AN ANCIENT GREEK VASE.

The vase shown in the accompanying engravings must not be classed with ordinary ceramic ware, as it is a veritable work of art. It is the celebrated cup of Arcesilaus, which is preserved in the collection of the library of Richelieu street after having figured in the Durand Museum. It was found at Vulsei, in Etruria. It was made by a potter of Cyrene, the capital of Cyrenaica, founded by Greeks from the island of Thera. It is remarkable that Cyrene, removed from the center of Grecian manufacture, should possess a manufactory of painted vases from which have come so many works of art. The traveler, Paul Lucas, discovered in the necropolis of Cyrene, in 1714, many antique vases, both in the tombs and in the soil. One of them is still preserved in the Museum at Leyden. The Arcesilaus, who is represented on this vase, is not the celebrated skeptical philosopher of that name; it is Arcesilaus, King of Cyrenaica, who was sung by Pindar, and who was vanquished in the Pythian games under the 80th Olympiad (458 years B.C.).

The height of this vase is 25 centimeters, its diameter 28 centimeters. The paste is very fine, of a pale red. It is entirely coated with a black groundwork, which has been generally re-covered with a yellowish white clay, baked on.

According to M. Brongniart, this piece has been subjected to the baking process at least two or three times, thus indicating that the ceramic art had made considerable progress in Cyrene even at that remote epoch.

The following description of this vase is given in the catalogue of the Durand Museum: The King Arcesilaus is seated under a pavilion upon the deck of a ship. His head is covered with a kind of hat with a large brim, and his hair hangs down upon his shoulders. He is clothed in a white tunic and embroidered cloak or mantle, and he carries a scepter in his left hand; under his seat is a leopard, and his right hand he holds toward a young man, who makes the same gesture, and he is weighing in a large scale assafœtida, which is being let down into the hold of the ship. We know that he deals with assafœtida because one of the personages (the one who lifts up his arm toward the beam of the scale) holds in his right hand something resembling that which is in the scale, and the Greek word traced near it signifies "that which prepares *silphium*." Assafœtida, the resinous matter of the silphium, is used largely by the Greeks in the preparation of their food. The Orientals to-day make frequent use of it and call it the delight of the gods; while in Europe, because of its repulsive odor, it has long been designated as *stircus diaboli*.

Fig. 2.—TOP OF GREEK VASE.

Snow-Raised Bread.

Somebody thinks he has discovered that snow, when incorporated with dough, performs the same office as baking powder or yeast. "I have this morning for breakfast," says a writer in the *English Mechanic*, "partaken of a snow-raised bread cake, made last evening as follows: The cake when baked weighed about three quarters of a pound. A large tablespoonful of fine, dry, clean snow was intimately stirred with a spoon into the dry flour, and to this was added a tablespoonful of caraways and a little butter and salt. Then sufficient cold water was added to make the dough of the proper usual consistence (simply stirred with the spoon, not kneaded by the warm hands), and it was immediately put into a quick oven and baked three quarters of an hour. It turned out both light and palatable. The reason," adds the writer, "appears to be this: the light mass of interlaced snow crystals hold imprisoned a large quantity of condensed atmospheric air, which, when the snow is warmed by thawing very rapidly in the dough, expands enormously and acts the part of the carbonic acid gas in either baking powder or yeast. I take the precise action to be, then, not due in any way to the snow itself, but simply to the expansion of the fixed air lodged between the interstices of the snow crystals by application of heat. This theory, if carefully followed out, may perchance give a clew to a simple and perfectly innocuous method of raising bread and pastry." And stop the discussion as to whether alum in baking powders is deleterious to health or otherwise.

Fig. 1.—ANCIENT GREEK VASE.

NEW AGRICULTURAL INVENTIONS.

An improved gate, invented by Messrs. P. W. McKinley and George L. Ellis, of Ripley, O., is designed for general use. It is operated by cords and pulleys, and can be opened without dismounting from the horse. It is constructed so that it cannot sag, and is not liable to get out of order.

An improved apparatus for pressing tobacco has been patented by Mr. F. B. Deane, of Lynchburg, Va. It consists mainly in the construction of a suspended jack, arranged to travel over a row of hogsheads, so that a single jack gives successively to each hogshead the desired pressure.

An improved combined harrow and corn planter has been patented by Mr. M. McNitt, of Hanover, Kan. In this machine the opening, pulverizing, planting, and covering teeth are combined with a single frame.

A machine, which is adapted to the thrashing and cleaning of peas and seeds, and for cleaning all kinds of grain, has been patented by Mr. J. J. Sweatt, of Conyersville, Tenn.

Mr. Amos M. Gooch, of Farmington, W. Va., has patented an improved corn planter, which drops the fertilizer simultaneously with the seed, and is provided with a device for pressing the soil around the seed, leaving over the seed a portion of loose earth.

An improved machine for harvesting cotton has been patented by R. H. Pirtle, of Lowe's, Ky. This machine carries two vertical cylinders armed with teeth or spurs, and two inclined endless belts provided with teeth. The teeth of the cylinders and the belts remove the cotton from the plants, and deliver it to a receptacle carried by the machine.

Messrs. Julius Fern and Samuel Bligh, of Oneonta, N. Y., have patented an improved power for churning and other purposes where little power is required. It consists in the combination of a drum and weight, a train of gearing, and a pallet wheel arranged to oscillate a balanced beam.

An improvement in the class of feed cutters in which two or more knives work between parallel bars attached to the cutter box, has been patented by Messrs. J. N. Tatum and R. C. Harvey, of Danville, Va. The improvement consists in arranging the knives so that one begins and finishes its cut in advance of the other.

Mr. William Bradberry, of Darrtown, O., has invented an improvement in reciprocating churns. The aim of this inventor is to utilize the resistance of the milk as a source of power. To accomplish this a peculiar combination of mechanism is required, which cannot be clearly described without an engraving.

Reading and Eyesight.

M. Javel, in a recent lecture, tries to answer the question, "Why is reading a specially fatiguing exercise?" and also suggests some remedies for this fatigue. First, M. Javel says reading requires an absolutely permanent application of eyesight, resulting in a permanent tension of the organ, which may be measured by the amount of fatigue or by the production of permanent myopy. Secondly, books are printed in black on a white ground; the eye is thus in presence of the most absolute contrast which can be imagined. The third peculiarity lies in the arrangement of the characters in horizontal lines, over which we run our eyes. If we maintain during reading a perfect immobility of the book and the head, the printed lines are applied successively to the same parts of the retina, while the interspaces, more bright, also affect certain regions of the retina, always the same. There must result from this a fatigue analogous to that which we experience when we make experiments in "accidental images," and physicists will admit that there is nothing more disastrous for the sight than the prolonged contemplation of these images. Lastly, and most important of all in M. Javel's estimation, is the continual variation of the distance of the eye from the point of fixation on the book. A simple calculation demonstrates that the accommodation of the eye to the page undergoes a distinct variation in proportion as the eye passes from the beginning to the end of each line, and that this variation is all the greater in proportion to the nearness of the book to the eye and the length of the line. As to the rules which M. Javel inculcates in order that the injurious effects of reading may be avoided, with reference to the permanent application of the eyes, he counsels to avoid excess, to take notes in reading, to stop in order to reflect or even to roll a cigarette; but not to go on reading for hours on end without stopping. As to the contrast between the white of the paper and the black of the characters, various experiments have been made in the introduction of colored papers. M. Javel advises the adoption of a slightly yellow tint. But the nature of the yellow to be used is not a matter of indifference; he would desire a yellow resulting from the absence of the blue rays, analogous to that of paper made from a wood paste, and which is often mistakenly corrected by the addition of an ultramarine blue. which produces gray and not white. M. Javel has been led to this conclusion both from practical observation and also theoretically from the relation which must exist between the two eyes and the colors of the spectrum. His third advice is to give preference to small volumes which can be held in the hand, which obviates the necessity of the book being kept fixed in one place, and the fatigue resulting from accidental images. Lastly, M. Javel advises the avoidance of too long lines, and therefore he prefers small volumes, and for the same reason those journals which are printed in narrow columns. Of course every one knows that it is exceedingly injurious to read with insufficient light, or to use too small print, and other common rules. M. Javel concludes by protesting against an invidious assertion which has recently been made "in a neighboring country," according to which the degree of civilization of a people is proportional to the number of the short-sighted shown to exist by statistics; the extreme economy of light, the abuse of reading to the detriment of reflection and the observation of real facts, the employment of Gothic characters and of a too broad column for books and journals, are the conditions which, M. Javel believes, lead to myopy, especially if successive generations have been subjected to these injurious influences.

Phosphorescence.

M. Nuesch records, in a recent number of the *Journal de Pharmacie*, some curious observations regarding luminous bacteria in fresh meat. Some pork cutlets, he found, illuminated his kitchen so that he could read the time on his watch. The butcher who sent the meat told him the phosphorescence was first observed in a cellar, where he kept scraps for making sausages. By degrees all his meat became phosphorescent, and fresh meat from distant towns got into the same state. On scratching the surface or wiping it vigorously, the phosphorescence disappears for a time; and the butcher wiped carefully the meat he sent out. All parts of the animal, except the blood, acquired the phenomenon over their whole surface. The meat must be fresh; when it ceases to be so, the phosphorescence ceases, and *Bacterium termo* appear. None of the customers had been incommoded. It was remarked that if

a small trace of the phosphorescent matter were put at any point on the flesh of cats, rabbits, etc., the phosphorescence gradually spread out from the center, and in three or four days covered the piece; it disappeared generally on the sixth or seventh day. Cooked meat did not present the phenomenon, but it could be had in a weak manner, from cooked albumen or potatoes. No other butcher's shop in the place was affected. The author is uncertain whether to attribute the complete disappearance of the phenomenon to the higher temperature of the season, or to phenic acid, or to fumigation with chlorine.

The Charms of Natural Science.

The Earl of Derby, in an address at the Edinburgh University, said: "Of the gains derivable from natural science I do not trust myself to speak; my personal knowledge is too limited, and the subject is too vast. But so much as this I can say—that those who have in them a real and deep love of scientific research, whatever their position in other respects, are so far at least among the happiest of mankind. . . . . No passion is so absorbing, no labor is so assuredly its own reward (well that it is so, for other rewards are few); and they have the satisfaction of knowing that, while satisfying one of the deepest wants of their own natures, they are at the same time promoting in the most effectual manner the interests of mankind. Scientific discovery has this advantage over almost every other form of successful human efforts, that its results are certain, that they are permanent, that whatever benefits grow out of them are world-wide. Not many of us can hope to extend the range of knowledge in however minute a degree; but to know and to apply the knowledge that has been gained by others, to have an intelligent appreciation of what is going on around us, is in itself one of the highest and most enduring of pleasures."

THE VESUVIUS RAILWAY.—The Italian Ministry of Public Works, in union with the Ministry of Finance and the Prefecture of Naples, has issued the concession for the construction of the Vesuvius Railway. The line will run along that part of the mountain which has been proved, after the experience of many years, to be the least exposed to the eruptions. The work is to be commenced immediately, and it is believed that it will come into use during the present year. A sufficient number of carriages are being built to convey 600 persons during the day. The line is to be constructed upon an iron bridge, built after a patented system.

The Pottery Tree.

Among the various economic products of the vegetable kingdom, scarcely any hold a more important place than barks, whether for medicinal, manufacturing, or other purposes. The structure and formation of all barks are essentially very similar, being composed of cellular and fibrous tissue. The cell contents of these tissues, however, vary much in different plants; and, for this reason, we have fibrous or soft, woody, hard, and even stony barks. To explain everything which relates to the structure of bark would lead us into long details which our space will not permit. Briefly stated, the bark of trees (considering, now, those of our own climate) consists of three layers. The outermost, called the "cortical," is formed of cellular tissue, and differs widely in consistency in different species; thus, in the cork oak, which furnishes man with one of his most useful commercial products, the cortical layer acquires extraordinary thickness. The middle layer, called the "cellular" or "green bark," is a cellular mass of a very different nature. The cells of which it is composed are polyhedral, thicker, and more loosely joined, and filled with sap and chlorophyl. The inner layer (next the wood), called the "liber," consists of fibers more or less long and tenacious. It is from the liber that our most valuable commercial fibers are obtained. In some plants the fibrous system prevails throughout the inner bark; but what we wish to refer to more particularly at present is a remarkable example of the harder and more silicious barks, and which is to be found in the "Pottery Tree" of Para. This tree, known to the Spaniards as *El Caouta*, to the French as *Bois de Fer*, to the Brazilians as *Caraipe*, is the *Moquilea utilis* of botanists, and belongs to the natural order *Ternstrœmiaceæ*. It is very large, straight, and slender, reaching a height of 100 feet before branching; its diameter is from 12 to 15 inches; and its wood is exceedingly hard from containing much flinty matter. Although the wood of the tree is exceedingly sound and durable, the great value of the tree to the natives exists in the bark for a purpose which, to say the least, is a novel one in the application of barks—that of the manufacture of pottery. The Indians employed in the manufacture of pottery from this material always keep a stock of it on hand in their huts for the purpose of drying and seasoning it, as it then burns more freely, and the ashes can be gathered with more ease than when fresh. In the process of manufacturing the pottery the ashes of the bark are powdered and mixed with the purest clay that can be obtained from the beds of the rivers; this kind being preferred, as it takes up a larger quantity of the ash, and thus produces a stronger kind of ware. Though the proportions of ash and clay are varied at the will of the maker, and according to

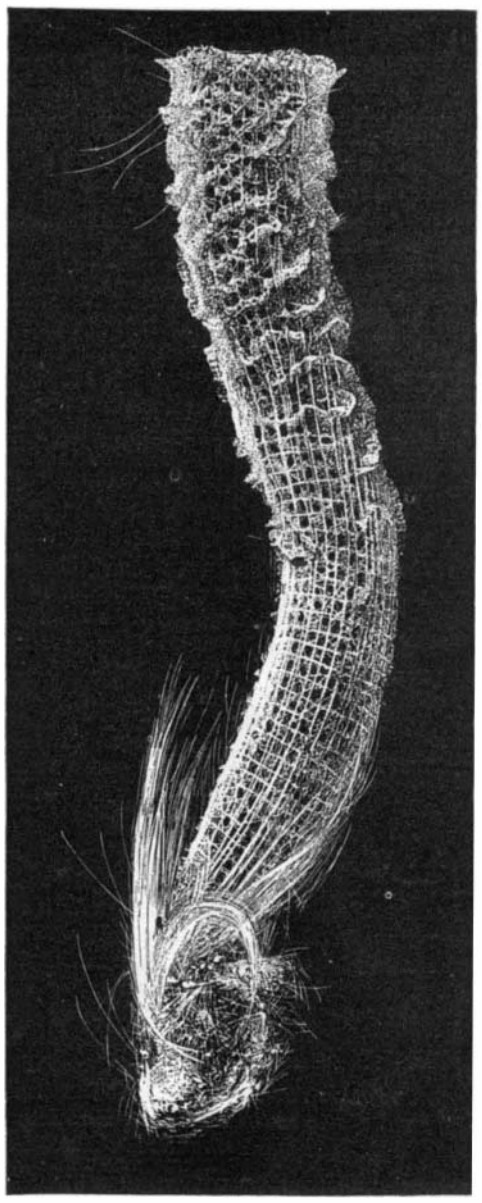

Fig. 1.—SPRINKLING POT SPONGE.—(*Eucleptella aspergillum.*)

the quality of the bark, a superior kind of pottery is produced by a mixture of equal parts of fine clay and ashes. All sorts of vessels of small or large size for household or other purposes are made of this kind of ware, as are also vases or ornamental articles, many of which are painted and glazed. These articles are all very durable, and are able to stand almost any amount of heat; they are consequently much used by the natives for boiling eggs, heating milk, and indeed for culinary purposes generally. A brief glance at the structure of the bark will show how it comes to be so well adapted for this purpose. The bark seldom grows more than half an inch thick, and is covered with a skin or epidermis; when fresh, it cuts somewhat similar to a soft sandstone, but when dry, it is very brittle and flint like, and often difficult to break. On examination of a section under the microscope, all the cells of the different layers are seen to be more or less silicated, the silex forming in the cells when the bark is still very young. In the inner bark the flint is deposited in a very regular manner, the particles being straight and giving off branches at right angles; that of the porous cells of the bark, however, is very much contorted, and ramifies in all directions. In the best varieties of the tree, those growing in rich and dry soil, the silex can be readily detected by the naked eye; but to test the quality of the various kinds of bark, the natives burn it and then try its strength between their fingers; if it breaks easily it is considered of little value, but if it requires a mortar and pestle to break, its quality is pronounced good. From an analysis of this singular bark, that of old trees has been found to give 30·8 per cent of ash, and that of young 23·30 per cent. Of the different layers of old bark, the outer gave 17·15 per cent, the middle 37·7, and the inner 31. The wood of the tree, in comparison with the bark, is relatively poor in silex, the duramen of an old tree giving only 2·5 per cent of silex.

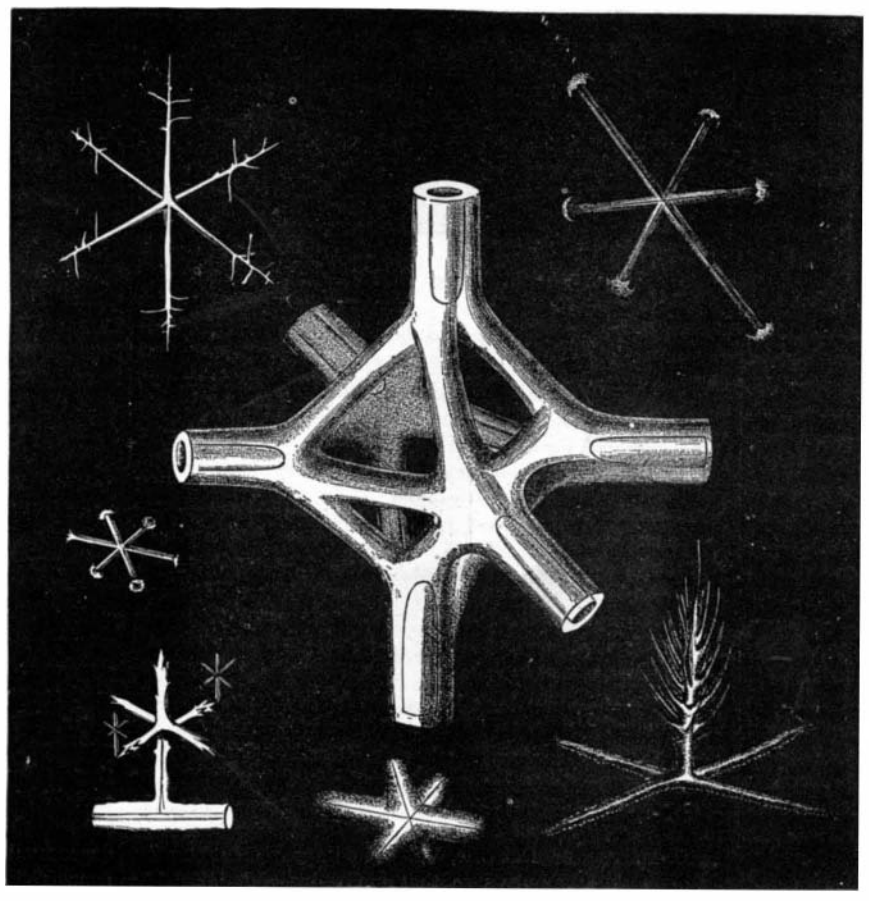

Fig. 2.—SPONGE CRYSTALS MAGNIFIED.

GLASS SPONGES.

The natural history of sponges had, up to the middle of this century, been comparatively neglected. Until 1856, when Lieberkuhn published his treatise on sponges, very little or nothing had been written on the subject. Later, Haeckel did much to determine their exact nature, and it is now universally admitted that sponges form one of the connecting links between the animal and the vegetable kingdom.

Sponges, generally considered, consist of fine porous tissue, covered, during life, with viscid, semi-liquid protoplasm, and are held in shape and strengthened by a more or less rigid skeleton, consisting chiefly of lime or silica. The tissue consists of a very fine network of threads, formed probably by gradual solidification of the threads of protoplasm. The inorganic skeleton is formed by larger and smaller crystals and crystalline threads. In the various families of sponges the quantity of inorganic matter varies greatly; some sponges are nearly devoid of an inorganic skeleton, while other families consist chiefly of lime or silica, the organic tissue being only rudimentarily developed.

As observed in their natural state, sponges are apparently lifeless. When, however, a live sponge is placed in water containing some finely powdered pigment in suspension, it will be noticed that in regular, short intervals water is absorbed through the pores of the tissue and ejected again through larger openings, which are called "osculæ." Following up these into the interior, we find them divided into numerous branches, the walls of which are, under the microscope, found to be covered with minute cells, fastened at one end only and oscillating continually. By means of these cells the sponge receives its nourishment.

Sponges with very rigid inorganic skeletons may be divided into two classes—calcareous and silicious—according to whether the skeleton is chiefly composed of lime or silica.

Our engravings represent two species of the latter kind, which are, on account of the peculiar appearance of their skeleton, called glass sponges.

Fig. 1 represents the "sprinkling pot sponge," *Eucleptella aspergillum*. It is generally found in very deep water throughout the Pacific. Specimens were found over fifty years ago, but, as they had to be brought up from depths between 500 and 800 fathoms, they remained very scarce and sold at fabulous prices.

The skeleton is formed by small crystals and long threads of vitreous silica, cemented together, during life, by protoplasm. They are arranged in longitudinal and annular bands so as to form a long curved cylinder, about nine to twelve inches long, the walls of which are about one inch in thickness. The threads and bands are interwoven with the greatest regularity, and when the skeleton is freed from the adhering organic matter, it looks extremely beautiful.

The mode in which the intersecting bunches of crystals are connected is shown in Fig. 2. The upper end of the cylinder is closed by a perforated cover, which probably has given rise to the name of the sponge. The upper portion of the cylinder is surrounded by a few irregular, annular masses of organic tissue, which adheres loosely only to the skeleton. The lower end is formed by a bunch of long threads, rooting firmly in the ground.

Up to about ten years ago the price of specimens of this sponge was very high. At that time, however, a colony of Eucleptellas was found near the cities of Cebu and Manila, in the East Indies, in a depth not exceeding 100 fathoms, and since they have appeared in larger quantities in the market. It is remarkable that, contrary to their habits, these organisms have immigrated into regions to which they were totally unaccustomed. Yet it must be regarded as a greater curiosity that they have been accompanied to their new abode by a few animals living