ANCIENT METHODS OF DRAWING WATER

We have already described some of the ancient methods of raising water, but these were confined to the elevation of water from streams or natural bodies of water lying on the surface. For elevating water from wells and cisterns, different mechanism was required.

One of the ancient machines for this kind of work is represented in Fig. 1. In this machine a long beam weighted at one end is pivoted in a forked post and arranged to oscillate on its pivot. To the lighter end of the beam is connected a rod which is attached at its lower end to a bucket, and the weight of the heavier end of the beam is more than sufficient to lift a bucket full of water. Upon the beam is placed a plank, and at the sides of the plank are arranged hand-rails. The operator walks forward and backward upon the beam, thus alternately adding his weight to the lighter end of the beam and removing it therefrom, causing the bucket to alternately dip into the water and lift it to the surface, where it is emptied by another person. In some cases these machines are provided with steps to give a better foothold. It is said that the operator upon these machines becomes so expert that the water never ceases running in the troughs leading from the well, and still his confidence is such, notwithstanding his apparently dangerous position, that he laughs, sings, smokes, and eats in this peculiar situation. This machine is peculiar to Hindostan, and is known as the picotah.

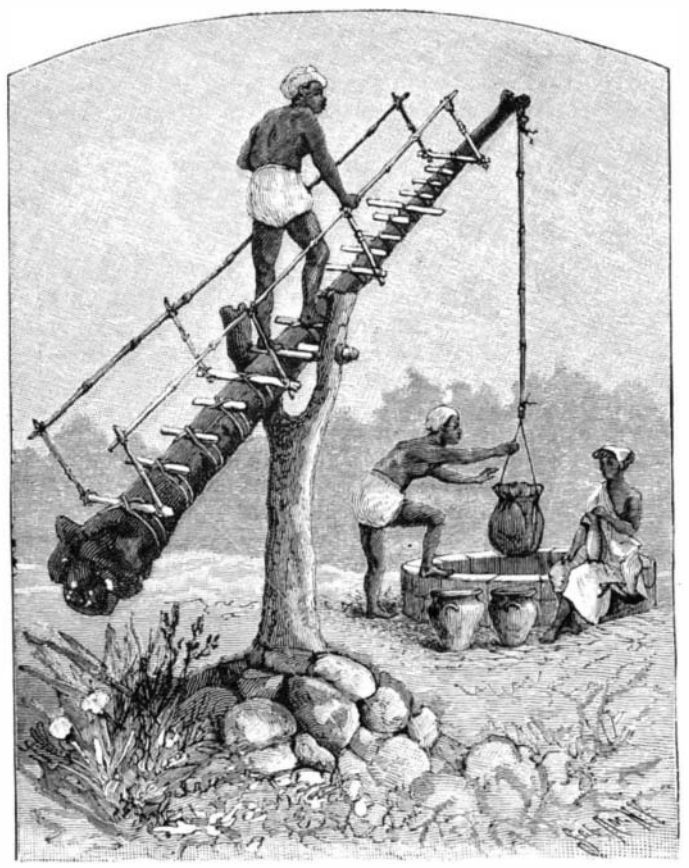


Fig. 1.—THE PICOTAH OF HINDOSTAN.

The earlier machines for raising water by power were known by such names as the tympanum, noria, chain of pots. Of these the tympanum and noria were driven by the stream from which the water was taken. The earlier form of tympanum consisted simply of a series of gutters united at their open ends to a horizontal hollow shaft placed a little higher than the discharge sluice, the gutters being arranged radially, and of sufficient length to extend from the shaft into the water. The sides were closed in by planking and the joints were made tight by calking. From the resemblance of this machine to a drum, the Romans gave it the name it bears. The tympanum shown in the engraving is an improvement on the older form, and consists of a series of tubular hollow arms extending from the periphery of a current wheel into the hollow shaft at the center. The blades of the wheel dip in the stream and are propelled by the current, and the mouths of the curved tubes scoop up the volume of water which advances toward the center of the wheel as the wheel revolves. The water thus raised is discharged through the hollow shaft into a sluice which conveys it away. These wheels are especially adapted to purposes of irrigation and mining.

The New Royal Mail Steamship Empress of Japan.

The new twin-screw steamer the Empress of Japan, which has been constructed by the Naval Construction and Armaments Company, limited, Barrow-in-Furness, has just undergone her speed trials, with the most satisfactory results. She has been built for the Canadian Pacific Railway Company, to run between Vancouver and China and Japan. She is the second of three steamers built for the same route, her sister ship being the Empress of India, while the third vessel was launched at Barrow yard recently. The builders' usual progressive runs under natural draught conditions were made on the measured mile at Skelmorlie on the Clyde, on March 30. Two runs were made with full power under assisted draught, and the mean speed realized was 18·91 knots, the engines developing close on 10,000 horse power. It is stipulated that these vessels shall run at the rate of 17½ knots on the measured mile and 16 knots on their 500 mile sea trials, these being the requirements of the contract the Pacific Company have entered into with the post office authorities. The vessel afterward proceeded on her sea trial of 500 miles, the course taken being from Wemyss Bay, on the Clyde, to Lundy Island, in the Bristol Channel, and back to Liverpool. The mean speed on this run was 16·85 knots, the mean horse power developed was 7,406, and the consumption of coal per indicated horse power 1·56.

AN International Hygienic Exhibition will be held in the months of January and February, 1892, in Leipzig. The exhibition will comprise, among others, sections devoted to hygiene, food stuffs, and ambulance.

Firing Porcelain.

The United States consul at Limoges, France, says, in his last report to the United States government, that the proprietors of the large porcelain factories there have been for a long time studying the question of reducing the price of fuel. At a recent congress of the manufacturers, it was said that some new and cheap way of manufacturing porcelain must be found for France, or the industry which has become so famous, and which employs so many of the inhabitants, would be driven from French soil on account of the cost of firing. It was there ascertained that the cost of firing china in Bohemia was not more than 10 francs a ton; in England it was only 13 francs; while, for the same thing in France, at Limoges, the cost was between 34 and 35 francs. This difference being so great, and making it impossible for the French manufacturers to make their china as cheaply as their foreign neighbors, various devices have been tried, but with little success.

In order to compete, wages have been reduced to the lowest point, and still the manufacturers are said to have lost money. The coal that is employed is necessarily costly, as a smokeless, long flame variety is required. Many of the factories burn wood only, as that produces a purer white than the very best kinds of coal, but wood is dearer than coal. It is consequently only used in firing the muffles, and in the finest grades of porcelain. A few years ago a new process was tried, that baked the porcelain in a short time, but the cost made the process impracticable. It was under such circumstances as these that one of the most progressive houses in Limoges was induced to employ petroleum or residuum oils as a fuel. To accomplish which, an American firm using the Wright burner was requested to come and make a trial with the fuel. There was very much doubt and fear connected with the experiment, but, after a time, it was attempted, and the results were far better than anticipated. The heat was shown to be absolutely pure. No gases or smoke in any way discolored the china, which came from the kiln much whiter and in better condition than when it is fired with the best of wood. In the muffles there was a decided advantage. The delicate colors, which show at once the presence of the slightest quantity of gas, were perfect. "This new discovery," says Consul Griffin, "promises to revolutionize the whole porcelain industry." It is estimated that, by employing these oils, there will be a reduction of about 15 or 20 per cent in the making of china.

The only question now is the present classification of residuum oils in the customs tariff, as the present duty on petroleum—120 francs per ton—is prohibitive, but strong pressure is being brought to bear on the government to have fuel oils classified as fuel, which pays only 1 franc 30 centimes a ton. New life is given to an industry that was seriously threatened, and it is hoped that the French porcelain will be brought to a greater state of perfection by this new American invention.

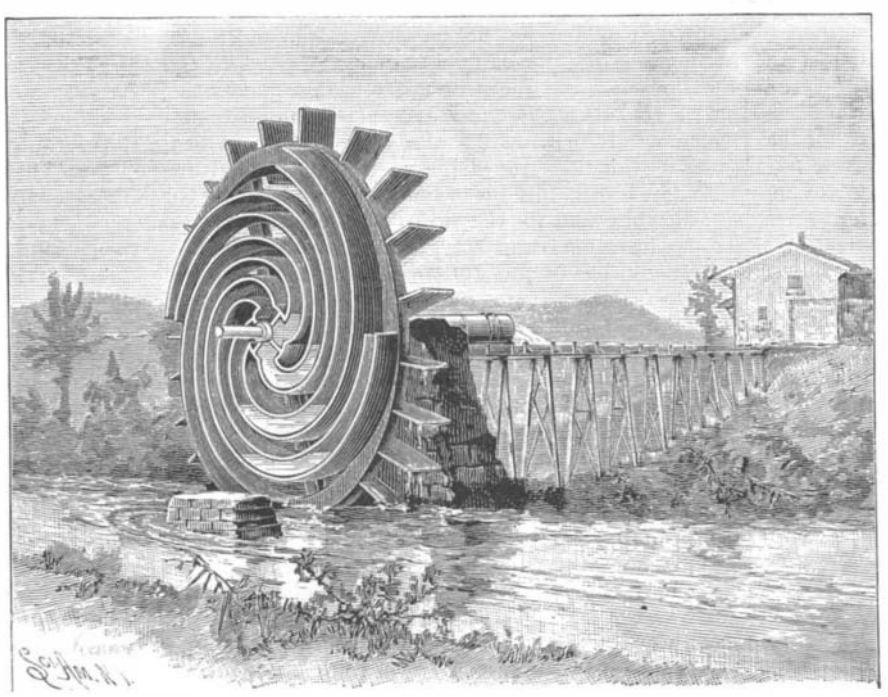


Fig. 2.—THE TYMPANUM.

Side and bearing removed to show the construction.

The Employers' Federation.

A federation of employers is in progress of organization in San Francisco, which will include the foundrymen, ship owners, lumber dealers, box makers, builders, harness and leather makers, etc. The idea is to form a federation of employers of the Pacific coast on the same plan and to be just as extensive as the organization of trades unions in the Council of Federated Trades, with its sub-federations in all parts of the coast, so that, no matter in what trade or locality the Council of Federated Trades might exert its power, it would meet an equally compact organization to oppose its decrees. It is not proposed to attempt to destroy trades unions, but to restrain them and to resist unreasonable demands; nor is it desired to reduce wages, but to so arrange matters that employers shall not be dictated to as to the individuality of employes. A committee is to be appointed, selected from the different industries, which will constitute a court of final appeal in disputes. The decision of the committee will have the power of the federation to sustain it.

Scientific and Practical Knowledge.

Some one has truthfully said that all knowledge is comprised in two classes. The first is that effect of mind which is the result of curiosity, that species of human instinct that prompts us to inquire the reason for everything we see, every action which takes place among others, among all living beings, among the elements and among the celestial bodies. Mankind being endowed with reason, the next impulse is to apply the knowledge so gained to some useful purpose, to produce some benefit to ourselves. The first of these two classes is called "scientific investigation," the second is called "applied science." For instance, we notice for the first time a light from which smoke arises, we investigate, we perceive heat, and that it produces a disagreeable sensation. These are the first scientific facts. We apply the knowledge so gained by resolving never to touch fire. This is applied science. We have employed curiosity to find out the facts. We now employ caution to guard ourselves against damage, and we determine never to touch fire. All knowledge so gained is by this process. We may be told a thousand times that fire will burn, but we feel that that is only theory. We want facts, and we obtain them by a course of scientific investigation. We use these facts and thus gain experience, knowledge, at first scientific, next practical; and these two conditions make up the sum of all knowledge. Science is the foundation, practice the superstructure.

Liquid Bronze.

Stroschein, of Berlin, makes this by treating dammar resin with about one-third of its weight of carbonate of potassium, stirring for about three days, and then finely powdering the resinous mass. Next it is scattered in thin layers on hurdles, exposed to a temperature of about 50° C., and left for several months. The resin is then dissolved in benzine or another distillate of naphtha under a boiling point of 150° C., after dry ammonia gas has been led through the solvent. The bronze powder remains suspended in this varnish. Articles bronzed with it are said to retain for years together the original fresh metallic luster.

With More Zeal than Discretion.

An esteemed contemporary announces the discovery of three "weak points" in the patent laws of the United States. It has reached the conclusion that the establishment of "oppressive monopolies" under the protection of patents ought to be effectively prohibited; the foreign inventor labors under almost insuperable disabilities in respect to the nature of proof required to establish his priority of invention in contested cases; and that patented inventions not put in public use within a reasonable time after the protection has been given, ought to be summarily deprived of it. We fear that the real source of our contemporary's disquietude is to be found in the fact that the American patent law has not been framed to meet the requirements of infringers. We may further remark that Congress appears to have no constitutional authority to change it to correspond more nearly to the views of this enterprising and industrious class of citizens. The Constitution of the United States, in express terms, empowers Congress "to promote the progress of science and the useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries." In view of the magnificent results achieved under its stimulus by the inventors of America, it is too late to question at this day the wisdom of the fathers' provision; but whether wise or unwise, there it is, a part of our organic law, and likely to continue so. The patentee's right is *exclusive*, and though it may be limited in duration, it cannot be limited in scope. Congress has no power to step in between the patentee and his personal property, and undertake to dictate to him how, where and when he shall use it or refrain from using it. We esteem it the one crowning merit of the American patent system that the grant is unconditional and absolute, or without drawback or restriction in the nature of conditions subsequent. Two of our contemporary's points are therefore disposed of by constitutional provision. As to the remaining one, it is declared that while "it is already possible for American inventors to obtain valuable patent rights in foreign lands, ... it is well nigh impossible for a foreign inventor to secure a patent here if there can be found an American unscrupulous enough to claim the invention, naming a date prior to the foreigner's application in his own country." This is a gross misstatement of the provisions and practice of our patent law. Our rules of practice provide that he who, being an original inventor, first makes known to others within the realm (thus enabling its existence to be legally proved) the invention he has made, and perfects and seeks to patent the same with reasonable diligence, is entitled to the grant. It matters not in the least whether he be a foreigner or a native; the rule is the same. The benefit to the public, which is the consideration, and the sole consideration, for the grant, arises from the making known of the invention to the people of the United States. There is no conceivable reason why we should reward a foreigner, as of a matter of right, for something he has done in his own country and not elsewhere, unless he has, by publication or otherwise, constructively placed some person in this country in possession of a knowledge of it, and the very moment he has done this, he stands precisely on the same footing, in every particular, with his domestic competitor.

Suppose it is true that a certain proportion of the patents granted are never put to use. Suppose that some "successful" inventor has "found that progress along a certain line was barred by some old claim that has never been put to any service whatever, and neither benefits the public itself nor permits any one else to do so." How large is the proportion? There are now in force about 300,000 patents. How many of these are obstructions in the way of progress because their owners will neither use nor permit them to used? Not one-tenth of one per cent. Is it then worth while in attempting to guard against a limited and largely imaginary evil, not only to inflict incalculable injury and injustice upon the vast body of deserving inventors, but, by removing what is the principal incentive and stimulus to invention, the absolute security for a fixed term of years of patented property, to dry up, as it were, the spring of invention at its very source?—*The Electrical Engineer.*

Rebuilding while Afloat.

A novel piece of work has been undertaken in San Francisco. The ship Edward O'Brien, built in Maine in 1865, has been practically rebuilt without being taken from the water. A crew of riggers was employed, and the fore and main masts, each weighing over 100 tons, were lifted by means of shores six inches clear of the keelson. This was done without sending down the topgallant masts or any of the light yards. The lower deck stanchions were then knocked out, and the old keelson taken out the entire length of the ship, together with the sister keelsons. These were then replaced with new timbers 16 by 16 inches in size. Four of these form the keelson, and two on each side form the sister keelsons. These run the entire length of the ship, and are scarfed and keyed with oak keys. The entire skin of the vessel has been replaced, 4 by 16 planking being used. Thirteen of the lower deck beams have been taken out, and new ones, 16 by 16 inches, put in. The new keelson is fastened down with bolts 1½ inches in diameter and 7 feet long, which are driven 16 inches into the main keel. New chain lockers have been put into the ship, and a heavy platform carries the big water tank, holding twenty tons of water, enough to last the crew six months. New 'tween decks have been put into the craft, and the entire main deck will be taken out, together with the poop deck, forward house, topgallant forecastle, and the forward part of the cabin, and all will be renewed, as will the waterways all around the ship. It is expected the work will be finished in three weeks, and the ship will then be given a seven year class and will load grain for Europe. The estimated cost of repairing the vessel is over $40,000. R. S. Alexander & Co. have the contract.—*Pacific Lumberman.*

Natural History Notes.

The Poison of Toads.—The skin of toads and salamanders has lately been submitted to a microscopical examination by Mr. Schultz, who finds that there are two kinds of glands present in the skin of these animals, viz., mucous and poisonous glands. The former are present all over the body, the latter are confined to the back of the body and limbs and the ear region behind the eyes, and in the salamander are present at the angle of the jaw. The poison glands are larger than the mucous glands in the salamander, are oval and have a dark granular appearance, due to strongly refractive drops of poison, a good reagent for which is copper hæmatoxylin. The poison is secreted by epithelial cells lining the glands, and, when the animal is stimulated electrically, it is exuded slowly in drops by the toad, but discharged in a fine jet, sometimes to the distance of a foot or more, by the salamander. The anæsthetic action of the poison of the toad and the use to which it is put in medicine by the Chinese have already been pointed out.

Effect of Light on Spines.—In a note communicated to the French Academy of Sciences, Mr. A. Lothelier states that in *Berberis vulgaris*, *Robinia pseudacacia*, *Ulex europæus* and other plants, the formation of spines is dependent on the access of light. Plants grown in comparatively little light present very few spines, but those grown with free access of it have more numerous, more differentiated and more developed spines. M. Lothelier has observed that the loss of assimilation power caused by the development of spines is usually balanced by the stronger growth of axillary leaves.

Protective Mimicry in Spiders.—In the journal of the Elisha Mitchell Society, Mr. Atkinson calls attention to two new cases of protective mimicry in spiders. A *Cyrtarachne* takes shelter in summer and autumn under leaves, where it has absolutely the aspect of a small univalve mollusk which is extremely abundant, and which often fixes itself in an analogous position. The second example is found in a small spider, *Thomisus aleatorius*, which is remarkable for the length of its fore legs, the hind ones being, on the contrary, very short. This spider, which lives upon grasses, ascends the culm, stops suddenly and disappears from sight. It suffices to fasten itself to the spike by its hind legs, and to bring together its fore legs, extended, and forming an angle with the culm, in such a way as to make itself nearly undistinguishable from the spikelets.

The Usefulness of the Elephant.—In modern times, we have only to look to India to be convinced of the great usefulness of the elephant. To the agriculturist, who uses him before his wagon or his plow, he is indispensable, and for the transportation of heavy articles he has no rival. We see him carrying immense tree trunks out of the Indian forest, and by his indefatigable industry, in picking up and carrying off large stones, aiding the construction of roads and railways. For labor of this kind a coolie receives from four to eight annas, while five and six rupees are paid for the daily work of an elephant. From this fact we conclude that one elephant performs the work of from twelve to twenty-two coolies. From the record of the British expedition against King Theodore, of Abyssinia, in 1868, we learn that 44 elephants were shipped from Bombay for use in the campaign. Each animal was in charge of two men. Of this number, five succumbed during the campaign. The remaining 39 rendered valuable services, being intrusted with the transportation, through a mountainous country, of cannon, ammunition and supplies. It was frequently very difficult to procure proper food for them, and as it was often necessary to traverse great distances to reach the watering places, the death of the five animals is ascribed to these hardships. Although elephants move slowly through a mountainous country and soon become footsore, they performed their task with admirable faithfulness. Without them it would have been necessary to await the building of wagon roads.

Green Butterflies.—"Grant Allen shows," says Mr. W. Doherty, in the journal of the Asiatic Society, of Bengal, "that, while greenish flowers are among the oldest, really green flowers are the most recently developed of all and among the most conspicuous. Very much the same thing is true of Lepidoptera. Pale green moths, like Actias, Geometra, and Pachyarches, are protected by their coloring, which is common to both sexes, and are quite hidden when nestling among the leaves. Such seems also to be the case with *Lehera eryx*, a lycaenid which is greenish on the under side, and may possibly be the case with some Catopsilias. But bright metallic green is, I think, the latest developed color among butterflies, and decidedly the most conspicuous. No one who has not seen it can imagine the brilliancy of *Arhopala farquharii* or *Ornithoptera brookeana* in the greenest jungle. The brightest of the metallic blue butterflies look dim beside them. It may be confidently asserted of all such butterflies that, unless the species is protected, only the male is green. The protected Ornithopteras have sometimes assumed green colors as well as golden and orange, and the female shares in this useful ornamentation to some extent. In non-protected butterflies the green is confined to the upper side, and is quite invisible except during flight. In the Lycaenidae it is found in many Zephyri, in some Poritias and Massagas, in a few Arhopalas, and in *Lampides marakata*, a rare butterfly I discovered in the Malay Peninsula, and named after its emerald tint above. Among all these, whenever the female is known, it is blue, orange, black, violet, or any other color but green. The conservative and, in butterflies, unadorned sex has not yet acquired the latest development in colors. It is also remarkable that the green colors seem to occur where the genus is most dominant. The Malay Peninsula and Borneo form the great center of development of the genera Arhopala and Lampides, and it is there that most of the green species occur. The outlying Arhopalas, those of the northwest Himalayas, and the Timorian islands, are all blue. In Zephyrus, the green species are found only where the genus is best represented and most vigorous. *Zephyrus pavo*, a species found in the Bhutan and Assam hill ranges, remote from the regular habitat of the genus, has, I discovered, the male blue and greatly resembling allied females from the western Himalayas. The green and orange Ornithopteras also occur only in the heart of the Ornithoptera region. These remarks on green butterflies also apply in some degree to certain other unusual colors of great brilliancy, such as the shining coppery gold of *Ilerda brahma* and the fiery red of *Thamala marciana*. It ought to be borne in mind that such colors must never be ascribed to a female without careful examination."

The Phenomenon of Autotomy in Certain Animals.—Mr. Fredwicq, of Liege, has established the fact that the amputation of the claws in the crab is a reflex phenomenon with which the will of the animal has nothing to do, and which is always brought about by an excitation affecting one of the articulations of the limb sacrificed. He has shown, too, that lizards suspended by the tail never succeed in breaking it, if bruising of this organ be carefully avoided. He concludes therefrom that, in these animals, autotomy is again dependent upon a reflex act, and he places in this category all the cases of mutilation, apparently voluntary, that are presented by insects, worms, echinoderms, etc. At a recent session of the French Academy of Sciences, Mr. Charles Contejean gave an account of some experiments that he has just made upon the grasshopper and lizard, and that permit him to bring new proofs forward to the support of this opinion. He has found, among other facts: (1) That autotomy cannot be induced in grasshoppers and in lizards enfeebled by long fasting; (2) that lizards artificially chilled can no longer break off their tails; (3) that such breakage is so much the more easy and more rapid, on the contrary, in proportion as the animal is more active; (4) that in the lizard, as in the grasshopper, electric excitation is that that gives most sucsess; (5) that autotomy is more easily induced in a decapitated lizard than in an intact animal, the moderating action exerted by the encephalus being suppressed.

Superimposed Magnetizations.

Experiments by M. Jamin have shown that two longitudinal magnetizations of inverse polarity may be imposed on a piece of steel without mutual neutralization. The same has been shown by M. Decharme to be true for transverse magnetization, and in a recent communication to the Academie des Sciences, M. Decharme describes the result of magnetizing the same piece of steel successively, longitudinally and transversely. The specimen of steel was 100 mm. long, 28 mm. broad, and 3 mm. thick. If the conditions were favorable and care was taken, it was found possible to obtain an iron filing sketch, showing two simultaneously existing magnetizations. In most instances, however, the two magnetizations were merely superimposed, and by making the proper passes the longitudinal and the transverse magnetizations could be made to predominate in succession, and with increasing strength, until saturation point was reached. A bar magnetized first longitudinally and then transversely would thus appear to be in a state of magnetic instability.

Periodical Locusts.

In reply to one of our correspondents who asked information concerning these insects, Dr. C. V. Riley, to whom we referred the inquiry, says:

"In reference to the 17-year locust, or periodical cicada, I may say that in more northern localities the insect appears once in 17 years in a given location, while further south it occurs once in 13 years. In other words, there are two distinct races, one called *Septendecim* and the other *Tredecim*, according as they appear either in 17 or 13 years. There are, however, a number of more or less well marked broods, according to locality. Of these I have tabulated 22, and have indicated in Bulletin No. 8 of the Division of Entomology and in the Annual Report of the Department of Agriculture for 1885, and also in other writings, the exact territory which each of these 22 broods occupies. The State of Indiana has 5 broods, viz., 1885 (XXII), 1888 (V), 1889 (VIII), 1893 (XI), and 1894 (XII). The next brood to appear in Indiana is brood XI. in 1893. The last occurrence of this brood was in 1876, and in that year I had no authentic accounts from Indiana. In 1842 and 1859, however, its appearance was recorded in Sullivan and Knox Counties. In 1894 brood XII will appear. Here again I received no records from Indiana in 1877, but in 1843 and 1860 it was recorded in Dearborn County. The largest brood which Indiana has is XXII, which appeared in 1885, and is due again in 1902. It occupies the entire southern part of the State. This brood is well recorded in Indiana as far back as 1834.

Destruction of Chinch Bugs.

BY F. H. SNOW.

At the recent meeting of entomologists at Champaign, Ill., Dr. F. H. Snow read an interesting paper on the above subject. His experiments have been continued through the two seasons of 1889 and 1890, and have been remarkably successful. As entomologist to the Kansas State Board of Agriculture, I had prepared an article for the annual meeting of that board in January, 1889, stating what was known at that time upon the subject, and calling attention to the investigations of Professors Forbes, Burrill, and Lugger. In June, 1889, a letter was received from Dr. J. T. Curtiss, of Dwight, Morris County, Kansas, announcing that one of the diseases mentioned in the article (Entomophthora) was raging in various fields in that region, and stating that in many places in fields of oats and wheat the ground was fairly white with the dead bugs. Some of these dead bugs were at once obtained and experiments were begun in the entomological laboratory of the university. It was found that living, healthy bugs, when placed in the same jar with the dead bugs from Morris County, were sickened and killed within ten days. A Lawrence newspaper reporter, learning of this fact, published the statement that any farmers who were troubled by chinch bugs might easily destroy them from their entire farms by sending to me for some diseased bugs. This announcement was published all over the country, and in a few days I received applications from agricultural experiment stations and farmers in nine different States, praying for a few "diseased and deceased" bugs with which to inoculate the destroying pests with a fatal disease. Some fifty packages were sent out during the season of 1889, and the results were in the main highly favorable.

It was my belief that sick bugs would prove more serviceable in the dissemination of disease than dead bugs. I accordingly sent out a circular letter with each package, instructing the receiver to place the dead bugs in a jar for 48 hours, with from ten to twenty times as many live bugs from the field. In this way the disease would be communicated to the live bugs in the jar. These sick bugs being deposited in different portions of the field of experiment would communicate the disease more thoroughly while moving about among the healthy bugs by which they would be surrounded. This belief was corroborated by the results. The disease was successfully introduced from my laboratory into the States of Missouri, Nebraska, Indiana, Ohio, and Minnesota, and into various counties in the State of Kansas. A report of my observations and experiments in 1889 has been published in the Transactions of the Kansas Academy of Science, vol. xii., pp. 34–37, also in the Report of the Proceedings of the Annual Meeting of the Kansas State Board of Agriculture, in January, 1890.

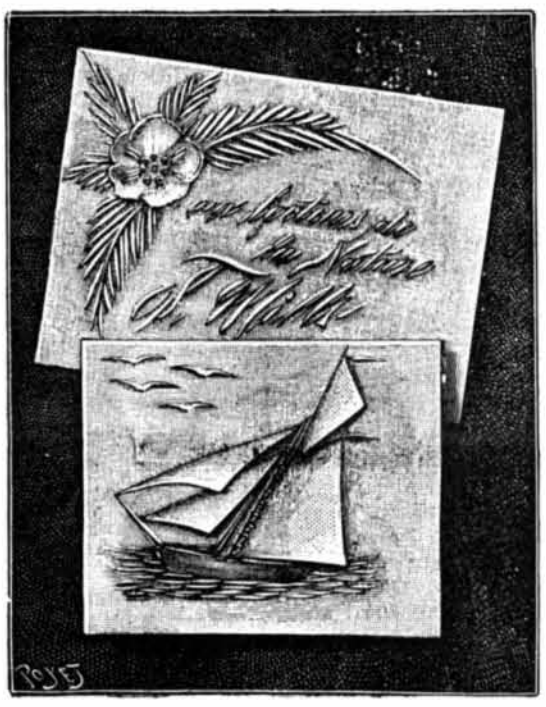
The next point to be attained was the preservation of the disease through the winter in order that it might be under my control and be available for use in the season of 1890. To accomplish this result, I placed fresh, healthy bugs in the infection jar late in November, 1889, and was pleased to note that they contracted the disease and died in the same way as in the earlier part of the season. I was not able to obtain fresh material for the purpose of testing the vitality of the disease germs in the spring of 1890 until the month of April, and then only a limited supply of live bugs could be secured.

The chinch bug seemed to have been very generally exterminated in Kansas in 1889, and only three applications for diseased bugs were received in 1890 up to the middle of July.

CASTROGRAPHY.

Do not look for the word *castrography* in the dictionary, for it is a neologism created to designate a new art. Castrography (from the Greek, meaning to write by cutting) consists in writing or drawing in relief in the substance of a sheet of thin cardboard, by means of the blade of a penknife. It was devised by Mr. Mills, an American, who exhibited the process at Paris in a public establishment. This artist traces the drawing or writing by means of incisions made in the substance of the card. As the knife blade makes a very sharp angle with the card, these incisions may be very deep. In measure as they are made, the operator, with the back of the blade, raises the upper part that he has just cut, so that its outline is at once converted into a sort of bass-relief. On illuminating the card, thus prepared, sideways, it exhibits, in fact, the high lights, tones and half tones and the true and projected shadows of sculpture. As for the rapidity of execution, it will suffice for us to say that the specimens prepared specially before our eyes by the artist, for the readers of *La Nature*, were executed in less than a minute by the watch. (See accompanying figure.) Mr. Mills varies the style of his delicate compositions *ad infinitum*. Here we see flowers, such as eglantines and forget-me-nots, here ornamental designs, and here again birds, ornamental plants, etc., rising suddenly under the blade of the rapid knife. In the time that it would take a draughtsman to put a sketch upon paper, Mr. Mills gives us not only the contour, but also the shadows, obtained by the play of light upon the bass-relief.

This process is scarcely capable of furnishing any-



BASS-RELIEFS MADE IN CARDS WITH THE BLADE OF A PENKNIFE.

thing but fancy work, visiting cards, bills of fare, out of the ordinary line of decoration, etc. A goodly number of our readers who are fond of manual recreations might practice it in their turn. They will find that it is very difficult to incise a sheet of Bristol board without the knife's point passing clear through it, but we believe that with a little exercise, and provided they do not try to work too fast, they will be able to obtain satisfactory results.—*La Nature.*

A Remedy for Cut Worm.

Cut worms are the caterpillars of night-flying moths. Most of them are very injurious to young and tender plants, such as cabbage, tomato, peppers, corn, beans, etc. They only work at night, and during the day remain hidden just under the surface of the ground in the immediate vicinity of their food plants or pastures. Many of the species climb trees, and often become very destructive to the expanding buds and young foliage. The moths of the species that infest our gardens usually lay their eggs near the roots of perennial plants, such as rhubarb, hollyhock, etc., and in the vicinity of such plants we may confidently expect to find plenty of young cut worms in spring. One of the easiest ways to get rid of the pest, says a correspondent in *Popular Gardening*, is to scatter pieces of green stuff, cabbage leaves, or sods with fresh grass, etc., that have been sprinkled with Paris green water, here and there over the area that we wish to clear of cut worms. Hand picking is a more laborious remedy, but it can be made effective. Plow the field, a few weeks before the intended crop is to be planted, and sow some beans over the piece. After the beans are up, the patch should be gone over early every morning, and the cut worms hunted up near the freshly cut plants, and destroyed. If this is done for a week or so, there will be few worms left to trouble the crop to be planted afterward. The worms can also be starved out of a piece of land or orchard by growing several successive crops of buckwheat on it, and allowing no other plant or weed to grow for an entire season. When mature, the larva enters the ground, where it forms an oval smooth cavity, within which it changes to a chrysalis of a deep mahogany brown color, pointed at the extremity. These chrysalides are often turned up in large numbers when the ground is plowed. Birds of all kinds, and even domestic fowls, are very fond of these chrysalides (as many of them are also of the larvæ), and many are thus destroyed by their enemies, to whose view they are exposed by the plow.

A Electrical Wedding.

At a wedding reported in Baltimore, a few days ago, no sooner had the company been comfortably seated than the room burst into a flood of light from numerous varicolored incandescent electric lamps hidden among the decorations. The entrance of the bride and bridegroom was welcomed by the automatic ringing of electric bells and the playing of electrical musical instruments. After the first course, the room was plunged into semi-darkness, when suddenly, from the floral decorations upon the table, there glowed tiny electric lamps. Not only the flowers, but the interior of the translucent vases in which some of them were gathered, scintillated with flashes of light. After a while a miniature electric lamp, which in some unexplained manner had attached itself to the bride's hair, was seen to glow with dazzling brightness. A toast having been given, two serpents slowly uncoiled themselves and issued from the wine bottle that stood beside the bridal couple. Cigars and coffee were served, and the cigars were lighted by an electric lighter, while coffee was prepared in full view of the company by an electrical heater. The speeches that were made were liberally applauded by an electrical kettledrum placed under the table. As the company dispersed, the electric current set off a novel pyrotechnic display, amid the crimson glare of which the festivities ended.

Caterpillars Stop Trains.

The Carolina Central runs through the Big Swamp just east of Lumberton on trestlework, broken here and there in the solid portions of the swamp by embankments of earth. On April 28 an army of caterpillars began moving out of the swamp, and when they reached the streams, they proceeded to cross on the trestles. The rails and ties were covered several inches deep with the moving mass, and the first train that encountered them was brought to a standstill, the driving wheels of the engine slipping around as if the rails had been oiled. The engineer exhausted the contents of his sand box before he got through the swamp and reached a clear stretch of track.

It was thought that trip would be the end of the caterpillar trouble, but the next day a train encountered another army of caterpillars crossing the trestle, and had the same difficulty. The Charlotte-bound passenger train recently had a similar experience. The rails and cross ties of the trestle were hidden from sight. Where the caterpillars came from is not known. The farmers on this side of the swamp express no uneasiness for the safety of their crops so long as the advancing army persists in using the trestle in getting across the streams, for none of them have got more than half way across before being overtaken by a train.

Preserving Plants.

Mr. J. Sauer has made known a process for preserving plants in the form and with the flexibility that they possessed in the fresh state, and also for coloring or bronzing the plants thus prepared.

The plants having been perfectly freed from dust, and washed, are immersed for two or three days in a strong solution of crystals of soda. The strength of the solution usually employed is eighteen ounces of crystals to one quart of water. Sometimes it is advantageous to add a little caustic lixivium.

The plants are dried between cloths for three or four hours, and are then greased either by immersing them in melted lard or by gently rubbing them with the hand with olive oil.

To color the plants thus prepared, they are painted with a solution of dextrine containing a proportion of about five per cent of solution of aloes. To this coating are applied the proper colored powders.—*Moniteur Scientifique.*

THE activity and originality shown in connection with the recent development of the American navy affords material for thought, not only to our shipbuilders, but also to our statesmen. Notwithstanding this activity, we sincerely hope that the two great English-speaking nations of the world will never disgrace civilization by going to war with each other. We may say, frankly, that we should have preferred to see America content in developing her industrial and mercantile resources. Since, however, she seems determined to take a position as a naval power, it is the evident duty of our statesmen to make themselves thoroughly acquainted with American naval progress, and to take steps to guard against possible contingencies.—*Industries, London.*