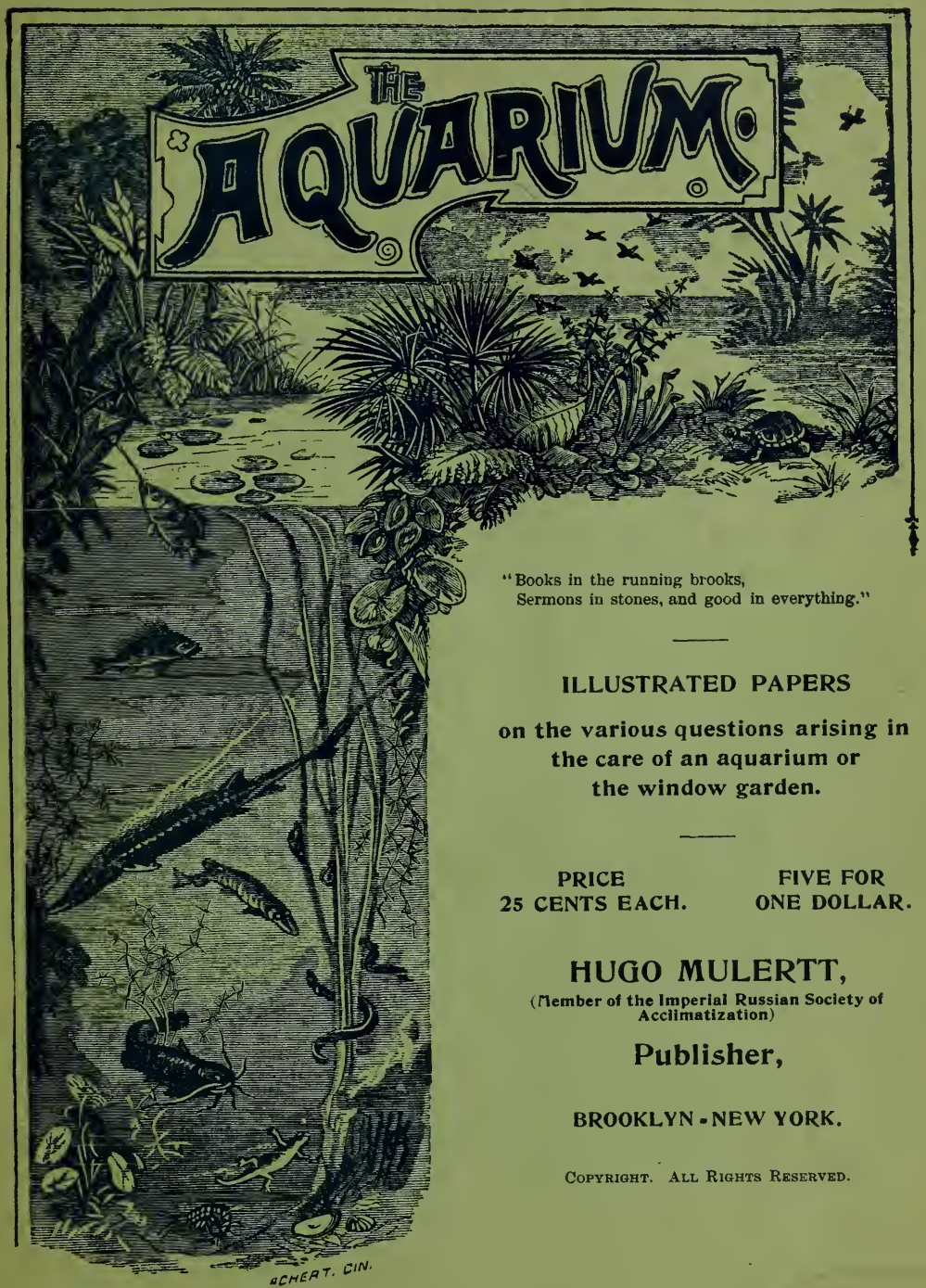

"Books in the running brooks,
Sermons in stones, and good in everything."

ILLUSTRATED PAPERS

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MY AQUARIUM.

BY H. B. SMALL.

In a work that I published on "The Fresh Water Fish of Canada," I quoted on the title page the following passage from W. Scrope, a writer in the early part of the century, where he says: "I like the society of fish, and as they cannot with any convenience to themselves visit me on dry land, it becomes me in a point of courtesy to pay my respects to them in their native element." Quaintly as he expressed it, it foreshadowed the study of their habits. Now Nature opposes certain obvious obstacles to the pursuit of knowledge in the water, which renders it difficult for the ardent naturalist, however much he may be so disposed, to carry on his observations with the same facility as in the case of birds and mammals. Still by observation here, and experiment there, watching through a sheet of plate glass, naturalists manage to piece together a considerable mass of curious and interesting information of an out-of-the-way sort, about the domestic habits and manners of sundry members of the finny tribe. To the eye of the mere casual observer, every fish would seem at first sight to be a mere fish, and to differ but little from all the rest of his kind. But when one comes to look closer into their ways, one finds fish are in reality as various and as variable in their modes of life, as any other great group in the animal kingdom. Concealed under stones in the babbling brooks, hiding in the grassy margin of purling streams, buried in the depths of silent ponds, roaming in the submerged forests of aquatic vegetation, is a multiplicity of animal life that may profitably be made a study, and to thoroughly explain which would require a lifetime.

In 1850, Mr. Robert Warrington addressed to the Chemical Society of London a series of observations on the fact announced by Ingraham in 1778, that plants immersed in water when exposed to the action of light, emit oxygen, and the consequent necessity of their presence for the preservation of animal life. He reported placing two small gold-fish in a glass, having first planted in sand and earth at the bottom a small plant of valisneria. The latter, as the leaves decayed, fouled the water, and to remedy this he tried the introduction of a few snails, which, feeding on decaying

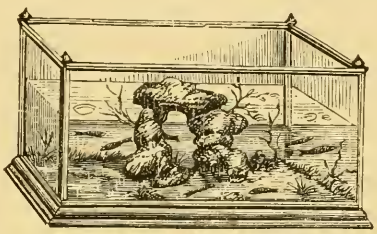
matter, quickly restored purity and clearness to the water. In 1852, he experimented with sea-water and its occupants, with equal success. To Mr. Gosse, however, the well-known naturalist, may be attributed the popularity of the aquarium which is certainly the purest of all household recreations. His first work on the subject, somewhere about the year 1855, was read with avidity, and although the London *Punch* levelled its keenest wit and satire against the new mania, and pointed to all the mishaps which might befall housekeepers by the breaking of the aquarium and the consequent deluging of carpets, the passion for aquaria grew, and in 1857 they may be said to have been formally established in England. In that year, one of the quarterly Reviews remarked that the making and stocking of these had created a new and important branch in commercial industry. In 1856, Barnum introduced into New York the first of what he styled—"Ocean and River Gardens," and a few months afterwards they were for sale, of all sorts and sizes, for private use. Before that, the glass globe for goldfish was the only representative of the new apparatus. In keeping an aquarium, very little is wanted besides the tank itself. It is well to have an india-rubber tube or a siphon for drawing off the water when necessary; a wooden forceps for removing any object, and a sponge stick for cleaning the glass, together with a small, fine-meshed hand net for handling any of the inmates if need be.

Some years ago, when residing in New York State, I was attached to one of the military colleges affiliated with West Point; and one of the first things that I did to engage the interests of the cadets under my charge, was to turn their minds, during leisure hours, to the study of Natural History. As I was at that time making collections of all kinds, I enlisted them in the work of procuring specimens, and I organized, on our Saturday holiday, field parties among the woods and mountains in the vicinity of the college, along the Hudson River. This was just at the time when aquaria were in vogue, and I took advantage of the first visit that I paid to New York, to purchase an aquarium for my own private use, which I kept in my quarters, open to the inspection of all who wished to see it. This was over thirty years ago, and that I still have the aquarium in almost as good condition as when I purchased it, is, I think, sufficient evidence that it was well adapted for its purpose. It is a comparatively small one, being only fifteen by nine inches. I think I may say it has done its full share in the way of attracting attention to "Life below the water." The first great difficulty I had to contend with was the multiplicity of objects that were brought to me for it by my cadets.

You would be astonished if I were to give you all the varied suggestions that were made respecting what should constitute the floor of the tank, some recommending small pebbles, others gravel or sand, till finally a compromise was effected to the satisfaction of all, by giving each of the proposed materials its own place. Experience afterwards showed that a little clean river sand is the safest ground work for all purposes. Then there was the natural inquisitiveness of boyhood to combat. Whilst the novelty was at its height, the inmates were subjected to all sorts of ordeals, such as poking up with a stick, to see if they were lively; and a contin-

ual desire was evinced to handle them. Over-feeding was one of the most trying evils to contend against, for the superfluity of bread and meat supplied, in all good intent, for the use of the inmates, had a tendency to sour and discolor the water, and to create, when overdoses were administered, a fermentation by no means conducive to vitality. However, for the sake of encouraging research and creating amongst the cadets an interest in my aquarium, I would naturally put up with all these little inconveniences, removing as soon as possible, when left to myself, all extraneous matters from the water, and by frequent use of the siphon withdrawing the disturbed contents to be replaced with fresh, healthy, spring water. In a very little time the aquarium ceased to be a wonder and became an object of interest, and so my point was gained.

I well remember its first inmate, which was the larva of a Dragon-fly, the various stages of whose subaqueous life were of continual interest, and great was the astonishment one day, when only an empty case was found attached to the stalk of the water weeds, its inmate having taken to itself wings and disappeared. The locality afforded a splendid field for collecting, as the Croton River emptied into the Hudson within a mile or two of the College. Rockland Lake and Haverstraw Bay were on the opposite shore, whilst in the hills back of us were numerous ponds and streams abounding with life. Near the mouth of the Croton River lay the old Van Cortland Manor House, on the lawn of which was a fish-pond, constructed by some of the early Dutch occupants and well stocked with gold-fish. During a heavy freshet one spring, some years previous to the time I am talking of, the banks of this pond gave way, discharging its waters and its contents into the Croton River. As a consequence of this, the gold-fish took up their quarters in the Croton and Hudson Rivers, and it was no unusual thing when the fishermen were drawing their seines in this vicinity, for a number of gold-fish to be among the fish taken. These were generally thrown back, but anyone on hand at the time could always procure what he wanted, and I, at various times, picked out such as I chose. These fish had also from time



to time been taken by boys to various ponds in the hills, so that there is no lack of gold-fish in the waters of Westchester county. I may here mention, that further up the Hudson River a similar fish pond years ago gave way, well stocked with the European Carp that had been brought from Holland. These have also taken to the Hudson River, and are from time to time netted there. Being of the same family, they have crossed with the gold-fish in breeding, and the result is that a mottled fish is frequently to be seen, some of which bear very little of the distinctive red that marks the gold-fish proper. I have seen the latter in the lagoons along the railway in that vicinity, eight or nine inches long, and although it may seem scarcely credible, I have seen them lying in shoals near the surface of the water on a bright, sunny day, in such abundance that the

surface appeared to assume where they were, a red tinge.

The Hudson River is famous for its eels, and small specimens of these were occasionally brought to me. A scoop-net, drawn through the liquid mud in any of the tide-water pools along the river margin generally brought up more or less small eels, so that a good selection could be made of the size best adapted for observation. From the experience I gained with them, I would never recommend more than one small eel being placed in an aquarium, as two which I first introduced took up their respective quarters at either end of the tank, and were perpetually doing battle like knights of old, charging on each other most furiously, with the final result one morning of my finding both dead on the surface of the water, one of them having half swallowed the other, but the latter in the operation choked his conquerer, with the result mentioned. A subsequent specimen of mine was in the habit of secreting himself between two stones, with part of his body only exposed, as if watching everything. There is apparently much of the snake in their habits, and the same timidity exists in each. The least noise disturbs their equanimity, and thunder seemed particularly to affect my specimen. Although he occasionally moved round in the daytime, night was the time for his activity, and the artificial light of a room seemed in no way to interfere with his apparent recognition of time. One eel at a time affords ample opportunities for studying the habits of that family.

One of the most interesting fish to watch is the cat-fish, which I am seldom without, but it must be kept well fed, and even then the fins and tails of other fish bear evidence of its attacks upon them. It is astonishing what an amount of food a cat-fish will swallow. You can watch its stomach swelling out to such an extent that it presents the appearance of a fowl's crop when fed to repletion. After he has thoroughly bloated himself out, he generally settles down, under or beside a stone, and lies there in a sort of comatose state for some time, closely resembling in this the serpent family. As soon as the effects of his meal has passed off, he becomes one of the most restless of the occupants of the aquarium, and swims backward and forward and up and down, incessantly, as if calling attention to his wants. I have not the slightest doubt that, after a time, fish know intuitively, to a certain extent, when feeding time comes and the party that feeds them. I think the cat-fish are affected by, and feel coming changes of weather, but one cannot deduce conclusions from observations taken in a room where the temperature is probably uniform, as compared with the natural temperature out of doors.

Sticklebacks I have had in abundance, but more than two at a time become a nuisance. It is a perpetual warfare all round, especially if the males predominate. They, together with sun-fish, are probably the most pugnacious of all fish showing hostility even to my finger when held towards them under water, their fins and spines bristling up like the hairs on a bull-dog's neck, when excited. They snap at everything, and it is impossible to keep any larvæ in an aquarium any length of time if these fish are joint occupants. I have read of sticklebacks building their nests and breeding among the weeds in an aquarium, but I never witnessed any operation of this kind myself, as I frequently changed my tenants

for the sake of watching the habits of the different kinds of fish from time to time brought to me, with the exception of the gold-fish, which I have always retained.

Bass I find, for the most part, nocturnal in their habits, lying comparatively still the greater part of the day. Like sun-fish, they are very tenacious of the spot they select, which they occasionally sail quietly round and round as if guarding, and woe to the unwary fish who may venture to settle down in the quarters they have chosen. The small brook sucker I have kept and watched with a great deal of interest. They are useful scavengers, cleaning up by suction everything they come in contact with at the bottom, rolling it over their palate, swallowing whatever suits their taste, and thus disposing of a good deal of refuse matter which otherwise gives considerable trouble in getting rid of. These fish are, however, of what I might style too delicate a constitution to be recommended as permanent occupants. Accustomed as they are to running water, and evidently given to roaming in streams, they seem to suffer when pent up in a small space, and except for temporary observation, I would not recommend their introduction into any private aquarium. Crayfish, in the same way, are very unsatisfactory occupants, and I never was able to keep one alive for any length of time.

One of the most interesting fish that I ever had in my aquarium was a small gar-pike, which was caught in a scoop net at the foot of the locks here in Ottawa and brought to me. This fish lived for several weeks, and after his death I placed him in spirits, where he still exists. He was most unsociable, turning his back upon all other fish that approached him, accepting the apparent overtures of none. The only surviving remnant of the fossil bony-scaled Ganoids of the Devonian rocks and belonging to the Mesozoic period, his pedigree probably caused him to look down on the finny tribe of the present age as his inferiors. Hugh Miller, speaking of the living representatives of these fossil fish, says: "They seem to have been spared amid the wreck of genera and species to serve as a key by which to unlock the marvels of icthyology of those remote periods of geological history appropriated to the dynasty of fish." I am inclined to think that my specimen scorned the ordinary food of the other fish, and died from inanition, as I never could induce him, while I was watching, to approach while they were feeding, and if he did satisfy himself at all, it must have been under the cover of darkness. However, as he did not appear emaciated at his death, he may have subsisted on animalculæ in the fresh water from time to time supplied. The ordinary pike and dorée I never attempted to keep, and it is almost needless for me to say that brook trout will not live in any ordinary aquarium. The "Shiner" is also too delicate for general keeping and requires highly aerated water.

I have had almost all kinds of small fry, known as "minnows," in my aquarium, consisting of young chub, dace and minnows. They are very lively and become in a short time accustomed to their confined quarters, but from their delicate formation I would never recommend them as permanent inmates. There is one exception, however; that is the barred, or black minnow, which is very hardy and a very amusing fish to watch. Sometimes motionless on

the bottom, as if wrapped in deep meditation ; at other times balancing himself in the water, he keeps up a continual flapping of his ventral fins, working them like a fly-wheel, with apparently no other object than exercise. At other times, he darts about from side to side, and if more than one of these minnows are occupants they seem to exchange ideas, as the rest of his own species sail about conjointly with him.

Moving about, as I have done, from place to place, my aquarium occupying the safest place in my baggage, and being the first thing attended to after unpacking, I have had opportunities of stocking it from various waters, and when I went to reside for a short time at Buckingham, I obtained one day, when fishing in a little trout stream back of the village, a small specimen of the bull-head, one of the very few that I have ever taken. He was carefully consigned to my aquarium, but only lived a few days, owing probably, to his transfer from the clear, crystal waters of that running stream to the narrow compass of still water, to which he was unaccustomed. He lay all the time ensconced between two small stones, hiding himself as closely as possible from observation, refusing food, and evidently sulking as wild animals do when first placed in confinement. The enormous size of his mouth as compared with his other dimensions, gave evidence of the capacity of these fish for disposing of a large meal at a time, but I never had the satisfaction of witnessing the operation of feeding.

(*To be continued.*)

AQUARIUM AND TERRARIUM COMBINED.

My aquarium is thirty-one by sixteen and twelve inches high. Disregarding marine shells and corals and ruined castles, I built a large rock out of tuffstone and other grotesque pieces of rocks,

Design for an Aqua-Terrarium.

reaching four to five inches above the surface of the water and concealing in its interior a pot with cyperus alternifolia (Chinese umbrella plant). The rocky cone occupies nearly one-half of the aquarium, and the space between it and the glass is filled with sagittaria planted in the sand. A few plants, water poppy and nymphœa flava, are in pots distributed in the other half, and the pots are covered and concealed by

small pieces of rock. So we have one dark, rocky, and one clear side of the aquarium, in which goldfish, eels, small cat and sunfishes, turtles and salamanders live together in perfect harmony. On top of the aquarium rises a straight line of glass resting on a tin frame, roof-like, but open at the top, fourteen inches high ; glass plates, six inches wide, laid across the ends of the aquarium, form the bottom of the terra rium. Both glass plates are united by a rustic bridge made of oak bark. One of the glass plates is covered with sand, in which small melocactus are planted ; it resembles a dreary desert with a few rocks, a good place for lizards. The opposite glass plate, and part of the bridge, is quite the contrary ; luxuriant moss, with ferns shading a rocky cave, are peopled with snails and young toads, who, however, venture sometimes over to the miniature "Sahara" in search of flies which assemble there in numbers, as sugar is spread on the sand.. The roof-like structure prevents the inhabitants of the terrarium from escaping. Z.

THE TOAD AND ITS HABITS.

Formerly the toad was considered a venomous reptile, but in our day its habits have been more carefully observed, and its great value to the pomologist and gardener has been fully estab lished on account of its propensity for destroying insects, especially those injurious to vegetation. We should, therefore, sedulously cultivate the friendship and crave the assistance of the insectivorous reptiles, including the striped snakes, as well as that of birds.

Every tidy housewife detests the cockroach, mice and other vermin. Two or three domesticated toads would keep the coast clear of these, and be found more desirable than a cat, as they are wholly free from trespassing on the rights of man as the cat does. The toad is possessed of a timid and retiring nature, loving dark corners and shady places, but under kind treatment becoming quite tame.

Many incidents may be cited of pet toads remaining several years in a family, and doing valuable service with no other compensation than immunity from persecution. All that is necessary to secure their co-operation in door or out, is to provide them with cool and safe retreats by day, convenient access to water, and they will go forth to the performance of their nocturnal duties "without money and without price."

In Europe the toads are carried to the cities to market, and purchased by the horticulturists, who, by their aid, are enabled to keep in check the multiplication of the insect tribes which prey upon fruits, flowers, etc.

No one can study the anatomy of this reptile without being convinced of its perfect adaptation to the sphere which it fills in the economy of nature. Its tongue, which is capable of great elongation, is attached to the anterior portion of the lower jaw ; its free end when the toad is in repose, reaching down to the borders of the stomach. The moment the toad sees its prey its eyes sparkle, its toes twitch, and quicker than the eyes can follow, the insect is transfixed and conveyed to the stomach of the captor.

It has been definitely settled that fishes *do not hear*. They *feel* the vibrations caused by certain sounds.

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MARINE LABORATORIES.

The facilities for biological work have been materially increased during the past few years. The first laboratory for marine biology in this country was, if we remember right, started by the late Professor Spencer F. Baird, Secretary of the Smithsonian Institution and U. S. Commissioner of Fish and Fisheries, when he erected a station for the study and propagation of sea fish at Wood's Holl, Mass.

This station is very favorably located, right on the seashore, and of easy access by either railroad or steamer. The station is quite an extensive one. Including the office building, hatchery, boiler house, wharves, boats and apparatus for various purposes, the visitor has opportunity to study a good collection of fish, crustacea and other forms of marine life peculiar to the vicinity of the station, which are preserved in alcohol and displayed in museum jars.

Besides these alcoholic specimens, we find others that are preserved in a dried form, such as sponges, corals and crabs; also, the various sea birds are represented by well prepared skins. In about a dozen of good sized aquariums, which are supplied with running sea water, pumped from the clear bay immediately outside of the building, live specimens are kept for observation and study.

This collection was a varied and very interesting one, consisting of young sharks, skates, a sucking fish (striped remora), flounders, blowfish, etc.; many species of crab, starfish, sea urchins, sea cucumbers, anemones, jellyfish, etc. The interesting remora had sucked its sucking disk against the side of the glass, where it could be nicely examined. This disk is located on top of the fish's head. It is oval in shape, resembling a shield, but perfectly flat, and about one-third the size of the fish ; white in color, and it consists of rows of tooth-like projections. The fish measures about twenty inches in length.

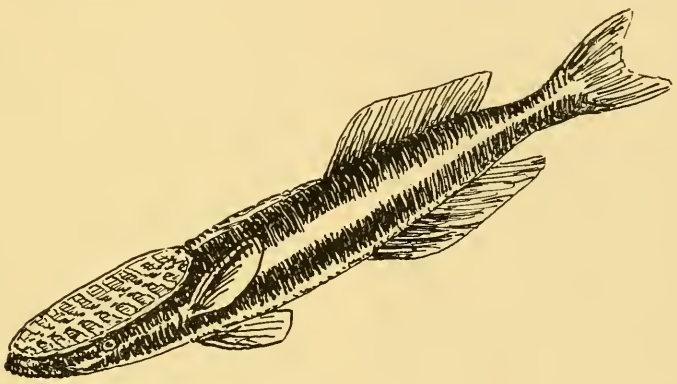
By means of this organ the fish attaches itself to moving or floating objects in the water; for instance, large sharks, turtles, and quite frequently to ships, and travels along without an effort. Its hold is very firm. This peculiarity is taken advantage of by the native turtle hunters of South America. They fasten a line to the fish, and when in sight of a turtle the fish is thrown overboard. As a rule the remora starts straightways for the turtle, and attaches itself to its plastron (lower plate.) The turtle is now a prisoner, the fish holding on firmly, both are pulled to the boat.

In another of the larger tanks we noticed in company of a splendid specimen of a squid, a very handsome threadfish. This fish is a native of the tropical seas; it had been carried away from home by the current, and was caught in the gulf stream not far from the station. The size of its body is that of a man's hand ; it is very much compressed, like that of the crappy, and of a dull blueish-lead color. The dorsal and anal fins are very large, each ray running about six to eight inches beyond the fins proper, giving them the appearance as if threads of fine seaweed were streaming from them. The

fish is very attractive, but one could see that the low temperature of the water was not exactly to its taste.

In the same building upstairs and also over the hatchery is the biological laboratory. Here it is where the specialists make their investigations. There is one large room where several students are at work, and a number of small private laboratories for exclusive use for professors or instructors in colleges and academies. Here, too, one meets work with the scalpel and their microscope. One studying the nervous system of the spider crab, the other that of the jellyfish, while most of them were dissecting young dogfishes. Live and prepared material of the various forms of marine life were in great abundance on hand. The former was kept in small aquariums in running sea water.

A little below the two main buildings the botanical section is located. Here



The Striped Remora.

rectangular aquariums and vessels of any shape, all supplied with small streams of running sea water and containing all kinds of living material.

This laboratory soon proved too small, and through the generosity of some Bostonian a second laboratory, entirely independent from the one mentioned above, was erected. This school, known as the Marine Laboratory, is situated only a few hundred steps from the U. S. Fish Commission Station. It consists of several spacious two-story buildings, built for this purpose only.

It was our good fortune to meet, among the students, some charming friends of ours, who delighted to escort us through the various departments.

We found the students all busy at the various marine algæ, of which the New England coast is so well supplied, are studied. Beautiful specimens of various colors and tints were kept alive in sea water, while others that had been pressed and dried to be used for reference were kept in portfolios.

The number of biological students who did practical work at the Woods' Holl Laboratory this summer exceeds two hundred. Ladies and gentlemen were about equal in number.

Another biological laboratory is located at Cold Spring Harbor on Long Island. This school is under the direction of the Brooklyn Institute of Arts and Sciences. It is yet new. Work here includes fresh water biology as well as marine.

PAPER AS A PROTECTIVE FROM FROST.

The power of paper to protect plants from frost has been tested in various ways, but never more thoroughly than by Mr. J. W. May—an English gentleman, who has given the result of his experiments to *The Country*, a London journal.

Ordinary newspaper was first used, and this answered very well, but having obtained a lot of thick wrapping paper, he substituted this and obtained a far better result. The experiment was carried out on frames which are banked up with ashes, and these covered with a sloping board to carry off water. A thermometer was hung in each frame. Four thicknesses of thick paper, seven thicknesses of thick carpet paper, or twelve sheets of newspaper excluded frost when the thermometer stood at 16° in the shade; but when it receded to 14° one degree of frost was registered in the frames. When, however, an extra sheet of carpet paper was placed over each frame, frost was quite excluded. For convenience the paper was tacked together with hemp, and each frame had a cover made just to lap over the sides, but not to reach either top or bottom by half an inch. To keep all dry, sheets of brown carpet paper, dressed with lampblack and boiled oil, were laid over the other covers, allowing these dressed covers to overlap about an inch all round. This throws off rain and moisture. One or two dressings are required, according to the state of the paper, and it should always be rolled up, not folded, or the dressing will crack. Thus the cover will be waterproof.

Out-door paper comes in very useful; a cone of thick paper, or a cone of brown paper of three or four thicknesses, water-proofed on the outside, would protect the majority of semi-hardy herbaceous or sub-herbaceous plants; while temporary covers of paper alone, simply folded and pinned, would protect bedding, plants, etc., from spring frosts. A newspaper or a sheet of brown paper laid over a seed bed, one or two inches above the ground, will protect tender seedings from both frost and excessive sun heat, and is worth knowing where such things are raised. To be useful it must, however, be borne in mind that the paper must be dry, otherwise it is useless. The advantages of paper protectors are efficiency, cheapness, portability, and, above all, its plentiful appearance in every house. Waterproofing is both easy and cheap. Boiled linseed oil applied quickly with an ordinary paint brush, dried in the sun, forms an efficient waterproof cover; but if lampblack is mixed with the oil to the consistency of paint, the paper absorbs more heat and thus keeps out the cold better.

HOW TO GROW TRAILING ARBUTUS.

Many have tried and failed to transplant successfully this sweetest of all spring flowers. The writer of the following, in our exchanges, seems to have been at considerable trouble and care to secure the desired end. But, to all true lovers of the May flower, time and trouble count for nothing, if only they can have its fragrant blossoms growing near them.

"I prepared a border of ground on the north side of my woodhouse, one foot in depth and composed of one-third leaf mould from the woods. It was so placed as to receive at the bottom a portion of the drip from the eaves of the

shed. I then procured from two of my friends in different parts of the country, boxes of plants, taken up with a good supply of earth adhering to the roots and carefully packed in moss. Along with these packages of plants I also procured boxes of the earth in which these plants originally grew. This soil was spread over the surface of the border and the roots of the new plants were carefully imbedded in it. The border was well watered and afterward mulched with leaves and moss. A few of these plants died in the course of the summer; but the most of them lived and flourished, as though they had not been transplanted. The following spring found them in good condition, and during the first half of May they furnished a fine display of blossoms.

"The result of these experiments seems to show the direction in which planters should work. It would seem that the Arbutus requires partial shade, a degree of moisture at the roots, a soil free from clay and composed largely of sand and leaf mould. And, to make the matter doubly sure, the plants should have a fair start in the soil to which they are indigenous. In the winter they should have a light covering of leaves and evergreen boughs."

DWARF FAN-PALMS AS HOUSE-PLANTS.

It is universally admitted that the gas and sudden changes of heat and cold in dwellings are destructive to all plants. The *English Garden* says: There is one exception to this rule—the different varieties of Chamaerops, which we have kept in good health and appearance for years in succession, in the worst possible position, both as regards light, heat, and draughts. When these will not live and keep in fair health, the growing of plants may be given up, and a stock should be obtained of the cast-iron aloes which are used to decorate some gardens. It is probable that these last, if painted regularly, would not lose their foliage very easily; but the Palms in question are nearly as easy to keep, and want but little more attention. In fact, they have the constitution of the cast-iron works of art, with the advantage of growing and changing their form every year and being less costly. When all other things fail, try these Palms and, if they do not succeed, plant growing may safely be given up as hopeless. Young plants of the *Chamaerops exelsa* and other varieties are sold for 75 cts., $1.00, $1.50, etc., and large plants for from $5 to $50. They can also be easily raised from seed, but to that end a little patience is needed. The seeds germinate rapidly, and the young plants require no particular care. They are ornamental even when young, but it takes a long time to grow a large plant.

PLANTS AND ATMOSPHERIC HUMIDITY.

Two questions of considerable interest, viz.: that of the effect of living plants on the atmosphere of houses, and that of the relations between forests and atmospheric humidity, appear to have no little light thrown upon them by the ingenious researches of Dr. J. M. Anders, published in the *American Naturalist*. We can not state with any degree of fullness the author's experiments to determine the amount of vapors transpired by plants in proportion to the area of their leaf surface. Suffice it to say that according to these experiments the "Washington Elm," at Cambridge, Massachusetts, with its two hundred thousand square feet of

leaf surface, would transpire seven and three quarter tons of watery vapor in twelve diurnal hours of clear weather. Carrying the calculations further, a grove consisting of five hundred trees, each with a leaf surface equal to that of the elm mentioned, would return to the atmosphere three thousand eight hundred and seventy-five tons of aqueous vapor in twelve hours. Indoors, transpiration is during the day only about one-half as active as in the open air, but at night it is about equal in the two situations; hence the transpiration of a plant indoors is more than one-half as much in twenty-four hours as it would be outside. It follows that growing plants increase the humidity of the atmosphere in closed rooms. This point is very important where the rooms are heated by hot air furnaces. In such rooms the air is drier than in apartments heated by a stove or open fireplace. In a dry atmosphere of the temperature of sixty-five to sixty eight degrees Fahrenheit, a great demand is made upon the system to supply the air with moisture, the skin and pulmonary mucus membrane are dried, and a condition is induced which is expressed in irritability of the nervous system, paleness and susceptibility of the skin to cold, liability to pulmonary diseases, and, in short, deterioration of all the functions. Now, if the presence of a certain number of thrifty plants in an occupied apartment warmed by dry air, would have the effect of raising the proportion of aqueous vapor, it is clear that plants in rooms heated by hot air furnaces would, in an hygienic point of view, be of very decided value since they may become the means of obviating very distressing symptoms, or even disease itself. As for the question of the relation of forest growth to atmospheric humidity, and consequently to rainfall, such relation would appear to be clearly established by the author's researches.—*Popular Science Monthly.*

TO BLEACH OR WHITEN SKELETON LEAVES, FERNS, MOSSES, ETC.

Chloride of Lime, four ounces. Carbonate of Soda, seven ounces. This powder mix with three pints of water, stir it well and let it settle, after which let it filter through filtering paper into a wide mouth bottle or glass jar, add three-fourths water to, or three parts to one part of the Alkali into a suitable dish, lay in the stripped or prepared leaves, and keep them in no longer than they whiten, take them out, lay them in clear fresh water, to remove the alkaline salts, and then lay them in soft paper to absorb the moisture.

HOUSE CULTURE OF BULBS.

Roman Hyacinths, Dwarf Tulips and *Crocuses* are best grown in moss or sand, or in both mixed.

Any bowl, pot or vase will do for this

CROCUSES.

mode of culture. Fill these partly with the moss or sand and on the top of this set the bulbs. Cover them loosely with

the same material and fill the vessel about half full with water and set all in a dark cool closet or cellar.

After the leaves begin to show above the surface, place them where they will get a moderate light, and when the plants assume a healthy green color, to the lightest possible situation in the window. After the flower spikes begin to show, the plants should not lack water.

Dutch Hyacinths.

Chinese Narcissus and *Daffodils* grow best in sand or pebbles, or both mixed.

Take any moderately sized deep bowl that holds water, fill this half full with sand or pebbles and pour sufficient water over this to just cover the pebbles, then place the bulbs on top of these, pushing them down a little with gentle force so that the bulbs will rest about half an inch deep in water. This done, the bowl is set in the lightest place in a window at once; if this be a sunny window, so much the better. Keep adding water to the bowl from day to day as it is absorbed.

Daffodils.

Chinese Narcissus.

A SUCCESSFUL CURE.

To the Editor of "The Aquarium."

As I so frequently see mentioned in your magazine diseases of goldfish, I would like to tell you of an experience I have lately had. I, of course, cannot tell, if the remedy would always prove efficient. I had owned for a year or more a very fine Jap, when suddenly she developed the disease which destroys both tail and fins, and which comes to my fish from time to time.

When I first noticed the trouble, the tail was in shreds and almost entirely gone. I removed her to a cypress tank of small dimensions, filled with an abundance of green, all growing nicely and fed twice a day, on snails only, the small common kind found in our ditches. The cure was complete, the tail as fine as ever, and this was about two months ago and no sign of a return of the disease. Wish I could say with certainty, that the large quantity of growing plants and the snail feeding would prove an infallible remedy.

Very respectfully,

Mrs. J. E. F.

OBITUARY.

Thos. H. Huxley, the famous English naturalist, died in Eastbourne, Engl., June 29, 1895.

Marshal McDonald, U. S. Commissioner of Fish and Fisheries, died at Washington, D. C., Sept. 1st, 1895. He had been in bad health for years—lung troubles. Colonel McDonald, as he used to be called, was a native of Virginia. He was a veteran of the late war, serving on General T. J. Jackson's (Stonewall Jackson) staff with the rank of Major of Engineers. He had been connected with the Fish Commission a great many years under Prof. Baird, and when the Fish Commission was separated from the Smithsonian Institution, after the death of this gentleman, President Cleveland, during his first term, appointed the deceased Commissioner. Mr. McDonald was the inventor of the fishway that bears his name. The Colonel was an extremely pleasant gentleman, a typical Virginian. May he rest in peace.

Drift Wood.

Lady Spencer Clifford, of England, has just passed with honors the examination for a sea captain's license; and if she desires to do so she can now serve as master of any ship on the high seas. But her immediate purpose is to be qualified as captain of her own yacht.

The Green Carnation.—A leading man among florists is reported to have told a lady recently, who applied for an entire decoration of green and white carnations for a debutante dinner, that he had banished them from his greenhouses, as the dye that was used to give them their brilliant green hue was too poisonous to be inhaled by human beings. Another revelation made by this same florist was that a certain worm or microbe, absolutely fatal to the plant, has recently appeared in the American Beauty roses, and that the liquid with which they were syringed to destroy the insect was such a deadly poison that it was no longer safe to bury one's nose in the heart of the flower in order to enjoy its perfume. Alas! says a correspondent, for the happy days when microbes were unknown and human lives seemed to extend themselves out to a very reasonable length without any knowledge of the risks that assail them at every turn.

Telephone Infection.—A special mouthpiece for public telephones has been introduced in Germany with the object of avoiding the spread of disease carried by the condensed moisture of the breath. A pad

composed of a large number of sheets of paper, with a hole in the middle, is inserted in the mouthpiece and the upper disk of paper is torn off after every conversation.

A Large Sunflower.—Mr. Geo. Combs, of Freeport, L. I., has growing on his place a plant of the above with 58 blooms, one individual head being nearly four feet in circumference; the stalk measnres 13 feet in height.

Snails are imported from France to the extent of 200,000 pounds per annum, and are mostly consumed by the French people.

There has been a great deal of discussion of late over the resolution adopted at the last meeting of the American Fisheries Society against stocking private waters with public fish. This practice, which has been general of late, should be stopped for all time. This is not only wrong on principle but it deprives breeders of many dollars which rightfully belong to them. A senator or congressman will send a favored constituent all the fish he may desire and as long as the pond owner enjoys this pull he of course will not buy fry from the breeder.

Sleeplessness in Plants.—It is now pretty well known that many plants belonging to the Leguminosæ and Oxalidæ exhibit the phenomenon termed sleep under certain conditions. When the light wanes in the evening or at sundown, the leaflets of which the leaves are composed fold upwards or downwards as the case may be, and close up generally face to face. When a number of these plants are examined on a bright day, it will be seen that (as a rule) the leaflets place themselves at such an angle that the sun will shine fully upon them. As the sun sinks so do the leaflets, until they are perfectly closed, exhibiting the phenomenon termed sleep. Now should the same plants be examined during daylight on a dull day, the leaflets will be seen to be fully expanded; but should the day be cloudy throughout, the leaflets in the evening will be found either fully expanded or imperfectly closed and sleepless so to speak. The cause of this would be the result of the feeble light during the day, and which has rendered the leaves so dormant, or their function so inactive, that they are less sensitive to the waning light, and consequently do not exhibit the phenomenon of sleep. Fancifully this might be compared to sleeplessness in animals which have not had proper exercise during the day, and consequently cannot sleep. The actual causes are different in the two cases, but the results are very similar, considered in the light that they cannot, or do not, go to rest properly. —*Gardening World.*

All on Account of a Fish.—The beautiful, very old village of Brotterode, in Thueringen (Germany), was entirely destroyed by fire this summer. Investigations have shown that a little boy had caught a little fish in the creek that runs through the village. Desiring to cook it, he started a fire behind a barn. The latter was filled to its capacity with this year's crop; it caught fire and in less than no time it started a blaze that destroyed 360 homes out of the 380 that constituted the village, including the Court House, the Church and the Post Office. 2,300 people are homeless, having lost everything; only a few were insured: two women and two children were burnt to death. The damage to property is estimated at two millions.

In the N. Y. Aquarium the plate-glass fronts of all the tanks on the main floor have been taken out. These plates, although one inch thick, did not stand the pressure of the water and most of them had cracked. The bottoms of the tanks are filled up eighteen inches, thus bringing their bases to the standard height, 36 inches, used in European aquariums. This way the pressure of the water is considerably lessened and the tanks get more appropriate shapes, at the same time bringing the inmates right before the observer's eyes. The glazed white tiles that formed the lining of the tanks have also been removed; a rustic coating will take their place. The work on the roof is also progressing nicely.

U. S. postage stamps are taken in payment for subscriptions to The Aquarium.

For the small sum of one dollar in advance, which pays for a year's subscription to THE AQUARIUM, you are entitled to ask information on any point regarding the aquarium or the window garden. We offer no other premium to our subscribers than than that of putting over 25 years of practical experience in these branches at their disposal. Ask as many questions as you please, but please to enclose postage for reply. All questions are answered by mail, and we publish only such in these columns as are of general interest.

Mrs. C.—Muddy water is to aquatic plants what dusty air (dust) is to terrestrial ones. The sediment stops up the pores of their leaves and consequently smothers the plant. Thus it is essential that the water which is used to fill an aquarium should be as clear as possible. When clear water cannot be obtained from the hydrant it is preferable to clear it by allowing it to settle in some tin or earthen vessel, or to filter it through a primitive bag filter, than to clear it with chemicals or the modern improved filters.

M. G. B.—For this season of the year we would advise the following list of plants, for an aquarium measuring 28 x 28 x 40 inches: sixteen Sagittaria New Era, four Ludwigia Mttii, and two strong Cabomba Caroliniana. If the tank is favorably placed, regarding light, these plants will supply sufficient oxygen for about seventy-five fish.

Mrs. B.—The glass of an aquarium should be fastened with regular aquarium cement, as sold by all first-class dealers in aquarium supplies. This cement should not be used in the same manner, however, as the glazier uses putty when he puts in a new pane of glass in a window frame. It should be used like glue, the cement being between the frame work and the glass. No cement, or at least very little, should come in contact with the water. The bottom of the tank, if of metal, should be painted with our waterproof cement paint; still better than such a coat of paint, however, is a glass bottom, which is easily laid over the metal one. The pane or panes of glass, for it is advisable to make the bottom in sections, as this avoids breaking by the weight of the water, that are to form the lining of the bottom, are imbedded in the same kind of cement and on the same principle as the side and end glasses.

Miss D. K. R.—What you read in our book, "The Goldfish and its Culture," in regard to the coloring of goldfish, is our opinion yet. When the young goldfish are about the size of a squash or pumpkin seed, it is safe to put them in the aquarium together with the old ones, provided that these are not too large; in that case they would swallow the little ones alive. Don't be in too great a hurry to put them with the old fish; they will not add greatly to the attractiveness of your aquarium, but will be in great danger of their lives. Why not keep them by themselves until they are about an inch in length? It affords a great deal of pleasure to raise young fish in a nursery tank. They will have to be fed regularly, to be sure, but just such little duties make fish-keeping so interesting. Their tank should be supplied with aquatic plants, etc., just as carefully as a tank intended for larger fish.

Mrs. K.—Ferns that have been grown in pots can be best kept by plunging in a cold frame or pit; a frame sunk below the surface in a shady or partly shady spot is best suited for this purpose. After severe cold sets in they should be covered with leaves or some other light material, which covering must be removed as soon as severe frost is over to prevent too soft a growth, as there is more danger from that source than from actual freezing.

Plants in rockeries can be left undisturbed if slightly covered with leaves. The protection must be carefully removed as soon as hard frost is over.

The Title page and Contents for Vol. III. accompanies this number as a supplement.