THE MASON WASP.

There is no one living in a warm country who has not observed certain little earthen structures of irregular form sticking to the beams, wainscoting, and walls of houses. At first sight, we would readily take these little masses for lumps of mud or for heaps of dust piled up by chance and left through the negligence of servants. This is not the case, however, and if we take the pains to examine these bits of earth with some attention, we shall find that they are nests whose architects belong to the family of mason wasps—hymenoptera of the tribe Eumenidæ.

The round apertures formed in the external face of these nests are so many orifices through which the perfect insects have made their exit. These latter, after each of them has undergone its mysterious metamorphoses in a separate cell, finally cast off their chrysalid envelop, and, after a long seclusion, come forth to enjoy life and light.

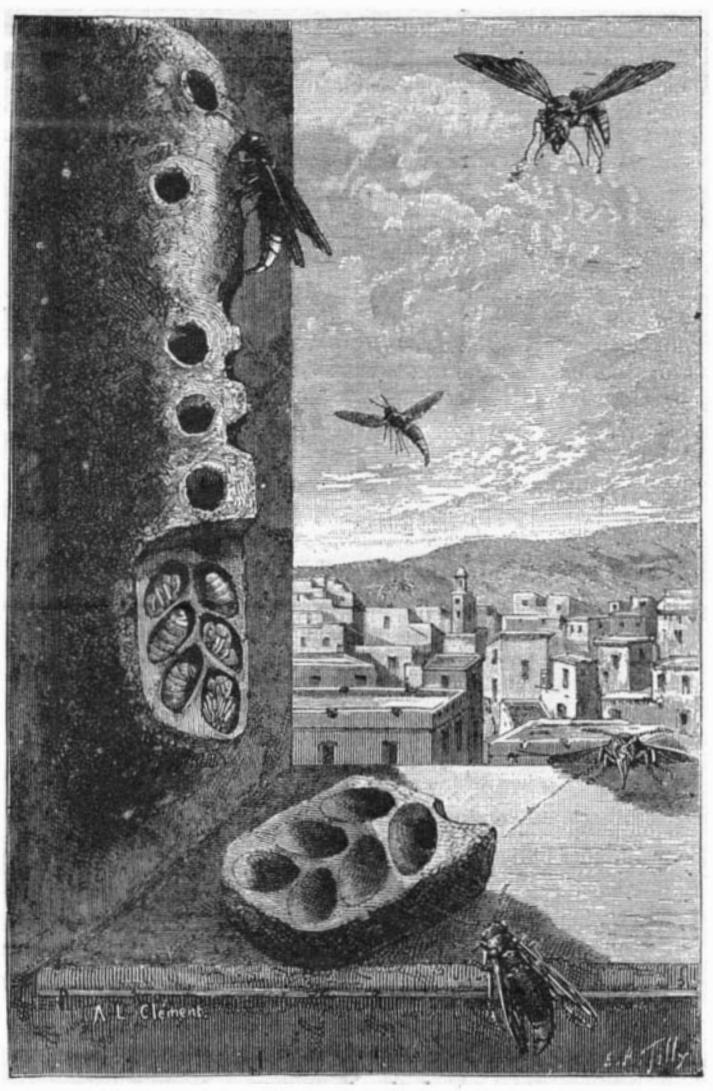
Let us watch the work of a solitary wasp. The insect resembles a large black fly, and its violet and iridescent wings have a most brilliant luster. Its abdomen, which is separated from its thorax by a very pronounced constriction, renders that comparison very just that our fathers instituted between these elegant insects and our grandmothers pinched up in their long corsets. The last rings of the abdomen are red, and the same is the case with the front, which is varied with fawn color. The mandibles of the male are curved in the form of a sickle. They remind one of the saber of an Abyssinian warrior, and, through their large size, out of all proportion to that of the insect, produce a most curious aspect.

This wasp is a stinging hymenopter of the division diploptera, and is known to science as *Synagris calida*, Fab. The female does the constructing of the nest. She begins by selecting a place along a beam or in the angle of a window, and, after a careful examination of the surroundings, flies away. Soon she is seen returning loaded with a lump of mortar made of sand that has been moistened with her saliva and kneaded with her mandibles. By means of these latter organs she applies the lump to the wall, spreads it out and shapes it, then makes another journey, and thus succeeds in accumulating a certain quantity of mortar. In a few days there is seen a rounded structure of earth, as long as one's finger, or flat and elongated, as shown in the engraving. The nest is then perforated with round holes, each of which corresponds to a very regular oval cell whose sides are carefully smoothed. The number of these cells is often considerable—certain nests sometimes containing more than twenty. The nest is then thirty times larger than the architect. The mother lays one egg in each of the cells, and accumulates prey around it which, although alive, is incapable of defending itself against the young larva that will emerge from the egg and devour it. This future food is captured and prepared as follows: The wasp, having started on a hunt, hovers about shrubs until she spies a caterpillar. This she swoops down upon like a bird of prey, seizes its neck in her mandibles, and pierces it with her sting. The caterpillar makes a few convulsive movements, vomits up a green liquor, and falls back inanimate, when its enemy seizes it in its mandibles and carries it to her nest, and disappears with it in one of the cells. This operation is repeated twenty or thirty times, according to the number of eggs to be provided for, the mean number being six caterpillars for each. When this work is terminated, the wasp closes each aperture in the nest with mortar, and soon afterward dies near the structure that she has so laboriously built.

We shall now soon see emerging from the egg a small, feeble, blind, white worm, which will at once resolutely attack one of the caterpillars accumulated around it. The caterpillar, which is of gigantic size as compared with its enemy, will endeavor in vain to defend itself; its jaws will move convulsively and its rings will contract, but it will be unable to escape, and the gnawing worm will keep on penetrating deeper into its body, tearing its sides and lacerating its entrails.

This phenomenon is due to the fact that the caterpillar has been paralyzed, and, although alive, exhibits every appearance of death. The reason of this state of things is known. The wasp stings the caterpillar in the middle of the body in such a way as to reach one of the ganglions of the chain of nerves. This stinging brings on a paralysis due to the action of the poison. It is always at this place that the larva attacks the first caterpillar, and, moreover, the mother wasp takes care to lay the egg nearly on that part of the latter's body which is to be devoured first. After the larva has increased in size, and its jaws have become stronger, it attacks the other caterpillars at random, and often leaves one-half eaten in order to begin on another.

At the end of about a month the larva has reached its full development, stops feeding, and prepares to enter the chrysalis state. At this time it is a sort of rounded worm about two-thirds of an inch in length, of a creamy white or rose color, fleshy, nearly torpid, and completely destitute of legs. The anterior part of its body is inclined forward, and its little round head resembles a ball of opal from which the mandibles and jaws stand out in relief through their reddish tint. The larva consists of fourteen segments inclusive of the head. These rings are clearly defined, and are provided on each side with a rounded projection containing an aperture. These are the stigmata, or organs of respiration. There are ten pairs of them. When the larva has reached this state of maturity, it lines its cell with a preliminary network of silk, and then spins and envelops itself in a yellowish white, silky cocoon, taking care in doing so to leave its dejections in one corner of the cell, and to spin in such a way as to leave them outside of the cocoon. If the latter be opened after a few days, a wasp will be found therein, but it will be soft and wholly white, and its legs and antennæ, folded along the body, will seem, through their transparency, to be so many rods of crystal. The wings, folded in all directions and partially covering the legs, will seem like stumps. At this stage the mouthpieces are spread out on the prothorax, and the whole insect is bent double. But gradually the eyes become fawn colored, then brown, and finally black. The mouth-pieces take on a color, the different parts of the thorax harden and assume their different tints, and finally the insect appears with all its colors. The *Synagris* still remains for some time in this nymphal state, but finally the hour of awakening arrives. It then frees itself from and devours the fine pellicle that invests it, tears the cocoon, pierces the wall of its cell, and at length sees the light. At first it is dazzled, but gradually it begins to stretch its wings in the sun and make them vibrate. It stretches out its legs and passes them over its mouth, and finally flies off in space, where it has a few days to live.—*La Nature.*



THE MASON WASP AND ITS NEST.

Sulphur Fires in Cholera Epidemics.

In the autumn of 1872, when sanitary officer at the Sonepore Fair, and during the height of the pilgrimage, when the people thronged in thousands to the bathing ghats, Deputy Surgeon-General Tuson first used sulphur fires as a prophylactic measure against cholera. These fires were made at fifty yards apart, and kept alight during the whole time that the fair was at its height. Not a single case of cholera occurred; a remarkable circumstance, since cholera had generally broken out at previous fairs. A similar good result was obtained at Dinapore, where cholera was actually prevailing. In the pamphlet on this subject which is published by W. H. Allen & Co., Waterloo Place, Dr. Tuson has adduced certain facts and arguments in support of the contention that sulphur fires are efficacious in epidemics of cholera. The basis of his explanation of their efficacy is the germ theory of the disease.—*Lancet.*

Uses of Gelatine.

Gelatine being now in ordinary use in the photographic laboratory, it may not be out of place to point out some of the purposes to which it may be applied, otherwise than in the manufacture of sensitive dry plates.

Mr. Woodbury has already published that a thin five per cent solution of gelatine colored a strong yellow by a sufficiency of bichromate of potash makes a good cement for uniting pieces of broken glass. The glass must be warmed, wiped dry, the cement then applied, and the mended glass article then exposed to light for several days. He has also published that a strong solution of gelatine to which a little glycerine and red coloring matter, such as carmine, have been added makes a substitute for wax for covering the corks and upper part of the necks of bottles.

In the form of capsules, gelatine is used by druggists to hold many liquids of a greasy nature—such, for instance, as castor oil—so that they may be swallowed without the unpleasantness arising from their nauseous taste. The capsules are made by the aid of a small egg-shaped, highly polished little knob of iron, having a pointed iron stem by which it is held. The knob is rubbed with a slightly oily cloth, then dipped in the warm gelatinous mixture, after which the pointed stem is put into a hole in a board, while the gelatine on the knob is cooling and hardening. The gelatinous mixture usually consists of six parts of gelatine, twelve parts water, and one sugar. In a short time after dipping, the capsule is cold enough to be removed from the mould, which is done by cutting the gelatine round the upper part of the stem with a knife, then pulling off the capsule dexterously with the fingers.

At this stage it should be elastic enough to pull off without tearing, and to shrink nearly to its moulded shape directly afterward. A syringe with a nozzle bent at right angles to the axis of its cylinder is used to fill it to about three-fourths its capacity; if more were forced in, the gelatinous envelope might possibly break afterward with changes of temperature. The hole is closed with a touch of a strong solution of gelatine, and the same end of the capsule is then dipped in a weak solution of gelatine to give greater security by the thin cap thus applied. The gelatinous solution used for sealing the capsules always contains a small proportion of gum. The capsules having been allowed to dry, a polished appearance is given to them by rubbing them with a slightly oiled cloth.

Gelatine is one of the many substances sometimes used for the coating of pills, in order that they may not stick together in the box, and may not be tasted in the act of swallowing them. The solution used for covering them consists of one part of gelatine to two parts of water. The pills are cleared from any dust or powder which may be on their surface; then each pill is stuck upon the end of a piece of wire four or five inches long, and the lower end of the wire is thrust into a basin of sand, which acts as a kind of a pincushion. The pills are next dipped one at a time into the warm solution of gelatine; then the other ends of the wires carrying them are replaced in the sand, where they look like an assemblage of large pins standing while their gelatine-coated knobs are setting and drying in the air. Sometimes on removing the pills from the wires a little tube of gelatine from the outside of the wire comes off with it; this tube is carefully cut off with scissors. The hole in the gelatine where the wire pierced the pill is then closed with a little warm solution of gelatine, applied by means of a small brush of camel's hair.

One fact about gelatine does not seem to have received that attention in photography which it deserves, namely, its curious power of dissolving phosphate of lime—the chief constituent of bones. Furthermore, it always contains a little phosphate of lime, which may or may not by double decomposition introduce a trace of phosphate of silver into all gelatine argento-bromide emulsions. The late Dr. William Gregory, Professor of Chemistry at Edinburgh University, says: "The property of gelatinizing depends on the presence of phosphates; for when gelatine is long boiled with water alone, or with a little alkali, phosphate of lime is deposited, and the solution no longer forms a jelly on cooling." If this be so, the functions of phosphate of lime in gelatine and in photographic emulsions deserve more attention than they have hitherto received.—*W. H. Harrison, Br. Jour. Photo.*

TRANSPARENT show bills may be cemented to glass windows in the following manner: Very fine white glue or preferably clean parchment chippings boiled in distilled water in glass or enamel until dissolved, must be applied very evenly with a soft hair brush to the face of the bill. Then press it on the glass, and in a few minutes the bill will be firmly fixed. Glass may be fixed to glass in this way, and the cement will bear a good deal of dry heat.

The World's Fair at New Orleans.

It is often the fate of those who conduct great public enterprises to be accused of incompetence and censured for neglect when, had they succeeded, success would have been without applause and diligence without reward. Hence it is that the managers of the World's Fair, if we may judge from the reports in the popular press, are now under the ban of public disapproval.

Special reports leave the city daily for all parts of the country, testifying to the incompleteness of the buildings, the tardiness of the arrangements, and the inability of the managers to handle the mass of exhibits which daily arrives. These reports are sincere, and are written by disinterested persons, though for the most part after only a cursory examination into the facts. That they are unreasonable few will deny who are aware of the obstacles which have unexpectedly appeared to thwart the efforts of the managers.

Considering that the majority of the exhibitors were very late in their demands for space, it is not surprising that the construction of buildings to receive their goods was retarded; and when it is remembered that most of the exhibits, instead of gradually arriving, came at the same time, it is by no means remarkable that the managers were unable to handle them at once. We are not surprised when a dog essays to stand on his hind legs that he does it badly, but that he does it at all. When the railroad facilities were, of a sudden, well nigh swamped by thousands of tons of freight, considerate people could not fail to admire the business-like means the managers improvised to bring it, though tardily, to the grounds.

The exhibitors, their agents, or consignees, who were waiting to receive it, expected that it would be sent out from the city at once, and were, naturally enough, impatient at the necessary delay. Yet what railroad or other corporation of carriers would go to the expense of quadrupling their facilities to meet a few days' "rush"?

Looking at the conditions under which the managers worked, and what they accomplished notwithstanding the obstacles in their way, it would seem that they have used more than due diligence. In a little over thirty days' time the managers handled nearly five thousand car loads of exhibits, the major part arriving at New Orleans within a period of fifteen days. During nearly all this time it rained. To say that the roads were "heavy" will but inadequately describe their condition to those who have had no experience with Southern roads when they are well soaked. To make matters worse, much of this freight was heavy machinery. Notwithstanding this, all of these five thousand car loads were brought to the grounds, classified, and placed.

Under the direction of the managers, the various departments are assuming, day by day, an expression of completeness. New objects are assigned without delay to their respective departments, and to judge from the number and character of the articles already placed, and the rate at which they are arriving, it is not unreasonable to predict that the Exposition will prove a World's Fair as well in fact as in name.

The plans for an electric railway around the buildings and grounds are now well nigh completed, and the parts are being assembled. This railway is likely to prove more of a convenience than a novelty, for there will be nothing new in its construction, the charged rail system being employed. The electric lighting and power companies are rapidly getting their apparatus into working order. Some of the lights are now aglow, and that all were not long since in operation is surprising, since the several plants were in use in the Philadelphia Electrical Exposition. The fact is, the projectors and promoters of these several systems were not altogether satisfied with the pecuniary results of their efforts at Philadelphia, and some of them were averse to any further expense in the way of gratuitous exhibition, each being tempted only by the proclaimed intention of some rival to appear at New Orleans. There is reason to believe, however, that they will be amply repaid for the efforts they are now making, because the present exhibition partakes far more than did that at Philadelphia of an international character, and the opportunity of displaying the various systems side by side before the official representatives, especially of Mexico and the South American republics, is too good to be lost.

The railroad now about to be built from the city proper to the fair grounds—about five miles—is so obviously necessitated that it seems strange it was not long since projected and in running order. But even this neglect, all things considered, may scarcely be laid at the doors of the managers. A railroad is a costly construction, and with a treasury only adequate to supply the absolutely necessary expenditures for building and grounds, they could scarcely be taken to task for not anticipating in the early days of preparation the grand dimensions which subsequent demands for space have made the enterprise assume.

With the expenses which the managers have been compelled to assume, and notwithstanding the bad weather and the incompleteness of the exhibits, both of which would naturally tend to keep visitors away, it is satisfactory to know that the managers have not run into debts which the actual contracts with exhibitors will not serve to liquidate. This alone will do much to show the financial ability of the managers. We have the authority of Director-General Burke for saying that the receipts, or rather the credits, were equal to the current expenses even during the bad weather, and that now the good weather is arrived the revenues are nearly ten times as large, or, in other words, ten times the amount of the estimated expenses.

The cotton exhibit at the fair is, of course, likely to be one of the most important features if not the chief attraction to foreign visitors; and though it is as yet by no means complete, good circumstantial evidence is at hand to indicate that it will constitute a thorough *expose* of every process in cotton industry, from the picking to the manufacture. Indeed, this fair commemorates the centennial of the first shipment of cotton from the United States. Since then we have grown to be the chief cotton producer of the world, though not the largest manufacturer. Those who have got accustomed to lament the rapid advance of India as a cotton producer, and who fear she will finally usurp the market we have come to look upon as our own, would do well to come here and examine the labor saving machinery now being exposed in the cotton section. The more recent arrivals are the cotton picking machine and the Oldham invention for spinning cotton. These mechanisms are designed to greatly facilitate the work of the picker and the spinner, and should they be perfected—for as yet there is still something lacking—their designers will have succeeded in accomplishing what heretofore has been regarded as practicable only by those supposed to be suffering from mechanic lunacy. It is not too much to say that in this cotton picking machine especially the wildest dreams of the cotton planter are realized. For, as is well known, he can at present plant four times as much cotton as he can pick; and it not infrequently happens, so I am told, that he must leave what would have been hundreds of bales of cotton in the field to rot, because of his inability to pick it. And yet, if the accounts we have read of the first introduction of Whitney's cotton gin years ago are not gross exaggerations, the cotton picking machine exhibited here is not more remarkable nor more cunningly devised.

It is because of the well known ingenuity of the American mechanic and inventor, of which these machines are the expression and exponent, that has led many experienced persons to believe that we shall be able in the future to overcome the terrors of that bugaboo, "pauper labor," and that the cotton crop of the future will be capable of an infinite expansion.

Of the new spinning machine an authority says: "The new process of ring spinning, which has superseded the old mule system, will itself give way to this, which proceeds somewhat on the principle of the discarded twister; its main feature, by which it promises to achieve a great diminution in the cost of production, being that two turns of twists are obtained for every revolution of the spindle. It corrects all the defects of ring spinning, including the inequalities of the yarn, and renders 'snares' and 'corkscrews' which are of such frequent occurrence where mules are employed, impossible."

The department of machinery is now very extensive, and if the spaces already bespoken are also filled, there is likely to be a very sea of moving shafts and whirring belts. At present some of the best engines in the world are in motion, as well as some of the least reliable. What is promised for some of these engines by their owners is really astonishing, considering how well informed the general public has become in this regard. Why these absurd claims are made it is difficult to understand; for when it is remembered that an official record is being made of just what they are capable of doing, they are not likely to deceive even the tyro.

Three well known and rival thread manufacturers have each their machinery in place and in operation. It is hard to understand why there should be such rivalry between them as there would seem to be, for the production of each is excellent in its way, and their respective machinery seems the one to be contrived as ingeniously as the other.

A machine for making barbed wire fence, instead of being placed with the machinery, would have been more properly set agoing in that department of the Music Hall where the new means of teaching articulate speech is to be illustrated, for there would be there no sensitive ears to be jarred by its clatter and clang.

The objections that have been urged against New Orleans as a locality for a world's fair, though well taken when considered from a manufacturing standpoint, are by no means so obvious when other and indeed the chief aims of the project are looked at. New Orleans, besides being the great cotton seaport, is, all things considered, the most convenient point at which to collect exhibits from Mexico and Central and South America; and it is perhaps not too much to say that this fair is looked to to foster and encourage trade between these several countries and the United States by exhibiting side by side the products of each. Now, among the many unique features of this fair are the agricultural and horticultural displays, and for these the climate is peculiarly suited. Favored by the balmy air, gardens have been laid out in the grounds, wherein the diverse growths of Mexico, Central and South America, California, and Florida are displayed. Here are to be seen the orange, lemon, and citron, the mesquite, maguey, banana, and other fruits; and, now that the deluge has ceased, hundreds of beautiful flowers, each in its respective section, are being set out. Within the adjacent buildings there are fine collections of grasses, fungi, edible and poisonous, and, what cannot help but be of great interest to very many people, the gathering at one point from the remotest ends of this continent of well preserved collections of insects. These are divided into several classes: 1. Insects without a metamorphosis, changing their skin but not their form, as spiders, lice, wood lice, and myriapods. 2. Insects with a metamorphosis: *a*, those moving in all stages of existence, at first wingless, then with rudimentary and finally with entire wings, including the neuroptera, orthoptera, and hemiptera; *b*, motionless in the pupa state, but having limbs, including the hymenoptera, coleoptera, and lepidoptera; *c*, ovate pupæ, wingless and motionless, as the diptera. The agriculturist will be especially interested in these, because, in the case of those which are destructive to plant life, the various means of preventing their ravages are made to accompany the collection.

In the South Carolina exhibit, large and varied specimens are shown of the now famous phosphate rock, so called. These are grouped together into a huge pyramid, making it easy for the interested and curious to examine the various nodules, all of which are of a grayish hue. It is only since the year 1868 that the great value of this substance as a fertilizer has become apparent, being now in demand at a rate of 400,000 tons a year.

The modes of treatment, the principal of which is by the use of sulphuric acid, are explained by an attendant. Following is a description of this deposit as given by Prof. Guerard, mineralogist for the South Carolina State exhibit: "The phosphate deposit occurs in beds or strata of rough masses of nodules of a size varying from a part of an inch to several feet in diameter, and is associated with numerous fossil bones and teeth. The remains of numerous extinct animals, such as the mastodon, elephant, megatherium, tapir, deer, horse, occur associated with the beds. It is found on the bottoms of the shallow creeks and rivers which intersect the coast, and on the lowlands which form a belt of country running parallel to and from ten to fifty miles from the seaboard.

"The beds are from six to twenty odd inches in thickness, and the limit of a workable deposit is eight feet underground and twenty feet under water. The phosphatic nodules are known as land or river rock according to the element in which they are found. The average yield of the land deposit is from 600 to 800 tons per acre; and though sometimes occurring in "pockets," that is, irregularly, these deposits are remarkably uniform, many contiguous acres often containing a phosphate bearing stratum at an accessible depth. The river rock having been washed into the rivers from the land, has occasionally accumulated in thicker beds than the original deposit of land rock. The river rock is obtained by dredging, chiefly in the Bull, Stono, and Coosaw rivers; the land rock is dug mainly in the section of country lying between the Ashley and Stono rivers and Rantowle's Creek. Extensive strata of excellent quality are also known on the banks of the Edisto and between the Edisto and Ashepoo rivers, but this deposit has not yet been worked to any extent. Carolina phosphate is remarkably uniform is composition, containing on an average from fifty-five to sixty-one per cent tricalcic phosphate and from five to eleven per cent of carbonate of lime. Among its other constituents are silica, oxide of iron, fluorine, sulphuric acid, traces of alumina and magnesia, water, and organic matter."

In regard to the vexed question whether or no the great fair shall be closed on Sundays, the managers have decided, and, it would seem, very wisely, that those of the exhibitors who choose to show their exhibits may do so, and those who do not so choose may cover them over. The machinery, however, will not be started during the Sabbath.

Japanese Dentistry.

The Japanese dentist does not frighten his patient with an array of steel instruments. All of his operations in tooth drawing are performed by the thumb and forefinger of one hand. The skill necessary to do this is only acquired after long practice, but once it is obtained the operator is able to extract a half dozen teeth in about thirty seconds without once removing his fingers from the patient's mouth. The dentist's education commences with the pulling out of pegs which have been pressed into soft wood; it ends with the drawing of hard pegs which have been driven into an oak plank with a mallet. A writer in the *Union Medicale* says that no human jaw can resist the delicate but powerful manipulation of the Japanese dentist.