NATURAL HISTORY NOTES.

American Palms.—It is only when the literature of the order is brought together, says a writer in *Science*, that we appreciate the extent and varieties of palms. In the new Genera Plantarum of Bentham and Hooker there are 132 genera of true palms characterized, and about 1,100 species indicated. The following palms are indigenous to this country: Without counting one or two tropical species, which grow in Southern Florida, and which are outlying Cuban and Bahaman species, we have two true palmettoes—*Sabal palmetto* and *S. Adansoni;* the Blue palmetto, *Rhapidophyllum hystrix;* the Saw palmetto, *Serenoa serrulata;* just beyond our national borders, on the islands off Lower California, a palm of a peculiar genus called *Erythea edulis;* and finally, in Southern California, the elegant *Washingtonia bilifera,* named in honor of our first President.

Scales, Feathers, and Hairs.—The idea current among naturalists generally, and largely taught to students, that scales, feathers, and hairs are identical in nature, is combated by Mr. J. E. Jeffries in a recent issue of the *Proceedings* of the Boston Society of Natural History. Mr. Jeffries considers the epiderm to be the primitive, if not the true skin, as it is formed long before the corium, which is a late and very variable product of the mesoblast; and because all the organs of sense are formed from it. The epiderm may be considered as primitively consisting of a smooth mucous layer, an epitrichial one, and perhaps an intermediate one of parenchymatous cells. In birds and mammals the outer layer is lost, and never renewed, while the middle layer becomes thickened and subject to various modifications, such as drying, conversion into horn, etc. Scales are moulted and renewed, scuta are not. The toe pads of birds may be seen to pass over into scuta on the sides of the toes of many birds. Scuta bear feathers as epidermal appendages, scales never do, thus pointing to scuta, which have a mucous layer and outer horn coat, with a mesodermal core, as simple folds of the skin, not as appendages.

The early stages of a feather and of a hair differ. The latter is formed in a solid ingrowth of the epiderm, and the latter from the epiderm of a large papilla. A hair does not contain any of the mucous cells, while a considerable portion of a feather consists of them. The supposed homology between feathers and scales seems to fail before the facts that the mucous layer is absent in the latter, and that Studer has shown that the imagined scale-like nature of the remiges of the penguins is a fallacy.

Mr. Jeffries avows his belief in the distinct origin of the dermal appendages of the higher vertebrates, and asserts that the nakedness of the Amphibia is a strong argument against the identity of any of the alvian appendages with those of reptiles or mammals.—(*American Naturalist.*)

The Coloring Matter of Flowers.—The petals of flowers are far oftener colored by a pigment soluble in the cell sap than by one in a solid, granular form. Of 200 species examined by Mr. P. Fritsch, who has recently investigated the subject, only 30 contained solid pigments in the cells either of the petals or of the fruits.

Far the most common of these solid pigments is yellow, much the greater number of yellow flowers, including nearly all the yellow compositæ, being indebted for their color to substances of this nature.

Exceptional instances of soluble yellow pigments occur in the petals of *Dahlia, Althæa* (marshmallow), and *Tagetes* (marigold), and in the hairs of many species. Solid yellow pigments are described in *Impatiens longicornu,* where they vary greatly in size and form, in the Indian cress (*Tropæolum*), in the evening primrose, pot marigold (*Calendula*), pansy, cone flower (*Rudbeckia*), digitalis, etc. The particles of pigment are often seen in a state of active molecular motion; they are always colored green by iodine, and are soluble in concentrated sulphuric acid, with a deep blue color.

The pigment appears to be always embedded in a matrix of protoplasm. A solid red pigment was observed in the fruits of the dog rose, mountain ash, lily-of-the-valley, white bryony, spindle tree, climbing bittersweet (*Celastrus*), and yew. The red pigment in the cortical portion of the root of the carrot is of a very peculiar kind, resembling long, pointed crystals.

Insoluble violet pigments are rare, but occur in *Thunbergia alata* and the larkspur; while blue granules are found in the fruit of *Viburnum tinus.* Brown insoluble pigments were found only in the seaweeds *Fucus* and *Furcellaria.*

The development of the colored granules does not end with their acting as pigments; for after this period they go through a variety of changes of development or degradation.

THE TIGER BY INSTANTANEOUS PHOTOGRAPHY.

Points about Patents.

The belief of some persons that sugar in paying quantities can be got from corn stalks as well as from sorghum, recalls the fact that the State of Connecticut gave to Edward Hinman a patent for making molasses from corn stalks in October, 1717, or nearly 167 years ago. Senator Platt, who introduced this statement in a recent speech, cited some other curious old Connecticut patents, showing that the spirit of invention was rife there at an early date. There were no devices in the list for manufacturing wooden nutmegs, but in 1783 a patent was given to Benjamin Hanks for "a clock which will wind itself up."

Another interesting point that may be derived from Mr. Platt's tables is that, while in 1790 there were but three patents issued by the United States Government, in 1792 but eleven, and in 1795 but twelve, the issue for year before last was 18,135, and for last year it was 21,196. At certain epochs there have been remarkable jumps in the annual list Thus, in 1854, the number of new patents rose to 1,759, from only 846 for the previous year, and the gain was held and continued. So, in 1866, the new issues were 8,874, but the following year the number bounded to 12,301. Very oddly, it never afterward varied two thousand, up or down, during fourteen years, the new issues for 1880 being 12,926. But the next year the number suddenly started forward to 15,548, and there have since been steady and great gains. If the reissues and the designs of last year should be added to the new patents, the aggregate would be 22,383.

THE TIGER BY INSTANTANEOUS PHOTOGRAPHY.

The portrait of the tiger which we herewith reproduce from *La Nature* was obtained by the same process as the one of the lion that we gave last year, that is to say, an instantaneous photograph was reproduced directly upon wood, and then accurately engraved by the artist. The photograph was taken by a skillful English operator, Mr. Henry Dixon.

Compressed Air Delivered in Pipes.

The machinery and plant of the Birmingham Compressed Air Power Company, which is shortly to be laid down upon a site already selected, will cost, with the necessary buildings and service construction, some £140,500. It will be capable of delivering 5,000 indicated horse power in compressed air. At the outset there will be put down four air compressing engines driven by compound condensing steam engines, and heated by six sets of elephant boilers, four in each set. Now, in the three wards forming the experimental area, we find from the latest total returns that scarcely 3,000 indicated horse power can be needed for engines up to 30 horse power; it may fairly be assumed that for no engines above that power is the new motor likely to supplant steam, since the pressure obtained by the user even after reheating will not exceed 40 pounds to the square inch. The whole of the surplus 2,000 indicated horse power is scarcely likely to be used up by tradesmen other than those engaged upon industrial processes, by builders and contractors for working winches and cranes, and by tramcar companies. In any case the user will have to look to the ice difficulty by having the service pipe passed through the nearest flue, or making special arrangements.

The air will be supplied at a pressure of four atmospheres, and heating to at least 321° Fah. will be necessary to obtain the best results. However, should the estimates of the engineers be anything like correct, the scheme should be a success. They see their way, it is said, to furnish the compressed air at forty dollars per annum per indicated horse power. An addition of 20 per cent—assuming say $50 for small steam power—is suggested. This movement, contemporaneously with the starting of refrigerating plant in the same town, is of much industrial significance for Birmingham, and of interest to all engineering centers.

Dr. Adolph von Bruening.

The German color industry has met with a serious loss by the death of Dr. Adolph von Bruening, who died suddenly in his forty-seventh year of age, on the morning of April 21 last, at Frankfort-on-the-Main. He was one of the founders of the colossal color works, known to the industry as the "Farbwerke, formerly Meister, Lucius & Bruening," at Hoechst-on-the-Main, which owe their flourishing condition in a great measure to his proficiency and inventiveness as a practical chemist. The excellent organization of institutions for the laborers connected with the color works are the manifestations of his philanthropic care for his subordinates. He was born at Ronsdorf, near Elberfeld, in 1837, and only a year ago he was raised to nobility, by the Emperor Wilhelm, in acknowledgment of his patriotism and distinguished merits in industry. He was also a member of the German Reichstag, representing from 1874 to 1881 the district of Homburg-Usirgan.

Whitewood.

Whitewood is gaining favor rapidly. Not many years ago it was used in this vicinity chiefly for coffins and wagon box boards. Farther south, in the sections where the wood grows, it has been used for finishing to considerable extent, but builders who could readily get white pine discarded whitewood.

Until recently, for finishing purposes, and for the manufacture of sash, doors, and blinds, whitewood was little thought of north of those sections where it grows plentifully. A representative of one of the largest sash, door, and blind factories in the country recently said in this office that if he were building he would have little choice between pine and whitewood for the purposes above mentioned. He admitted that his interest is purely identified with white pine, and that he would not admit openly that whitewood is the peer of pine; such, however, in his opinion, is a fact. This is a big admission to come from such a source, but one that is based on a good foundation.

It can be easily understood why whitewood can be used successfully for many purposes for which pine is employed. It is more inclined to twist than pine, but this is not much of an objection where it can be used in small pieces, or if in large ones, securely fastened. Even gum, the most rebellious wood that grows out of the ground, if properly nailed, answers for finishing admirably. Whitewood is very easy to work—it probably ranks next to pine in this respect—takes a good finish, and makes a close joint. There are complaints against cypress for sash, doors, and blinds because, it is said, it is too hard a wood to drive together and make a perfect joint. Too much work must be put on the pieces where they come in contact to cause them to fit closely. In pine work this extra work is unnecessary. The wood is so soft that it readily gives, and the tight joint is at once produced. There are others who claim that such a fault with cypress does not exist; but that it does somewhat there can be no question. Not that perfect cypress sash, doors, and blinds are not made, but it requires a little more attention and labor to make them than it does from pine. In regard to softness, whitewood probably ranks next to pine; it is not quite so easily worked as pine, and a little more easily than cypress.

The easiness with which whitewood can be smoothed is greatly in its favor, as it is prepared at light cost for the paint. Its ability to hold paint well is questioned, and justly where the lumber is used on the outside of a building. Place two boards, one pine and the other whitewood, side by side in an exposed condition, and paint them at the same time and with the same number of coats, and the pine without question would look the better for the longer time. For inside work, though, any difference that may exist in this regard would not count for enough to take into consideration. The paint holding quality of whitewood is good, while in white pine it is extra good.

The cost of whitewood is decidedly in its favor. When clear whitewood can be bought for $20 per thousand less than clear pine, the difference shows up in the light of a big inducement to the consumers of lumber. With many there would have to be big advantages in favor of pine to counterbalance this difference in price. Twenty dollars in a thousand feet of lumber is a good deal of money, and when such a difference exists there ought to be more points in favor of the higher priced lumber than in this case really exist. As the prices of the different kinds of lumber are now ranging, whitewood, considering its value, is the cheapest finishing lumber to be had.

With the popularity that whitewood is winning it is not to be wondered at that whitewood stumpage is increasing in value, and it may be expected to be worth still more. Not many years ago it did not take much money to buy as much timber as any man cared to own, and few cared to own much; but now it is sought not only where it can be immediately got at, but in the out-of-way places which will necessitate the timber standing until improvements in streams and in the way of building railroads are made. It has also come to light that it is not so plentiful as many, a few years ago, supposed it to be. In some of the best Tennessee districts a good share of the available whitewood has been cut; a big proportion of it, when it is considered how short a time the whitewood mills have been at work.—*N. W. Lumberman.*

New Style of Parlor Car.

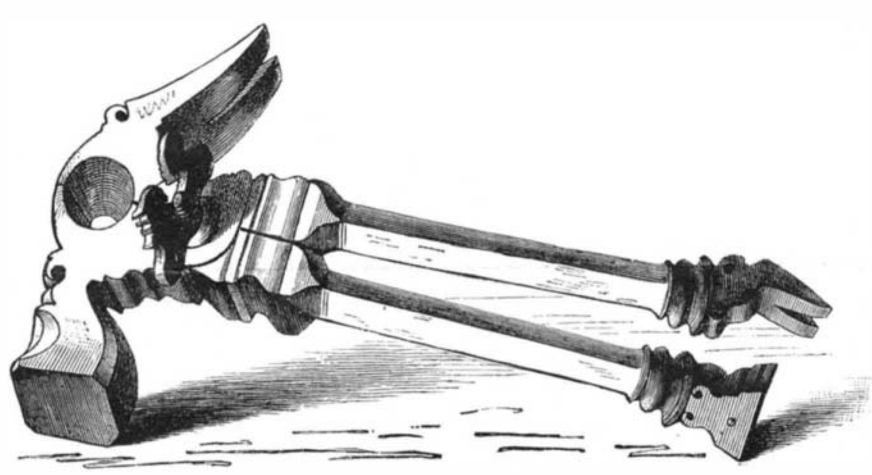
The Pennsylvania Railroad Company have had built at their Altoona shops a parlor car, No. 901. Its dimensions are 62 ft. in length, 9 ft. 10 in. in width, and 9 ft. from the floor to the upper deck of the roof. It is constructed upon an entirely new plan. It contains five separate compartments, retiring rooms for ladies and gentlemen, one at each end of the car, the main parlor, a ladies' boudoir, and a smoking room. The parlor contains four movable rattan chairs, fourteen fixed chairs, and a sofa, a seating capacity of twenty-one. A noticeable improvement is the manner in which the fixed chairs are secured. They are balanced on a handsome brasswork pivot, and furnished with two gracefully curved brass legs at the back, which upon the occupant reclining and the chair touching the floor and giving the chair stability, prevents unpleasant swinging from one direction to another when turning sharp curves, and at the same time readily permits the chair to be moved while in that position, as the feet of the legs are formed of easily moving rollers.

The boudoir is 7 ft. by 6 ft., and contains a lounge and three rattan chairs. A wooden partition of the height of the window sills separates it from the parlor, and entrance to it is obtained through a highly ornamented gate. Rich curtains, of fine plush, of a *gendarme* blue, supported by rods attached to a framework of oak, afford the means of securing to the occupants perfect privacy if desired.

The smoking room is 12½ feet by 6 feet. Partitions reaching to the roof divide it from the other portions of the car. A novel arrangement of the windows has been adopted. Instead of the old style flat window, there are five bay windows on each side, each window about 7 ft. in width. The center light or outer glass of each window is within the outer line of the car, and from it two panes deflect inwardly in opposite directions. This arrangement affords not only a greater lighting surface, but enlarges the prospect from the window, and, it is claimed, ventilation and air can be secured without the introduction of cinders by opening the rear panes of these windows, thus forming a draught outward from the interior. The interior woodwork is oak, prepared to resemble English oak. There is no frescoing or veneering, but the ornamentation consists of elaborate carving and beautiful repousse brass work, exquisite chandeliers of brass, cut globes, rich upholstery and carpets, delicately stained glass ventilators, all harmonizing delightfully and giving a most pleasing air of solidity and comfort. The exterior is painted in the standard red of the company; the guards and railings of the platforms are nickel plated, and the body of the car rests upon two six wheel trucks, larger than ordinary, the introduction of an additional spring giving greater ease.

AN OLD UNIVERSAL TOOL.

Several years ago a so-called "universal tool" was advertised everywhere as an American invention, and this tool is still bought by many people who wish to busy themselves in a practical way, but have not had sufficient experience to know that such an implement is not convenient. It is interesting to know that this "novelty" is very old, and had died out of existence until the modern imitation of old things brought it to light again.



AN OLD UNIVERSAL TOOL.

In the collection at the Flechtingen Castle, among other things, is the "universal tool" shown in the accompanying cut, taken from the *Illustrirte Zeitung.* This implement is at least three hundred years old; it is almost nine inches long, very heavy, of very good workmanship, and bears traces of having been gilded.

Electricity and Light.*

Electricity appears almost to realize for us one of the oldest and most striking of the representations of creative power, "Let there be light, and there was light." In most of our other sources of artificial light we appear to consume something which to the ordinary mind is converted into light. Here we have to all appearance light produced out of nothing, or as the next step from the ordinary unscientific reasoning to that of partial scientific enlightment, *electricity converted into light.* A further advance in knowledge teaches us that—1. Electricity is not converted into light; 2, that no illuminating agent is so converted; 3, that light does not exist at all; that it is not *a thing,* but the *perception of an action.* The light is in the eye itself.

2. *Light is a function of energy,* and its study involves four considerations—1. The phenomena of its origin; 2, the mode of its transmission across space; 3, the nature of its perception; 4, the energy expended in these several processes. Each of these calls for and will be worth some little examination; but inasmuch as one of the great dangers of science is the acceptance of *words* (which are worthless except in so far as they convey a definite meaning) in the place of realities, it will be well to begin at an even earlier starting point. Electricity itself is a word which we all use, and which too many employ as though it were one of the old "words of power," the mere utterance of which is in itself sufficient to place the powers of nature under subjection. Yet what conflicting ideas exist as to what the word really means, and how few could give a really intelligible explanation of what they mean by it. That task we need not now attempt; but the latest of these magic names of science which we shall have much occasion to use calls for some particular consideration.

3. *What is energy?* We have outgrown the intellectual stages at which men invented a specific fluid to answer such a question, and we recognize that we cannot say what anything *is;* we can only state the idea we form of it from its actions; we have no conception of energy except as a relation of matter and motion. It may be either expressed as the work capacity of matter in motion, or of matter under a stress capable of generating motion. But the essential feature of the modern scientific ideas as to energy is the recognition that it is uncreatable and indestructible. We can form no concrete idea of its nature; it is best conceived as *motion,* yet it is impossible to even conceive of motion apart from matter. It must therefore be recognized as an attribute of matter, yet distinct in its origin and nature, because it is transferable from one mass of matter to another, and even to that more intangible something, the *ether.* It is here, in fact, that the most usual explanations of energy fail us; we can form some sort of idea of energy in the form of work imparted to or effected by a moving mass of matter, but the imagination fails in realizing the existence of vast stores of energy in mere space. It is a relief to accept the "ether," of which we know nothing, as almost representing the underlying essence of all things—the *substance* of metaphysics, endowed by the mathematician with the properties of an elastic solid, possessing none of the attributes of *matter* itself, while it is interchangeable with matter in the relations of energy.

4. *Kinetic energy* appreciable as work is the natural starting point of the endeavor to reach the unseen. A cricket ball struck by the bat gives us a perfect picture of the nature of energy, for it shows us an inert mass of matter suddenly endowed with motion, and with the capacity of doing work in consequence of that motion. We know that this capacity of doing work has been imparted to it from the muscles which moved the bat, that it is partly expended in friction of the air during its transit, and that if the motion is suddenly arrested some considerable results may be produced; in fact, the ball has received, has transmitted, and has transferred that something which modern science calls "energy," and which is one most important element out of which modern science is constructed.

5. *This energy can be definitely measured.* But here we should clearly recognize that, while professing to measure a thing which has after all no conceivable existence, we are measuring, not the thing itself, but an effect it produces. This not an idle truism, for probably few people realize that it applies to all measurement, to all our knowledge. The most concrete idea—apparently—is that of matter, and the most apparent of our conceptions of matter is its *weight,* or in scientific terms, its mass. Yet, when we weigh a thing we are *not weighing matter itself,* we are merely measuring a *force exerted by it.* In ordinary cases we simply measure the mutual forces of attraction of the earth and the object.

6. *The most concrete measure of energy* is furnished by this very attraction, viz., the unit of mechanical work, the foot-pound, the energy imparted to a pound weight while moving through one foot of space under the force of the earth's attraction, or which must be expended in lifting that pound weight against the earth's attraction.

7. *Heat gives us another concrete unit* in the quantity of heat, which is now known to be an action of energy, necessary to raise one pound of water one degree of temperature. Here again, however, we have to recognize that we cannot measure a thing itself, but only its effects. We speak of a *quantity of heat,* but we never measure *heat itself;* we measure either a temperature effect, variable in every separate substance, and necessary to be ascertained by experiment, or we measure an expansion effect variable also in every substance except in pure gases.

8. *The correlation of the forces,* the knowledge of which is the greatest achievement of this age, as far as pure science is concerned, because it is the starting point of progress of discovery in all directions, means that many actions which used to be attributed to special fluids or *forces* are merely different manifestations of *energy.* It follows, therefore, that one unit of energy can represent all these actions; that is to say, that just as a quantity of heat contained in a mass of red hot iron can be expressed in terms of the number of pounds of water it will raise 1° F. in temperature when the relations are ascertained, so can it equally be expressed in foot-pounds of mechanical work once the interrelation of these actions of energy is ascertained.

9. *The action of heat on a pure gas* is the most apparent evidence of this relation, although not the one by which it is usually illustrated. We can impart heat to a gas in two ways: 1. The gas being inclosed in a rigid vessel and heated, a certain number of degrees exhibits that heat in the form of temperature, just as water or iron does; this is the *heat of constant volume.* Under these circumstances a force is also developed—a pressure or tendency to expand. 2. The gas may be allowed to expand freely while heating, and will now absorb what is called the *heat of constant pressure.* Now, if we pass the gas into a calorimeter, we shall find that the heat of this second case is the greater by a

* John T. Sprague in the *Electrician* (London).