[For the Scientific American].

THE BUTTERFLY.

[By Edward C.H. Day, of the Schoolof Mines, Columbia College].

Nothing strikes the nature-loving stranger, who chances to land here from the British Islands or the northern part of Europe, during the hight of our summer season, more than the abundance of insect life that swarms around us. The incessant shrilling of the crickets and the grasshoppers, led by the energetic cries of the katydids, drives sleep from his eyes by night, while by day, if the somewhat too monotonous and high-pitched music of the cicada as "he trills his sonorous drum," continues the offense to his ears, he is compensated by the sight of a multitude of beautiful insects, such as he seldom or never had the chance of observing in his own more temperate native land. The gorgeous butterflies that sport among our flowers, adding fresh beauties to the parterres, and giving a flickering of gay life to the oppressive stillness of the noontide heat, include, as a rule, larger and more gaily-colored kinds than are to be found in Northern Europe.

Handsome, however, as are our larger kinds they are but aberrant witnesses of the almost tropical intensity of our summers; for we are but on the verge of the conditions that favor the development of these, "the knights," as Linnæus termed them, of butterfly society. If we would see these aristocrats at home we must visit the moist regions under the equator—sojourn with Bates on the banks of the mighty Maranon or wander with Wallace amid the islands of the East. And who that has read the writings of these enthusiasts has not wished to stroll in the glades of the South American forests and see those glorious beauties of the air, that flash meteor-like above the topmost hights of the trees, scorning to descend within mortal reach? or has not felt a longing to gaze for once, if only for once, on that wondrous *Kallima paralekta*, as it sits in a bush of dead leaves, itself the most perfect imitation of a leaf in decay, "blotched, mildewed, and pierced with holes," and, more than all, apparently covered with minute fungi. Or who would not travel far to see such sights as described by Sir Emerson Tennent, as occurring in Ceylon, flights of butterflies, "apparently miles in breadth, and of such prodigious extension as to occupy hours, and even days, uninterruptedly in their passage—whence coming no one knows; whither going no one can tell. The natives have a superstitious belief that their flight is ultimately directed to Adam's Peak, and that their pilgrimage ends on reaching the sacred mountain.

"A friend of mine drove for nine miles through a cloud of white butterflies which were passing across the road by which he went." And does not the thought of the sylph, or "specter-butterfly," described by the same author, "as found only in the deep shade of the damp forest, usually frequenting the vicinity of pools of water and cascades, about which it sails, with graceful flight, heedless of the spray, the moisture of which may even be beneficial in preserving the elasticity of its thin and delicate wings, that bend and undulate in the act of flight," suggests a whole world of marvels and poetry to the genuine lover of nature? Truly the museum of the naturalist is in the field and the forest, and not in dingy, deceptive mausoleums of dried bugs and stuffed skins.

But there is no need, good reader, for us to be disheartened; we have a splendid collection around us, albeit we are a long way from "the line." The traveler who wishes to see the most must pay the heaviest fees; and if we will but read and inwardly digest the observations and reflections of such men as Darwin, Bates, and Wallace, and then go forth with an observant eye and a trifle of patience, we may see beauties and marvels enough around our own doors, without exposing ourselves to hardships and fevers, and to the thousand extra ills which flesh is heir to in the tropics. For instance, you are passing by a blighted apple-tree—a moderate-sized, orange-brown butterfly is flitting around it; it has vanished, and you are sure it did not fly away. Look closely at the aged trunk, and perchance you detect several such butterflies, the marbled underside of their wings, erected as they are at rest, so exactly resembling the varied shades of the bark, that even an observing person might pass and repass the trees without noticing these unless they take wing. These "bark-winged" butterflies, as we might well term them, are common butterflies, upon the undersides of the wings of which you will detect little metallic letters, and we think that you could scarcely find a better illustration of a protective resemblance of this particular kind, even among South American examples. Have you been reading of "polymorphism," or the fact that individuals of the same species in some cases are found differing widely from each other, though of the same sex? Our common *Papilio turnus*, or large yellow "swallow-tail," furnishes you at once with an illustration that has recently been oft quoted; and if you wish to earn a reputation for research, you have but to discover what are the peculiar conditions that influence this species, so that, north of the latitude of New York, females, yellow, similar to the males, prevail, while south of that line, black females are the rule; females, in fact so black that they resemble other species much more than their own! So you see, good reader, that you need not journey far from your own door to find illustrations of the observations of more traveled naturalists, or to enable your own thoughts to make intelligent criticism on their writings.

Your own observations, coupled with your readings, will soon bring you back to the point whence we set out. You will recognize that while the head-quarters of the Papilios and other large and strikingly-colored butterflies are in the tropics, species belonging to other families extend the range of the Lepidopters, even into the Arctic regions. Such arctic forms occur in the United States, restricted, however, to the summits of the highest mountains, isolated there by the gradual amelioration of the climate that has advanced over these regions since the close of the glacial epoch. These forms belong to the family of the *Satyridæ*—a family that is otherwise extensively developed over the temperate regions of both the Old and the New World.

The butterflies belonging to this group are mostly of sober hues; the very name in French of the insect figured herewith

THE HALF-MOURNING BUTTERFLY.

indicates this fact. It is called the "Demi-deuil," or "Half-mourning" butterfly, from which the reader will safely infer that its coloration is simply black and white. Its scientific name is *Arge Galathea*. The *Satyridæ* of this region mostly haunt the shades of woods and form no exception to the general rule of sober coloration. Browns and grays of various shades only relieved by eye-like spots of brighter colors, predominate among our native species. They fly with a quick jerking flight, and when they alight the dull tints of their underwings correspond well with those of the objects amid which they rest and the shadows that surround them. The caterpillars of many species of this family feed upon grasses, as is the case with those represented before us.

Simply adorned as these retiring butterflies are, they are not devoid of a neat beauty of their own, and doubtless there remains much of interest in their habits and associations to repay the student who may devote his attention to them.

THE fall of a large mass of rocks situated between Heidelberg and Weisloch, caused by the recent earthquakes in Germany, has revealed the works of an ancient silver mine which was worked by the Romans. Very little silver ore was left in the mines, but an abundance of rich zinc ore has been found which had remained untouched by the ancient workers.

Crime the Result of Disease.

In "Hammer and Anvil," recently published by Leypoldt and Holt, we find the following extract, which those who are giving attention to social reforms will do well to heed:

"As the only true criticism is creative, which takes the secrets of art as the starting point of its judgment, so that none but an artist can be a real critic, even so men's actions can only be judged by those to whom the old wise word applies, that nothing human is alien to them, because they have experienced in themselves and in their brethren the whole misery of humanity. But for this are necessary, as I said before, the feeling heart and the seeing eye, and an ample opportunity for training and using both.

"Who has a better opportunity for this purpose than the superintendent of a prison? He and the physician, when their views coincide and they strive together towards the same ends, alone can know what the most conscientious judge has no means of learning, how the man whom mankind have thrust out from among them for a time or forever, became what he now is; how, born thus, and of such parents, brought up in such associations, he acted thus and not otherwise at such a critical moment. Then when the superintendent, who is of necessity the confessor of the criminal, has learned his life in all its details, and the physician has discovered the defects with which he has suffered for years, when they consult upon his case, the question only is if he can be helped and how; and in the so-called prison they see, respectively, but a reformatory and an infirmary. For—and this is a point of infinite importance, which physiology will yet compel jurisprudence to acknowledge—nearly all who come here are diseased in the ordinary acceptation of the word; nearly all suffer from organic defects, and in almost every case the brain lacks the proper volume which a normal man needs for normal activity, for a life which shall not bring him into conflict with the law.

"And how could it be otherwise? Almost without exception they are children of want, of wretchedness, of moral and physical malformation, the Pariahs of Society, which in its brutal egotism sweeps by with garments gathered up for fear of defilement, or thrusts them away with cruel violence from its path. The right of wrong! Insolence of Phariseeism! A time will come when this invention of the philosophers will be placed on a level with that other of the theologians, that death is the atonement for sin, and men will thank God that at last they have awaked from the night of ignorance which gave birth to such monsters.

"That day will come, but not so soon.

"We are still deeply sunk in the mire of the Middle Ages, and no man can yet see when this flood of blood and tears will have passed away. However far the glances of a few brighter intellects may reach into the coming ages, the progress of humanity is unspeakably slow. Wherever we look abroad into our own time, we behold the unbeautiful relics of a past that we had believed to be overthrown long ago. Our systems of government, our nobility, our religious institutions, our official arrangements, the organization of our armies, the condition of the laboring classes—everywhere the scarcely hidden relation between masters and slaves; everywhere the critical choice whether we will be hammer or anvil. All our experience, all our observation seems to prove that there is no third alternative. And yet no greater misconception of the real state of the case is possible. Not hammer *or* anvil, hammer *and* anvil is the true word, for every man is both, and both at once, in every moment of his life. With the same force with which the hammer strikes the anvil, the anvil strikes the hammer; the ball is thrown off from the wall at the same angle under which it impinges upon it; the elements which the plant has appropriated in its growth, it must exactly restore in its decomposition—and so throughout all nature. But if nature unconsciously obeys this great law of action and reaction, and is thereby a cosmos and not a chaos, then should man, whose existence is subordinated to precisely the same law, acquire an intelligent knowledge of it, and endeavor intelligently to shape his life in conformity with it; and his worth increases or diminishes exactly in proportion as he does this or neglects it. For though the law remains the same, whether the man knows it or knows it not, yet for himself it is not the same. Where it is known, where the inseparableness, the unity of human interests, the inevitableness of action and reaction, are recognized, there bloom freedom, equity, justice, which are all but varying expressions for the same law. Where it is not known, and he fancies in his blindness that he can with impunity make a tool of his fellow-man, there flourish rankly slavery and tyranny, superstition and priestcraft, hatred and contempt, in all their poisonous luxuriance. What man would not naturally wish rather to be hammer than anvil, so long as he believes that the choice lies open to him? But what reasonable man will not cheerfully renounce the part of hammer, when he has

learned that the part of anvil will not and cannot be spared him, and that every blow that he gives smites also his own cheek; that the serf corrupts the master as well as the master the serf, and that in politics the guardian and the ward are rendered equally stupid."

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

The Pine-Apple.

MESSRS. EDITORS:—There is, perhaps, no production of the tropics which is so generally and deservedly esteemed by the people of the North as the pine-apple, yet of none have they such vague ideas as to its manner of growth. Not unfrequently have we heard it expressed as being the fruit of a tree; associating it with the cone-bearing trees of our own country. The pine-apple plant (*Ananassa sativa*) is a native of tropical America, growing wild in the forests, but is also largely cultivated in those regions, as well as to some considerable extent in the West Indies, and on the eastern continent.

It has fifteen or more long, serrated, ridged, sharp-pointed leaves springing from the root, resembling in its general aspect the century plant, but much smaller in size. In the center of this cluster of thick, succulent leaves, springs up a short stalk bearing a spike of beautiful flowers, which in time produces a single pine-apple. On the summit of the fruit is a tuft of small leaves, capable of becoming a new plant, which, together with suckers, are the means by which it is propagated, as the cultivated plant seldom produces seeds. It flourishes best in a moist and warm climate, but is able to survive a long drought and extreme heat.

There are several varieties of the pine-apple, differing in their leaves being more or less spiny on their edges, and in the shape and color of the fruit. Great care is requisite in its cultivation, otherwise it will be coarse and fibrous, with but little sweetness. Nothing can surpass the rich and delicate flavor of a pine-apple which has been properly grown, or of the wild fruit of the forest, which we always found equal, if not superior to the cultivated ones.

A word as to the manner of preparing a pine-apple for eating may not be out of place here. Let the rough exterior first be removed to a sufficient depth, and then slice the fruit longitudinally with the core, and not across the hard center, as is generally done with us. As soon should an ear of green corn be divided in sections when the kernels must be pulled from the cob, as a pine-apple across the core, instead of nicely slicing the fruit from its adherents. The deliciousness of a pine-apple when freshly picked from the plant and prepared in the above manner cannot be surpassed.

H. M. MYERS.

Orbital Motion.

MESSRS. EDITORS:—I have devised a simple addition to the gyroscope, to serve as a popular proof and illustration of the demonstrable truth, that axial motion produces orbital motion. Dr. G. M. Ramsay says (Cosmos p. 78) "the Gyroscope demonstrates that axial, tangental force becomes an orbital propelling power, but it carries the gyroscope in a reverse orbital direction;" and hence he draws the conclusion, that "if the planets had an independent, direct axial force, they would move in a retrogade orbit."

I maintain that the gyroscope itself will show his conclusion incorrect. Set it to spinning with a direct motion, and observe it when the axis deviates a little from a perpendicular. The hub describes an orbit with a direct motion, the same as the wheel moves. The inclination of the axis represents the inclination of a planet's axis to the plane of its orbit; and also the nutation of the earth's axis. And even when the axis becomes horizontal, the under side of the wheel is, in fact, the outer side of the orbit, and its orbital motion is direct, the same as before.

Thus planetary, axial, and orbital motions are well represented by the gyroscope; but more truly and plainly by my addition, which any person can readily make or get made. It consists of a metallic bar (1 foot long and $\frac{1}{10}$ inch in diameter for the small gyroscope), bent about 30° in the center, a cavity on the concave side, so as to balance on a pivot like a compass needle; a socket on one end, a weight on the other, to balance the gyroscope. Set it to spinning in this socket, and it at once produces an orbital motion around the pivot, direct or retrograde, just as you spin the gyroscope.

That this must be so appears as certain and plain as Archimedes' "Eureka." The radius vector of a planet may be regarded as a lever. The direct axial tangental force at the outer end of the planet's diameter, which coincides with the radius vector, is just equal to the tangental force at the inner end of the same, where the motion is retrograde to the orbit; but the outer tangental force having the longest leverage, the motion must be direct.

S. N. MANNING.

Kankakee, Ill.

How to Make a Perfect Boiler.

MESSRS. EDITORS:—To make a perfect boiler the following rules should be observed: First, the iron in each cylinder should be of uniform thickness and of good quality, and a templet made corresponding with the thickness of iron and size of boiler. Each plate should be marked off with a marking punch from this templet. (I do not approve of using a pencil or white lead for marking). There should be a center on the press punch to enter the mark indicated by the marking punch. This will make every hole in the boiler so perfect that a reamer will not be required. Secondly, the rings should be so laid out that by driving a pin in each of the lap holes both rings will be closely hugged together. To make good holes the punches should be largest at the end, and tapering back, with the face a little concave, so that the edges touch the plate first. When the punch becomes dull throw it in the scrap heap; it will not pay to repair or reharden it. Thirdly, all flat surfaces of boilers should be braced to sustain a pressure equal to the bursting pressure of the cylinder; the braces being in all cases straight, so as to take a direct and positive strain, fitted of the exact bevels of the plates and riveted when possible, never using pins, as they are liable to work loose; for in my opinion, this evil has caused the destruction of many boilers. Use the *best American iron*; thanks to protection, we can now produce an article equal to the best in the world. The edges of plates should be planed, not chipped, and the riveting and caulking done by experienced workmen. For working pressure Haswell's rule should be the guide, as it is more accurate than any I have ever seen. The boiler should be in charge of a *sober*, intelligent, industrious man; then there will be no fear of explosion.

As bituminous coal is now much used; would it not be economy, to say nothing of the abatement of a great nuisance, to consume the smoke? I think also that if the water was sufficiently heated to disengage impurities, and injected into a receiver, beneath the fire box, it would be attended with benefit; there would be little or no commotion, and the water would then flow into the proper channel, and leave impurities where a blow pipe would carry them off. I think both these results can be effected; let me have your opinion upon the subject.

PATRICK QUINN.

South Newmarket, N. H.

Mental Science.

MESSRS. EDITORS:—There are periods of crime, as illustrated by the homicidal epidemic prevailing throughout the country. There are also tendencies to mental and moral insanity in various degrees, from ungovernable temper to mania, and the question arises, "Should these particular tendencies absolve from responsibility either at the bar of conscience, or in the verdict of the jury?"

If such tendency be the result of indulged selfishness or intemperance of any kind, the acquittal places a premium on criminality, and the next step may be as in the East, to consider the insane not only deserving of sympathy, but under the special protection of the Almighty.

While we predict the eclipse and the revolutions of Saturn, we unfortunately know little of the wondrous system within us, and our educators would vindicate their noble profession by teaching the pupil the science of self-knowledge, to ascertain the recurring laws of emotion, controllable to a certain point, and regular (to the thoughtful) as the cycle of the seasons. Said a recent victim, "My paroxysm is coming; be careful at such an hour." Would it be impracticable to extend this idea to self-application; to watch the recurrence of internal tendencies carefully as external occasions; to realize that injury to ourselves or others from uncontrollable passion (alias insanity) comes in most cases from long continued criminal negligence, and cannot, therefore, escape the penalties of responsibility?

G. A. LEAKIN.

Baltimore, Md.

A Question for Watchmakers.

MESSRS. EDITORS:—I would be very glad to see through your excellent journal what argument pocket chronometer makers use when it is stated to them that the balance in the chronometer escapement has an unlimited motion, and in the pocket, winding, or careless handling, a valuable hair-spring may be subject to more tension than it ought to have.

I never could account for this oversight, and always wondered how it is looked at from a watchmaker's standpoint, who not unfrequently has much trouble before he can get the spring to work to his notion; and, there are springs in use in high priced pocket chronometers that could not be bought at half the price a whole movement costs, while a mere accident may destroy them.

In this matter the lever principle has the advantage over the chronometer escapement, as every one can see. Now, I do not want to find fault with the chronometer, I only want to point out the cause of hair-spring breaking, and a necessity for its prevention in expensive watches.

J. MUMA.

Hanover, Pa.

Information Wanted About Brick Making.

MESSRS. EDITORS:—I desire to learn all the improvements in brick manufacture. I manufacture bricks in this city. I use the Vervalen & Wiley machines. The main difficulty is that in this part of the South we have so much rain, during the summer months, that it prevents the bricks from drying. I understand there exists some artificial invention to dry them as it would to dry vegetables and fruits. I have an idea that it is similar to a bakers' oven. I would like to know at once, without experimenting, as I have no time to lose; and also to learn how to make the concave bricks for roofs, and fire-bricks. I wish to obtain the pamphlets of all brick manufacturers that exist at the present day. I will pay for the pamphlets, and also for the tunnel or anything else that can answer for that purpose.

JOSEPH BORRO.

Savannah, Ga.

DR. STÖLZEL gives what he considers an excellent, cheap, and durable substitute for the copper cylinder in Daniell's battery. A piece of well-polished sheet tin is immersed in a very dilute solution of a copper salt and put in connection with a weak galvanic current. After the lapse of from fifteen to eighteen hours a layer of firmly-adhering copper is deposited upon the plate, which may now be bent into the required form.

WHAT INVENTORS SAY.

We are in daily receipt of strong testimonial letters from patentees who have employed this office to secure their letters patent. We present some examples received within a few days:

MESSRS. MUNN & CO.:—It is with the greatest pleasure I inform you, that through your Agency, I this day received my letters patent all right and in good condition; and in expressing thanks to you would say, that next to having a good patentable article on which to obtain a patent, is the importance of employing those whose experience and discernment—as solicitors—enable them to "sift the wheat from the chaff," and while tenacious in giving their clients the full benefit of what rightly belongs to them, are conscientious as to the rights of others—always painstaking and reliable. Such, gentlemen, have I, on more than one occasion, found your firm to be, and for which please accept this acknowledgment.

Meantime, I remain, yours truly,

WM. A. COBB.

Orange, Mass., June 23, 1870.

MESSRS. MUNN & CO.:—It affords me much pleasure to acknowledge the receipt of the patent papers for my Lock Nut, also the duplicate specifications of the same. The success of this, your fourth effort, in securing patents for me, is an additional assurance to me that the increase of business, does not lessen your interest in the applications of those who intrust their business to your hands. If success is possible, I am satisfied that your firm is the most reliable medium to secure it. It may be of some satisfaction to you to know how my method of tying a nut stands practically. I can say that it has stood the test of nearly six months on the Reading road, and is being tested on two other roads leading from this city.

Yours respectfully, U. B. VIDAL.

Philadelphia, Pa., June 20, 1870.

MESSRS. MUNN & CO.:—Allow me to express to you my thanks for the very prompt and efficient manner in which you have successfully prosecuted my application for a patent on my Vapor Burner, which was allowed May 26th. I have already realized from it the amount of $3,000, and consider myself not only truly fortunate in that, but that in selecting you to prosecute my claims, I found those who did it so promptly and ably.

Accept my best thanks, therefore, and allow me to say that the fees I paid you were not only the best investment I ever made, but that I can earnestly recommend all the inventors of America to intrust their cases to you if they desire a certainty in having them faithfully and ably attended to.

Yours truly, THOS. MOORE.

Bloomington, Ill., June 20, 1870.

MESSRS. MUNN & CO.:—The letters patent for my Rotary Pump came duly to hand. I am highly pleased with the prompt and efficient manner in which you have conducted my business at the Patent Office, and shall take pleasure in recommending your Agency. Respectfully yours,

W. B. ALLYN.

Boston, Mass., June 27, 1870.

MESSRS. MUNN & CO.:—We are perfectly satisfied with our patent, and we must say that it is impossible to secure an invention better than you do. You have found in our invention applications we never dreamed of. You may depend upon us to praise and recommend your office.

Respectfully yours,

E. LOISEAU & C. REQUIN.

Nashville, Tenn., June 25, 1870.

MESSRS. MUNN & CO.:—Letters patent for my Projectile have just been received. I desire to thank you for the perfect and satisfactory manner in which you have prosecuted my claim to a successful issue.

Respectfully, your obedient servant,

JOHN G. BUTLER.

Philadelphia, Pa., June 22, 1870.

The White Man's Feet.

Edward E. Cheever, in the May number of *The Naturalist*, gives a most interesting paper on the "Indians of California," in which we find the following passage: "In tracking white men, they (the Indians) cannot make mistakes. The white man's foot is deformed, made so by the shape of his boots and shoes, and even when barefooted, his toes are turned inward. The Indian's foot, never having been compressed, has the toes naturally formed and straight as our fingers are, and he can even use them to hold arrows when he is making them. When he walks, therefore, each toe leaves its imprint in the dust or sand, the imprint of the little toe being as straight, perfect, and distinct as the largest."

This paragraph might be made the text for an article, and perhaps Mr. Brigham will make it one before he concludes his present series of valuable papers. We wish we knew of some plausible reason, why Indians deserve better formed feet than white people, but we do not. No doubt it is a matter of accident, rather than of choice, but so it is. And surely, the white race, with all their glorious achievements in the sciences and the arts, might easily construct boots and shoes on such models as would allow nature full play; and we believe they would if they had a proper understanding of the subject, and a higher ideal of what a glorious state physical perfection is, and the degradation of deformity. The foot is not so degraded a member of the body that we should neglect it, and it cannot grow into perfect form if pinched and cramped by bad shoes, and the sooner people know it the better. It is no excuse that it is kept so much out of sight,