BUTTERFLY FARMS IN FRANCE.

BY JACQUES BOYER.

Up to within a year or two, the butterfly farm established at Eastbourn, England, by Mr. William Watkins, an entomologist, was the only one of its kind. To-day, however, there exist several such farms in France, among which we desire to call special attention to those of M. André at Mâcon, Department Saône-et-Loire; M. de Labonnefon, at Cercoux, Department Charente-inferieure; and Doctor Hugues, at Chomérac, Department Ardèche.

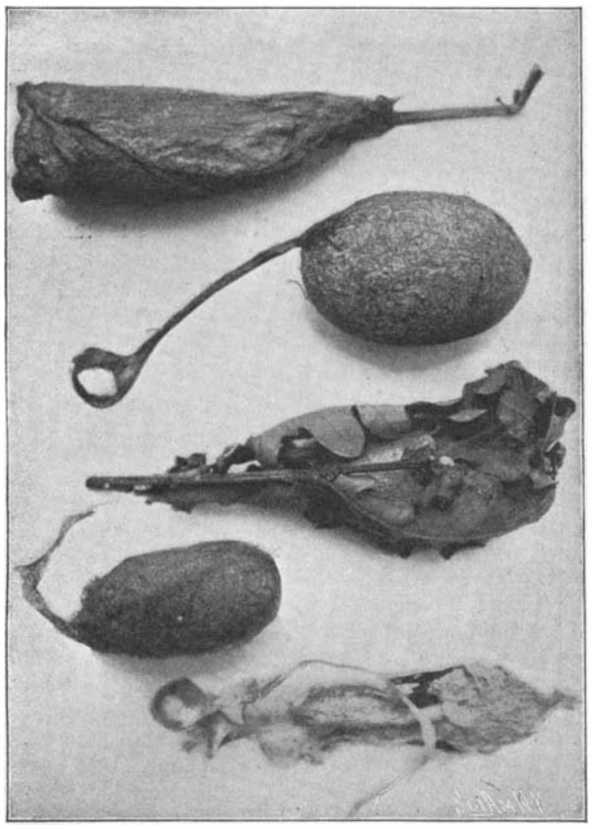

Fig. 1.—COCOONS OF SEVERAL VARIETIES OF SILKWORM.

These gentlemen practically confine their efforts to the rearing of the rarest genera of the family bombycidæ or silkworms; and by fortunate crossings they have obtained some new varieties for which the collectors and the museums of natural history contend with weapons of gold. Moreover, they are endeavoring to acclimate in France the silkworms indigenous to other countries. The silk-producing larvæ will live and reproduce in a wild state in the forests of France, and it is only necessary to collect the cocoons, from which the silk threads are easily obtained.

These attempts at acclimation have in some cases been attended with encouraging results. The ailanthus silkworm, *Attacus Cynthia*, so called because its caterpillar feeds upon the leaves of the ailanthus tree, is a native of Japan; the *Antheræa Yama-Mai*, a native of India, and a most beautiful butterfly whose caterpillar thrives well upon the elm and the chestnut; the *Antheræa Pernyi*, better known under the popular name of the oak silkworms; the *Antheræa Mylitta*, which because of its late hatching or breaking forth is more difficult to raise; and the *Attacus Atlas*, the largest known of the bombycidæ and which produces very large cocoons, have all been successfully domesticated or acclimated. Fig. 1 shows the cocoons of the exotic silkworms which are being introduced in France. 1 is that of the *Attacus Cynthia;* 2, *Antheræa Pernyi*, one having broken out of and one being still concealed in an oak leaf; 3 is the full ovoid cocoon of the *Antheræa Mylitta;* and 4 is the *Attacus Atlas* carefully wrapped up in the leaf. The requisites for the successful culture of the butterfly are a garden of greater or less extent in which are oaks, ailanthus trees, pines, plum trees, ricinus or castor-oil plants, and other bushes the leaves of which serve to nourish the larvæ or caterpillars. Disposed here and there about the garden are various appliances of the most simple kind. Ordinarily the eggs are placed in a brooder such as is shown in Fig. 2. This is altogether a home-made contrivance for preserving the larvæ from destruction and at the same time affording them a means of nourishment after they are hatched.

Branches of the trees with the cocoons still clinging to them are plucked and arranged so that their woody stems may be inserted in a vase of water, the whole upper part being enveloped by gauze or mosquito netting. In the lower part of the netting, where it comes in contact with the stems, is placed a lot of crumpled paper to prevent the wandering insect from taking an involuntary bath. Notwithstanding all these precautions, sometimes the imprudent little beasts fall into the water, and if an attendant with his pincers does not come promptly to their aid, they suffer the same penalty as other mortals who cannot swim. On the other hand, these caterpillars have a most fastidious taste.

They need pure air, offensive odors are detrimental to their health; above all, their food must be sound, succulent and plentiful. They are ravenous feeders, incessant eaters, and consume much more in proportion to their size than an ox. Accordingly, as soon as the leaves in a brooder have been nearly devoured, another one is prepared, placed in a vessel of water, and brought sufficiently close to the first one to allow the insects to change their habitation without great discomfort. They do not require much coaxing—their dominant appetites urge them to possess the new fields. Since a uniform temperature is an important factor in the rearing of these insects, they are very often kept in a room until after the first moulting. They are then placed on bushes in the open air, and to shield them from the birds and another equally deadly enemy, the *Forficula auricularia* (earwig), the branches containing them are inclosed in a sort of sleeve of muslin or tulle. In Fig. 3 can be seen several of these sleeves with the attendants inspecting them. This represents an actual scene on the farm of M. André, at Mâcon.

The breeding of butterflies is not accomplished without work. The attendants must take care that sufficient nourishment is constantly at hand, which, in view of the incessant craving for more on the part of the boarders, is no light task. Besides, it is necessary to frequently remove the excrement from the muslin envelope. After the bodies of the caterpillars have attained a certain thickness, the enveloping hood is removed, there being no more fear of the beaks of the feathered tribe, as they are not eager to make a meal of such oleaginous morsels.

As for the more robust species, such as the *Telew-Polyphemus*, imported from Asia, or the *Attacus Cynthia*, indigenous to Japan, it is only necessary to place the grain or eggs upon the trees in paper cornucopiæ attached to the trees, bell down. Hatching follows without further care, after which the cocoons that are found rolled up in the leaves or hanging from the branches are gathered. Well protected from the rats, who are extremely fond of them, the chrysalides are now brought in and stored in a dry and well ventilated place. If the eggs are desired for the next season's hatching, the cocoons are placed in grilled boxes, where the butterflies emerge from them at birth.

Fig. 3.—PLACING THE SLEEVES AND THEIR CONTENTS ON THE BUSHES.

Should it be the desire of the breeder to mount the butterflies for the museum, he first asphyxiates them in a vial containing potassium cyanide. Once dead, they are mounted on stands with wings carefully and completely distended. To prepare the caterpillars for the entomologist's cabinet is quite another thing. The best process for preserving them is by inflation, a manipulation which requires no little dexterity and patience. Fig. 4 shows M. André in the act of inflating a caterpillar. Before this can be done the insect must first be prepared by pressing it between sheets of paper, and, after all the soft parts of the body are expelled through the posterior opening, by making an incision with a scalpel in the large intestine 2 or 3 centimeters from the end of the body, the latter is threaded, so to speak, upon the fine point of a thin glass tube, which is connected by its other end to an ordinary rubber spraying bulb, or any bulb provided with valves for the admission and ejection of air. The one shown in Fig. 4 is a combination of two bulbs and an idea of M. André, the naturalist.

Moreover, during the inflating process, the subject is placed in a little stove or oven heated by an alcoholic lamp, shown in the figure just in front of the operator. After a few minutes the caterpillar begins to assume the appearance of life, and it is then ready to be placed in an entomologist's collection.

Various other openings of an industrial or artistic nature are available to the French "bombyculturist." The butterflies are worked into brooches or even into highly ornamental cathedral windows by placing, for example, some *Actias Mimosæ* and other insects, together with some desiccated flowers and leaves, between panes of glass.

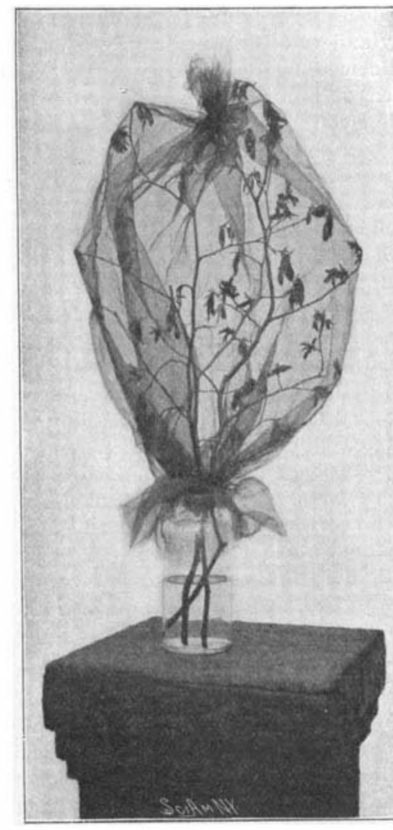

Fig. 2.—A BROODER.

Our elegant dames also affect a gorgeous decoration of their hats with butterflies, for which purpose the insects must undergo a certain extensive preparation. After the wings have been covered with a transparent alcohol varnish, the butterfly is glued upon a piece of satinette which is afterward cut out to conform exactly to their contour. A steel or silver wire is run through the thorax, forming a skeleton at once rigid and light. Mounted in this manner, the butterflies become a very attractive and graceful ornament.

Automobile Improvements.

Some ingenious improvements have been made by Sir David Salomons, Bart., the pioneer of the motor car movement in England, in connection with the vital parts of a petrol car, to facilitate and expedite inspection of the engine, and replacement of parts. Instead of attaching the ignition wire to terminals of the plug, as is the usual practice, Sir David Salomons has devised an intermediate piece which he can disconnect from the plug by the half-turn motion, similar to that in the withdrawal and insertion of an ordinary incandescent electric lamp into the holder. By this arrangement, the plug can be instantly removed by the hand, for examination or cleaning. Another important time-saving improvement he has also made is concerning quick access to the valves. In many petrol engines it is necessary to detach by unscrewing two unions, and to remove a copper pipe. This pipe he has cut in two, and attached a single union provided with a coarse thread, and has so arranged the screw collar that it may be released by the hand without the aid of a tool. In his car he has also removed the tap controlling the supply of petrol from the tank of the carbureter, from its general position near the reservoir to the point where the pipe enters the carbureter. This is a valuable improvement, since by the existing practice the supply pipe, when the tap is turned off, often contains a quantity of air, which prevents the passage of the petrol from the tank to the carbureter, and thus delays, and militates against, the starting of the motor, since the petrol cannot enter the carbureter.

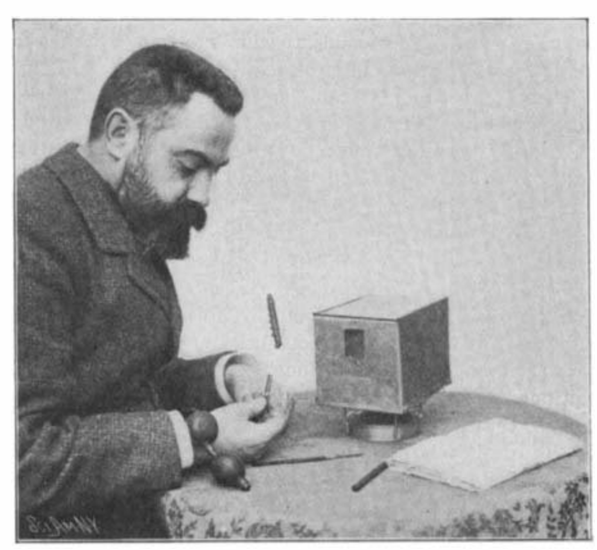

Fig. 4.—INFLATING A CATERPILLAR.

The Interior of the Earth.

Prof. John Milne, the well-known seismologist, has published some interesting facts concerning the crust and interior of the earth. At the present time it is only possible to imagine the formation of the earth's crust from the strata present in the matter thrown out by volcanoes. How thick the earth's crust is we do not know, but as it is an established fact that earthquakes and similar earth tremors pass right round the world, through the interior in waves, it is possible to deduce the medium they have traversed by their quality and velocity. According to Prof. Milne, the denser this medium the greater is the speed of the propagation of the waves, varying from 3 kilometers to 9.3 kilometers per second, the velocity increasing the nearer the course of the wave to the earth's center. Assuming the world to weigh more than five and a half times an equal bulk of water, Prof. Milne concludes that a lighter crust of approximately 200 miles and a denser medium fairly uniform and about five and a half times the density of water would satisfy the seismological conditions. To such a core as this, which would be somewhat lighter than iron, he has supplied the special name of "geite," and continues to explain that what seismological observations lead us to suspect is that beneath the lighter crust there is a magnetic medium of greater density, which during penetration slowly passes into a fairly homogeneous "geite," and he anticipates that it will be possible in time to deduce the physical and chemical composition of the white-hot matter in the interior of the earth with the same certainty that we now know the composition of the various bodies of the solar system.

A Chemical Apparatus for the Removal of Boiler Scale.

Among the impurities of feed-water, the sulphates of calcium and magnesium are more especially deposited as a hard crust or scale on boiler-plate. The active means for avoiding this crust or scale is the treatment of the feed-water with soda or other suitable substances. By the action of sodium carbonate there are formed from the sulphuric-acid salts dissolved in the water insoluble carbonic-acid salts of calcium and magnesium. These salts collect on the bottom of the boiler as a coarse mud, and can be easily removed by occasionally blowing off.

The amount of these salts contained in the feed-water can be determined by chemical analysis, and from this the weight of soda or other chemical which must be added to the feed-water can be calculated. It is not always possible, however, to undertake these chemical investigations, for in most cases the boiler attendants lack the necessary knowledge of chemistry. Consequently an arbitrary quantity of chemical is usually added.

An inventor who lives in Rotterdam, Ferdinand R. K. Erfmann by name, has devised a controlling apparatus, by the aid of which the amount of chemical that must be added for a ton of boiler water can be determined in the simplest manner and in a very short time. The operation of the apparatus is based on the following principle:

A definite quantity of boiler water is caused to react on a definite quantity of basic solution of a definite strength, so that a precipitate is formed. This mixture is filtered. It is then determined how much of the basic solution still remains in the filtered liquid; for this purpose the base is colored yellow, by adding an indicator (methyl orange). If the base be now neutralized by an acid, the indicator will be colored red by the acid at the moment when the neutralization is complete.

These experiments can be carried out with the new apparatus, very simply. The number of pounds of chemical which must be added per ton of boiler water can be read off on a scale.

New Quick-Firing Gun for the British Army.

Both the artillery and field forces of the British army are being equipped with a new type of quick-firing gun of ingenious design. The gun itself, which is of 20-pounds caliber, is both heavier and longer than those employed in the South African war, and is equipped with several new quick-firing accessories. Yet despite these increases there has been no augmentation of the total weight of the arm, and it will not require any additional horse power for transport.

At the end of the trail of the gun is a simple spade, supplanting that which has hitherto been attached to the axle, the feature of which is that it does not act as a check to the recoil of the gun. This is a grave disadvantage to the axle spade, since every time the gun is fired the force of the discharge drives the spade deeper into the ground, and renders it impossible to move the gun quickly when desired, as the spade has to be first released.

Instead of the spade bearing the brunt of the recoil, there is a special mechanism which allows the gun itself to slide back when fired in a semicircular bed, and neither the position of the carriage, nor the training of the gun, is altered in the slightest. The gunners are also afforded protection against the enemy's fire by steel shields.

Two other improvements have been carried out, which will enhance the firing capacity of the gun to a very appreciable degree. A breech-block has been designed which is not liable to corrosion, and which therefore will not blow back when worn. This constitutes a grave objection to the Ehrhardt gun cone-shaped breech-block, which after continuous firing blows back. In this new army field piece also the breech is closed and opened by one rapid and single action, which is quickly and easily performed, so that the interval necessary between opening, loading, and firing the gun is reduced to the minimum.

A MAN WHO WAS STRUCK BY LIGHTNING AND LIVES.

P. D. Keim and his son, Clyde, of Rand, Col., went upon a mountain hunting trip last summer. While the party was ascending a steep incline a storm came up. As he walked into a clearing, the elder Keim was struck by lightning. Nearly every article of clothing that he wore was torn off; even his shoes were stripped from his feet. His son Clyde, who was about fifty feet away, was also struck. He regained consciousness, and, despite the fact that one side was paralyzed, he managed to crawl to his father, whom he supposed dead—pulling himself along by means of the long grass, using but one hand and arm. When he reached his father, he found that he had not been killed. Fortunately, the remaining members of the party came up, and worked over the unconscious man for two hours, finally succeeding in reviving him.

THE EFFECT OF A STROKE OF LIGHTNING.

The body of Mr. Keim was burnt from neck to toes; both ear drums had burst. After he had been revived, Mr. Keim and his son Clyde boarded the train for Rand, Col., where they live. On the way, however, it was necessary to call in medical assistance. Mr. Keim wrote to us last January that he had then sufficiently recovered to don the clothes which he wore at the time of the accident, and to have the picture taken which we reproduce herewith. The picture tells better than words how narrow was his escape.

Borax, which is so largely used in the arts, and for household purposes as well, is found in many parts of the world in a more or less pure state, and the process of separating it from the crude mineral is very simple. A first operation is grinding the material in boiling water containing a small portion of calcined carbonate of soda. The clear solution thus obtained is run into tanks and crystallized. This is only fifty per cent borax, other elements being sulphate of lime and common salt. The crystals obtained by this process are then put through another process by heating them to a certain temperature at a given concentration, when the borax proper crystallizes out, and separates from the impurities held in suspension, the mother liquor being drawn off. Borax has been found in such quantities of late years that it has declined greatly in price; at one time it cost over $200 per ton, but is now but a fraction of that sum.

Engineering Notes.

Prof. Thurston believes that the gas engine is a formidable rival of the steam engine and is capable of further development. Each has given a horse power for about one pound of coal, and the efficiency of both, between the coal pile and the point of delivery, is about 20 per cent. The steam engine, he says, has so nearly reached its limit that further progress under commercial conditions would seem to be very slow, but its range may be increased by employing very high pressures and superheating combined with them. In Sibley College work, 1,000 pounds per square inch have been used, and Prof. Thurston expresses the view that twice that pressure may be successfully used eventually, or with sufficient experience in its management. These factors would raise the efficiencies nearly 50 per cent and reduce the coal per horse power hour to about three-fourths of one pound.

One of the principal difficulties of adapting the steam turbine to marine use lies in the necessity of providing some arrangement for reversing the motion of the ship. In the case of light launches a similar difficulty has had to be faced, but for the small powers and speeds here needed it has not proved difficult to construct reversible propellers, a hollow shaft being used in conjunction with pivoted blades. Such a system seems, however, hardly applicable to the transmission of the heavy thrusts involved in the case of high speeds and large vessels. Consequently some attention is now being directed by one or two large firms to the construction of reversing turbines. The difficulties in making these are purely mechanical, since from the point of view of efficiency it matters little whether the turbine wheel rotates in one direction while the casing is held fast, or whether the latter is allowed to revolve in the opposite direction and the turbine proper held fast. The relative motion of the steam through the guide-blades and buckets is identically the same in the two cases, though in the second case the steam should be introduced into the casing with an angular velocity equal to that of the casing, and a corresponding arrangement should be made at the exhaust end. A writer in London Engineering suggests that by coupling up through friction clutches either the casing or the turbine wheels to the propeller shaft, the latter could be driven in either direction at will. The writer states that he is unacquainted with the principles on which the firms above mentioned are at present experimenting, but the governing ideas are probably somewhat on the above lines.

An aerial transportation system which is in use in Italy is described in the Bulletin des Ingenieurs Civils. It has been installed by the factory of G. Pratti at Longara. At the end of 1900 a cardboard factory was established in the valley of the Piave, using wood pulp. In order to use hydraulic power the plant was located at the bottom of the valley. The national route by which the raw material was brought and the products transported lies 2,300 feet away on a horizontal distance and is 64 feet higher than the factory. Hence the problem of transportation had to be studied; the aerial rope system was preferred, as it was necessary to cross the Piave, then two roads and a large field. An aerial cable was stretched upon which travel the cars. It is 2,340 feet long and has a difference of level of 78 feet between the ends. The two parallel cables are fixed by anchorage at the upper part and are stretched by counterweights at the lower. The cables are fixed along the route upon wood pylons from 18 to 50 feet high by cast-iron brackets. The cable is one inch in diameter and made up of 37 steel wires; the two cables are placed 6 feet apart. For the traction a continuous cable is used, of 0.4 inch diameter. It runs over pulleys fixed to the pylons underneath the supporting cables. The lower station has a horizontal pulley of 6 feet diameter upon which runs the traction cable. A small turbine operates it by a set of gearing which allows a forward or reverse movement. It takes about 4 horse power. At the upper station is a horizontal pulley over which the cable passes. This pulley has a shaft whose bearing can be displaced in a slide, and a counterweight attached to the latter gives the proper tension to the cable. The material is conveyed in small cars; it consists of packages containing 200 pounds each which are taken from the factory to the national route and of sawed trunks of trees carried in the opposite direction; these are about 15 feet long and the weight carried reaches 2,200 pounds. Two cars are constantly in circulation on this line; one leaves from above and the other from below, and they cross in the middle. The speed is about 5 feet per second and it takes 8 minutes to make the trip. The loading and unloading takes 4 minutes, giving five trips per hour for each car. This represents a capacity of 10 tons. A special model of car has been designed for receiving the bales and the logs. The latter are hung underneath by two stout hoops. The whole is supported from two rolling chariots. The cost of the plant, which has been put in by Ceretti & Tanfani, of Milan, is $5,000. Its operation has proved very satisfactory.