

Mr. Nathaniel Dunn, of New York city, has patented an automatic tension, more particularly intended for lock-stitch machines, but adaptable to single thread machines, which may be readily attached to existing machines, and be operated by the action of the needle bar in such manner as to positively clamp and release the thread at proper points in the stroke of the needle, so as to insure a stitch of proper tightness on any kind of work, either thick or thin, without any special adjustment.

An improved wood grinding machine for paper pulp has been patented by Mr. Benjamin F. Perkins, of Bristol, N. H. The improvements relate to the class of wood grinding machine using revolving stones, to which the wood is pressed by feeding devices. The inventor makes use of a bevel edge stone set horizontally with the smaller side downward, combined with feed mechanism at opposite sides, so that in operation the step of the stone spindle is relieved from undue pressure, the pulp leaving the stone readily, and at the same time the weight of the stone is utilized to aid the grinding.

An improved recording mechanism for spirit meters has been patented by Mr. Julius Leede, of Washington, D. C. The object of this invention is to furnish an improved automatic apparatus or machine for accurately measuring and recording the quantity, specific gravity, and temperature of distilled spirits or other liquids passed through it. These functions are performed simultaneously, and the three records—to wit, of quantity (in gallons) and temperature and specific gravity (in degrees)—are made ineffaceably on the same traveling paper sheet or strip by means of puncturing needles or styluses. The sheet, which is practically continuous, is suitably marked and graduated for the purpose, and is drawn off automatically from a roll, and the recording or puncturing devices are operated by mechanism connected with a vibrating lever attached to floats that rise and fall alternately in separate cylinders, and constitute the primary elements of the meter.

OPERCULUMS AND EYESTONES.

BY A. W. ROBERTS.

Nearly all univalve shells have an operculum, or door, that fits closely to the inside of the mouth or opening of the shell. This door is generally situated on the upper side of the back-part of the foot on which the animal moves. [See article on the *Pyrula*, or Winkle Shell, SCIENTIFIC AMERICAN, No. 11, Vol. 44.]

When the univalve draws in his body the operculum is the last part that is taken into the cavity or mouth of the shell, where it fits so accurately, and is of such a horny or calcareous nature, that it affords perfect protection to the animal against enemies from without.

Fig. 1 represents the under side, or that part of an operculum which is attached to the body of the animal. Fig. 2 illustrates the side, which is presented, when the animal has withdrawn into its shell, as a shield or barrier against the sharp teeth of fish. This operculum is an exact representation or duplication of an eyestone on a very large scale. In fact, all eyestones are operculums or small close-fitting doors that are used by the eyestone bearing univalves to protect them from intruders.

Fig. 3 is one of the most common of our eyestone bearing turbos, which, in the engraving, is shown natural size. A is the under side of the eyestone, which is composed of numerous slightly concentric grooves. When moving over the eyeball, the grooves collect and retain all foreign substances. The movement of the eyestone is caused by the pressure of the eyeball against the stone. The arrow, at B, indicates the mouth or opening wherein the operculum or eyestone is situated when in its natural position.

Eyestones are composed of calcareous material, and when placed in a smooth plate containing a weak solution of lime juice or vinegar, are slowly moved about by the evolution of carbonic acid gas. It is from this fact that ignorant people imagine that the eyestone has life, and a particular weakness for vinegar, in which above all other fluids it delights to swim.

Most of the eyestones sold to the wholesale drug dealers of New York city are supplied to them by sailors employed on vessels engaged in the fruit trade of Venezuela and other South American Republics. They are regarded with great mystery and awe by the native inhabitants, by whom they are collected in large quantities.

A very prevalent error exists as to the origin of the eyestone. Many persons imagine, and many works on the subject state, that the eyestone is the product of the fresh water lobster or crayfish, and that the stones are found in the stomach of the above-named animal, and constitute a storage of lime during the moulting season. This is not so. The stones found in the crayfish are known as crabstones. In Poland, Russia, Astrachan, the crayfish are rotted in deep pits dug in the earth, after which the refuse is washed to obtain the crabstones, which are used in many parts of Europe to correct stomachic difficulties.

Fig. 4 is one of the most beautiful operculums

known. In fact its coloring is so brilliant and gemlike and the blending so exquisite that it is being used extensively by



Fig. 1—Under Side of Operculum.

our leading jewelers, and always commands a high price for the most brilliantly colored specimens.



Fig. 2—Top Side of Operculum.

Fig. 5 is the operculum of the *Natica heros*, one of the most common of the larger varieties of shells to be met with on the Coney Island sands. This operculum is composed of



Fig. 3.—The Eye Stone sold by Druggists. (Nat. size.)



Fig. 4.—Gemlike Operculum used for Jewelry.

a horny and translucent material, which, when exposed to a flame, burns like horn and gives off the same odor.



Fig. 5.—Operculum of *Natica heros*.

These curious and puzzling hornlike objects are always to be met with on the shores of Long Island at low tide.

PECULIARITIES OF THE CEPHALOPODA.

BY C. F. HOLDER.

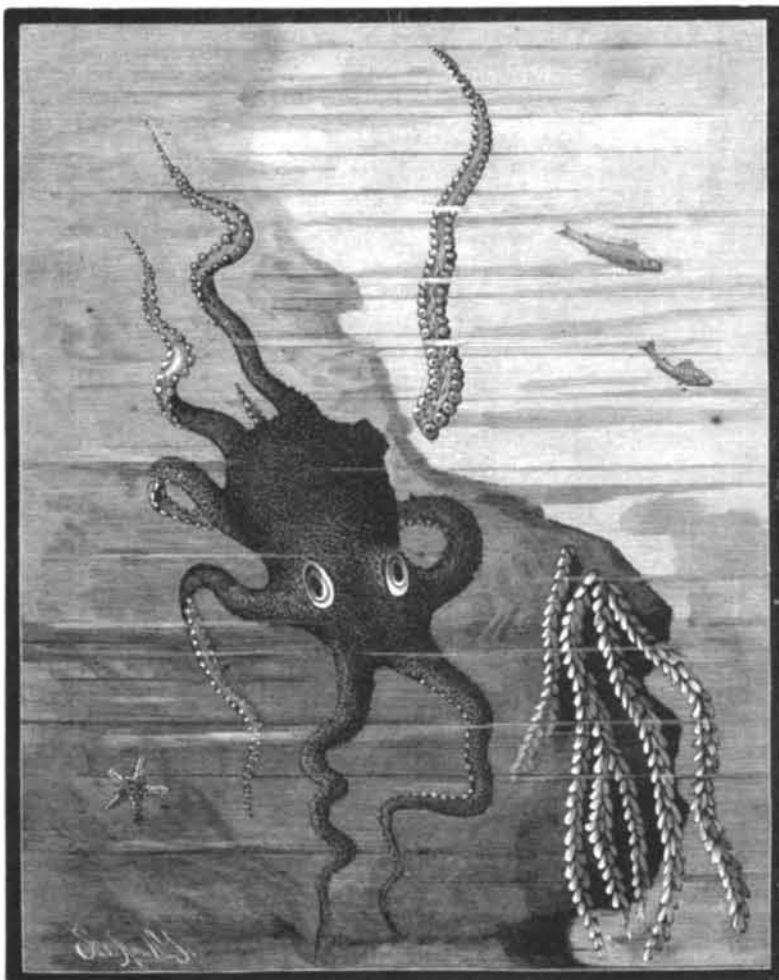
Among the mollusks of the highest class the cephalopods have many remarkable features well worthy the close attention of the student. They are divided into two general classes by naturalists, according to their number of gills. The common octopus, and in fact all the cephalopods except the nautilus, belong to the two-gilled or dibranchiata, while the nautilus forms the only living representative of the tetrabranchiata; other divisions are based upon their number of legs—hence the octopoda, with their eight arms, and the decapoda (as the squids), with ten. The most striking feature in the anatomy of these animals is the brain, which is covered by a decided and distinct cartilaginous covering or cranial envelope that closely resembles the skull of the vertebrates. Furthermore, the head is distinct, and in the squids movable; the eyes large, bright, and, so to speak, intelligent; in fact, their entire composition bespeaks for them a high position in the scale of life.

The octopods, with the bag-like bodies, green eyes, and branching arms lined with suckers, are far from pleasant objects. Each arm is lined with two rows of round suckers that act like so many air pumps and hold on to any foreign substance with death like tenacity; besides these weapons the octopus possesses an ink bag and two parrot-shaped bills of great power. They rarely swim, except one or two species that have peculiar webs for this purpose between the arms, and generally are found hidden among the dead coral of the reef or under the refuse of the bottom. Their power of attenuation is remarkable, and I have often observed them draw their entire body through an orifice that seemed scarcely large enough to admit a single tentacle. When touched, rich waves of color follow each other over the body in rapid succession, and they assume a mottled appearance. Another attack will cause the sharp eyes to glow with a baneful light, and, like a flash, a dark cloud permeates the water, and under its protection the animal makes off. Their strength is surprising. I have frequently struck them with a spear a foot and a half across, and having lifted them into the boat found it almost impossible to tear their arms from the boards after they had taken hold. The strength of one sixteen feet across can well be imagined. A story comes from the northwestern coast, which has been substantiated, to the effect that a monster octopus had seized an Indian woman while bathing, and several hours after the body was discovered in deep water in the arms of the monster.

Some interesting experiments made by the writer with these animals, on the Florida Reef, seem to show that they at times use their color as a protection. Ten or a dozen specimens were taken and placed in inclosures in a shallow portion of the open reef. In one the bottom was of pure white coralline sand; another was merely an inclosed head of *Meandrina cerebro* forms, which was a brownish olive, while the third had a bottom almost black. Into these inclosures the animals were released, and the next day examination showed that they had very decidedly assumed a hue in conformity with that of the bottom upon which they rested; those on the white sand were the palest gray; those on the living coral had assumed a darker hue than usual; while those on the black bottom could hardly be distinguished. Many other animals also adopt similar methods for protection.

The octopods are oviparous, and deposit their eggs in clusters that resemble bunches of fruit, often called sea grapes by seamen. They are always deposited upon some solid substance, as shown in the accompanying illustration, hanging to a rock.

The most remarkable peculiarity concerning them is the formation of the male, who is entirely different from the female in every respect. What is generally called the male is represented in the engraving as a common octopus, but in reality he is but the parent of the real male that appears by a process of fissuration. This curious freak of nature can better be understood by observing the animal at different stages. When the breeding season arrives, the third left hand tentacle or arm of the so-called male octopus assumes a different shape. On one, the *Octopus bairdii*, it appears as a short rounded arm, as if torn off and the wound healed up and swollen; the change increases until, finally, the arm is detached, and becomes itself a living organism, and swims freely in the water, being either deposited by its originator in the funnel of the female or finds its way there instinctively. When first discovered it was considered a parasitic worm, and so described and named *Hectocotyl*, but later investigations have shown its true nature. Cuvier describes the hectocotyl of *Octopus granulatus* as five inches in length and resembling a detached arm of the octopus, its under surface being bordered with forty or fifty pairs of alternate suckers. Dr. Kolliker, of Messina, describes another, the hectocotyl of *Tremoctopus*, which was adhering to the interior of the gill chamber and funnel of the *Poulpe*. The body is worm-like, with two rows of suckers on the ventral surface, and an oval appendage on the posterior end. The anterior part of the back is fringed with a double series of branchial filaments (two hundred and fifty on each side). The suckers, forty on each side,



THE OCTOPUS.

closely resemble those of the tremoctopus in miniature. Between the suckers are four or five series of pores, the openings of minute canals, passing into the abdominal cavity. The mouth is at the anterior extremity, and is minute and simple. The alimentary canal runs straight through the body, nearly filling it. The heart is in the middle of the back, between the branchiæ. It consists of an auricle and a ventricle, and gives origin to two large vessels. There is also an artery and vein on each side, giving branches to the branchial filaments. Nerves extend along the intestine, with one ganglion. The oval sac alluded to above incloses a small but very long convoluted tube, ending in a muscular *vas deferens* containing innumerable spermatozoa.

The hectocotyl of the argonaut was considered a parasitic worm, described under the name *Tricocephalus*. It is similar to the others.

This strange method of propagation is not found among the squids; with them the male and female are alike, except a slight difference in size. The last ten years has set at rest the question as to the size of some of these animals, and from well-preserved specimens they are known to grow to a length of sixty or seventy feet. In the natural history of almost every country there are legends of the existence of these huge creatures, but it is only within a few years that perfect specimens have been found. Whalers often found immense pieces of squid in the stomachs of whales, and finally scientists made some decided efforts to obtain one of these gigantic animals. Rev. Dr. Harvey, of Newfoundland, was the fortunate finder, and in a short time a number of them were secured.

The one bought by the New York Aquarium was by far the best, and Prof. Verrill, of Yale, and Dr. Holder, of the American Museum, were fortunate in examining it and taking its measurements. It was afterwards ruined by being kept out of alcohol, and shrank to nearly half its original length, which was nearly forty feet. The body resembles a great gray bag, and the tail an arrow head; from the head the eight short arms branch out and the two long ones. These latter enlarge at the tips, and only these have suckers, while the short tentacles have suckers their entire length. Each of these disks contains a hard bony marginal rim, sharply serrated, that when pressed upon the flesh can be pressed into it by the piston-like arrangement of the sucker. The effect of thousands of these can readily be imagined. A peculiar arrangement is noticed on the end of the long sucker; between the rows of suckers, many of which are on stalks or pedicles, are hard callous cushions; their use is seen in the movements of the animal as it secures its prey. They move slowly through the water, and sighting their victim with their large saucer-like eyes, instead of rushing at it, the two long arms are thrown out thirty feet or more and clasp it; the use of the cushions is now seen, as the suckers of one arm clasp the cushions of the other, and *vice versa*, and thus double power is brought to bear. The act can be better illustrated by tying the hands at the wrists, and the use of them in this position is analogous to the movements of the squid. Once caught in these long handled pinchers, the fish is drawn within reach of the eight short arms, which wind around it like so many snakes, lacerating its body, and finally press the back of its head against the parrot-like beaks, which penetrate the flesh and sever the spinal cord. This method of severing the spinal cord is very general among the squids, and all the fishes that have been noticed that have been cut by them have been cut in exactly the same spot, and the most effective one, as its struggles are instantly stopped.

The power of the animal is very great. A fisherman in Newfoundland saw one lying evidently dead on the surface, and struck it with an oar and came near being a victim. The squid, which was the *Architeuthis princeps*, ejected a column of ink and water from its funnel, and threw its arms over the boat, almost sinking it. One of the tentacles caught the man by the arm, lacerating the flesh terribly; he seized an ax, however, and succeeded in severing several of them, finally sending an oar blade into the eyes and destroying the animal.

A use of the long arms has been noticed when one was thrown upon the shore in a gale of wind, and although in a heavy sea, it fastened the long suckers to the rocks and out-rode the gale, swinging to them as would a ship by a hawser.

The squids are undoubtedly denizens of the deep sea, which accounts for their rarity. In the later geological ages they reigned supreme among their kind, and their curious hardened ink bags are found and still used as ink.

The shelled cephalopods grew to enormous dimensions. The ammonite is found almost as large as a cart wheel; the orthocerote, a straight chambered cephalopod, has been found fifteen feet long, and according to some geologists they occur in the Black River limestone, at a length of thirty feet. It would take a volume to even enumerate the wonders of this interesting family, whose history is written indelibly on the rocks of the primeval world.

A Large Collection of Spiders.

Captain Holden, of Cincinnati, Ohio, is credited with an exceptionally valuable collection of spiders, numbering nearly 25,000 specimens, and embracing 4,000 species. They are arranged in glass bottles, with labels giving name, collector, and locality. California furnished 5,000 specimens, and New England as many more. One species is represented by 108 specimens, from all parts of the United States, showing how much effect environment has in modifying form. The collection is supplemented by a full and complete cata-

logue of the literature of the subject, comprising about 70,000 references on 10,000 cards. This valuable contribution to the study of this little known branch of natural history he hopes to complete and publish at an early day.

Musk Rat Musk.

Mr. Fairthorne says, in the *American Journal of Pharmacy*: "The difficulty of obtaining pure musk, and the high price of the same, make it a desideratum to find a substitute for it for use in perfumery that possesses the advantages of strength and cheapness. We find these in an article by the above title, and offered for sale by numerous itinerant colored merchants, who come chiefly from New Jersey, where they obtain their supplies, and offer the musk pods generally at the moderate price of 10 or 15 cents a pair. If ten or twelve pairs are cut up with scissors into small pieces, and, with the addition of two drachms of slaked lime, allowed to macerate for a week or two in a pint of alcohol, a very fragrant tincture will be obtained, which will be found at least three times as strong as the tincture or extract of musk generally employed. I have used it for several years in making most delicate-flavored colognes, and found it to answer equally well as the musk generally employed. I do not know whether the musk from musk rats has ever been used as an internal remedy."

The musk rat, or musquash (from the Indian name, *muskwessu*), is frequently spoken of in connection with its powerful musky odor by the earlier writers on America. Thus, for instance, in "Virginia Richly Valued" (Hakluyt, 1609), we read: "If China suppose a merit of precedence in Muske, Virginia may justly oppose them with her Muske-Rat, or *Muscassus*, which in all probability cannot but be the same."

Basket Willows.

The subject of the periodical overflow of the Thames and other rivers, upon which a good deal of public notice has lately been bestowed, should be the means of directing more attention to the possible improvement of wet ground in marshy situations by the planting of osiers, which, under the technical name of "rods" and "willows," are a merchantable commodity, regularly in request by the basket-makers, which will yield a more certain return, perhaps, than many agricultural crops that are subject to casualties arising from adverse seasons, the profit being very considerable, and the management comparatively easy and simple.

Nature, indeed, spontaneously suggests this application; for the goat-willow, or sallow (*Salix caprea*), may often be found indigenous in moist ground, more particularly in those waste and marshy situations that are, under usual practice, so difficult to deal with. A two-year old seedling plant of the goat willow will often produce several shoots three or four feet high, and if allowed to grow longer still, and cut down every three or four years, no tree will produce so great a bulk of fagot wood, for a well established stock will sometimes give out in one year shoots eight to twelve feet long, straight and well proportioned, some of them an inch in diameter at a yard from the ground. Ultimately the goat-willow becomes a fine tree, often attaining a height of forty or fifty feet, with a trunk varying from one and a half to two feet in diameter, and for hoops, poles, rods, crates, sheep-fences, and other purposes, the earlier produce of the goat-willow is extremely valuable.

But it is in the form of osiers regularly cropped, that can be grown upon land subject to tidal overflow, that a definite produce and consequent regular income can be relied on, and as there is a good deal of confusion existing as to the various species of *Salix*, we will briefly indicate them.

The green-leaved osier, or ornard (*Salix rubra*), is strong and tough, and in request for carboy baskets.

The Spaniard, or Spaniard rod (*Salix triandra*), has several varieties, some very good and others very inferior. The black-budded Spaniard is used for the bottoms, rims, and handles of large baskets. The gray Spaniard comes in useful for coarse brown baskets. The horse Spaniard is a very poor kind.

The old common osier, being soft, of course, and brittle, is not worth cultivating in many instances; but there are some varieties of the *Salix viminalis* that are extremely useful, and the good and inferior ones bear such a close resemblance to each other that the difference often cannot be detected except in the working. The best variety is known under several names, as those of the snake osier, brindled osier, blotched osier, and speckled osier. The yellow-barked osier is also a good one, while the long skin is of smaller growth, but has the good qualities of being heavy, firm, and tough. The brownrod, brownard, or silver osier (*Salix hoffmanniana*), has a whitish hue on the under side of the leaf, eel baskets being usually made of this variety. The gelsler partakes somewhat of the nature of the Spaniard, but is of more tapering habit, with a thick butt. The new kind (*Salix forbyana*) is also akin to the Spaniard, being equally strong, but more pliable in working. The Hollander resembles the new kind in its qualities, but is different in appearance, and these may be seen growing in large quantities on the Dutch coast. The stone osier is a good kind, used for fine work.

The blunt-leaved ornard (*Salix lambertiana*), the bastard French (*Salix lanceolata*), and the rose ornard (*Salix helix*) are very inferior, used only for fish baskets and hampers, their ends snapping in the working inward and outward, which consequently makes inferior work; but the bitter ornard (*Salix purpurea*) grows tough and slender, and, like all the other ornards, will grow in water.

The French, French rod, or real French has been imported from France, where it is much used in the manufacture of small ornamental baskets. On the Continent it is much in request by wine coopers, who bind on their wooden hoops to the wine casks with it.

The rods, or willows, as they are termed in the trade, comprise several varieties, as the skit willow, the goldstone, or hornrod, of which there are two subdivisions—the wire hornrod, which is thin and tough, and the water hornrod, which is very inferior. The rods (osiers, etc.) grow best on strong and loamy soils.

And here we should remark that soil exercises as material an influence upon the growth of osiers as upon other crops, requiring a compact sub-soil that retains moisture, and thus they will not answer in strong clayey soils, which in summer become hard and dry; for these crack, and the moisture of the land evaporates. The Spaniard, new kind, and French sometimes answer very well upon light land, where the sub-soil is kept moist by land springs; but where the supply of moisture is imperfect, an osier plantation lasts a comparatively much shorter time, and requires renewing in a space of time varying from fifteen to twenty years; but in land the best adapted for their growth, by the margins of rivers subject to tidal overflow, they will last for fully seventy years with occasional mending; but on light land the osiers are smaller and shorter, and the crop less bulky than when grown upon strong loam.

Upon the first formation of an osier plantation the ground should be well trenched to the depth of a foot and a half, and in light soil the sets should be planted in rows eighteen inches apart and fifteen inches from each other in the row; for where the supply of moisture is not continuous, the shoots are fewer and shorter, and it is in such situations that the smaller varieties suited for the manufacture of small baskets are grown; and there is an advantage in thus planting them close, for if more space were allowed, instead of drawing each other up long and slender, they would branch out and grow crooked and "clubby" near the stools.

Upon the soils better adapted for their growth, which is rich and continuously moist, they are planted at wider intervals, for upon such they will reach a length of eight, ten, or a dozen feet, so that the rows should be placed two feet asunder, and the sets stand a foot and a half apart in the rows. If these were planted as close as the former the result would be that, there not being room enough for the number of shoots that the stronger plants will throw out, a few of the leading ones would get very tall, and their growth would prevent the action of light acting upon the others, which in consequence would become of inferior quality and not ripen their wood in the course of the season, which in this state would be soft and pithy, and consequently unfit for manufacturing purposes.

The action of light upon osiers is somewhat remarkable. In ordinary seasons they are of a yellowish brown, but they sometimes assume a dull green color. The willows in cloudy seasons are of a dull brown mahogany color, but in clear seasons the shoots grow of a bright red color.

The sets are cut from the lower part of the shoots, and are generally used about the thickness of one's little finger for the larger varieties. The small part of the rods would strike just as quickly, but they produce smaller shoots. The sets should be about sixteen inches long, and be inserted into the ground at about half their length.

In severe seasons some of the plants will die, the most injurious weather to an osier plantation being when mild winters are succeeded by hard frost in early spring. The plantations will then require mending, which is done in the following manner: The longest and smoothest rods are chosen, which are cut from their butt ends in a slanting direction, and are thrust into the ground by the side of the dead stool, to a depth of eight or nine inches. These are inserted as they have grown, without being shortened, for if this were done they would be smothered by the shoots of the older stools, and by being inserted of their full length, they have the benefit of air and light for a considerable time, which enables them to establish themselves before the others grow high enough to overtake them, when the summer will be considerably advanced.

Osiers may also be grown upon springy land that is sometimes met with near the bottoms of elevations, the slopes of which are kept moist by the drainage of higher lands; and although such springs might often be cut off and drained by means of a few deep drains, aided by auger holes driven down into the porous watery strata which form their reservoirs, by the method known as the Elkington system, after the name of the farmer who first practiced it, such drainage is very often left undone; and there are many waste spots upon which osiers could be profitably cultivated, which would prove a source of profit to owners or occupiers of land, that are frequently entirely neglected and overlooked.

Osiers can be cut any time between the fall of the leaf and the rising of the sap in the spring. And although they are often cut before and after this time, it is not good practice to do so, especially when cut late in the spring, as it weakens the succeeding crop.

According to the accounts which have been published, the osier grounds upon the estate of Holkham that are planted with *Salix viminalis* commence their profitable return the second year after their formation, the first crop averaging £34 17s. per acre, after which they are cut down yearly and realize about £27 10s. per acre; these figures furnishing a strong argument in favor of the plan now recommended for more general adoption.—*The Farmer*.

The Great Bamboo of Japan.

In a paper recently read before the Horticultural Society of Victoria, Mr. F. C. Christy, describing a specimen of the Japanese gigantic bamboo, now growing in the society's gardens in Melbourne, says: "It is cultivated in groves on the hillside or valley, in deep volcanic chocolate soil—not in wet situations, but where there is a moderate amount of moisture. In early spring the bamboo throws up large offsets, or suckers, around the parent plant; these are about 3 in. or 4 in. diameter, and are removed when about 12 in. above the ground, leaving three or four to mature, which apparently mature during the summer, or in about six months, and attain a height in one summer of from 40 ft. to 80 ft., according to soil and situation. The groves consist of several hundred bamboos, planted about 12 ft. apart, kept free from weeds and undergrowth of every kind. The bamboos produce dense shade; a bamboo grove is one of the coolest retreats in summer; the shade and shelter produced contribute in a great measure to their luxuriance. This bamboo rarely seeds, and the few seeds produced are said to be most difficult to germinate; the propagation is by the removal of one-year-old matured stems with roots; the young offset taken in spring invariably withers and dies. The young offsets removed to strengthen the growth of those required for commerce when matured are edible; sliced and boiled they are tender and crisp and of a very delicate flavor, and are served at table as an ordinary vegetable; the offsets at the same tender age (when about 6 in. or 12 in. through the ground) are also sliced and preserved with ginger, and form the commercial preserve 'chow-chow.' When the bamboos are matured, they are cut near to the ground, and used for scaffold poles, fences, guttering for houses, down pipes, underground drains, garden seats, ladders, and a thousand other purposes. This bamboo will grow on Australian mountain sides, and in any valleys where ordinary shelter and rich, deep soil can be procured, and will stand 14° of frost." This plant appears to be well adapted for cultivation in the United States.

Great Find of Egyptian Relics.

A discovery of great importance to Egyptologists, and of no little popular interest, is reported by a Cairo correspondent of the *London Times*. The finds include not only the largest and most beautiful papyri yet discovered, but also the mummies of no less than thirty royal personages, among them Kings Thothmes III. and Ramses II. These names have lately been made familiar to our readers in connection with the obelisk lately transferred from Alexandria to Central Park. It was the former who ordered the construction of the obelisk, and the latter who, 270 years later, caused to be inscribed on its faces his own official titles and honors. These two monarchs have been removed to the Boulak Museum, where they lie side by side, and even the flowers and garlands which were placed in their coffins may to-day be seen encircling the masks which cover the faces of the deceased just as they were left by the mourners over three thousand years ago.

The story of the discovery runs as follows: Last June, Daoud Pasha, Governor of the Province of Kenah, which includes the ancient Theban district, noticed that the Bedaween offered for sale an unusual quantity of antiquities at absurdly low prices. The Pasha soon discovered that the source of their hidden treasure was situated in a gorge of the mountain range which separates Deir-el-Bahari from the Bab-el-Melouk. This gorge is situated about four miles from the Nile to the east of Thebes. Daoud Pasha at once telegraphed to the Khedive, who forthwith dispatched to the spot Herr Emil Brugsch, a younger brother of Dr. Henry Brugsch Pasha, who, during M. Maspero's absence in Paris, is in charge of all archaeological excavations in Egypt. Herr Brugsch discovered in the cliffs of the Libyan Mountains, near the Temple of Deir-el-Bahari, or the "Northern Convent," a pit about 35 feet deep, cut in the solid rock; a secret opening from this pit led to a gallery nearly 200 feet long, also hewn out of the solid rock. This gallery was filled with relics of the Theban dynasties. Every indication leads to the conviction that these sacred relics had been removed from their appropriate places in the various tombs and temples, and concealed in this subterranean gallery by the Egyptian priests to preserve them from being destroyed by some foreign invader. In all probability they were thus concealed at the time of the invasion of Egypt by Cambyse.

Herr Brugsch at once telegraphed for a steamer, which on Friday last safely deposited her precious cargo at the Boulak Museum. The full value of this discovery, of course, cannot as yet be determined. The papyri have not yet been unrolled, nor have the mummies been unwrapped. Conspicuous by its massive gold ornamentation, in which cartouches are set in precious stones, is the coffin containing the mummy of Maut Nedjem, a daughter of King Ramses II. Each of the mummies is accompanied by an alabaster canopic urn, containing the heart and entrails of the deceased.

Four papyri were found in the gallery at Deir-el-Bahari, each in a perfect state of preservation. The largest of these papyri—that found in the coffin of Queen Ra-ma-ka—is most beautifully illustrated with colored illuminations. It is about 16 inches wide, and when unrolled will probably measure from 100 to 140 feet in length. The other papyri are somewhat narrower, but are more closely written upon. These papyri will probably prove to be the most valuable portion of the discovery, for in the present state of Egyptology a papyrus may be of more importance than an entire temple, and, as the late Mariette Pasha used to say: "It is cer-

tain that if ever one of those discoveries that bring about a revolution in science should be made in Egyptology, the world will be indebted for it to a papyrus."

No less than 3,700 mortuary statues have been found which bear royal cartouches and inscriptions. Nearly 2,000 other objects have been discovered. One of the most remarkable relics is an enormous leather tent, which bears the cartouche of King Pinotem, of the 21st dynasty. This tent is in a truly wonderful state of preservation. The workmanship is beautiful. It is covered with hieroglyphs most carefully embroidered in red, green, and yellow leather. The colors are quite fresh and bright. In each of the corners is represented the royal vulture and stars.

The following Theban sovereigns are the most important of those whose mummies Herr Brugsch has identified:

Aahmes I. (Amosis), first King of 18th Dynasty, reigned B. C. 1700 (about).

Amenhotep I. (Amenophis), second King of 18th Dynasty, reigned B. C. 1666 (about).

Thothmes I., third King of 18th Dynasty, reigned B. C. 1633 (about).

Thothmes II., fourth King of 18th Dynasty, reigned B. C. 1600 (about).

Thothmes III. (the Great), fifth King of 18th Dynasty, reigned B. C. 1600 (about).

Ramses I., first King of 19th Dynasty, reigned B. C. 1400 (about).

Seti I., second King of the 19th Dynasty, reigned B. C. 1366 (about).

Ramses II. (the Great), third King of the 19th Dynasty, reigned B. C. 1333 (about).

Pinotem, third King of the 21st Dynasty, reigned B. C. 1033 (about).

Raskhenen (Dynasty and date of reign unknown).

Queen Ra-ma-ka (Hatasou?)

Queen Aahmes Nofert Ari.

A correspondent of the *London Post* adds the following details about the recent discoveries in Egypt: "The place where these precious relics were found is an almost inaccessible cave in the face of the perpendicular mountain, in another part of which the royal cemetery, known as Bab-el-Melouk, is excavated, and not far from Deir-el-Bahari. The most remarkable of the 4,000 objects are 36 royal sarcophagi, with their inner cases and mummies intact, belonging to Pharaohs, queens, princesses, and high priests of the seventeenth, eighteenth, nineteenth, and twenty-first dynasties, so that we are actually in possession of the lifeless bodies of many heroes, who, upward of three thousand years ago, ruled over this country and adorned it with temples and obelisks which are the wonder and admiration of the whole civilized world. Among them is that of Seti I., whose tomb in the Bab-el-Melouk was discovered by Belzoni, but that explorer found neither coffin nor mummy, only the large alabaster sarcophagus now in the Soane Museum, which was made to contain and preserve them. Next in importance we have the plain but highly polished wooden coffin of Ramses II., the Sesostris of the Greeks, with the mummy intact, the royal cartouche distinctly legible on the coffin lid and on the mummy cloths enveloping the body. The mummy cases of Amosis, son of Amousa, of Thothmes I., II., and III., of Queen Ra-ma-ka and her daughter Moutem-bat, of King Raskhenen, of Aahmes Nofert Ari, of Aah Hotep, of Ramses I., and of Amenophis, are also in the collection, with the mummies in perfect preservation. The majority of these mummies are inclosed in two coffins, both elaborately ornamented with paintings and gildings, some of them having also certain ornaments inlaid with colored glass, and many of the faces have glass eyes, which give them a most lifelike appearance. Another remarkable object is a royal tent made of colored leather in a checkered pattern of red and green. The inner side of the dome is of blue leather, with yellow stars, and the hieroglyphic inscriptions are perforated in the colored leather with a backing of yellow. Fifteen royal wigs for state occasions are also in the collection. Besides the human mummies we find one of a gazelle, which was probably a favorite playmate of one of the Egyptian princes or princesses. We have also four scrolls of papyrus of great size, on which is inscribed the Ritual of the Dead, elaborately illuminated, and containing the cartouches of the royal persons for whom they were written, one of whom is Queen Hatasou, sister of Thothmes III. Moreover, we have several sets of canopic vases in alabaster, with royal names engraved on the outer surface, 3,700 funereal statuettes, and many other objects of interest. The position of the cave is an almost inaccessible part of the mountain, the well, 36 feet deep, communicating, by a gallery of 250 feet in length, with a rough-hewn chamber, and the confused state in which all these objects of veneration were found, heaped one on another and strewn about on the ground, lead Mr. Brugsch to the very plausible inference that they had been by friendly hands collected from the various tombs and concealed in this place of safety at the time of some threatened foreign invasion."

Vaccination and Smallpox.

During the six months ending June 30, the Deptford Smallpox Hospital, which receives patients from all parts of London, received 546 cases of smallpox, of which 326 had been vaccinated, and 264 had not been, while of 46 it was unknown whether they had been vaccinated or not. Among the vaccinated cases the deaths numbered only 6, or 2.5 per cent; among the unvaccinated they reached a total of 127, which was 48 per cent. Of the 46 doubtful cases 9 were fatal.

Canal Work at Panama.

The engineers and laborers on the Panama Canal are said to be suffering severely from yellow fever and the malarial fevers peculiar to the Isthmus. Many deaths are reported. In a recent issue the *Panama Star and Herald* criticises somewhat unfavorably the manner in which the work is conducted and the seeming discrepancies between the reports given in the Canal Bulletin and the actual work going on. On the latter point the *Star and Herald* says:

"So far as machinery is concerned, material, etc., we are aware that important arrivals are announced by every steamer. Launches, excavators, railroad iron, carts, tools of every description, and large amounts of lumber are now on hand at Aspinwall, but they do not move out on the line quite as fast as people there thought was likely. American opinion of the machinery is unfavorable. The tools are of old styles, rolling stock of the most antiquated pattern, heavy, and unsightly, and not adapted to the class of labor obtainable on the Isthmus. A couple of hand-cars sent out are a curiosity, with their iron frames, iron seats, and old style of movement. It is hardly likely they will be used. The excavators are ponderous affairs, and will probably do work in loose soil or sand, but in that which confronts them on the Isthmus will hardly work effectively without some trouble.

"For removing bowlders and loose rock of any sort we are told they do not come up to inventions employed in the United States. In fact, we understood that the machinery, tools, etc., to be employed were to have been manufactured in the United States, and, notwithstanding the heavy orders now under way in Europe, we fancy a return to that idea would not be disadvantageous to the service. It is well known that in the matter of axes, picks, shovels, etc., and in more important and heavier machinery, for work of this class America beats the world. Give a workman good tools if you wish him to serve you well.

"However, there is work in progress, and important work also, and for that, as friends of the enterprise, let us be thankful. In addition to the work going forward at Culebra, Empire, and other places, at Gatun considerable movement is noticeable. A gentleman connected with the enterprise informs us that they now have there about 250 men, who are leveling in front of the station for a machine shop, etc. The hill back of the station-house will be reduced about 25 feet, and leveled over an area of between one-quarter and one-half mile square. This they will do with pick, shovel, and wheelbarrow. When it is leveled they will put 200 houses on it for their employés."

The Phosphates of South Carolina.

In a paper on the resources of South Carolina, read before the convention of bankers at Saratoga, Dr. Andrew Simonds gave some interesting statistics of the phosphate trade and its influence upon the general prosperity of the State. The first shipments of crude rock were made in 1867, six tons to domestic ports, which has increased year after year, the shipments to both foreign and domestic ports reaching in 1881 near 300,000 tons crude rock, marketed by both the land and water companies. An idea of the value of the deposits may be formed from the fact that the shares of one company of the par value of \$100 have sold at \$1,000 each. The distribution of these fertilizers through the South Atlantic cotton belt is telling wonderfully on the increased production of cotton on the old and worn lands of these States. While the production of cotton has nearly doubled in the last decade, the increase far outstripping the increase of population; the greatest specific increase being in the Atlantic cotton States, which have first felt the influence of the phosphates where the product per acre has almost reached that of Mississippi and Texas. In 1880 there were in South Carolina alone about 1,800 looms and about 93,000 spindles, as against 700 looms and 33,000 spindles in 1870, and it is only now, in 1881, that the people are really turning their attention to this branch of industry, realizing at last what has been repeatedly urged by sagacious writers, that the looms should be brought to the cotton, rather than the cotton should be carried to the looms. Southern spinners have some decided advantages over their Northern competitors. They get the raw material from or very near the producer, and therefore at lower cost; the cotton is cleaner, and there is less waste; the operatives live more cheaply, and are satisfied with less wages; the hours of labor are longer; and lastly, a part of the products can be sold directly from the mill, and therefore at a saving in the cost of transportation. But the most gratifying feature is that the great bulk of the capital invested has been furnished by Southern people."

The Heart of Asia.

At a recent meeting of the Russian Geographical Society, M. Severtzov gave an account of the Pamir Mountains, which he had lately visited. Many of the facts are novel. The Pamir is not a table land, and it has no steppe region up to a height of 12,000 feet. Like the Tien-Shan and Thibet, the Pamir has narrow valleys along the rivers up to a height of 14,000 feet, and the mountains rise in lofty ridges above the valleys in some instances to an absolute height of 25,000 feet. The mountain ranges run in the direction of the meridian, and seldom strike out at right angles. The explorer discovered evidence that the range of the Inner Pamir has risen 600 feet in the course of the last 12,000 years, and that the process of elevation is still going on.