

### III. Papers on Natural History.

#### No. 1.

#### THE AQUARIUM, OR AQUA-VIVARIUM.

We have requested the gentleman whose name appears at the end of this description to write it for us, believing that it will prove of interest to our readers:—I will commence by giving a brief account of the history and theory of the Aquarium. The first hint on this subject is found in a book published at Leyden, in 1778, wherein it is stated that plants immersed in water, and exposed to the action of light, emit oxygen gas. In 1833, a Mr. Danbury, and in 1837 a Mr. Ward, again promulgated the practicability of supporting animal life by oxygen furnished by vegetable growth. In 1852, a Mr. Warrington and a Mr. Gorse almost simultaneously made experiments, which have resulted in the successful sustenance of animal life in connection with vegetable existence.

The Aquarium, or Aqua-Vivarium, is founded upon the principle that aquatic plants, while growing, emit sufficient oxygen gas for the support of animal life to a limited extent; the plants, in their turn, forming their solid structure by means of the carbonic acid thrown off by the animals in the process of breathing. This is the theory; the application is as follows:—A clean, tight vessel, with glass sides, is employed for a tank. The bottom is first covered an inch deep with clean, coarse sand, upon which I have found it best to put a thin covering of dark gravel. A rude rock-work adds much to the beauty of the tank and to the comfort of its inhabitants. Over the surface there should be scattered a few aquatic plants—if marine, attached to stones or shells; if fresh water, having their roots buried in the sand; and water is then added, and the whole left for a week or more until the plants are acclimatized and are growing nicely. When thus ready, the "stock" may be added by degrees, until the proper balance of animal and vegetable life is effected. In both marine and fresh water *Aquaria*, a mucous or fungous growth is soon developed, which may be kept down by pond snails, or by the buccinum or salt water snail.

My first attempt was with gold fish (*Cyprinus*); but not being able to obtain the proper plants, I stocked a confectioner's glass jar with a few other plants from the sea, and there soon appeared a large number of small animals, which, viewed by lamp-light, were very interesting. I have found that very deep and narrow tanks, of various shapes, have not succeeded so well as those having a much greater breadth and depth. The tank which I successfully stocked was of an octagonal form, of thirty inches in diameter and about eight in depth. Excepting the great difficulty of rendering it tight, this tank has succeeded admirably. After being in use for a long time, the rock-work is still covered with vegetation, and crabs, minnows, eels and mollusca still sport and wrangle in the home which they have so long occupied.

The animals which I have found to thrive most easily, and to accommodate themselves most readily to their new home, are the minnows or killy fish, the stickleback (*Gasterosteus trachurus*) the shrimp, small specimens of lobsters, hermit crabs, serpulidans, small common crabs, eels, and star fishes. I have been told that the small sheep-head (*Sargis ovis*) is also very good. The petella, the buccinum or sea snail, the purpura or whelk, and several varieties of crepidulas, have also succeeded nicely. The scallop, one of the most beautiful of animals, whose iridescent hues are marvellous in their brilliancy, I have not been able to keep for any length of time. The barnacle, also so interesting in its mode of breathing and of its catching its prey, has not lived long. The spider crab, which the ancients held emblematic of wisdom, and which is noted for his fondness of dress and mischief, has been found altogether too reckless of the consequences of his pranks, and has been banished to a tank kept for "unruly offenders."

No animal in a tank, however, has behaved with more propriety and been productive of more amusement than the small species of hermit or soldier crab. They are ever active, and constantly ready to change their shells for their own gratification or that of beholders. They seldom pass each other without disputing the right of way, and yet never injure each other at all. A little incident will show the pleasure that may be found in observing them. While watching my tank, I saw a hermit crab cogitating upon the expediency of vacating his shell for an empty one lying near him. After mature deliberation he concluded upon the exchange, and suddenly popping his tail into the vacant shell, he crowded out a cloud of particles, probably of decayed animal matter; this attracted the attention of a shoal of minnows, which immediately attacked the poor hermit, endeavoring to draw him from his shell. But a new claimant immediately appeared in the person of a common crab, who clasped the hermit in his claws and attempted to carry him off by "force of arms." The minnows, unwilling to be thus defrauded, now beset the robber, while the hermit, taking advantage of this diversion, crept quickly away from the scene of strife; doubtless convinced that "there is no place like home."

Prawns and shrimps are also objects worthy of admiration. No bird sails through the air with more gentleness than these fishes float through the water. Star fishes, likewise are very pleasing: they live long in confinement, but are, however, quite greedy, and the larger ones will soon destroy a stock of buccinums. The small sheep-head is said by those who have kept it to be very hardy. Many other aquatic animals will doubtless be found to be as suitable as those already named.

The study (for study it is) of *Aquaria* is but yet in its infancy in this country; and we may reasonably hope that when those who are close observers of nature become interested in this matter, we shall learn much more of the "private life" of the inhabitants of the ocean than we have ever hitherto known. Probably no such facilities for the study of natural history have ever been offered as are now presented by the *Aquarium*. We have in our rooms, where we may examine it at our leisure, a sort of section of the ocean, whose inhabitants may be examined in their natural abode, and under most favorable circumstances. With such facilities it will be easy to learn more in a few months' observation than we have heretofore been able to learn by years of examination of dead or dying specimens.

Tanks may be made of various forms. The simplest are made of confectioners' jars or any open-mouthed glass vessels. These will answer very well for small specimens: but the best kind, most proper for the fish, and well suited for observation, are those made in a rectangular form, with four glass sides. It has been found very difficult to make these permanently tight, and at the same time free from the taint of cement. This has, however, been remedied, I believe, by some of the dealers in tanks, so that they may now be purchased so constructed as to be put into use without fear of leakage.

In a fresh water tank we have no anemones nor hermit crabs; but we have newts, the stickleback, which builds its nest beneath the waters, the water beetles, the tadpoles, and numberless others, which fully compensate for the absence of those that are found only in sea water.

The speedy popularity of this piscatorial and botanical "institution"—the *Aquarium*—is undoubted. All that is needed is to exercise patient perseverance, regular attention, and, above all, perfect cleanliness. No decayed matter, animal or vegetable, must be permitted in the tank. A strict care to not overstock or crowd the animals, and a determination to overcome obstacles, will insure success; and the *Aquarium* will become—what it has already become to thousands in Europe—a "new pleasure."

CHAS. E. HAMMETT, JR.

Newport, R.I., Sept. 21, 1857.

[At the polite invitation of our correspondent, we were permitted, while spending some time at Newport this summer, to examine the specimens to which he alludes; and we have seldom spent an hour more pleasantly.—*Scientific American*.

### IV. Papers on Practical Education.

#### 1. COMPULSORY MEASURES FOR SCHOOL-GOING.

Those who take an interest in the education of the people, and have followed what has of late been said and written on this subject, must be aware that in several countries of the Continent where national education is more advanced and universally spread than elsewhere, a particular law enjoins the acquisition of at least a certain amount of elementary knowledge, whilst, at the same time, the means thereto are placed within the reach of every one. The object has been repeatedly mentioned, but always in a very superficial way, with a short summary remark that similar regulations are too much opposed to the feelings and institutions of this country to admit of any further consideration. A policeman driving a herd of reluctant children away from their home and family is the only image that at once stands before the imagination, as representing the nature and consequences of such a law; which latter is at the most thought an efficient one, but only worthy of a country where free institutions are unknown, and the rights of the individual may be disregarded by the will of an absolute ruler.

#### GERMANY.

In Germany, people take a different view of the case, and, strange as it may sound, not so abstract, but a more practical one. Education is there considered and treated as a most important state affair, and not entirely left to private exertions or speculation. A complete system of public instruction and education has been for a long time in operation, and, amongst other advantages, secured that superiority of primary as well as general instruction which it is impossible not to acknowledge. The people at large have by this time learned fully to appreciate the benefits of that system; and there is no doubt, even if more constitutional liberty were granted, it would not be made use of to overthrow that system, the abolition of which