THE GATHERER.

Balloon Photography.

The invention for which the brothers Montgolfier were chiefly responsible contained the promise of a much wider range of usefulness than they ever dreamt of. Their balloon was probably looked upon as a curiosity and nothing more, and it was not until a comparatively recent period that it came to be considered as a valuable means to all-important ends. Our readers will remember that in the siege of Paris, in 1870–1, the inhabitants of the French capital were largely indebted to balloons for communication with the outside world. For reconnoitring purposes the invention was utilised at a much earlier date than the Franco-German war. But peace has her victories no less renowned than war, and accordingly we find that science has been greatly benefited by the employment of balloons in various circumstances; witness Mr. Glaisher's marvellous ascent of 7½ miles, and the results which he then obtained. Holiday-makers are often gratified with the spectacle of an ascent, and to be up in a balloon is now popularly regarded as rather a pleasant sort of thing. Ballooning, however, bids fair to become of still further service, and we shall proceed to chronicle an instance in which both military and scientific men may hope to gain something from it. We refer to Mr. W. B. Woodbury's plan for photographing by means of electricity from the balloon.

The balloon is raised to the desired height, and is then moored by a rope, along which the electrical wires are laid. A box, open at the bottom, occupies the place of the car. To one side of the box the cable is joined, and to the other is fastened a kind of sail to prevent the balloon from turning round. Inside the outer box is an inner one, swung on a pivot to keep it horizontal, which contains the photographic appliances—namely, the lens, which is placed in the bottom; a dark slide having two rollers carrying the sensitive tissue, moved by clock-work; and an electro-magnetic apparatus for guiding its movements, and working an instantaneous shutter placed over the lens. By electric communication with the earth, the clock-work is set in motion and stopped at will, thus exposing a fresh length of sensitive paper as required. The shutter is a disc of ebonite or metal, with an aperture at one side, and is made to revolve rapidly in front of the lens every time it is released, by a catch acted on by the electro-magnet excited from *terra firma*. The circuit for controlling the clockwork, and that for working the shutter, involve three wires of communication. When the lens is properly focussed, and the tissue in position, the shutter is set in motion by a current giving instant exposure. A photograph is thus obtained, and by further controlling the clock-work, a fresh sensitised surface may be exposed, and more images taken. Mr. Woodbury's invention, it will be seen, may be of vast service in war, where a plan of the country is of such great importance to strategetical operations, and there is no reason why it should not be as advantageously employed in the arts of peace. It possesses the additional recommendation of being entirely worked from the earth, so that there is practically very little risk to life or limb.

How to produce an Antique Bronze.

There is a Hibernian smack about the heading of this note, but of course its object is to indicate the means by which copper or brass articles may be made to acquire an antique-looking green bronze appearance. First of all, like the celebrated hare, the article—be it statuette, bust, ornament, or what not—must be procured. Then, this having been obtained, repeated applications of alternate washes of dilute acetic acid, and exposure to the fumes of anmonia, will in due course produce the desired result. There are, however, speedier methods than this: (*a*) the articles may be steeped in a solution of one part of perchloride of iron in two parts of water, when the tone assumed will darken with the length of immersion; or (*b*) they may be boiled in a strong solution of nitrate of copper; or (*c*) they may be immersed in a solution of two ounces of nitrate of iron and two ounces of hyposulphite of soda in one pint of water. Washing, drying, and burnishing complete the process.

In connection with this receipt we would add a few words of caution and advice. It would be hardly worth while to purchase a bronze article in order to have the satisfaction of making it green. It would certainly be unwise to experiment upon any object that was really valuable. Lastly, don't let the children tamper in any way with the various mixtures, and see that you are yourself very careful in this respect.

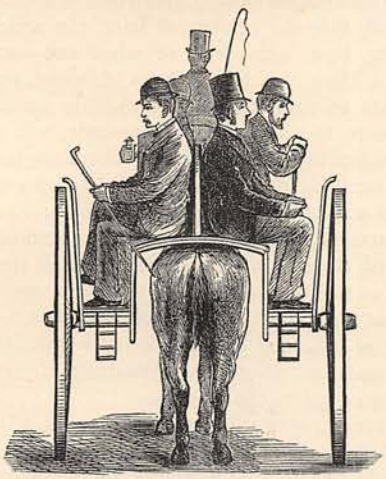
Prevention of Colliery Accidents.

It is sad to reflect upon the large number of lives that are annually lost by colliery catastrophes. Some of these disasters happen from causes unfortunately beyond human control, others are the result of accident pure and simple, or of negligence, and it may be hoped are not irremediable. For instance, overwinding does not fall within the former category, and a new method has been discovered for preventing calamities due to this source. This invention is on a different principle from the self-acting, safety-detaching hooks, and every one must be sincerely anxious for its complete success should it ever, unhappily, be tested in cases where the issues of life or death hang upon its operation. Assuming that somehow or other the engine has become unmanageable, or that the engine-keeper were to leave the engine altogether, the cage, when it ascends three feet above the landing-stage at the pit-head, strikes an

apparatus which at once throws the engine out of gear, and at the same time puts a brake on the winding-drum or pirns, as the case may be, sufficiently strong to hold the cage in position, and without doing any injury whatever to the machinery. The invention is considered, and we trust on ample grounds, to be well fitted for the important purpose for which it has been devised.

A Novel Vehicle.

Should this meet the eye of any coach-builder who is at a loss for a novelty, we commend to his emulative spirit a machine which an American gentleman has recently evolved out of the depths of his inventive faculties. We give an end view of this strange "trap," and whatever its chance of success, there can be no doubt about its ingenuity. Roughly speaking, it looks like a vehicle without shafts, the body of the machine



"EQUIBUS."

being placed across the horse, so that when looked at sidewise it resembles a huge wheel, with the fore and hind quarters of the quadruped in question. It is suggested that the carriage should be constructed to hold four sitters—two on each side—besides the driver. The wheels are not connected directly by an axle in the ordinary way, but—as the engraving shows—the body of the machine rises from the inside of one wheel, goes across the steed, and descends to the inside of the other wheel. The vehicle runs up to the collar, to which it is harnessed, and the driver's seat is placed right above in front—a position which he might find unpleasant if his horse became unmanageable. The principle of construction, it will be seen, is very simple and intelligible. The suggester proposes to call the machine the "Equibus," and he claims for it, with great enthusiasm, the advantages of catching the load close to the collar; the proximity of the driver to his animal, whereby he not only has it under great immediate control, but can also try, if he like, the gentler influence of moral suasion; the adaptability to crowded thoroughfares; cheapness, compact lightness, no annoyance from dust unless the wind blow aft and the horse be too slow to get away from it, and other particulars. As to cost, he argues that, as compared with an outlay of $1,000 upon a dog-cart, a handsome 16-hand horse, and a nice harness, he would have to spend only $430 in setting up *his* carriage, saving $250 upon both the vehicle and the beast—a useful rather than a handsome nag being wanted in the "Equibus"—and $70 upon the harness. We must, however, confess that the machine would, in our opinion, look ungainly, not to say ugly.

Home-Sickness, an Actual Disease.

Most people have a notion of what home-sickness is, many have suffered from it, but it has been left to a distinguished French physician to classify it as an actual disease. Mons. H. Rey finds that it is uncommon among children and old folk, and more frequent among men than women. Those who are most liable to it are the young conscripts drawn from the country who join the infantry: town lads are too accustomed to change and bustle to be readily susceptible, while the cavalry soldier is supposed to be too busy to have time to devote much attention to home and its concerns. Dr. Rey considers nostalgia (that is, home-sickness) a form of insanity. Its symptoms are that the patient becomes sad and moody, forbears to eat, retires to weep *solus cum solo*, and gives himself up to reveries of home. In the second stage, he wears the aspect of ill-health, suffers from headache and sleeplessness, and, should the disease advance, delirium, prostration, and decay set in, terminating in death. Occasionally veterans also are afflicted with the malady. This generally happens when fighting has to be done in retreat, in the bitterness of defeat, when they feel forsaken, cold, hungry, when they have to sleep on damp ground, agonised from thirst caused by their wounds, when they are taken prisoners, and become familiar with the strange bedfellows that misery acquaints them with—in these circumstances, utterly downcast and disheartened, the old soldier thinks of his home, his aged parents, his wife and bairns, with keenest, liveliest memory, and a severe attack of nostalgia is added to the other ailments of which he is already the victim. Dr. Rey's observations were probably drawn from French cases, and it is extremely unlikely that the young British recruit ever suffers to the same extent as his more unfortunate *confrère* who may be compelled to enter the army against his will. Instances of the disease in its gravest form are, we should say, very, very rare, and Dr. Rey, whose views on the subject are highly interesting, sets them forth apparently in an eminently French style.

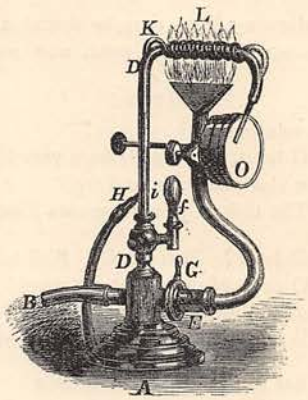
Type-Setting in Japan.

It must be no joke to be employed in a Japanese printing-office. In our own and most other countries of the world, except China and Japan, the language is written by means of an alphabet of separate *letters*. Among the Celestials and their next-door neighbours, on the other hand, each *word* has a distinct

character. The compositor's difficulties in either instance are obvious almost at a glance. In setting up this note, he has the letters conveniently arranged before him in what is known as the "case." But in Japan, according to an American contemporary, a full fount of type comprises 50,000 characters, of which 3,000 are in constant use, and for 2,000 more there are frequent calls! Instead of being compactly arrayed before him, the type is disposed about the composing room on racks, and the unfortunate compositor has to wander up and down the room setting his "copy" and stretching his legs, though he would probably be quite willing to dispense with the greater part of his enforced exercise. It is for the reason that it is impossible to apply the system of single-character words to telegraphy, that that inestimable boon to civilisation is apparently unavailable to the inhabitants of Japan and China.

New Lights for the Magic-Lantern.

Magic-lantern entertainments depend, for their success, upon the interest attaching to the slides exhibited, and the power and purity of the light used in displaying them. Those who are interested in this form of amusement will be glad to know that two new lights have been introduced which, though equally well adapted for other purposes, are peculiarly suited for the magic-lantern, in which they may be employed to great advantage. One of these is called the pyro-hydrogen lime-light, and its patent is of recent date. The accompanying engraving will help to explain our text. A is the stand, which is provided with a pipe B, into which gas is admitted from any convenient source of supply. The pipe B is divided into two branches, D and E, the supply of gas to either of which may be regulated at *f* and G. The branch D has a smaller pipe H inserted into it at *i*, which pipe is again brought out at K, and is then coiled round the pipe D, after which it is re-inserted into the latter, and ends in a jet concentric with the latter. The branch E has a Bunsen burner L formed at its upper end under the small coiled pipe, an opening being made in it through which air is admitted to mix with the gas, which passes through a jet regulated at G. O is a disc of lime upon which the heated air and gas are discharged. The action of the apparatus is briefly as follows:—Gas being admitted, by attaching at B a piece of india-rubber tubing connected with a chandelier or other source of ordinary gas, it is allowed to pass into the branches D and E. An air-pressure apparatus (either hand or foot blower) being attached to the pipe H, compressed air is admitted into the smaller pipe at *i*, and after passing through the coils in the latter, is discharged, mixed with gas from the pipe D, in a jet upon the disc O. The mixed air and gas passing through the pipe E are burned at L, and sufficiently heat the air in the small pipe and the gas in the pipe D before they are discharged upon O. The lime disc is placed in the brass cup, and the flange screwed on; by means of the milled head at the back, it may be turned round so as to present a fresh part of its surface to the jet when necessary, or it may be reversed so that the back of the block may be used. When done with, the cup holding the lime may be



placed in a tin box filled with dry powdered lime, and in this way the same disc will last for a considerable time. The best proportions of air and gas will soon be found by experience.

The other light specially adapted for use in connection with the magic-lantern is called the triplexicon. It owes its specific name to the fact of its possessing three wicks, each two inches wide, the centre one being straight, that on each side curving so as to include the middle one between them. This shows a burning edge of six inches, and the position of the wicks, along with the particular arrangement for combustion, produces a light of intense whiteness and dazzling brilliancy, having a strength equal to that of at least 110 candles. It has four-inch condensers, and is so constructed that the air in the cistern remains intact and cold, the hot-air passages allowing plenty of vent for the cold air to rush in through the perforated disc below. The lantern has an annealed glass chamber which will stand any amount of heat, and is covered over with a metal cap, with openings back and front, to allow the light to pass out when it is attached to the metal chimney. Crystal oil is the material which is used to feed the triplexicon.

American Horses in England.

The extension of the tramway service in this country naturally led to a great demand for horses. Our breeders having mainly turned their attention to cart-horses and high-blooded saddle and carriage-horses—none of which are suited for car work—were unable to meet the call that was made upon them. For a time, light, enduring animals were obtained from Ireland, but the present chief sources of supply are Canada and the United States. The importation of horses for tramways began two years ago, and already over 5,000 have been shipped from New York and Quebec. At first they were devoted to the killing labour of our "street railways," but it is said that they are becoming

favourites for family use—we wish we could add, partly because of the employment of steam or other motive-power for driving the tram-cars.

A Hidden Quotation.

In the following lines may be found a well-known quotation from a modern poet, one word in each line:—

BLIND!

"It was but an hour ago!
O hour, you seem like a year!
For slow, slow, to and fro,
The tick of your moments I hear.

"Still hear? Still smell? Still touch?
O echo of days that are dead!
Availeth a miser's clutch
When his gold has vanished—fled?

"What use in a hand that feels
And falters and seeks in vain?"
Through the dull dead darkness steals
The sound of a mighty pain,
Of a heart that is sorrow-slain.

* * * * *

A year that seemed like a life,
And the voice is a voice no more!
The heart that complained of its strife
Is a heart whose troubles are o'er;
Still death gives sight as before. W.

The Defence of the Thames.

In bygone days its wooden walls were proudly supposed to be Britain's best defence. With our hearts of oak and jolly tars it was confidently believed that our island home was secure against every foe. Attempts have been periodically made to fortify the coast by martello towers and the like, but they have all in the long run been abandoned as impracticable, and we have fallen back—not despairingly, but with undiminished faith—upon the good old tradition. The wooden walls, it is true, have to a great extent been replaced by ironclads; but, with our splendid navy and gallant seamen, the hearths and homes of Britain are still safe from attack. Nevertheless, caution has prompted the placing of the Thames in a complete state of defence, irrespective of the aid of the fleet; and we suppose that the same system of protection will ultimately be extended to other of the more exposed river-mouths of the country. The torpedo seems to be regarded as the limit of perfection in naval weapons of war. This terrible instrument it is which is to form the defence of the Thames. The station is situated at Shornemead Battery, and in the operating-room there is a number of bells, each in electrical connection with a torpedo, which can only be fired by completing the circuit. When a ship touches a torpedo the bell belonging to the latter will ring, and the officer in charge can either explode the machine or allow the vessel to pass on her way unimpeded. Of course, the torpedoes are not in position, but they are ready, with all the appliances, for being moored when required. This precaution is exceedingly necessary, otherwise there is no knowing what disaster an insidious torpedo unwittingly discharged might cause.

The Marvels of the Microphone.

Apparently we have as yet felt but the first pulsations of a giant wave of invention and discovery in physical science, that bids fair to stagger us with its marvellous wonders. Hardly has our surprise at the telephone, bringing within our ken sounds originated hundreds of miles away, had time to lessen, before we are startled with the phonograph, with its marvellous powers of perpetuation of sound. And while the phonograph still seems "a weird, uncanny thing, gifted with magic spell," a new discovery in the same direction makes us open our eyes wide with amazement, and wonderingly wait the next surprise. The telephone may bring us sound from a distance; the phonograph may bottle it up for indefinite periods, and yield it forth obedient to human will; but the microphone bids fair to do still more than either of these: it will render audible sounds previously unheard by the human ear, and carry them whither one will. This is the latest triumph of science, some slight account of which we will endeavour to give. The microphone is the invention of Professor Hughes, and is the result of the discovery by him that certain bodies are peculiarly sensitive to sound, and will increase sound in the same way as the lenses of the microscope magnify objects. By placing such bodies in the circuit of the telephone—by, in fact, breaking the currents transmitted through the wire—a wonderful augmentation of the intensity of the sound-waves is produced. Professor Hughes has found that the interposition of charcoal permeated by fine atoms of mercury will, at present, give the best results; and in his microphone, pieces of gas-carbon, tempered in mercury, are used to form the "transmitter." But, in the words of the inventor, "the best form and materials for the instrument have not yet been fully experimented on;" and as he has most unselfishly abstained from taking out a patent, further improvements may be daily expected. But even as at present constituted wonderful results have been achieved: the gentle rubbing of a camel's-hair pencil has been augmented to a crackling noise, painful in its intensity; the walking of a fly has produced a sound like the tramp of some six-legged horse, while its mere breathing has been heard as the trumpeting of an elephant. By the aid of the microphone, in conjunction with the telephone, sounds almost inaudible at their source—such as the beating of a pulse, the tick of a watch—may be transmitted and heard hundreds of miles away. What a prospect is thus opened up, what a possibility of wondrous advancement of knowledge in every science in the future! The microphone cannot, of course, produce sound; but what a world of sounds there is at present undistinguishable by the human ear! The impinging of a ray of light on any body, the growth of a tree, the rise of the sap in a plant, the

flight and breathing of minute insects, the flow of the blood in the veins, the passage of the air in the lungs, the combination of chemicals—all of these may be rendered distinctly audible to the human ear. Truly, in the microphone, as it is and as it will be, appears to exist a wonderful agent with which to wrest from Nature many of her grandest secrets!

Conversation at the Bottom of the Sea.

While on the subject of acoustic wonders, it may be interesting to our readers to hear of another practical use to which the telephone has been put. It seems that a French war-steamer has lately been engaged in towing an old ship out to sea, to form a torpedo training-vessel. Attached to one of the towing cables was a conducting wire, with one end on either vessel, and it was found that by the action of the sea on the copper sheathing of the ships, an electric current was set up, and telephonic communication was at once established along the circuit. So successful, indeed, was the experiment, that conversation could readily be carried on between the two ships. This result suggested to the commander of the French war-vessel the idea of impressing the telephone into the service of the diver, and in this way:—One of the glasses of the diver's helmet is replaced by a copper plate, and in this is inserted a telephonic wire. As in the case of the ships, an electric current is established, by means of which it becomes an easy matter to hold converse with the divers, even while they are "fathoms deep below"—at the bottom of the sea. In cases where it is necessary that divers should make observations, whether as to the state of the keel of a ship, or as to wreckage, and report thereon, the practical value of this new use for the telephone is obvious.

Double Acrostic.

Strange lovers these, who oft in verse confessed
The tender love that glowed within their breast;
Yet when they met as bridegroom and as bride,
All knowledge of these feelings they denied!

A much-admired, swift, fleet-footed steed,
For gentleness much noted and for speed.

Brave little maiden, wouldst thou give thy life
A substitute, to save the prince from harm?
Yes, with firm purpose, with devotion warm
She tried; but, strange to say, became his wife.

'Twas here the famous Grecian hero killed
The monster which the land with terror filled.

There comes a time, a happy time,
When blushing maidens coyly give
To loving youths a promise that
Henceforth for them they'll live.

Decked with the produce of the earth she stands,
Protectress of the fruits of many lands.

Against the conquering foeman's arms
They bravely fought, they bravely died;
Led by their queen, war's dread alarms
And all its evils they defied.

In literature, science, art,
This person plays a foremost part;
If e'er this *rôle* should fall to you,
Unbiassed be, impartial, true!

The sun by day and moon by night
Give their light,
And both unite
In sea and bight
To keep me moving swift and bright.

Answer to Double Acrostic on page 445.

CHRYSALIS—BUTTERFLY.

C r a B
H o n o l u l U
R o u T
Y a c h T
S cheherazad E
A v o i R
L e a F
I s a b e L (Tennyson's "Isabel").
S o r c e r Y

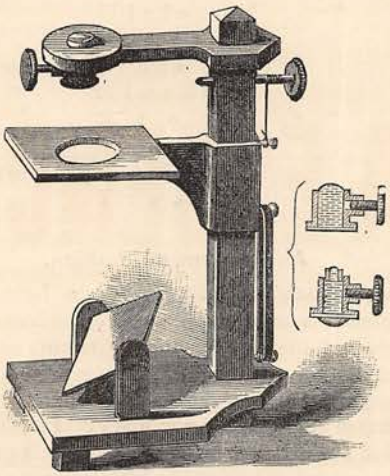
An Economical Fashion.

However steadfastly Englishwomen have set their face hitherto against any change in underwear, there is no doubt that combination garments are gaining ground steadily. They are approved of for many reasons, and are now recognised under the name of "Princesse lingerie." The motives that induce to their adoption are various; being closely fitted to the figure, they are approved by fashionable women, because they aid in making them look slender; stout women prefer them to bulky underclothing; economical women approve them because two garments are combined in one; consequently, there is a considerable saving in material and in the labour of making. Lastly, delicate women like them because the weight of combination garments is suspended from the shoulders instead of from the waist. Hence Princesse lingerie has much to recommend it so long as the present clinging drapery and sheath-like style of figure obtain.

A Rough-and-Ready Microscope.

Those who prefer to spend their leisure hours in mechanical pursuits might do worse than turn their hands to the making of a microscope, which, without being of much service in important studies, would still be of sufficient value to spend the time in pleasant and profitable amusement. The whole instrument can readily be constructed at home, and its cost would be trifling, the chief items of outlay being the brass fittings. The stand (see illustration) is made of wood. The sleeve supporting the table slides upon the vertical standard. A stout wire, with a milled head by which it may be turned, passes through the upper end of the standard, and has wound upon it a strong silk thread, one end of which is tied to a pin inserted in the sleeve. Attached to the lower end of the sleeve, and to a pin projecting from the standard near the base, is an elastic

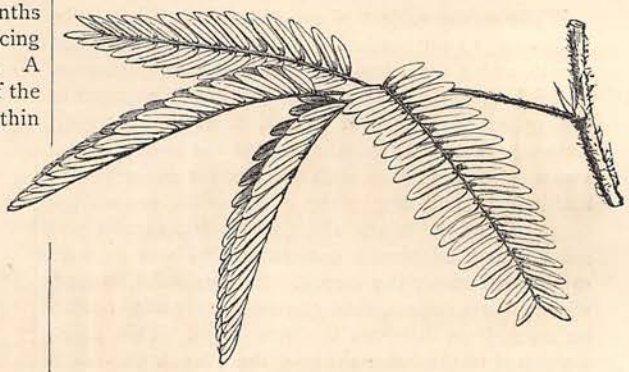
rubber band, by means of which the table may be drawn downwards, in order to allow a nice adjustment of focus. Two uprights in the bed-piece receive the corners of a rectangular piece of silvered glass, which forms the reflector. The lens consists of water placed in a cell drop by drop. The vertical section of the lens shows the screw for adjusting the convexity of the drop. The best kind of cell is a brass tube about three-eighths of an inch long, and with an internal diameter of from one-eighth to three-sixteenths of an inch, having in one side a screw for displacing the water to render the lens more or less convex. A thin piece of glass is cemented to the lower end of the tube, and the inside of the tube is blackened—a thin



coating of black sealing-wax will serve this latter purpose. Several "bushings" may be fitted in the upper end of the tube to reduce the diameter of the drop, and so to increase the magnifying power of the lens. If air bubbles form they may readily be got rid of by the use of a needle. The object to be examined is placed upon the movable table, and the lens must, of course, be adjusted to suit the individual using it. A microscope of this sort is not proposed as a means of abstruse scientific research, but passing recreation may be extracted from it, and the making of it will also probably afford some amount of gratification.

Do Plants Dream?

Within recent years the life-history of plants has developed into a most fascinating and suggestive study. There are those wonderful insect-eating or flesh-feeding plants which, experiments have conclusively shown, thrive better upon a meat diet than upon the ordinary sustenance of vegetable life. Some of them have a natural will-you-walk-into-my-parlour look about them, and the unwary fly that is once enticed across the fatal threshold may abandon all hope, for it will be infallibly prevented from returning to the regions of the upper air. Dr. Francis Darwin, who has worked up the subject of their life-history with the thoroughness that is always to be found in the ardent scientific observer, raises the question whether or not plants may be capable of dreaming. He was sitting in his hothouse one night, waiting to make an observation at a given time, when he noticed the leaf of a sensitive plant suddenly drop to its fullest extent and slowly rise to its original position. In this action, he affirms, the plant behaved exactly as if it had been touched on its sensitive joint; and accordingly he concludes that some internal process produced the



LEAF OF THE SENSITIVE PLANT (*Mimosa pudica*).

same impression as an actual external stimulus. In like manner, he says, "a dog dreaming by the fire will yelp and move his legs as if he were hunting a real instead of an imaginary rabbit." Unfortunately, Dr. F. Darwin is led to believe that this power of dreaming is only a fanciful resemblance between the sleeping

AN INSECT-EATING PLANT (*Sarracenia*).

of plants and animals. If it had been otherwise, we should have liked to ask him to carry his investigations a step farther, and to tell us what the plant was dreaming about!