

ton for it. They save something by the sale of coke, tar, and ammoniacal liquor, so that their coal costs them \$3.14 per ton, or 32 cents a thousand cubic feet of gas manufactured. One great saving expected by the new company is in the cost of coal and in the transportation. Another saving will come, they think, from the freshness of the coal, since coal newly mined produces more and better gas than coal that has been exposed to the air and weather. The cost of pumping the gas is offset by the value of the coke. The deterioration of gas in the long pipe they expect to counterbalance by making the gas extra rich at first. The pipe is to be of iron, six feet in diameter, laid in hydraulic cement.

AGRICULTURAL INVENTIONS.

Mr. Sheldon B. Parker, of Groton, N. Y., has patented an improved potato digger, consisting of a carriage carrying a curved or angular bar provided with digging teeth and hinged at its ends adjustably to plates attached to the axle, the curved or angular bar provided with gathering teeth and hinged at its ends adjustably to the axle, and the two levers for regulating the pitch of the teeth, whereby the potatoes and the soil in which they are embedded are raised, and the potatoes are separated from the soil and collected along the center of the row.

An improved plow has been patented by Mr. Isaac V. Newsom, of Mount Meigs, Ala. The object of this invention is to facilitate the adjustment of plows and promote convenience in repairing them. The plow standard is made in two parts, or is slotted longitudinally, to receive the beam in its upper part and the plow fastening bolt in its lower part. The standard is hinged by a bolt, at or near its middle, to a metal block bolted to the lower side of the beam so that this standard can be adjusted to regulate the pitch of the plow.

An improved sulky plow has been patented by Mr. George Applegate, of Yoncalla, Oregon. The object of the invention is to provide means whereby the depth and width of the furrow cut by the plow may be easily regulated and the plow controlled while in motion, and to provide a plow of light construction and draught, and one which can be easily turned at the corners, and capable of such manipulation as to adapt it for plowing in indirect lines or curves.

An improved flax puller has been patented by Mr. Samuel W. Gaines, of Scio, Oregon. In using the machine, as it is moved forward the flax is clamped between reel bars and a padded drum, and is pulled by the reel and drum and deposited upon a platform whence it can be raked off by hand, or by an automatic mechanism connected with and driven from the driving parts of the machine.

The Geology of the Lake Region of New York.

At a recent meeting of the New York Academy of Sciences, Dr. Lawrence Johnson read an interesting paper on the "Parallel Drift-hills of Western New York." A glance at the topography of the western section of the State shows a series of long and narrow lakes, among which may be mentioned Skaneateles, Cayuga, and Seneca as perhaps the most important. These bodies of water vary from a few to one hundred miles in length, and are of extreme depth, considering their breadth, which is often not more than four or five miles, and at points even less. They lie in cup-shaped valleys between series of hills whose general direction is from north to south. They are connected by a stream of water called at different points Duck River, the Clyde, and so on, which finally turns the flank of the great limestone formation of the Niagara and empties into Lake Ontario. After minutely describing the surface of the section and noticing the extreme comparative depth of the lakes, varying from 400 to 690 feet, Dr. Johnson proceeded to consider the question of their formation, rejecting, for many reasons, the theory that they were excavated by icebergs. The section, embracing from 800 to 1,000 square miles, was one of great interest, the speaker said, because no such ranges of drift-hills had been elsewhere noticed on this continent, save possibly by Sir William Logan, who described a somewhat similar formation high up on the Ottawa River in Canada, whose ranges lay north and south in the same manner. Dr. Johnson advanced the hypothesis that the whole section he had described was once nearly covered with water, and there were evidences, as, for example, in the marshes north of Cayuga Lake, that they had formerly extended further northward. The tamarack tree grew in great abundance in these marshes on the north, and the nature of the strata beneath was such as to show that they were formerly parts of the bodies of water that they joined. It would be noticed by the listener that the long axes of the small lakes he had described, while pointing in the same general direction, all converged at such angles that they would meet, if continued on the map, in the great peninsula of Labrador, which was now believed to have been the mother of a vast prehistoric series of glaciers concerned in the formation and modification of the tract lying to the south and southwest. Lake Ontario was evidently formed by the same tremendous glacier that excavated the basin of Lake Erie.

Ceramoid.

Dr. R. Martin, of Sonneberg, in Thuringia, has invented a substance which is said to resemble matt porcelain biscuit and faience, and has the ring of ceramic products. The process employed by him consists in mixing the clay with water glass so that it hardens without the necessity of burning. The objects made of it, especially doll heads, key escutcheons, vases, etc., are made of clay, mixed with in-

fusorial earth, cellulose, or fibrous substance, and either pressed in plaster moulds or made by pouring the thick paste into moulds, and then, after they are taken out of the mould, they are dipped in a solution of water glass. Owing to the capillarity of the substance mixed with the clay the water glass solution is rapidly absorbed by the substance and soon penetrates the entire mass, and when it hardens the mass resembles stone.

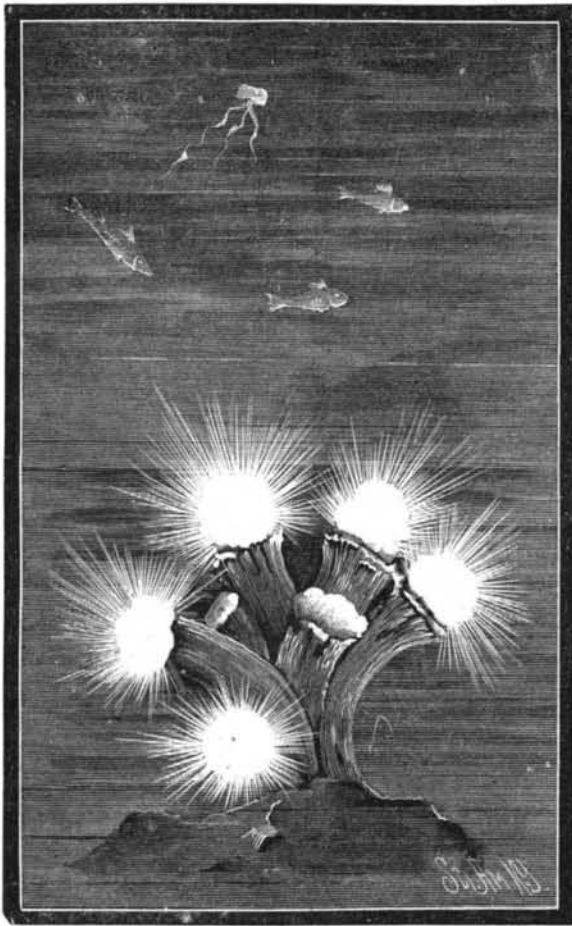
To color the article at the same time the paste is colored and poured or pressed into the form, and then the ground mass poured in as in making terra-cotta, where the finer parts are first filled up with prepared clay, which can be colored at will, and then filled out with ordinary clay that has not been elutriated.

It is well known that silicate of alumina, and also clay, when mixed with water glass solution, hardens and does not readily get soft in water. The strength and durability and power of resisting water is not, of course, equal to that which can be attained by burning. W. I. G. Z.

A PHOSPHORESCENT CORAL AND OTHER MARINE PHOS-ANIMALS.

BY C. F. HOLDER.

The appearance of phosphorescent light among corals is of extremely rare occurrence, and during a long residence



in the coral country, and of continued observation, the phenomenon was only observed once, and that in the genus *Caryophylla*. The specimen was first seen from the boat in about thirty feet of water, and brought up by diving, by the writer, and immediately placed in a jar of water, and finally transferred to an aquarium that had been built so that the tide rose and fell in it. Here the beautiful specimen was lodged, so that every movement of the animal could be observed. It had five branches, each one forming a cell showing beautiful radiating plates, striated externally, and collected into a solid conical polyparium fixed at the base.

The appearance of the animal when extended, though extremely attractive, did not come up to the one described by Professor Johnson, of London. "When taken," he says, referring to one dredged in deep water by Professor Travers, "the animal was scarcely visible, being contracted; when expanded, the disk was conspicuously marked by two denated circles of bright apple green, the one marginal and outside the tentacula, the other at some distance from the transverse and linear mouth."

In the specimen kept by the writer the green was only faintly observed; and when the animal was within its cell the color of the mass was more inclined to yellowish brown, while two of the branches were denuded of animal matter, and were pure white.

The situation of the coral was about a foot under the surface, and a platform had been arranged so that the observer could watch it from the water's edge, and while so doing the light was first seen. At first we thought it might have been the phosphorescent flash of some minute aculeph, myriads of which were floating about, but to remove all doubt a glass funnel, slightly tinted, was gently lowered down over it, and a second later a slight flash illuminated it, and then another, showing a faint light that made small objects visible in the immediate vicinity of the polyp; and at one time a pteropod was suddenly thrown into a brilliant light when within a few inches of it. The flashes seemed to be intermittent, and to pervade the entire face of the cell in much the same fashion as does the light of the firefly the surface of that insect. By lowering a black glass near it an idea was obtained of the size of the reflection which was on the glass, an oval illuminated spot seemingly about the size

of a silver quarter, and the color of the spark yellow, with perhaps a bluish tint.

In the accompanying illustration we have attempted to merely show the size and appearance of the illumination as it appeared twelve inches under water. The cause of this curious phenomenon is probably the same here, in a general sense, as in other forms. Perhaps there are special organs, as has been suspected in some of the aculephs, or it may be due to some fatty degeneration of the parts. In the sea pens (*Pennatulidae*) the same phenomenon has been noticed, and a recent Arctic exploration discovered one of these curious creatures growing about four feet in height in water nearly a mile deep. The one known to science as *Rapilla reniformis* is a rich purple species found off the coast of South Carolina. According to Agassiz it is remarkably phosphorescent, showing a golden-green light of wonderful softness. Another—the *Pennatula phosphorea*—is found in European waters of a rich red-purple color. Dr. Grant, in speaking of them, says: "A more singular and beautiful spectacle could hardly be conceived than that of a deep purple (*P. phosphorea*), with all its delicate transparent polypi expanded and emitting their usual brilliant phosphorescent light, sailing through the still and dark abyss, by the regular and synchronous pulsations of the minute fringed arms of the whole polypi."

Linnæus says that "the phosphorescent sea pens which cover the bottom of the ocean cast so strong a light that it is easy to count the fishes and worms of various kinds that sport among them."

One observer has been fortunate in discovering evidence of phosphorescent light in the boring mollusk pholas, having seen a faint flame or light playing about the entrance to its retreat; but the most wonderful of all the light-givers of the ocean are certain forms of ascidians. A compound one, the *Pyrosoma*, has been found, in the shape of a barrel, nearly five feet in length—an aggregation of many thousands of individuals. Huxley says of this interesting form: "The ascidiarium of *Pyrosoma* has the form of a hollow cylinder, rounded and closed at one end, truncated and open at the other, formed of a firm and transparent texture, in which the zooids are arranged in whorls; their oval apertures open on the exterior surface, and their atrial apertures into the interior of the cylinder. The hæmal aspect of each zooid is turned toward the closed end of the cylinder. The branchial sac has the ordinary structure, and each zooid is provided with a testis and with an ovisac containing a single ovum." To move along each zooid draws in water through its oval aperture and discharges it into the interior of the cylinder. The effect of so many currents being forced out of the open end propels the whole mass ahead in the direction it happens to take. Each of these zooids sometimes shines with a brilliant flame, so that at a distance through the water they have the appearance of great fire balls moving to and fro. The naturalist Bennet thus speaks of them: "I threw the towing net over the stern of the ship, which soon cleaved through the brilliant mass, the disturbance causing strong flashes of light to be emitted. On taking the towing net in it was found to be half filled with *Pyrosoma atlanticum*, which shone with a beautiful pale greenish light. After the mass had been passed through by the ship the light was still seen astern. The second occasion of my meeting these creatures," he says, "was in high latitude and during the winter season. It was on the 19th of August, the weather dark and gloomy, with light breezes from north-north-east, in lat. 40° 30' S. and 138° 3' E. long., at the west entrance of Bass's Straits, and about eight o'clock, when the ship's wake was perceived to be luminous, while scintillations of the same light were abundant all around. To ascertain the cause I threw the towing net overboard, and in twenty minutes succeeded in capturing several pyrosoma, which gave out their usual pale green light; and it was no doubt detached groups of these animals which were the occasion of the lights in question."

Humboldt also attests to the wonders of the colony of animals: "Only imagine," he says, "the superb spectacle we enjoyed when, in the evening from six to eleven o'clock, a continuous band of those living globes of fire was passing near our vessel. With the light which they diffused we could distinguish at a depth of fifteen feet the individuals of thymnus, pelamys, and sardon, which have followed us these several weeks, notwithstanding the celerity with which we sailed. Among these are other free swimming ascidians, as the salpa—animals that join in long bands, and from the masthead look like fiery serpents, winding their way through the sea. Myriads of jelly fishes add to the wonders of this submarine festival, and oval forms of red, blue, yellow, and green tints are seen rising and falling—veritable constellations of the sea; while the waves, charged with disconnected masses, break and roll away, lighting up the darkness with a ghastly glare that is reflected by the masts, sails, and rigging, that cast strange shadows over the deck and sea. The office of this strange light is mere speculation, as some fishes show the same, and many forms from great depths of the ocean. It has been surmised that its purpose is to provide light for those regions never to be explored and of utter darkness."

THE boiler of the Missjou Soap and Candle Works, on Sixteenth street, between Folsom and Harrison streets, San Francisco, Cal., blew up about 4 o'clock A.M., December 7. No one was injured. The building, which was worth \$3,000, was demolished. The machinery, valued at \$50,000, was more or less damaged.