

vide with jointed wings. It must not be overlooked that the "Lebaudy II." is a trial ship, and that the pilot Juchmès must have at his disposal several means of procuring the requisite stability of his ship during flight, so that he may choose that which offers the greatest advantages.

The "Lebaudy II.," having no need of ballast, may without inconvenience make ascents of 6,500 feet, a circumstance that offers many considerable advantages. First of all, the pilot has more latitude in the choice of a more favorable current of air or in the avoidance of unfavorable currents. Again, from this height he can examine the surface beneath him, comprised within a circle having a radius of 74.5 miles—surely an inestimable advantage in time of war. Still another good quality possessed by the "Jaune" is that of preserving its shape without variation and not forming pockets. An airship which does not fulfill these conditions is a hundred times worse than a spherical balloon. The catastrophe attending the "Santos-Dumont II." furnishes a memorable proof of this. The danger begins at the moment when the apparatus which inflates the bag ceases to act, from any cause whatever. The precaution taken by Mr. Julliot, of placing two independent motors in the basket, is therefore a good one.

Presumably no accident will happen to both motors at the same instant; such a disaster is less to be feared, because both of the motors are under care of an engineer, who never loses sight of them while in operation.

NATIVE DWELLINGS AT THE ST. LOUIS EXPOSITION.

BY THE ST. LOUIS CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

In previous articles on the World's Fair at St. Louis, we have referred to the unique opportunities which are presented for a study of the various races of the earth, their habits and their modes of life. A most attractive and eminently instructive branch of the anthropological section is a group of reproductions, built to full size, of native dwellings, the greater part of which represent the homes of the various aboriginal tribes of North America. The exhibit encircles the large parade ground in front of the building of the United States Indian Industrial School, of which we shall have more to say in a later article. In every case the dwellings are built of the same material and in the same manner as were customary, or are to-day customary, among the tribes that they represent. In the case of several of the North American Indian tribes, it was difficult to find Indians who were familiar with the art, now extinct, of building these homes, and in almost every case it was necessary to seek out some very old Indian, who acted as master builder over the younger natives. The first, and in some respects the most striking structure, is the bark house of the Kickapoo Indians, which is about 12 feet in diameter by 6½ feet in height. It consists of a framework of willow poles, each frame being approximately semi-circular in form, to which is fastened wide strips of overlapping white or red elm bark, the pieces of bark being tied to one another and to the framework by strips of the bark. There is a single low door, that is usually covered by a skin. In the center of the roof is a square opening that serves as a chimney, and is sometimes provided with a bark or canvas hood, which can be shifted with the wind.

Next follows the primitive dwelling of the Maricopa Indians of Arizona. The huts, which were generally built along the rivers, were constructed on a willow frame, the sides and roof being built of arrow weed. The Maricopas are gentle, and of kindly disposition. When the white man first discovered them, they were prosperous, having adapted themselves to the Aztec style of farming, and making use of the old Aztec ditches for irrigation. When the white people came, they found that the land was of good quality, suitable for irrigation. They went above the Indian reservation, taking out by means of ditches all the river supply, and leaving practically no water, under normal conditions, for the farms of the Reservation. As a consequence, these people soon found themselves to be objects of charity, depending upon Government rations; and many who were formerly prosperous had to leave their homes and scatter in search of work. Next to the Maricopa dwellings one sees two small, conical, earth-covered houses of the kind that were built by the Navahos. These consist of a framework of willow poles covered with grass sod. Compared with some of the other native homes, they are small and uncomfortable. The Navahos are still a more or less nomadic tribe.

In most cases the exhibit includes both the winter and summer homes of the tribes represented. Thus the winter tepee of the Cheyennes is shown side by side with their light bark-covered summer house. The same is true of the Arapaho exhibit, of which we present an illustration. It shows a typical tepee, or winter tent, consisting of framework of poles covered by canvas (originally of course, the Indians used skins for this purpose) and surrounded by a brush stockade, which serves to break the force of the winds that sweep at

times with great force across the prairie. In front of the tepee is the light summer house, consisting of a flat roof covered with grass and supported on four corner posts; the object in building the summer dwelling being to get as much ventilation as possible, while securing shelter from the direct rays of the sun.

The most imposing building of the whole group is a Pawnee earth lodge, 40 feet in diameter and 20 feet in height. This is an ordinary size; but at times these lodges would be built with a diameter as large as 65 feet. The framework of the building is very heavy, as it must needs be to carry the great weight of the earth and grass sod with which it is covered. A circle of eight 6-inch posts stands in the center of the lodge, the posts serving to support the main rafters. Arranged around the wall are a number of bunks, and entrance is had by a long vestibule or porch, the doorway of which is shown in our engraving. Adjoining the earth lodge is a summer house of light construction, but more pretentious appearance than that of the Arapaho. A picturesque group is that of the Wichita Indian dwellings, which comprise a winter grass house and two summer houses. The frame is of split willow, the rafters of lighter split willow, and the intersections are tied together by willow bark. The framework is roofed with rice grass. Of the two summer houses, it will be noticed that one is the customary flat roof carried on four posts, while the other is a larger and more pretentious structure, affording a considerable amount of shelter from the weather, but being left open near the ground to allow the wind to pass through. Another of our illustrations shows a typical dwelling of the kindly Cocopa Indians of old Mexico. It is a very primitive affair, built of willow poles and the tule rushes which grow in the water at the edge of the streams. On the top of the rude porch in front of the house are one or two native baskets, while on the table are spread out various samples of native bead work for sale.

One of the most curious and picturesque of the native homes is the dwelling of the Ainus, the aboriginal race of Japan. The hut has vertical walls and a rather high-pitched roof, the side walls and the roof being thatched with a native reed. Their dwelling is protected from the evil one by sacred prayer symbols, one of which is a head of a bear, which, by the way, is an object of worship. There is not a race among the many present at St. Louis that is attracting more intelligent interest than these remarkable people, who are ethnologically a puzzle even to the Japanese themselves.

The Patagonian "giants" as represented at the Fair are something of a surprise in the fact that their stature, judged from American standards, is not abnormally tall. Their dwelling, as shown in our illustration, is of a very primitive character, consisting of skins sewn together and supported upon poles and rafters in the manner indicated. We have so lately dealt with the Filipino that it is not necessary to say much about his bamboo house, as shown herewith. The particular Igorrote in front of the house is engaged in cooking a portion of the dog meat which forms one of their favorite and characteristic dishes.

The Making of a Welsbach Mantle Briefly Told.

The incandescent gas mantle was invented by Auer von Welsbach in 1855, and patented all over the world. The manufacture and use of mantles was first taken up in Austria, and has since found its way in all of the civilized countries where gas is introduced. At the present time it is estimated that no less than one hundred and fifty millions of mantles are manufactured annually. In the United States, although there are about forty millions manufactured annually, the industry is only partly developed. The public is gradually learning to use the mantle.

The mantle is made as follows: A "cone" or spool of No. 40 white cotton thread is knitted into a "stocking" or hose, about two inches in diameter. This stocking is thoroughly washed and dried. Then it is saturated with a solution of nitrate of thorium and one per cent of nitrate of cerium. The thorium is manufactured from a sand called monazite, which is found in Brazil and in the State of Carolina, and is rather expensive, being sold at \$6.50 per pound.

One pound of nitrate of thorium yields from 300 to 350 mantles, depending on the quantity distilled. After the cone has been washed and dried it is either cut to proper size and impregnated with the thorium solution, or is first impregnated and then cut to the required lengths. The impregnated stockings after being cut and dried are sewed at one end with asbestos thread, so as to form a head provided with a loop, which serves to hold the mantle in process of manufacturing and when in use on the burner.

Then the impregnated stocking is hung on a wire by an asbestos loop, and heated in a gas flame of the Bunsen type. This is done in order to burn out the thread. The next process is called the shaping. The mantle now consists only of ashes of thorium (oxide of thorium) and is carefully held over a Bunsen flame, and gradually given the right shape, at the same time being

hardened. As soon as the mantle is shaped and hardened it is practically completed; but in order to protect it from breakage it is "dipped" in a stiffening solution. There are many forms of "dip," but the one most used is made of soluble cotton (guncotton) dissolved in good alcohol and acetone. To this mixture castor oil and shellac are added. Before the mantle can be used on a burner this "dip" or coating must be burned off. The method employed in the manufacture will be described in detail in an early issue, and fully illustrated.

Automobile Notes.

Gen. Gallieni has lately organized an automobile service in Madagascar for transporting postal matter between Tananarive and Mahatsara. In spite of numerous difficulties which are due to the local conditions the experiment has succeeded very well. Capt. Gruss states that the automobiles have been running for seven months past with great regularity. At present there are six of the postal vans, but it is hoped to increase the number to ten, to take care of the large amount of mail matter which passes over this route. In seven months the automobiles have made a total distance of 30,000 miles, carrying 106 tons of mail matter. The total expense has been \$18,000. The present system was supposed to be impossible by many, but it is now proved to be a success and will no doubt be greatly extended in the future and other lines will be run on the same plan.

The French Minister of War has opened a contest of automobile wagons for use in the army. They are to be heavy hauling cars or vans for transporting provisions and different kinds of material. The first three vehicles which come out best in the contest will be purchased by the state. The price of each is not to exceed \$1,700. The trials will be made in the neighborhood of Paris and will comprise eight days of different kinds of tests. Only cars of French make are allowed to enter the contest. The total weight of the car when loaded is not to exceed 3.7 tons, of which 1.8 tons represents the net load. The motor is to give 12 horsepower at the minimum, at a limited speed of 1,000 revolutions per minute. The jury will pass upon the following points, giving each a certain co-efficient for a total of 100: Power of motor and design, simplicity, etc., 13; cooling, 5; consumption of combustible, etc., 15; operation of different organs, 15; wheels and tires, 15; brakes, 10; good handling of the car, 5; starting and grades, 8; proportion of load to total weight, 5; speed, 3; cost, 6.

To find out how automobiles can be best utilized for military service, an interesting series of maneuvers is now being held in Italy. The idea is to call upon automobiles in time of need and to mobilize them just as is done in many countries for horses belonging to private individuals. The present tests have been organized by the Minister of War in connection with the Milan Automobile Club. The tests last for a week and were commenced on the 30th of August. More than fifty chauffeurs entered the maneuvers, which were held at Brescia. They started early in the morning. At the last moment each chauffeur received a sealed envelope giving him a certain route to follow, and he was obliged to reach a certain point, which was often at a great distance off or at a high altitude in the mountains. The chauffeurs were required to return to their posts in less than 24 hours. Some of them were ordered to proceed at full speed to the Austrian frontier. The result was very satisfactory. All the cars except one returned to Brescia before midnight. The remaining car had been damaged by running into a telegraph pole. The military authorities are highly pleased with the performance of the cars and the skill of the chauffeurs. These experiments will no doubt be followed by others.

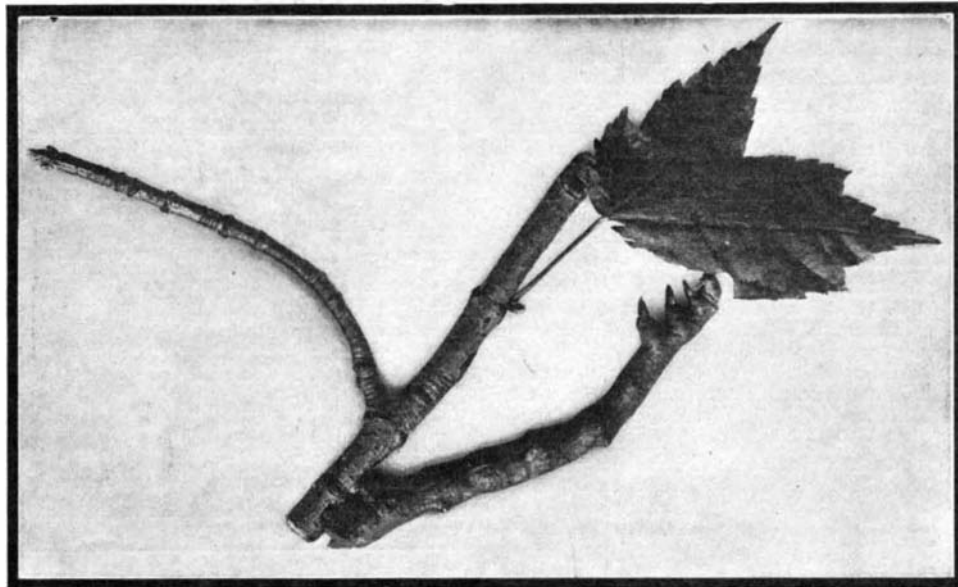
The autumn military maneuvers in France have brought out an unusual number of automobiles. The chauffeurs who figure in the exercises are to pilot the officers of the Etat-Major in their cars. The maneuvers of the automobile corps commenced by a grand review which was passed before Commandant Gentry. This well-known officer has charge of the army automobile matters and is himself an experienced chauffeur. Each *quartier general* will have two high-speed cars and four light cars at his disposal. To each corps of the army is allotted one high-speed car and one light automobile. In the maneuvers are many well-known chauffeurs, and nearly all the leading makes of car are represented. The cars which are to follow the maneuvers of the East will start from Paris and arrive at Dijon on the 6th of September; those of the Northwest maneuvers reach Verneuil on the 4th. Gen. Pendeze, the chief of the Etat-Major, who is in charge of the exercises, will be piloted by Marechal Caillois on a Georges Richard car. The military chauffeurs will receive an indemnity during the whole of their voyage which has been fixed by the Minister of War at \$0.008 per horsepower-mile, and \$0.027 per horsepower per day. To this is added a fixed indemnity of \$0.50 for soldiers of the troops and \$0.60 for the inferior officers.

STRIKING EXAMPLES OF INSECT MIMICRY.

BY O. FULDA.

Natural history, including insect study, entomology, is taken up in the public schools, and in walking in the country we often come across our American boys with butterfly nets.

One of the most interesting observations that can be made in the study of insects is the manner in which the animals attempt to protect themselves when pursued by their enemies. There is, for example, among the moths the genus *Catocala*. As a rule, their hind wings have a beautiful, bright coloring, but they can so conceal these under the wing sheath, which is usually gray or brown, that it takes a sharp eye to discover the animals when at rest on the trunk of a tree. A striking fact is that the dark-colored varieties seek concealment on trees with dark bark as, for instance, the oak, while the lighter-colored varieties rest on trees such as the



A Caterpillar (*Eunomos magnarius*) Simulating a Twig.

large, open eyes. It is easily conceived that the animal is able to frighten, when, spreading its wings, it suddenly simulates the appearance of an owl.

The giant Indian moth, *Attacus atlas*, may also be here mentioned. This animal can assume such a position that it represents the head of a certain Indian snake. Its wings when completely spread measure eight inches from tip to tip.

Corks and Their Supposed Induced Radio-Active Effect on Photographic Plates.

BY MYRON METZENBAUM, M.D.

While investigating the action of radium and radio-active substances on photographic plates, I observed that whenever radium, uranium, thorium, or zirconium compounds were placed on a plate of plain glass which was elevated by means of corks above a photographic plate, whenever the corks were directly in contact with the film of the photographic plate, not only did these radio-active substances affect the photographic plate, but an image of the structure of the corks was also to be seen on the plate.

This image of the corks could be noted on the plate after twenty-four hours, and could only be seen while developing the plate, but would wash out almost entirely in the fixing solution.

If the time allowed was at least four days, the action on the plate was sufficiently deep, so the image of the corks remained after the fixing, but it required at least twelve to twenty days before the plate was acted on sufficiently so a good print could be made from the negative.

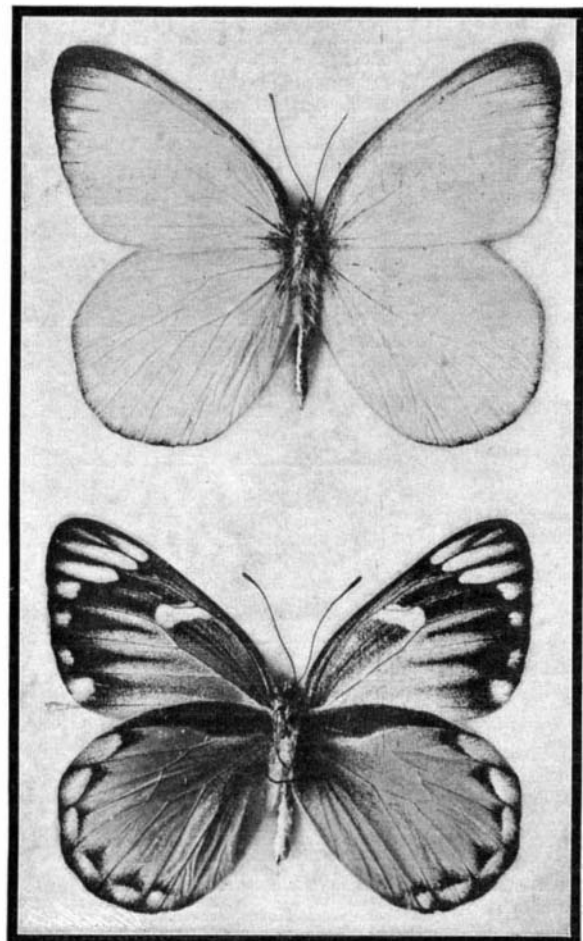
This observation of the action of corks on photographic plates was naturally interpreted as due to induced radio-activity caused from the radio-active substances on the suspended plate of glass, until the time when I made the observation which I reported in the *SCIENTIFIC AMERICAN* of May 14, 1904, on "Induced Radio-activity and Aluminium."

In this article I showed that when radium is contained in hermetically-sealed tubes, and these tubes placed in various solutions and various powders for as long as twenty-one days, after this time neither the solutions nor the powders show the slightest effect on photographic plates; but when the solutions

or powders were placed in aluminium boxes, and these boxes placed in direct contact with a film of a photographic plate, these boxes produced their image at the points of contact. I was able to show further that all sorts of aluminium articles, when placed only in direct contact with the film of the plate, gave an image, and that this action is one not due to radio-activity, but is either a chemical or electrical action between metallic aluminium and the albumenate of silver of the plate, or possibly due to pressure alone.

I therefore took new corks, and placed them in direct contact with the films of photographic plates and kept them out of all possible influences from radio-active substances, and then I noted that the new corks produced their image on the photographic plates just as before.

That this action is one not due to radio-activity may be inferred from the facts that when corks are separated from the film on the photographic plate by a piece of very thin paper, or placed on the reverse side of the plate for as long a time as



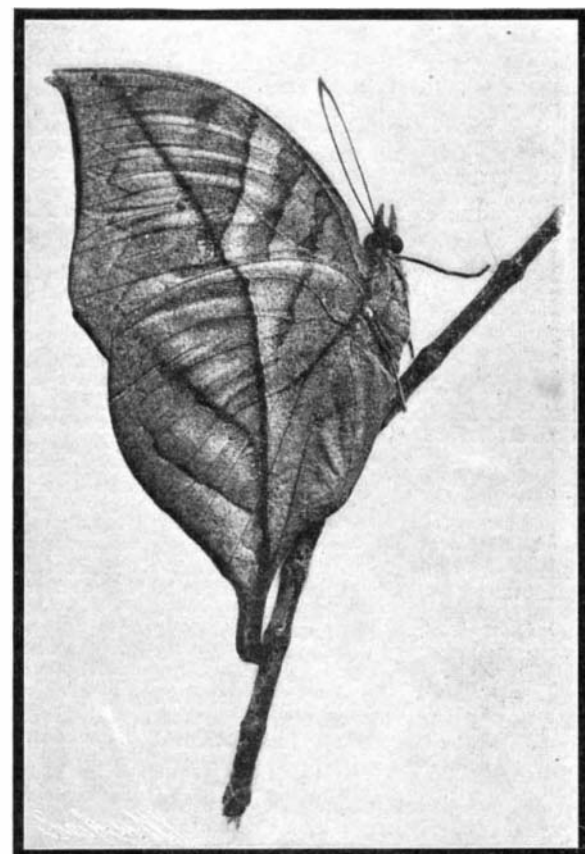
Upper and Under Sides of *Delias des Combesi*, India, Showing the Protective Marking

birch or maple. But the best example of mimicry in the insect world is that which is given us by the leaf imitators, which are brightly colored on top, but when their wings are folded, exactly represent a leaf. One of the most striking examples of this is the *Kallima inachis*, found in India.

Moths are able to deceive the eye in more than one way. There is one species that, when sitting on the bark of a tree, exactly imitates the lichen. Others, when resting on the upper side of a leaf, present the appearance of bird droppings.

Of other insects the "walking stick" can make itself particularly difficult to see, in that it appears like a green or a dry twig according to its color. The caterpillars also of many butterflies and moths imitate their environment. One of our illustrations shows a caterpillar of the *Geometridae*, *Eunomos magnarius*, which always assumes such a position that it is frequently taken for a twig of the plant on which it feeds.

Among the butterflies there are kinds that seek, through their appearance, to frighten their pursuers. The South American *Caligo* species are on the upper side a beautiful blue or gray and blue, while the under side has the color and marking of an owl's head with

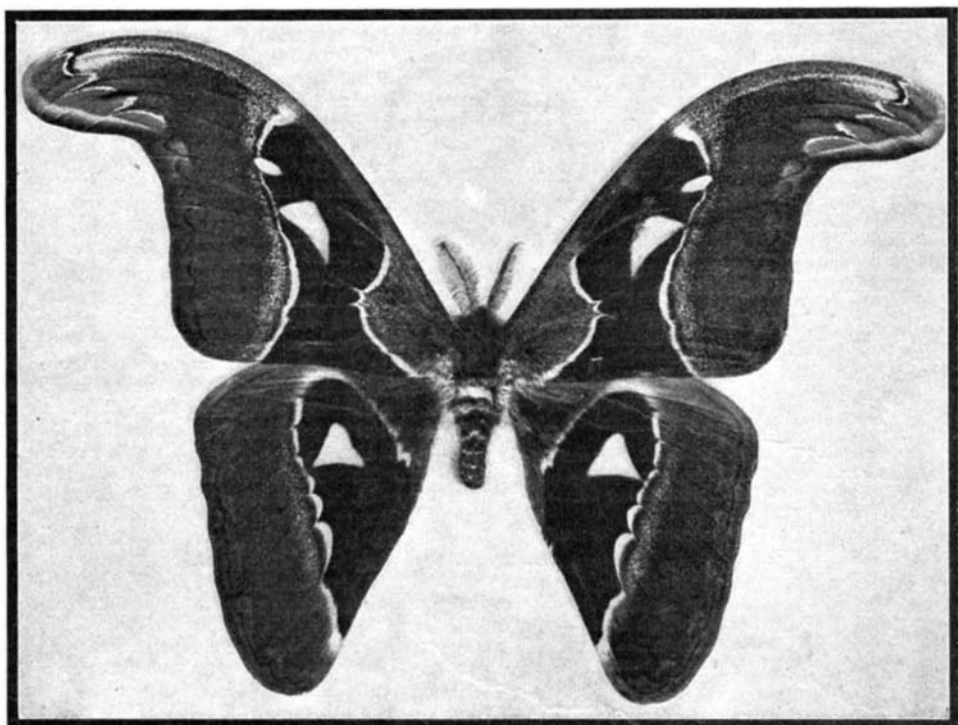


The Indian Leaf Butterfly (*Kallima inachis*) which Mimics a Leaf Even to the Veining.

forty days, the plate is not affected in the least, nor do corks have any effect on the electroscope.

This action may possibly be explained as a chemical one between the residue of chemicals remaining in the corks after their bleaching and the film of the photographic plate, or possibly it may be pressure alone.

In either case this action depends on an intimate contact existing between the corks and the film of the plate, which means that the corks affect the plate only at the points of contact, for it is only the grain of the cork which is seen, causing the picture to seem as though it were a direct photograph.



Attacus atlas, India. Spread of Wings, Eight Inches. Protectively Marked to Resemble a Certain Snake's Head.

STRIKING EXAMPLES OF INSECT MIMICRY.

The construction of a large terminal railway station with every facility for loading and discharging vessels, in basins specially to be constructed, has been decided upon at New Orleans. The situation of this station will be at Chalmette, to the east of the city, and a few miles lower down the Mississippi River. A number of engineers and their assistants are at present engaged taking soundings to a depth of 60 feet, and the ground destined for the works is being planned out. The company is working with San Francisco capital and will construct several basins 1,500 feet long by 250 feet wide, with a maximum depth of 50 feet.