

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 underside, 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.

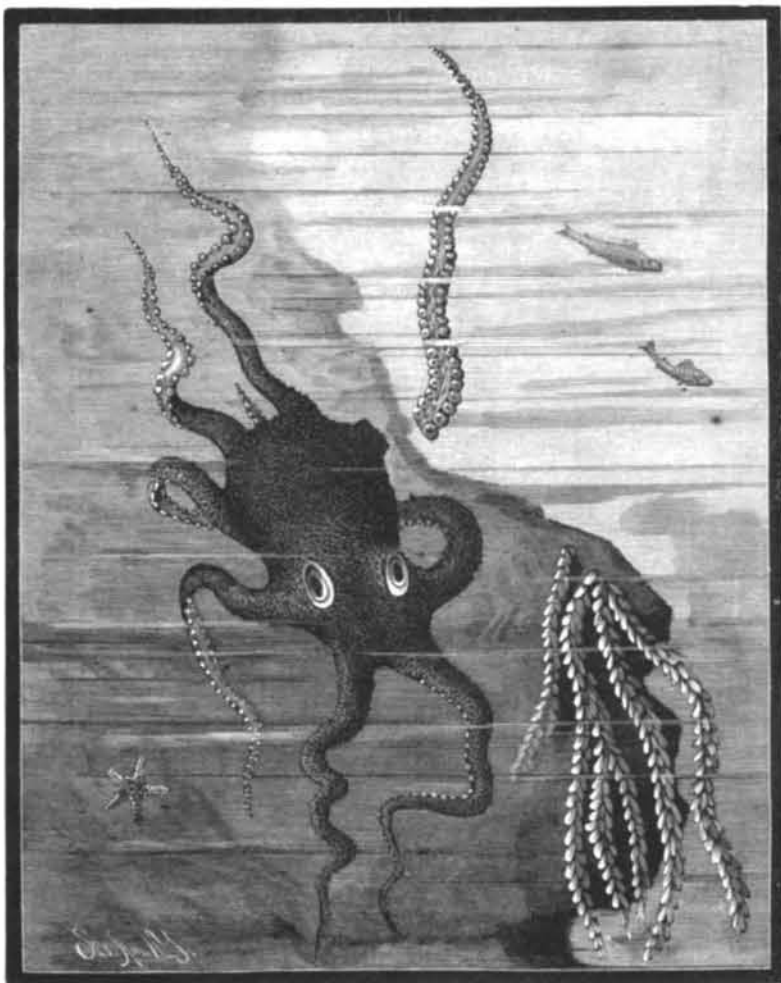
Among the mollusks of the highest class the cephalopods have many remarkable features well worthy the close attention of the student. They are divided into two general classes by naturalists, according to their number of gills. The common octopus, and in fact all the cephalopods except the nautilus, 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 beiradii*, 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.