two opposite poles of the battery touch upon opposite sides of a commutator cylinder supported a short distance above the top of the box.

Two opposite sides of the commutator are provided with straight bars connecting all the springs on each side, so that the current from all of the positive electrodes may be taken from the binding post attached to the spring at the end of the series on one side, and the current from all of the negative electrodes may be taken from the binding post at the end of the series of springs on the opposite side. When the commutator is in this position the battery may be charged and a quantity current may be obtained from it. When a current of high intensity is required, the elements are connected in series by means of the diagonal wires running through the commutator cylinder and terminating in buttons arranged on a median line between the metal strips. With this device all that is necessary to connect the elements for intensity is to turn the commutator through a quarter of a revolution.

It is too early to speak with any degree of confidence in regard to the capabilities of this new battery, but it seems susceptible of a great number of very useful applications.

For general experimental work its advantages are obvious. For electric lighting on a small scale it appears practicable, since a larger secondary battery may be charged by a small battery during the night and day for use during the evening. For use in connection with small electric motors for domestic purposes it would seem to have another application. For galvano-cautery it may serve a good purpose, and there are a thousand uses requiring only a brief expenditure of considerable power which would allow a large margin of time for the accumulations of electricity, where this battery may be advantageously applied.

The action of the battery is thus described in one of the English journals: "When a current is passed into this cell the minium on one plate is reduced to metallic lead, that on the other is oxidized to a state of peroxide. These actions are reversed while the charged cell is discharging itself."

A Water Carrying Tortoise.

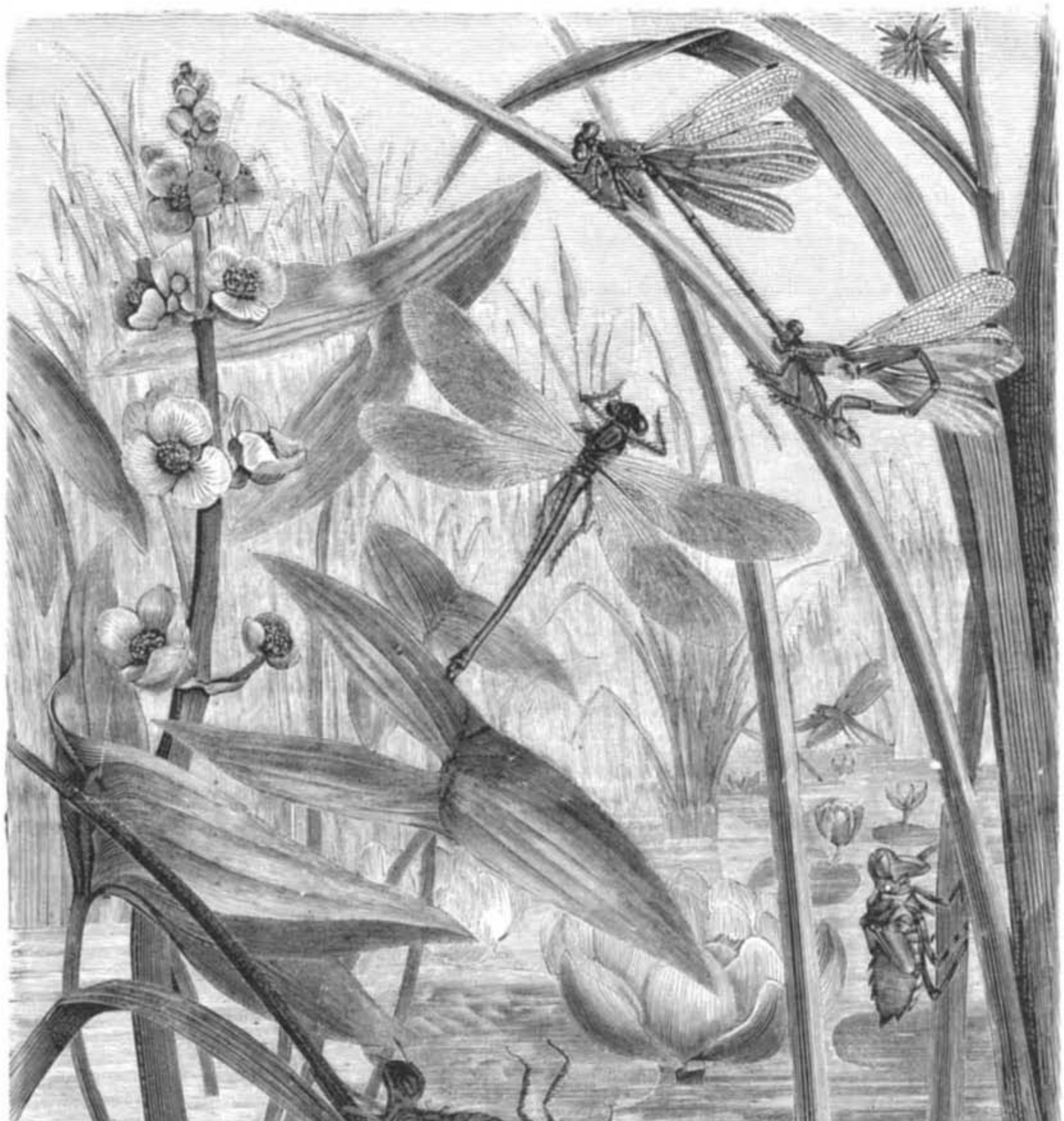
At a meeting of the California Academy of Sciences the other evening, a very fine specimen of the desert land tortoise, from Cajon Pass, San Bernardino County, in this State, was received. The specimen had been carefully prepared, and was as large as an ordinary bucket. The tortoise is a native of the arid regions of California and Arizona, and Prof. E. T. Cox, who was present, related a curious circumstance connected with it.

He found on dissecting one of them that it carried on each side a membrane, attached to the inner portion of the shell, in which was about a pint of clear water, the whole amount being about a quart. He was of opinion that this water was derived from the secretions of the giant barrel cactus, on which the tortoise feeds. This cactus contains a great deal of water.

The tortoise is found in sections of country where there is no water, and where there is no vegetation but the cactus. A traveler suffering from thirst could, in an emergency, supply himself with water by killing a tortoise. They are highly prized by Mexicans, who make from them a delicious soup. The foxes of the desert attack the tortoise and finally overcome it by dragging them at times for miles.

B. B. Redding said he would try to obtain a live one for the Academy, in order that its habits and peculiarities may be carefully observed and noted. He instanced being on the Gallapagos Islands in 1849, and assisting in the capture of 92 land tortoises, varying from 450 to 600 pounds in weight, which the vessel brought to San Francisco and sold for more money than the whole cargo of lumber netted at that time. They were two months on board the vessel, yet ate nothing, and those killed had in them considerable quantities of pure water. They live on the high lava rocks, which rise as mountains on the island, where there are no springs or streams, and the only dependence of animal life for water is necessarily upon the irregular and uncertain rain showers.

It may be mentioned that the tortoise are of different species, though they may have the same habit in respect of carrying water. The famous edible species of the coast of the Pacific and Indies, of which the headquarters is at Gallapagos Islands, is the *Testudo Indica*. They grow to five, six, and even seven hundred pounds or more. Those found in this State are smaller, and are the *Agassii* species, first described some years ago by Dr. J. G. Cooper, if we recollect aright. Those Mr. Redding describes from the Gallapagos were offered water while on the ship, but refused it. Yet when killed they all contained water. The place they inhabit is a dry one, lacking water. It may be that they go to the high places and obtain it from the vegetation, the same as our species does.—*Mining and Scientific Press.*



SLENDER DRAGON FLY.

THE SLENDER DRAGON FLY.

There are many species of dragon flies, all similar in their habits. They are properly named, being among the most voracious and cruel of insects, and even in their preliminary stages they exhibit their predatory disposition. In their larval and pupal state they inhabit the water, and are found in most streams, propelling themselves along by a very simple apparatus. They breathe by means of the oxygen which is extracted from the water, the liquid passing into and out of their body through a gill at the end of the tail. After giving up its oxygen the water is violently expelled, thereby forcing the insect forward.

The lower lip is jointed and can be extended about an inch. When at rest it may be folded, and can be protruded and withdrawn. It is furnished with a pair of forceps at the end, so that it may be able to grasp objects. This creature remains for some ten or eleven months in the preliminary stages of existence before developing into the perfect insect.

Our engraving represents the slender dragon fly (*Lestes*). The male has a light gray encircling band around the middle part of the emerald-green body, the brown or black wing markings have almost a white edge, and it has two large pointed teeth at the inner edge of the clasping pincers.

The manner in which this species lay their eggs has been observed by Siebold, on the borders of a pond overgrown with rushes, and is shown in the engraving.

After the pairing the male clasps the female firmly by the neck and controls her movements. Both fly in this condition with outstretched bodies, lighting upon the water plants and appearing to be animated by one will. Frequently the male settles down on the top of one of the rushes; in this case the female curves her body, and placing the point of it behind the feet, pushes the sabre-formed egg-depositing instrument from out its horny sheath and presses it into the outer skin of the rush. As soon as this is done she creeps down the rush a single step, piercing another place with this apparatus, and continues to work in this manner, drawing the male after her, until the bottom of the rush is reached. Then both fly away to another rush and repeat the operation. Upon the stalks worked upon in this manner there may be perceived rows of whitish yellow spots. A strip of the skin of the rush is ripped up from the top to the bottom by this operation, but is pressed back again by the convex part of the apparatus after it is withdrawn. In almost every one of these pierced places an egg is found deposited in the back part of the roomy air cells of the rush, with its pointed dark-brown end crowded into the inner part of the principal crevice; the somewhat thicker rounded end is of a pale-yellow color and projects into the cell.

Sometimes no egg is found behind the pierced place in the rush; in this case it is probable that no time was given to the female to deposit one, for the male often flies up before the whole length of the stalk is traversed. Pairs of these insects have been observed upon the rushes which grow up out of the water. This does not prevent them from pursuing their accustomed way to the base of the plants. They both disappear under the surface of the water, having previously laid their four wings close together.

If the female betakes herself to the water the male quickly follows after, and she does not begin her work until he is quite surrounded by water. He bends the back part of his body into a position like that of the female, so that all the pairs that have been observed under water form a double curve with their bodies. A thin stratum of air clings to their bodies, their legs, and wings, which they use without doubt for breathing, for they will remain under water half an hour, for here as on the land they descend in the pond to the base of the rush. When they have reached the bottom they creep up the stalk again and fly away. It often happens that when one pair are alr[eady] upon a rush

Minute Disease Organisms.

The organisms described by Pasteur as the origin of epidemics and contagious diseases are so minute and few compared with the multiplying swarms of bacteria, etc., pervading all generating solutions, that it becomes necessary to provide a means of eliminating the masses of infusoria from solutions to be studied under the microscope. These microzoa haunt even the clearest water at times. M. Certes suggests the use of osmic acid as a sure means of killing them without destroying their tissues. He dips a glass rod into the solution to be examined, and then into 1½ per cent solution of the acid; washing this in a narrow test tube of distilled water, it is easy to collect what is necessary.

GOOD bricks are unquestionably the best building material used. They come nearer to being fireproof than any other substance. Iron is treacherous and almost worthless in many places where it is used. A good oak pillar is far better as a support in case of fire than iron.

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under the water another pair betake themselves to the water upon the same side of the rush. In this case the upper pair turn to the opposite side of the stalk, and thus they carry on their work unhindered. At the approach of an observer they fly away, apparently disturbed in their work, but when they are under water they can only be disquieted to a certain degree. If they are touched they clasp the stalk more firmly, and if still further disturbed they creep up the stalk more quickly than usual in order to fly away.

The pierced places in the stalk spread out into a brown spot under the water. The larva emerge from the pointed end of the egg.

Nearly all dragon flies are brilliantly colored, but the colors fade with their life, and in a few hours after death the most brilliant dragon fly will have faded to a blackish brown.—*Brehm's Animal Life.*

NATURAL HISTORY NOTES.

The Seventeen-Year Locust.—Professor C. V. Riley states in the *American Naturalist* that the present year will be marked by a quite extended appearance of this interesting insect, both a seventeen and a thirteen year brood simultaneously appearing. These two locusts agree in every respect except in the time required for their full development. The last simultaneous appearance of the two broods was in 1860, and their appearance the present year will doubtless give entomologists a chance to perfect their knowledge as to the geographical range of the insects. Pupæ have already been reported either near or upon the surface of the ground in several localities. The thirteen-year brood is by far the more extended, and occurs very generally throughout the Southern States, both east and west of the Mississippi.

Electrical Insects.—Entomologists inform us that a few insects are known which have the power, like the electrical eel (*Gymnotus*), of giving slight electrical shocks to those who handle them. Kirby and Spence, in their Entomology, describe one of these insects, the *Reduvius serratus*, known in the West Indies as the "wheel bug," and state it can communicate a shock to the person whose flesh it touches. Two instances of effects upon the human system resembling electric shocks, produced by insects, have been communicated to the Entomological Society by Mr. Yarrell: one mentioned in a letter from Lady de Grey, of Grobz, in which the shock was caused by a beetle, one of the *Elateridæ*, and extended from the hand to the elbow on suddenly touching the insect; the other caused by a large hairy lepidopterous caterpillar, picked up in South America by Captain Blakeney, R.N., who felt on touching it a sensation extending up his arm similar to an electric shock of such force that he lost the use of his arm for a time, and his life was even considered in danger by his medical attendant.

Growth of Plants in Oil.—M. Van Tieghem has quite recently discovered, and communicated to the *Bulletin* of the Botanical Society of France, the curious fact that many of the lower plants (Ascomycetes, Mucorini, etc.) can live and sometimes fruit very well when they develop in oil alone and far removed from all contact with the atmosphere. Unpurified oils are sown with a quantity of spores, and then, if a slightly moist substance be immersed in the oil, it becomes covered with vegetation. The common mould, *Penicillium glaucum*, among others, develops in oil and fructifies very well in the midst of the liquid, but to make the spores germinate requires the introduction of a small quantity of water at first. These plants germinate owing to the oxygen dissolved in the oil, and they possess the property of forming water at the expense of the elements of the oil. A species of yeast cultivated under such conditions has the property of extensively saponifying the oil in which it develops, without the disengagement of gases.

The Flora of Pompeii.—In 1851, the botanist Schouw published in his book, "Die Erde, die Pflanzen und der Mensch," some facts relating to the plants represented on the frescoes of Pompeii. In a recently published work by Professor Horace Comes, "Illustrazione delle Piante rappresentate nei dipinti Pompeiani," the author has passed in review no less than fifty species which are represented on the frescoes, and which he was enabled to identify, and twenty concerning which he is in doubt. Among the identified species are several that have never been mentioned by other writers on the subject; for example: *Althæa rosea* (holly hock), *Chrysanthemum coronarium*, *Lagenaria vulgaris* (calabash), and *Narcissus pseudo-narcissus* (daffodil). The *Althæa*, well enough known by the ancients to have a place on their frescoes, may well have been the "arborescent mallow" of which Theophrastus speaks, and which has been referred to *Lavatera arborea*, although its full growth is attained in a few months, according to the Greek author. *Narcissus pseudo-narcissus* corresponds in its emetic properties with the "Narcissus genus alterum herbaceum" of Pliny. The edible fungus, *Lactarius deliciosus*, is easily recognizable on the frescoes, and it is to this species, and not to a *Boletus* nor to *Russula integra*, that Pliny refers in the passage: "Fungorum lætissimi qui rubent," etc. (Hist. Nat., xxii., 23)

It appears from the frescoes that in the time of Pliny the naturalist, the Romans possessed through acclimatization, or at all events knew with certainty, plants foreign to Italy. Among these are the *Lagenaria*, cited above, the peach tree, *Acacia nilotica*, *Platanus orientalis* (plane tree), *Tamarix indica*, etc. One of the pictures represents the *Papyrus* and *Nelumbium speciosum*, along with the hippopotamus. *Morus nigra* (black mulberry) is among the plants recognized by Professor Comes, and this confirms the opinion of Fraas. The author has classed the plants in alphabetical order, and devoted to each one an article in which he recalls the principal passages of the authors and commentators who have referred to it. He believes the huakindos of Homer to have been *Gladiolus segetum*, and the hyacinthus of Pliny, *Iris germanica*.

A New American Fern.—The many lovers and collectors of ferns will be interested to know that another new species has recently been added to the list of the Pacific Coast forms. This time it is a *Cheilanthes*—a very beautiful species—and it has been named by Mr. G. E. Davenport (who describes and gives a very beautiful figure of it in the June number of the *Torrey Botanical Bulletin*), *C. Parishii*, in honor of its discoverer, Mr. W. F. Parish, of San Bernardino, Cal. It was detected in the crevices of rocks on a hill in San Diego county. Nothing definite is as yet known of its abundance, but Mr. Parish thinks that it is probably scarce, as he could find but two or three plants.

AGRICULTURAL INVENTIONS.

An improved sack or flexible receptacle for cotton, wool, and other substances, has been patented by Mr. Milledge B. Wever, of Johnston's Depot, S. C. The sack is attached to and envelops a jointed extensible frame that may be so adjusted as to distend it and support it in upright position, thus enabling it to be filled quickly and easily.

An improved stalk and weed roller and cutter has been patented by Mr. Henry H. Spencer, of Mound City, Ill. This machine is so constructed that the knives are at rest or have no reciprocating movement until, in the revolution of the cylinder, they arrive underneath the axle, when they are made, by cam-and-gear mechanism, to make a quick stroke, thus instantly severing the stalks or weeds upon which the whole weight of the machine is at that moment imposed. The knives are instantly retracted after such stroke by means of springs suitably arranged for the purpose.

Mr. Lewis Shepard, of Mace, Ind., has patented an improved harrow that can be conveniently adjusted to adapt it for various kinds of work. The harrow is made in two parts, each of which is made in the shape of what is known as the "A" harrow.

An improved hopple or device for confining the legs of horses or other grazing quadrupeds, so as to hamper their motion and thus restrain their wandering, has been patented by Mr. Charles J. Gustaveson, of Salt Lake City, Utah Ter.

How Hides are Taken Off and Salted.

In the abattoirs of this city the flayers of cattle use in taking off the hides a knife with a straight back and a keen edge, broad at the haft, but tapering up almost into a point at the end. The hoofs are first taken off at the first joint, a piece of the loose flesh at the throat cut out, an incision made in the neck, and the knife run down through the middle of the belly and the center of the lower side of the hair tail. The animal, which, up to this time, has been lying on its back, is inclined a little to one side, being supported in that position by a prop under the downwardly-inclining forequarter. Beginning at the neck, the flayer runs his knife carefully along until the hide is taken nearly off the side which is uppermost, then the animal is rolled over on that side and propped up as at the beginning, and the same flaying operation is repeated on the part which was downward at first. Next a wooden support, about four feet long, six inches deep, and two inches wide, having a large iron hook in the middle adapted to be fastened to a rope for hoisting purposes, is run through incisions made in the hind legs just above the first joint; the rope is adjusted to the hook, and the carcass lifted up by a windlass, when the projecting ends of the joist are supported by cross beams about nine feet from the floor, and the body hangs suspended therefrom. One of the workmen now grasps those portions of the hide which have been taken off the sides of the animal near the neck, and another takes a large butcher's cleaver, and using the back, not the edge of the instrument, by repeated blows frees the skin from the rest of the carcass, while it is pulled off by the first workman. Great care is exercised in the process of flaying, as the workmen are subject to a fine for each cut and score on the hide.

When freshly taken off the hide is worth about 8 cents per pound. In this state it is sold to the salters with the pates and tails on. The salters place them in beds of about 600 each. The floor of the salt room is generally cemented, and the bottom layer of the hides is laid with the hair side down; the salt is then sprinkled on the flesh side, and another layer is put down in like manner until the bed is complete. The hides are usually left in the salt from ten days to two weeks. The salt used must be of good quality and ground rather fine, as in case a lump of even the size of an egg is left upon the flesh side it will eat into the hair of the hide placed above it and very seriously detract from its value. It takes about 180 bushels of salt, worth from 32 cents to 35 cents per bushel, to each pack of 600 hides. When the hides are taken out of salt they are well shaken and folded, first doubled lengthwise, and then wrapped up in four or five folds. In some cases salters contract their hides to tanners by the month or year, and settlements are made at the end of each month on the basis of the average ruling price during that period. It is now, however, becoming customary for them to sell each lot to the tanner or dealer who will pay the highest figure at the time of delivery.

In some of the abattoirs where the butchers do not do their own salting, the salters hire the pens and make no charge to the slaughterers, but receive the hoofs of all the animals killed in lieu of other compensation. In the Jersey City abattoir the salters pay $1,000 per annum for each pen, affording accommodation for fifteen animals at a time.—*Shoe and Leather Reporter.*

Sugar from Rags.

The newspapers have lately taken up the subject of making sugar from rags, and some of them seem to regard it as a new invention. This, however, is by no means the case. It has been long known to chemists that if vegetable fiber, such as that of cotton, flax, etc., be submitted to the action of sulphuric acid, it is converted into soluble starch or dextrine, and this is readily convertible into sugar. The ordinary process of malting is simply a conversion of the starch of the barley into sugar by the agency of a ferment called "diastase," which is formed in the barley, and is so effective that only one five-hundredth part is sufficient to set up the action by which the insoluble starch is converted into dextrine, and then into sugar. This occurs when the grain of barley is sown in the ground, and is the natural operation by which the germ is fed: the germ having neither mouth nor stomach, cannot take solid food like the original starch granules which surround it in the seed; but when that starch is converted into sugar, the baby plant can absorb it, and continues to absorb it until its rootlets and first leaf are formed. By this time the sugar is all used up, but the plant is now able to obtain its nourishment from the ground by its root, and from the carbonic acid of the air by its green leaf or leaves.

Such is the ordinary life history, not only of the barley plant, but of all others. The starch is to the plant germ what the yolk and white of the egg are to the chick germ. If the sugar were ready formed in the seed it would be dissolved away at once by the water in the soil, and the germ would perish prematurely, but by the exquisite chemistry of nature the conversion of the insoluble starch into the soluble food of the germ goes on just so fast as the germ can use it, and thus the supply is kept up till the young plant can shift for itself. The maltster forces the natural process, and then kills the germ by roasting the seed when he has obtained the maximum amount of sugar.

Fruits also are sugar factories, in which is conducted the whole process of making sugar from rags, the fiber of the rags being represented by the fiber of the unripe fruit. Every boy who has struggled to eat an unripe apple or pear knows that the unwholesome luxury is what he calls "woody," as well as sour. The chemist describes it similarly. His technical name for the tough material is "woody fiber," under which name he includes nearly all the fibrous materials of the vegetable world, for they all have fundamentally a similar chemical composition. This woody fiber is made up of carbon and the elements of water. Starch and sugar are composed of the same elements, their differences of properties being due to differences of arrangement and proportions of the constituent elements. Thus the change of insoluble starch into dextrine, and dextrine into sugar, or the change of woody fiber into dextrine and sugar, are effected by very small modifications of chemical composition.

We all know that the unripe apple or pear is sour, or that it contains an acid as well as the woody matter. Now, this appears to act after the manner of the sulphuric acid that the chemist applies to the rags, but it acts more slowly and more effectively. The sweetest of pears are gathered when hard and quite unfit for eating, but by simply setting them aside and giving this acid time enough to do its work, the hard fibrous substance becomes converted into a delicious, sweet, juicy pulp.

The natural chemistry here has a great advantage over the artificial operation, seeing that the natural acid either becomes itself converted into sugar or combines with the basic substances in the fruit, forming wholesome salts. Not so the sulphuric acid of the chemist. He must get rid of this from his rag sugar; and herein lies the difficulty of the process. The writer tried the experiment more than twenty years ago, using lime for the purpose of removing the sulphuric acid, but found that in removing the sulphate of lime he lost much of the sugar which this solid absorbed, and from which it could only be removed by great dilution, and then not completely. To do this practically would cost so much that the rag sugar would be far dearer than that which nature beneficently manufactures by similarly, but more effectively, acting upon the fibers of the sugar cane or beet root.

There is little risk of the sugar trade being disturbed, or of the paper makers being deprived of their raw material, by the rivalry of rag sugar, though the chemist may display in a show glass some crystals that he has made from one of his own worn-out shirts.—*London Grocer.*

A Good Word for Cast Iron Stoves.

For some time Prof. Ira Remsen, of Johns Hopkins University, has been investigating for the National Board of Health, the alleged danger to health in apartments heated by hot air furnaces and cast iron stoves. The results of the investigation, Prof. Remsen tells the Baltimore *American*, "cannot well be given in a few words, but in general, it may be said that there is practically not much danger from carbonic oxide involved in the use of hot air furnaces and cast iron stoves."

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