinion actuates the drive-wheel and impels the machine forward. The motion of the foot is exactly the same as in walking. A brake is supplied for stopping the motion of the pedomotor, and is made to act upon one of the small wheels by pulling a cord that runs upwards for attachment to some part of the wearer's clothing.



Telegraphing by Dynamo-electric Currents.

Voltaic batteries are almost universally employed for generating the electric currents for sending signals along telegraph wires; but there are signs of a reform in this respect, and quite recently the colossal telegraph company of the United States, termed the Western Union Company, decided to supersede the enormous batteries used at their central station in New York by five of Siemens' dynamo-electric machines, driven by a steam-engine. To give some idea of the work done by this company, we may mention that during last year they despatched no less than 23,000,000 messages. At their central station they employ about 20,000 voltaic cells, amounting to an aggregate weight of sixty tons; and the proposed substitution of coal fuel for zinc and acid in generating the currents will be advantageous not only on the score of cleanliness and room, but also of safety, for this heavy dead weight on an upper floor of the building is a constant source of danger to the premises.

Perini's Planetarium.

Non-mathematical readers of Sir John Herschel's text-book on astronomy will remember with what delight they read his first chapter, and how their interest in the engrossing but abstruse study grew small by degrees and beautifully less when they were confronted with the sternly scientific details of the subsequent chapters. Astronomy will probably never be "made easy," but though there is no royal road to the acquisition of sound knowledge of the subject, attempts have often been made, on behalf of the young, to explain its rudimentary principles by means of working models, generally of a very rough description. However, there has at length been constructed a model of an altogether superior character, which may fairly be considered as leaving nothing to be desired. It has for its object ocular demonstration of the motion of the planets round the sun, and of the general disposition of the solar system. It consists of a circular dome-shaped structure standing upon twelve wooden pillars, the dome being fourteen feet in diameter at its base, and high in proportion. The inner surface of the dome is painted deep blue, to represent the "azure vault," and upon it are placed the fixed stars, in their proper positions. A "milk" glass gas-globe suspended from the roof does duty for the sun, rotating on its axis, and, like the great ruler of the day, casting light and warmth all around. The different planets are suspended by almost invisible wires around the sun, about which they revolve in series of ellipses according to their relative approximate position, distance, size, and velocity. As soon as the machinery is set a-going, the planets begin to describe their orbits in strictly proportionate time, and one really grasps a strong and clear conception of many principles respecting which one's ideas had previously been somewhat hazy and undefined. The earth has its diurnal motion, the moon proceeds round it in its appointed orbit, Saturn has his rings, and so with the rest, the elliptical orbit described by each planet being mapped out with the utmost care upon the dome-sky, so that it is perfectly possible to follow the course which any particular planet would travel. A box above the dome contains the machinery, which is absolutely noiseless, moves by clockwork, acts for five hours and a half, and is invisible to the spectator.

Its inventor, Signor N. Perini, has spent almost seven years upon its construction, which has besides cost him nearly £700. He has devised his apparatus from a single-hearted love for astronomy and zeal as a mechanician, amid the cares and demands of an important and extensive connection as a teacher. It gives us extreme pleasure to place upon record so gratifying and so rare an example of unselfish labour devoted to a praiseworthy object with the most complete success. Signor Perini's planetarium ought certainly to be secured by some of the great educational institutions of London. It is not only by far the largest ever constructed, but is the only one adapted either for lecturing or for otherwise imparting instruction in some of the most interesting and important phenomena of astronomy.

Heating Wheel-Tires by Gas-Jets.

The following simple plan for heating the tires of wheels in order to hammer them into proper shape is another interesting application of coal-gas to heating purposes. A ring of iron pipe, set round with gas-jets projecting like short spokes from its outer rim, is placed within the circular tire, and connected by a flexible tube to the nearest source of gas. When the jets are lighted the flames play on the tire, and soon make it red-hot, when it is taken and fitted upon the wheel in the usual way.

Coral Houses.

Common white coral is an excellent material for building houses, and the wonder is that it has not been utilised for this purpose to a greater extent in the West Indies and other tropical parts where it abounds. In the Bermudas, however, many houses are built of the rock-coral cast up on the beach by the sea-waves. It is very durable, and besides being white in colour, is permeable by air currents, so that it renders the rooms both cool and light, which is an advantage in hot climates. The heavy bosses known as "brain-stone," being non-porous, are not so suitable for walls; but in Barbadoes they are used for doorsteps and road-metal. For sea-walls they are particularly well adapted, owing to their exceptional durability under the washing action of the sea. The texture of these corals is of infinite variety and beauty, and might very well be employed in mosaics for the walls and floors of halls and conservatories, or for mantelpieces. Doubtless the time will come when the inexhaustible ruins of this organic architecture which strew the shores of coral islands will be imported into Europe for decorative purposes.

Natural Cement.

The young and growing State of Kansas, in America, is found to be enriched by beds of "native lime" outcropping along the borders of some of its rivers, and excellently well adapted for the finer cements. The lime is of a beautiful white colour, and very fine grain. It is soft, smooth, and readily made into a plastic condition without any other preparation than admixture with a suitable quantity of sand and water; and the mortar which results is equal to that obtained from burning the purest limestone.

Ground Honey.

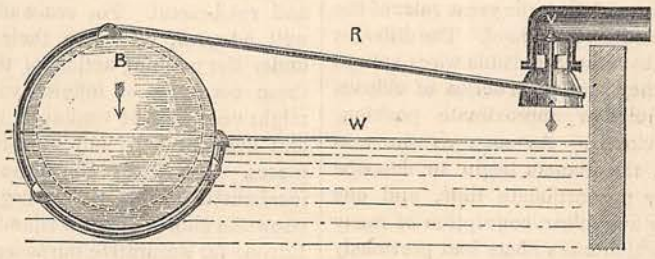
A French traveller, M. Pierre Arnoux, while lately travelling in Abyssinia, discovered in small cavities of the soil a species of honey without wax, produced by an insect resembling a large gnat. Its composition resembles that of the manna of Sinai and Kurdistan, and the sugar found in the leaves of the plane-tree, as well as ordinary honey; but it is distinguished from all these substances by the total absence of cane-sugar. In Abyssinia the natives use it as a remedy for affections of the throat.

Extraordinary Length of Hair.

In one of his recent lectures, Dr. Erasmus Wilson exhibited the photograph of a woman thirty-eight years old and five feet five inches high, whose tresses, when she stood erect, enveloped her entire form in a golden veil, and trailed several inches on the ground. The longest fibres measured six feet three inches and a half. Thirty inches is the mean length for females, and three feet is considered a very remarkable length. This instance is exceeded, however, by two American women—one whose hair measures seven feet six inches, and another, the wife of a druggist in Philadelphia, whose luxuriant *chevelure* is almost as long, and so thick that when seated upon a chair she can completely cover herself with it.

A New Balance Supply-Valve for Cisterns.

This improved valve, which is the invention of Mr. G. F. L. Meakin, has several advantages over those in ordinary use. It consists of three connected parts, which are simple, cleanly, inexpensive, and not likely to get out of order. These are the valve proper, which is marked V in the figure; the lever-rod, R; and the floating ball or counterpoise, B. The valve is formed by a short stem or metal plug, carrying near its upper end a conical ring or cap which, when the plug is lowered, fits into the conical orifice of the valve and shuts it, thereby stopping the flow of water. When, however, the plug is raised, the cap is raised with it out of the valve-socket, and the water is permitted to flow. Now this plug is raised or lowered by the lever-rod R, which in turn is actuated by the floating ball B, as it rises and falls with the level of the water in the cistern. The lever-rod is a galvanised iron wire, and the counterpoise is a globe of glass, which is preferable to the ordinary thin copper balls in use, on the score of purity, durability, and cost. The water-pressure on the valve is balanced by this counterweight in such a way that when water is drawn from the cistern, the weight, losing its support, falls, and thereby opens the valve and allows more water to flow into the cistern. When the old level has been regained, the balance is restored, and the lifted ball once more closes the valve. The pressure of water on the valve, being counterbalanced by the weight, prevents all friction. The power of the counterpoise may be adjusted so as to enable water companies or consumers to regulate the pressure at which any cistern shall be supplied, so that when that pressure is exceeded the valve will close, and the water will then supply other cisterns at higher levels, thereby effecting a great saving in pumping power. Further, by increasing their pressure, water companies will be able to keep closed all valves soever, and thus obtain the maximum quantity of high-pressure water in cases of fire—a result which is impossible with the present fittings. A very fair mode of rating any house could also be obtained by regulating the capacity of any cistern and the pressure under which it is supplied.



We may add that the new valve has been tested by the Lambeth Water Company with a pressure of 200 feet head of water, and has been found to act in a highly satisfactory manner.

A Spark Arrester.

Serious damage has often been caused by live sparks escaping from funnels or short chimney-stacks and setting fire to grain or goods, or even to premises. An appliance has been introduced for remedying this mischief by preventing it, which ought to be fairly effectual if it can only be employed cheaply and easily. This improved spark arrester consists of a smoke-stack in which the sparks that fly upward and cinders are diverted laterally by an inverted cone, and strike upon inclined wings or flanges, where they are extinguished and reduced to dust before finally escaping from the stack.

Artificial Diamonds.

Although the recent announcement of Mr. Mactear, chemist, of St. Rollox Works, Glasgow, to the effect that he had artificially produced the transparent crystalline form of carbon known as diamond, has proved a false alarm, his failure has been followed by the success of another Scotch chemist, Mr. J. Ballantine Hannay, of Glasgow. Prof. Neville Story-Maskelyne, the eminent mineralogist, whose scientific tests were the means of showing Mr. Mactear's crystals to be spurious, is likewise the authority who has pronounced Mr. Hannay's to be genuine. The small crystallised particles examined by him have all the appearance of the diamond—its lustre, refractive power, and lamellar structure—besides satisfying the characteristic tests of that substance. Like the diamond they are nearly inert in polarised light, and they are hard enough to score with ease the polished surface of the sapphire, a feat which only diamonds can do. The angle between the cleavage faces of one of them was the same as that for the natural gem; and, finally, one of the particles on a foil of platinum glowed brightly and then disappeared exactly as mineral diamond would do. "There is no doubt, whatever," says Prof. Maskelyne, "that Mr. Hannay has succeeded in solving this problem and removing from the science of chemistry an opprobrium so long adhering to it; for, whereas the larger part of the great volume recording the triumphs of that science is occupied by the chemistry

of carbon, this element has never been crystallised by man till Mr. Hannay achieved the triumph which I have the pleasure of recording to-day. His process for effecting this transmutation, hardly less momentous to the arts than to the possessors of a wealth of jewellery, is on the eve of being announced to the Royal Society."

Storing Electricity.

Accumulators of electricity have long been known to science. The apparatus termed a "condenser" is in daily use for signalling on submarine cables, and for the duplex and quadruplex systems of telegraphing on overland lines. But the condenser, after being charged with the electricity to be stored, discharges itself in a moment, and, except for special purposes, this is a demerit. The most valuable electric store for electric lighting and such purposes would be one which would yield up its stock of electricity by degrees at the will of the employer, in much the same way as a gas-holder gives up its gas. The contrivance known to electricians as the "secondary battery" is an instrument of this kind, and depends for its action on chemical decomposition. The current to be stored is caused to separate the constituents of certain chemicals in solution, and these in re-combining refund the original current in a gradual manner. Secondary batteries, however, have been somewhat neglected, until the recent cry for electric lighting has brought them into greater prominence, and the result thus far is that two new and improved ones have been constructed. Fig. 1 represents the first of these, which is due to Professors Houston and Thomson, of Philadelphia. It consists of a glass vessel, V, containing a solution of sulphate of zinc, in which are immersed two plates —one of carbon, A, and one of copper, C—separated by a porous diaphragm, B. The poles of the electric machine generating the current to be stored are connected to these plates by wires in such a way that the current passes from the copper plate up through the solution in the cell to the carbon plate above. The action of the current is to decompose the solution, depositing metallic zinc on the carbon plate, and sulphate of copper on the copper plate. When, therefore, the supply current is cut off, these temporarily divorced substances seek their old chemical alliances, and in slowly re-combining set up a current through the wires in the reverse direction to the storing current.

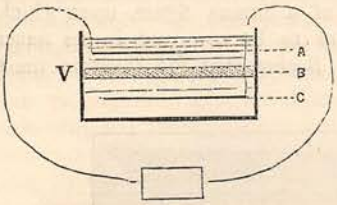


FIG. 1.

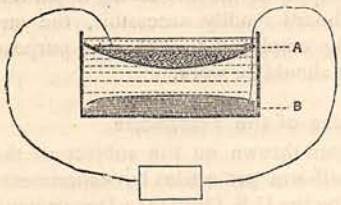


FIG. 2.

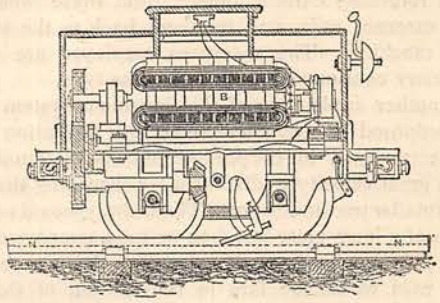
Fig. 2 represents another form of secondary battery, invented by M. d'Arsonval. Here the solution in the vessel is the same as above, sulphate of zinc; and while the upper plate is carbon, surrounded by lead shot, the lower is liquid mercury. The action of the charging current, which ought to flow from the carbon plate *down* the cell to the mercury, is to deposit peroxide of lead on the lead shot and metallic zinc on the mercury, with which it amalgamates. A cell of this kind, after being charged a short time by a battery or dynamo-electric machine, will work a Deprez household motor for several hours.

Photographing on Leather.

A successful mode of taking photographs on leather has been patented by Herr Lewisohn, of Stuttgard. A coating of copal varnish is put upon the leather, and well dried; then a second coating is placed over it, composed of albumen and white lead. When this is dry, the faced leather is ready for the silver bath which forms the sensitive surface. The composition of the albumen and white-lead varnish need not be very definite, so long as the stratum of lead deposited is thin and uniform. A little practical experience soon enables the operator to estimate the proportions to a nicety.

An Electric Railway.

The idea of superseding the steam locomotive by an electric engine is at least twenty years old; but it was never practically realised until last year, when Dr. Werner Siemens, the famous German electrician, actually built and operated an electric tramway at the recent Industrial Exhibition in Berlin. During the course of the summer 100,000 persons were conveyed by this line at a speed of from three to four mètres per second; and this conclusive success has so far emboldened the inventor, that he is now engaged in organising a scheme for introducing the system on a public scale into the streets and squares of the German capital. The principal of the electric railway is the transmission of power to a distance by means of electricity, a subject which we have on several occasions treated of in these columns. To carry out



this principle, two dynamo-electric machines are employed. One of these is stationed at some point where there is a convenient source of mechanical power to drive it, say a steam or gas-engine, or a fall

of water, and the electric current generated in it by its rotation is led by means of metallic conductors to the second machine, which is mounted on a car upon the rails in front of the train. The current, on being passed through this auxiliary machine, communicates a rotary motion to its movable part or armature, and this motion is in turn communicated to the wheels of the car, the result being that the car travels along the line and draws the train after it. The conductors which Dr. Siemens employed were the rails themselves; a central one being provided to take the current from the stationary machine to the moving one, and the outer rails being utilised in completing the circuit back to the stationary machine again. Below is a general view of the electric tramway at the Berlin Exhibition, and on page 319 is a diagram of the internal construction of the electric locomotive. Here, N is the central rail, from which

the current is let into the revolving bobbin of the machine by means of a brush of copper wires, T, which constantly sweeps against the rail; and the rotation of the bobbin, B, is communicated to the driving wheels of the car by means of a gearing. The returning current passes from these wheels to the external rails, and by them back to the stationary machine. The machines employed are of the ordinary continuous current Siemens type.

Another application of this ingenious system which is proposed by Dr. Siemens is the formation of an "Electric Post," for the purpose of conveying mail-bags with great velocity to distances far exceeding the existing tubular pneumatic post. The railway would take the form of a long plate-iron box or tube, supported upon iron pillars. Light glass or wooden sleepers to carry the rails would be laid in the bottom of this and fastened down. On these rails would run small four-wheeled carriages, each having an axle taking the form of a rotating bobbin in a small dynamo-electric machine attached to the front part of the carriage. The hinder part of the carriage would be fitted up to hold the mails and other parcels transported; and by means of stationary machines every twenty miles or so, a post could be sent off every ten minutes.

How to Wear the Life-Preserver.

An ingenious mode of showing how life-preservers should be "put on" comes from America. It has very properly been contended that vessels of every description should be compelled to carry an ample supply of life-preservers; but it has been noticed that though many ships have complied with so reasonable a regulation, there are some persons who do not know how to adjust the preserver even when they have succeeded in obtaining it. Consequently, Mr. Delhommer has constructed an iron drinking-fountain in the model of a human figure, upon which the life-preserver has to be arranged in its exact position, as for use. Seeing that the fountain must be repeatedly visited by all the passengers, and that they cannot possibly fail to observe the preserver-arrayed figure, it is assumed that they will speedily acquire a knowledge of the manner of applying it. Of course a large supply of the life-saving apparatus must be kept on board readily accessible, the one on the model being employed for the sole purpose of explaining how it should be worn.

Novel Use of the Telephone.

Fresh light has been thrown on the subject of the time of flight of small-arm projectiles by experiments recently conducted by the U.S. Ordnance Department, in which the telephone rendered indispensable assistance. A telephone was connected with two transmitters, one near the gun, the other in front of and near the target, while the time between the report of the gun and the impact of the bullet on the target was "taken" by a stop-watch. The results never varied more than a quarter or half a second. A head wind, it was found, lengthened the time of flight, and a rear one shortened it.