Valentia (Ireland) and Heart's Content (Newfoundland), and 310 knots between Newfoundland and Cape Breton, and for this the total expenditure was £533,250; so that with the enlarging experience time gives, and the reduction in cost, half a million sterling may be roughly placed as the cost of each cable between the two sides of the Atlantic. The monetary results to the owners of the cables cannot be said to be extravagant. The receipts from the working of the associated cables are "pooled," and divided amongst the companies in proportions varying according to the number of cables in working order each possesses. Taking the largest company, its traffic receipts in six months were £225,000; and the cost of working, salaries, rent, maintenance of land lines, use of patents, office expenses, &c., were £36,500 in that time; but new buildings, provision for renewal, &c., claimed considerable sums, and in the end the holders of ordinary stock received only £1 10s. interest on £100 for the six months—three per cent. per annum. For this, offices are kept up in London and elsewhere; stations in Newfoundland, Ireland, France, and other countries; a staff specially experienced is provided, and a magnificent collection of electrical instruments is in use; whilst there is gradually growing up a greater knowledge of the length of "life" of cables, and of the conditions and the rates at which they can be most efficiently and economically worked.

Atlantic telegraphy, indeed, is still young and still undeveloped. One cable—a patriarch, from Brest to St. Pierre—is fifteen years old, but most of those we have named are comparatively young. Their working capacity under present conditions is known, but it is not known how soon these conditions may be altered, or at what rate messages may be sent. And as yet only the fringe of trans-Atlantic telegraphy has been touched. With few and short exceptions, the rates for messages have been heavy, and thus the extent of the work is minimised; but with the enlargement of the number of cables, and with a growing competition, lower rates will become current, and every year the growth of interest, of business, and of friendly relationship between the two great communities at each end of the wires, will increase the number of the messages of business, of news, of social life.

The Poet-Laureate has spoken of the "march of mind in the steamship," but it is yet more apparent in the telegraph, for whilst the steamship has, at vast cost and with enormous exertion, brought down the length of the passage from England to America to one week, the under-ocean wires are in seconds carrying momentous messages, and, in the strong words of Lowell, along them "tremble the joys, sorrows, wrongs, triumphs, hopes, and despairs" of myriads of men and women everywhere. This is now the outcome of the work of thirty years ago, and of the efforts of the Penders, the Grimstones, the Fields, and others who have developed the work.

THE GATHERER.

A Boot-Label.

Our engraving illustrates a household convenience recently introduced. It is designed to insure the calling of travellers in hotels and residences at the proper time in the morning. At present the custom is for "Boots" to chalk the hour on the boot-soles of the guest who wishes to be roused; but this plan sometimes leads to highly inconvenient mistakes. The new boot-labels are hung in the coffee-room and bed-rooms of an hotel, so that when the guest takes off his boots he may write the hour of his morning call on the label and affix the latter to his boots. One form of the labels is a clock-face, which can be set to the hour; another is fitted with cards, which can be shifted as in a calendar; a third (which is shown in our illustration) has provision for ordering a bath or breakfast, &c.

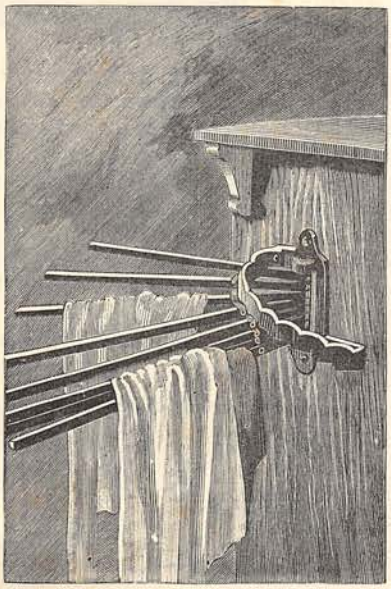
An Electric Parcels Post.

At the Royal Aquarium, Westminster, there has been on view for some months an interesting variety of the electric railway, adapted for conveying parcels. There is nothing novel in the system except, perhaps, the rails, which are placed one directly over the other, and the carriage runs between. The wheels of the carriage, placed one in front of the other, are deeply grooved to clutch the rails and prevent the car leaving the track, no matter how sharp the curve or high the speed. The motion is, of course, imparted to the wheels by a dynamo or electric motor carried by the car, and the dynamo is driven by an electric current conducted to it by the rails, and in this case supplied by a primary battery. Mr. Danchell's railway is an interesting experiment, and we hear that a larger trial will be made of it ere long.

"Squaring the Circle."

Mr. C. E. Parker Rhodes has brought out a simple contrivance for facilitating certain geometrical calculations. It consists of a shallow square trough, an adjustable "right-angle," and a quantity of small shot. To find approximately the "square" of a given circle, the latter is cut in some hard material, and the

circle thus made is placed on a level slab and carefully filled in with small shot, none of which overtops the rest. The shot are then placed in the shallow trough, and the right-angle adjusted until the shot just fill the square formed by the right-angle and the corner of the trough. This area is the square of the circle in which the shot were first placed. If, instead of a circle, a surveyor wanted the area of an irregular piece of land, he has to cut the plot to scale in cardboard and fill it out with the shot, then find the square in the trough equivalent to this area by means of the shot and adjustable right-angle. The plan may be useful sometimes.



A Useful Rack.

This rack is designed for airing and drying clothes, for hanging towels in a bath-room, or for any other similar purpose where it is essential that each article should be separated from the others and yet be fully exposed to the air. As will be seen from our illustration, the rack consists of a number of arms pivoted, one above another, on an axial pin, and kept apart by means of a collapsing metal band, which admits of the arms being folded and unfolded fan-wise. The arms are of great strength, and can, of course, be made of any required length.

A New Railway Engine.

The engineering department of the South-Eastern Railway have at last overcome the difficulty, hitherto met by the use of two engines, of drawing a heavy train. They have now produced an engine capable of drawing heavy trains. Its inside cylinders are much larger than those of the ordinary engine, and its front part rests on a four-wheeled "bogie" truck, which enables it to turn curves with ease, without danger of leaving the rails. Such an engine is now working the tidal trains between Cannon Street and Folkestone, the total distance of 70 miles being travelled in 91 minutes, with trains varying from sixteen to twenty-six coaches. We may add that the same company have also constructed a new six-wheeled detaching composite carriage with electro-plated panelling, which obviates the necessity of re-painting The vehicle is 32 feet long, and comprises two first and two second-class compartments and a guard's van. The carriage is very handsome, the mouldings being of sheet-copper stamped under the press and electro-plated. Iron is also largely used in its construction. The carriage is attached to the down mail from Charing Cross to Shorncliffe.

A Giraffe Hotel.

A curious structure in the form of a gigantic giraffe is now being built at Sheepshead Bay, Rhode Island, directly over the Jerome Hotel, to which it will be an annexe. The structure will be 280 feet high, and stand on four legs, three of which will be used as stairways, the fourth as an elevator. A large dining-hall, 40 feet by 60 feet, will occupy the body of the animal, and a clam-bake dining-saloon will be fitted up in the head. In the eyes two electric lights will beam out over the sea.

A New Lamp-Glass.

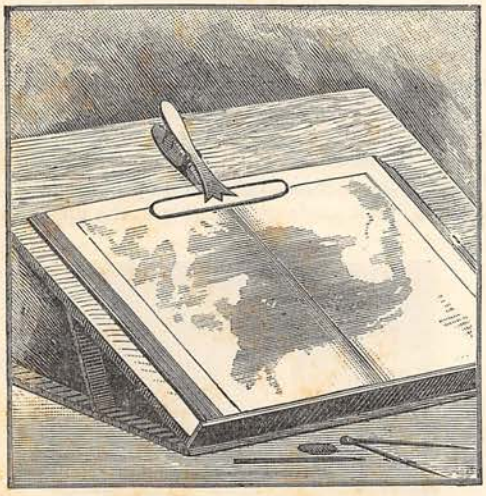
A novel form of lamp-glass has been introduced by M. P. Bayle, which gives a more perfect combustion of oils in lamps than the ordinary form of glass. As shown in the woodcut, it has the form of two cones united at *a*, the narrowest part, and opening out above and below. The angle of widening in the upper part,

b, should not be more than 5° ; and that of the lower part should be between 35° and 45°. The best effect is obtained when the height of the glass is about six

times that of the diameter at the narrow part. The wick of the lamp is shown at *w*, and the glass enters the lamp by means of a cylindrical part at its lower end. This glass resembles that of the Argand reading-lamp in the narrowing of the tube; but it is an improvement on the latter, and more scientific. If the lamp is intended to burn in a still atmosphere free from draughts, the height of the glass may be reduced to four times the diameter of the neck. The best position of the wick is obtained when its top is just a trifle below the lower end or base of the lower cone. The glass is applicable to oil, petroleum, and gas lamps, with a gain in brilliancy of light, and freedom from fumes.

Gas-tight Tubing.

A great obstacle to the use of many of the applitions to which gas has of late years been put, has been the want of a tubing which, while being flexible, should yet not allow of any escape of gas. Mr. T. Fletcher, F.C.S., has devised a tubing which will bear continuous heavy pressures without escape or smell. It consists of two separate layers of rubber, with a thin layer of pure tin vulcanised between, tin being absolutely gas-proof.

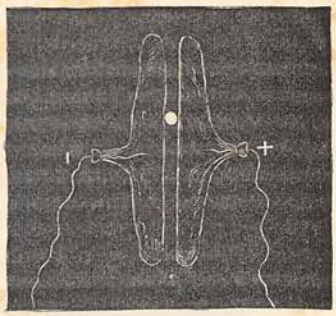


A Book-Clip.

This handy little device is intended to hold open and in position the pages of an account-book or other volume from which copying is to be done or extracts made. In form it resembles an ordinary spring letter-clip, to the top plate of which is attached an ellipse of strong wire, which serves to hold the pages in position, while it does not altogether obscure the heading or top lines.

Artificial Globe Lightning.

Fire-balls, or globe lightning, are a curious and hitherto unexplained form of the electric discharge which are frequently seen in summer. Thus, during the past August great balls of fire were seen rolling down the slopes of Lochnagar in Scotland during a violent thunderstorm. The best explanation of fire-balls has been given recently by M. Gaston Planté, a well-known French electrician, who actually produces what is a very good imitation, if it is not actually a miniature artificial fireball. The figure illustrates his apparatus, which simply consists of two damp surfaces formed of pads of filter-paper moistened with distilled water and brought very close together. These pads were connected with a Planté secondary battery of 16,000 cells, giving an initial electromotive force of 40,000 volts. On making contact, a small ball of fire, shown in the figure by the white spot, appeared between the pads, and ran from one side to the other between the two surfaces. In the experiment the pads take the place of charged clouds, or a charged cloud and the ground; M. Planté thinking globe lightning is produced when a column of charged air or vapour comes very close to the earth.



An Electric Governor.

When used for electric light purposes, engines should govern quickly. Hence, we have the new Porte-Manville governor, which is illustrated in Figs. 1 and 2. The bevel wheel, B, runs between two collars, D D^1. The boss of the wheel is tapped and has a threaded spindle running through it. Part of the spindle is cut square, and runs through a square hole in the collar D, which prevents the spindle turning with the wheel, and only allows it to be screwed up and down. This arrangement provides that when the bevel wheel turns, the valve is either open or shut. Movement is given to the bevel wheel by a spur wheel, to which

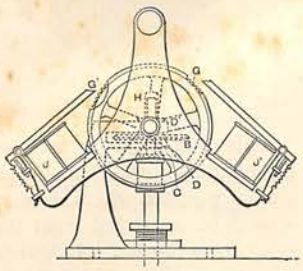


FIG. 1.

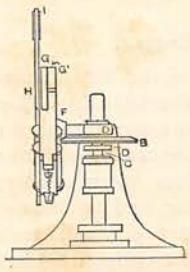


FIG. 2.

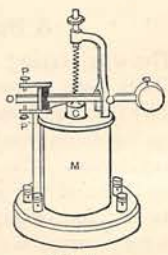
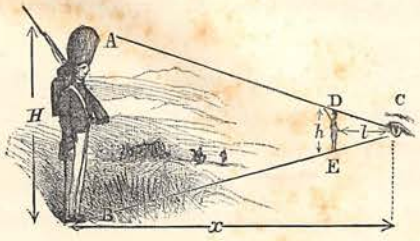


FIG. 3.

are attached two ratchet wheels, G G^1, with their teeth cut in opposite directions. Upon the same spindle as the spur and ratchet wheels, but unattached to them, is the three-armed carriage H, which is kept oscillating about its centre by the upper arm, I, being attached to a reciprocating part of the engine. On the other two arms of the carriage are electromagnets, J J^1, having their iron armatures prolonged into pawls, the pawl of one magnet being over one ratchet, and the pawl of the other magnet over the other ratchet. If, now, a current is sent through the left-hand magnet, its armature is attracted and engages with its own ratchet wheel, which turns the whole system in the direction that raises the valve. If the current flows through the other magnet the reverse action takes place, and the valve closes. The current is sent by a relay which may be caused to operate by the tachometer when the speed becomes too high or too low; or it may be controlled by the electric-lighting current itself by means of the device shown in Fig. 3. Here we have a solenoid, M, which, when traversed by the current, sucks down a soft iron core, C, into its hollow interior, and pulls on the spring lever O, thereby causing it to make contact with the piece P^1, below. If the current is too weak, O makes contact above with P; but in either case an electric current is sent to the governor to open or close the valve.

A Distance Judger.

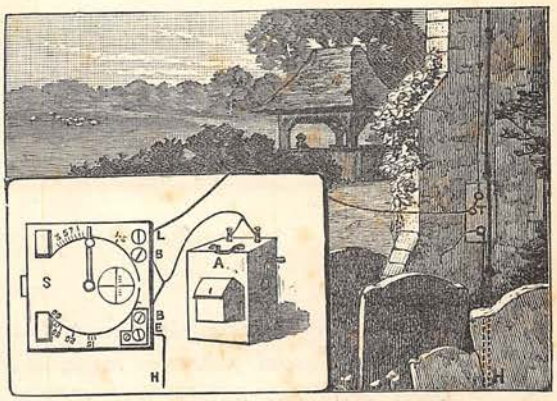
The following practical device for estimating distances at sight emanates from a French source. One or more silhouettes of standing or kneeling men are to be drawn on a card—the standing ones 25 millimetres in height, the kneeling ones 16 millimetres. These may be coloured for army use with uniforms of the enemy, but ordinarily they may simply be in black ink. The



figures are then cut out of the card with great care, leaving attached a base of cardboard to be held between the thumb and first finger. The appliance thus made is callibrated in the following manner:—Station several persons corresponding to the figures on the card at a distance of 200 metres, and cause an assistant to hold the instrument up in front of you. Move back until the resemblance of the distant figures corresponds to those of the card in height, and measure the distance between you and the silhouettes. The comparison of the two distances gives the clue to the use of the instrument. It is best to make the cards of such a size that at a certain distance from the persons the eye requires to be an even number of paces behind the silhouettes. Thus, if it is four paces behind the silhouettes (4 × ·75 metres = 3 metres), the multiplier (as proved below) is 50 to give the distance. If, then, on looking at a distant party of men in this manner the observer recedes from the silhouette until the men equal in size the figures on the card, the number of paces he has receded multiplied by 50 will give the distance of the men in metres. The figure illustrates the principle of the device, where H is the height of a distant person, A B, and h is the height of the silhouette figure, D E; l is the distance of the eye, C, from the card, D E, and x is the distance sought. Now in the similar triangles, A B C and D E C, we have

$$x = l\frac{H}{h}$$

and, since the length of a pace is ·75 metres, if n is the number of paces taken back from the card, we have $l = n \times ·75$ metres. Now, if we agree to make $\frac{H}{h} \times ·75 = 50$, we shall arrive at the proper height to give the card figure. Thus, taking H at 1·665 metres (5 ft. 5½ in.), we find $h = 0·249$ metre, or say 25 millimetres, as originally stated.

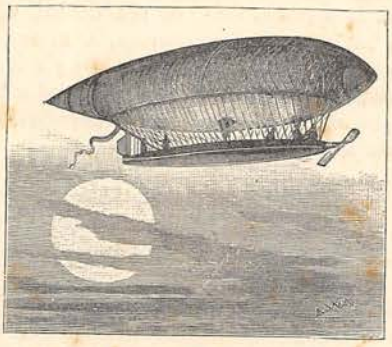


Siemens' Lightning-Rod Tester.

Messrs. Siemens Brothers have devised the apparatus which we illustrate for quickly testing lightning-rods. It consists of a small hand-dynamo, which is contained in a box A, and generates the testing current on the handle being turned. Into this box when not in use slides the indicator-face S, on the left of the engraving. The latter is fitted with four terminals L, B, B, E, and and has resistance coils underneath. To test the rod a copper wire is connected to its point: but this is best done when the rod is first erected. The wire runs down beside the rod. In making the test, terminal L is connected by the loose wire to the point of the rod, terminal E is joined to a good "earth," and terminals B B to the hand-dynamo or generator. The handle of the latter is then turned to generate the testing current which, when the hand on the dial is held down, flows through the rod and apparatus. A small galvanometer attached to the dial-face shows how the current operates; and the hand is to be moved on the dial until there is no deflection of the galvanometer needle. When this is so, the dial will show the resistance of the lightning-rod in ohms.

A Propelling Balloon.

On August 9th an interesting and successful balloon ascent was made from Meudon, in France, by two Government aëronauts, Captains Renard and Krebs. The balloon was dirigeable, and driven by a screw propeller while steered by a rudder like a large square sail. Captains Renard and Krebs have been engaged for some years past in experiments on ballooning at the Government establishment in Meudon, and their past work culminated in the effort of August 9th. The balloon, of light strong silk, is cigar-shaped and pointed at both ends. It is 197 feet long and 39 feet in diameter. A light netting covers it, and supports a platform 131 feet long by 10 feet broad. This is the basis of the car which carries the passengers and freight. The propeller, which consists of a screw of light wooden framework and air-tight cloth, is fixed to the front of the platform. It is driven by a Gramme dynamo, actuated by a current from a set of stored accumulators, or secondary batteries. It may be remembered that in a recent GATHERER we gave an account of a somewhat similar ascent made by Gaston Tissandier. In the latter case the dynamo was driven by primary batteries. Captains Renard and Krebs ascended together, the former having charge of the propelling gear, the latter of the rudder. On being liberated from the ground, the aërostat rose quickly to a height of 180 feet, and then, the propeller being in full play, started off for Villebon, a town seven miles distant, which had previously been fixed upon as the destination of the trip. The day was calm, but there was a breeze blowing against the balloon at the rate of 18 feet per second. On arriving at Villebon the aërial craft was steered gradually round, describing half a circle, and started back to Meudon, where it arrived safely some forty minutes after it set out. When within 20 feet of the ground the vessel was eased, reversed, and stopped, then hauled to earth by a rope thrown from the car. Since this attempt, others equally successful have been made.



A PROPELLING BALLOON.

SPECIAL ANNOUNCEMENT.

OUR readers will be gratified to learn that arrangements are being made for the introduction of a novel and very useful feature in magazine literature, in the form of a New Department, to be entitled OUR MODEL READING CLUB, the full explanation of which will appear in our NEXT ISSUE.

In the SAME ISSUE *will appear two New Serial Stories—the first,* "A DIAMOND IN THE ROUGH," *the Story of an American Family in their English Home, by the Author of "Horace Maclean: a Story of a Search in Strange Places;" the second,* "SWEET CHRISTABEL," *a Study of Girl Character, by the Author of "The Probation of Dorothy Travers." Both these Stories will be more than usually interesting, and it may be added that the Short Complete Stories will maintain the long-established reputation of the* MAGAZINE *in this amongst so many other respects.*

The Programme of arrangements for the immediate future is so full and varied, that the Editor can only point to the separate Sheet issued with this Part of the MAGAZINE, *where it will be seen that it would be almost invidious to select only a few of the items for special mention to the exclusion of the majority. The contents of that Programme will show that the* MAGAZINE *will continue, as heretofore, to fulfil the comprehensive aim which has characterised it from the commencement, by providing for the wants of a large and increasing public in the United Kingdom, in America, and in the British Colonies. The present phenomenal success of this* MAGAZINE *is a striking proof—if, indeed, any proof were required—of the sterling soundness of the principle adopted by its conductors in strengthening, consolidating, and extending year by year the attractions, resources, and practical usefulness of each Department (and that without undue encroachment of one upon the other), so that the* MAGAZINE *itself "has ever proved its own best advertisement" when placed in the hands of new readers.*